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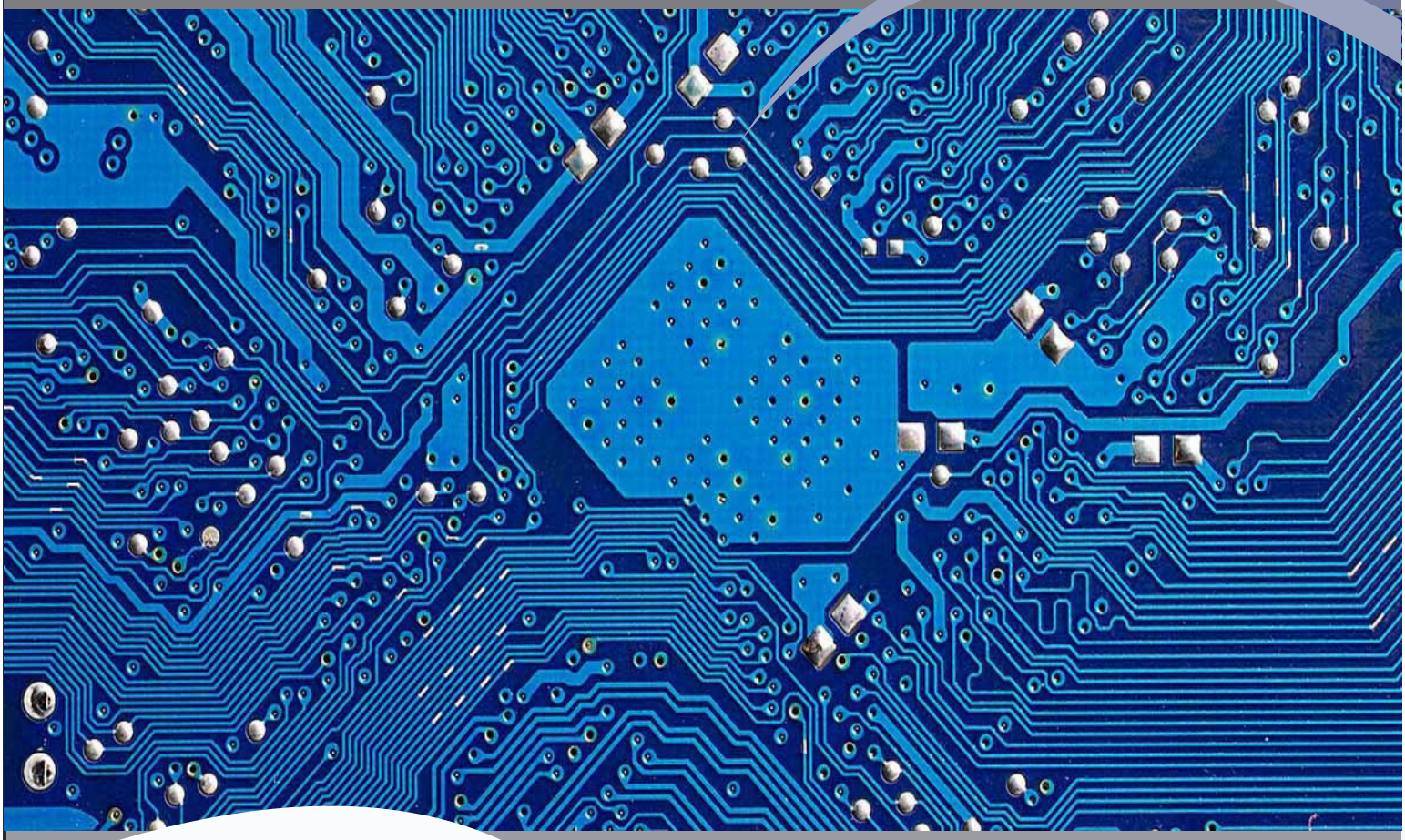

(ICEECS-2012)
28th October, 2012
CHANDIGARH, India

Interscience Research Network (IRNet)
Bhubaneswar, India

SELF OPTIMIZING KERNEL WITH HYBRID SCHEDULING ALGORITHM

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Abstract— In this paper an operating system with a unique Hybrid scheduling algorithm (HSA) is proposed. The HSA incorporates the scheduling policies of both Round robin and priority based scheduling techniques along with a smart kernel which will self-optimize the system by providing a variable time slice to the tasks. The objective of developing this operating system is to improve the system efficiency and with an optimized usage of the resources available for the tasks, radically in terms of context switches and average waiting time.

Keywords*: Operating system, Hybrid scheduling algorithm, Self-optimize , variable time slice, context switcing.*

I. INTRODUCTION

An operating system is basically an interface between applications and physical resources. Operating Systems are basically classified under two major categories, Real Time Operating Systems and General Purpose Operating Systems.

A Real Time Operating System is the one which is deterministic in terms of its application and is very time sensitive whereas, General Purpose Operating System is the one which is non-deterministic, time insensitive and the one which can use virtual memory concept. Here an RTOS should be pre-emptible to enable multi-tasking. A system of priority inheritance has to exist along with a proper estimate of the interrupt latency so that we can have an optimized scheduling algorithm with which we can carry out two major functions of multi-tasking and resource guarding which will in turn affect the task handling capacity and improve the efficiency of the operating system making it more reliable.

II. FUNCTIONS OF KERNEL

A. Context Switching:

Context Switching is the process of switching over from one process to another in as operating system environment. The context consists of all the things that define the state of the process and the processor. This varies depending upon the architecture of the processor and the operating system constraints. Usually the context consists of the Program Counter, the Stack Pointer, all CPU registers. The entire context is saved on the process stack during the context switch.

Steps of Context Switching:

- Scheduler Interrupt arrives.
- All context of the current process is saved onto current process stack.
- The kernel is executed and scheduler is called.
- The scheduler determines the next process to be executed.
- The stack pointer is changed to the top of stack of the new process
- The context of the new process is popped from the process stack.
- Return from Scheduler Interrupt

B. Resources Guarding:

Resource guarding is a critical function of any operating system kernel. The kernel has to allocate resources to processes as and when the processes request them. If a particular resource is not available then the kernel cannot allow the process access to that resource. The process will then take appropriate action or the kernel will block the process from execution. For example if two processes request for a USART access then only one (whichever requests first) will get access to the USART. The kernel cannot allow both the processes to access because they will corrupt each other's communication. This is accomplished by programming practices like semaphores and mutexes. Situations like the 'Dining Philosophers Problem must also be handled by the kernel by effective manipulation of the semaphores.

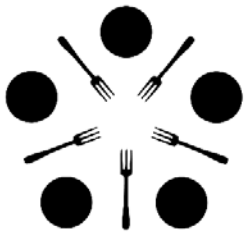


Figure (a) Dinning Philoshophers Problem

III. SCHEDULING ALGORITHMS

Whenever we have more than one task to handle, its necessary to decide the task that has to be executed and proper resource allocation so that we can avoid

the condition of deadlock. Some of the traditional scheduling algorithms are:

A. Shortest Job First:

In SJF priority is associated with each process, and the CPU is allocated to the process with the highest priority. Equal-priority processes are scheduled in FCFS order. An SJF algorithm is simply a priority algorithm where the priority (p) is the inverse of the (predicted) next CPU burst. The larger the CPU burst, the lower the priority, and vice versa. Here the execution of the task is also decided by the waiting time of the task.

Here we can take the following as an example of the SJF scheduling algorithm.

	Burst		Waiting	Turnaround
Process	Time	Priority	Time	Time
P_1	10	3	6	16
P_2	1	1	0	1
P_3	2	4	16	18
P_4	1	5	18	19
P_5	5	2	1	6
Average	-	-	8.2	12

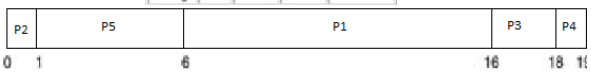


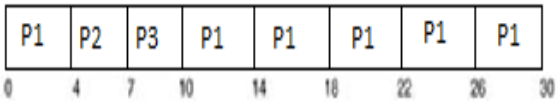
Figure (b) SJF

Thus according to the burst time and the waiting time in the above example task P2 is executed first and P4 at the end.

B. Round Robin scheduling algorithm:

The round-robin (RR) scheduling algorithm is designed especially for time-sharing systems. It is similar to FCFS scheduling, but pre-emption is added to switch between processes. A small unit of time, called a time quantum or time slice, is defined. A time quantum is generally from 10 to 100 milliseconds. The ready queue is treated as a circular queue.

	Burst	Waiting	Turnaround
Process	Time	Time	Time
P_1	24	6	30
P_2	3	4	7
P_3	3	7	10
Average	-	5.66	15.66



Figure(c) Round Robin

The above is an example which illustrates the round robin scheduling algorithm in which the time slice for a task is of four units. Here a task after being serviced for the provided number of time slices will have the lowest priority. Thus the above tasks will be executed in the order shown in figure (c).

IV. HYBRID SCHEDULING ALGORITHM

Many of the traditional algorithms concentrate on either varying the time slice provided or varying the priority of the task in order to implement task handling efficiently. Ours algorithm brings in a new concept of combining static prioritized scheduling with sub priorities to be executed in a round robin pattern. Our novel Hybrid Algorithm expands the domain to schedule to a high priority task in a proficient way.

Time Slice =100

		C0	C1	C2	C3	C4	C5	C6	C7
P0 (highest)	0	0	0	0	0	0	0	0	0
P1	0	0	0	0	0	0	0	0	0
P2	1	0	1	0	0	0	0	0	0
P3	0	0	0	0	0	0	0	0	0
P4	1	0	0	1	0	0	1	0	0
P5	1	0	1	0	0	0	0	0	0
P6	0	0	0	0	0	0	0	0	0
P7 (lowest)	1	0	0	0	0	0	0	0	0

Array Check

0	1	2	3	4	5	6	7

Eight available tasks in each priority level

Figure (d) HSA

The above figure illustrates the Hybrid Scheduling Algorithm, in which we have eight static priorities and each static priority has eight sub-priorities. To recognize the task which has the highest priority we have a concept of array check.

A. Array Check

Here we have an 8x8 matrix to represent occurrence of 64 different tasks. Further, to represent every row we have an 8x1 array. The array check is used to represent occurrence of a task in any row. According to the figure (d) the priority of task in row P0 is the highest and in P7 is the lowest.

B. Sub-Priority

In a row we have 8 different tasks with same priority. These tasks are scheduled in a round robin pattern based on the sub priority with C0 as the highest and C7 to be the lowest.

	Burst	Waiting	Turnaround
Process	Time	Time	Time
P2 ,C1	215	10	225
P4 ,C2	160	10	170
P4 ,C5	424	10	434
P5 ,C1	300	10	310

Figure (e) Tasks

The above figure (e) shows the sorting of the tasks as shown in figure (d) with respect to their priorities. The bits in the array check shown in figure (d) are used to identify the row in which tasks with the highest priority are available. It then checks for columns for the highest sub priority task which will be then executed.

Tasks ready in the same row are circularly queued for execution. Thus according to the algorithm P2,C1 will be executed first. The tasks P4,C2 and P4,C5 will be executed in round robin pattern after execution of P2,C1 and the task P5,C1 will be executed in the end.

V. SELF OPTIMIZATION IN HYBRID ALGORITHM

A general idea of improving on scheduling policy in a system seems inadequate. Hence we came up with a concept of self-optimization. The unique and effective idea of self-optimization during the task handling will be removal of the time taken by the kernel to shift between two tasks. Here, self-optimization will require a large number of samples of time slices required to get the task done or the amount of system ticks after which the task terminates itself. Based on these values factors like range, threshold and mean are calculated. These values are used to decide the self-optimizing factor.

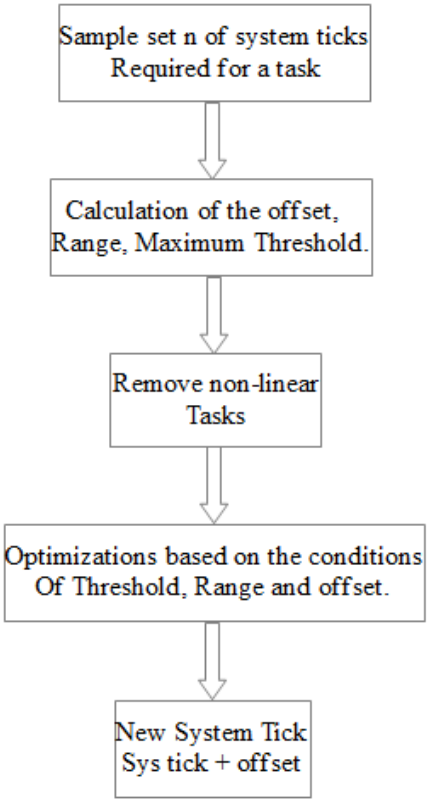


Figure (f): Flow Chart for Self Optimization.

The following figure shows execution of the tasks as per the suggested Hybrid Scheduling Algorithm with self-optimization, taking into account the priorities in both the rows and columns for problem in figure (e).

-	P2,C1	P2,C1	P2,C1	P4,C2	P4,C5	P4,C2	P4,C5	P4,C5	P4,C5	P4,C5	P5,C1	P5,C1	P5,C1
10	110	210	225	325	425	485	585	685	785	809	909	1009	1109

Figure (g)

Increasing the sample space and considering non-liner factors we can further improve the self-optimization factor. We are still working on process of incorporating various other factors like event t_max, event t_min and the above mentioned non-linear factor to further improve the process of self-optimization and implement it on a larger scale. Let us consider an example as shown in the figure (h) below for task1 to task4

Task1	100	100	10	100	100	15	100	100	14	100	100	13
Task2	100	100	100	20	100	100	100	25	100	100	100	23
Task3	100	10	100	100	10	100	100	100	12	100	100	100
Task4	100	20	100	40	100	50	100	35	100	10	100	50

Figure (h)

Taking modulous for all the system ticks we get

Task1	0	0	10	0	0	15	0	0	14	0	0	13
Task2	0	0	0	20	0	0	0	25	0	0	0	23
Task3	0	10	0	0	10	0	0	0	13	0	0	0
Task4	0	20	0	40	0	50	0	35	0	10	0	50

Figure(i)

The various deciding factors are:

Task	Range	Mean	Standard Deviation
Task1	5	13	3.74
Task2	5	22.67	3.55
Task3	3	11	2.23
Task4	40	31.17	37.77

Table (1)

Considering linear system with factors like mean and standard deviation:

Offset = Mean + Range

For the above tasks the offset values are

Task	Offset	Self-optimization
Task1	18	Yes
Task2	27.67	Yes
Task3	14	Yes
Task4	-	Non-linear system

Table (2)

VI. PARAMETERS FOR SELF OPTIMIZATION

- Range: After taking the modulus of the system ticks (Burst- time) with the time slice provided to the task , the maximum difference between non-zero values is known as range.
- Mean: The average of non-zero entities after taking the modulous is known as mean.
- Threshold (T_max): The maximum value of the non-zero enity after taking the modulous for which optimization is performed .
- Event T_max and Event T_min: The number of occurances of T_max and T_min respectively.
- Offset: Offset is self-optimizing factor which is integrated with the time slice to achieve optimization. The value of offset is the main factor to increase the effeciency of the system.

VII. COMPARISION BETWEEN ROUN-DROBIN, SJF & HSA WITH SELF OPTIMIZATION

A. Optimised Hybrid (HSA)Vs round robin

Consider the example of four tasks taken earlier in figure (e) where burst time is defined. The tasks will be serviced in a different way for different algorithms, it is as follows:

Round Robin

P2 C1	L	P4 C2	L	P4 C5	L	P5 C1	L	P2 C1	L	P4 C2	L	P4 C5	L	P5 C1	L	P2 C1	L	P4 C5	L	P5 C1	L	P4 C5	L	P4 C5
10 - 110	10	120 - 220	10	230 - 330	10	340 - 440	10	450 - 550	10	560 - 620	10	630 - 730	10	740 - 840	10	850 - 865	10	875 - 975	10	985 - 1085	10	1095 - 1195	10	1205 - 1229

Hybrid Algorithm with Optimization

P2 C1	L	P2 C1	L	P4 C2	L	P4 C5	L	P4 C2	L	P4 C5	L	P4 C5	10	P4 C5	L	P5 C1	L	P5 C5	L	P5 C1
10 - 110	10	120 - 235	10	245 - 345	10	355 - 455	10	455 - 515	10	525 - 625	10	635 - 735	10	745 - 869	10	879 - 979	10	989 - 1089	10	1099 - 1199

Figure (j)

As we can see that the number of system ticks required for executing all the four tasks in round robin type scheduling is more than the system ticks required in HSA with optimization. Here in the above example we have saved 30 system ticks, 0.024% of the total system ticks is saved when we used HSA in place of round robin for scheduling the tasks. For 'n' times execution of the tasks the saved ticks would be '30*n'.

B. Optimised Hybrid (HSA) Vs Shortest Job First

Shown below in the figure (k) is the task scheduling scheme using Optimized Hybrid Scheduling Algorithm and Shortest Job First scheduling algorithms for the problem in figure (e).

Shortest Job First

P2,C1	L	P4,C2	L	P4,C5	L	P5,C1
10-170	10	180-395	10	405-705	100	805-1129

Hybrid Algorithm with Optimization

P2 C1	L	P2 C1	L	P4 C2	L	P4 C5	L	P4 C2	L	P4 C5	L	P4 C5	L	P4 C5	L	P5 C1	L	P5 C5	L	P5 C1
10 - 110	10	120 - 235	10	245 - 345	10	355 - 455	10	455 - 515	10	525 - 625	10	635 - 735	10	745 - 869	10	879 - 979	10	989 - 1089	10	1099 - 1199

Figure (k)

Here the SJF alogirthm executes the tasks in less number system ticks but it does not switching to the other task untill it executes the task with comparivtively low burst time first. This gives you low flexibility as the programmer. Here the priority is always decided by the burst time which might not work well for various applications. All the above drawbacks are covered well in the optimized HSA algorithm.

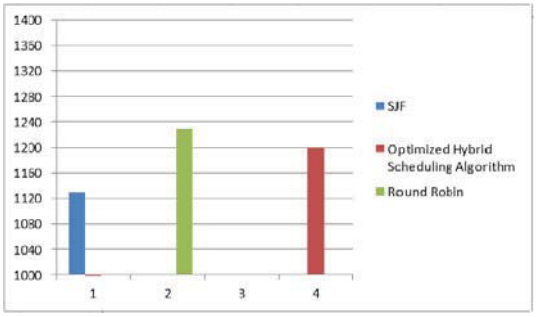


Figure (l): Comparison

The above graph shows the comparison for the various scheduling algorithms i.e. The SJF, Optimized HSA and Round Robin.

VIII. EXPERIMENTAL AND THEROITICAL RESEARCH

We are currently developing a Real Time Operating System based on our hybrid scheduling algorithm. We aim to be able to introduce a new task at runtime without any change in current execution. We have worked on an auto-optimization algorithm that will increase the overall efficiency of the operating system. We are trying to incorporate non-linear factors and other variables like Event_Tmax and Event_Tmin to further improve the efficiency of the system. For our RTOS we have chosen an LPC1768 microcontroller by NXP. The LPC1768 uses the ARM cortex-m3 architecture. This architecture provides us with an on chip dedicated 24 bit system tick timer which we use as our kernel timer. This microcontroller has an NVIC (Nested Vectored Interrupt Controller). It allows high priority interrupts to preempt low priority interrupts. It also supports Tail-Chaining and reduces the latency period.

IX. CONCLUSION

From the above experimental analysis it is clear that the proposed Hybrid Scheduling algorithm has advantages in terms of the user having more freedom in terms of priorities and it is more efficient when combined with the concept of self-optimization of the system.

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AUTOMATION OF A DRY STEAM GEOTHERMAL POWER PLANT

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Abstract- The power sector in India have grown up to 2, 06,456 MW, as a result of which fossil fuels are depleting at a fast rate. Studies have shown that India is having a geothermal energy potential of about 10600Mw [1].The top hundred geothermal energy sources have potential of about $40*10^{18}$.cal which is equal to 27.6billion barrels of petroleum and about 5730 million tons of coal energy.

Small geothermal power plants in these zones can play a vital role to meet the rising demand of power across India. These geothermal plants should be efficient, they should be safe and the power generated must be cheap.

For these reasons an attempt has been made in this paper to automatically control the generation of a geothermal power plant. For this purpose Programmable Logic Control (PLC) has been used.

The PLC was invented in response to the needs of the American automotive manufacturing industry. In 1968 GM Hydrometric (the automatic transmission division of General Motors) issued a request for proposal for an electronic replacement for hard-wired relay systems [2]. The main reason for using PLC is cost effectiveness and safe operation. It can be used for full plant automation.

This includes speed control, load control, excitation control, turbine governing system, cooling towers, heat exchange mechanism, and control of the pump of the production well. It can be used for data recording, instrumentation and for protection purpose.PLC can also be used for remote operation as well as for continuous recording of data [4], for which only a simple pc interfaced with PLC is needed.

1. INTRODUCTION:

Geothermal energy is the energy stored inside earth's surface in the form heat. And that heat is used for the generation of electrical energy. Geothermal power plant has many things in common with traditional thermal power plant. They use same components like turbine, heat exchanger, generator and other standard power generating equipments, which are used by a traditional thermal plant. When water is pushed into an injection well, depending on the temperature underneath the surface, the fluid which comes out can be steam, brine or a mixture of both. Pressure and temperature are not same for all the heat reservoirs, similarly the chemical composition of the resources also varies from place to place. Depending on the temperature underneath the surface type of geothermal power plant varies.

1.1 ***Flash Steam Power Plants*** *:*
They have reservoirs with water between 148 and 371 C. This water comes up from the well and is converted into steam, which powers a turbine.

1.2 Binary cycle power plants**:** They have have reservoirs with water between 121 and 182 C, which is not quite hot enough to generate enough steam to power a turbine. The water which is heated is used to heat another liquid with lower boiling point which produces steam, which rotates the turbine.

1.3 Dry steam power plants They have reservoirs which can produce steam because of the high temperature but not water. The steam is piped directly into the plant, where it spins a turbine. All types of geothermal power plants have no emissions and can produce a huge amount of power. Another advantage with geothermal power is that the size of the power plant can be extended from 100 kilo watts to hundred Mw.

Out the above stated geothermal power plants in this paper automation of a dry steam geo thermal power plant has been discussed using PLC. PLC is an industrial computer used to monitor inputs, and depending upon their state make decisions based on its program or logic, to control its output to automate a machine or a process.

2. NEED FOR THE AUTOMATION FOR A DRY STEAM GEOTHERMAL POWER PLANT:

1. In a dry steam geothermal power the temperature of the steam is very high; it is around 500degrees [3].So for safety purpose it will be good if it is automatically controlled by PLC.
2. The operation cost will decrease significantly [5].
3. It will provide more adequate and smooth operation.
4. Generally dry steam geothermal power plants are located in remote areas, so manual control is difficult.

So here PLC has an application for automatic control.

3. OPERATION OF A DRY STEAM GEOTHERMAL PLANT:

Geothermal power plant which uses hydrothermal fluid (which are dry) are called dry steam geothermal power plant.dry steam comes from a production well This dry steam is directly used in the turbine.

According to the operation of the dry steam geothermal power plants are of two types.

3.1 Simplified atmospheric exhaust cycle:

Here after the dry steam hits the turbine, it goes out into the atmosphere [11].

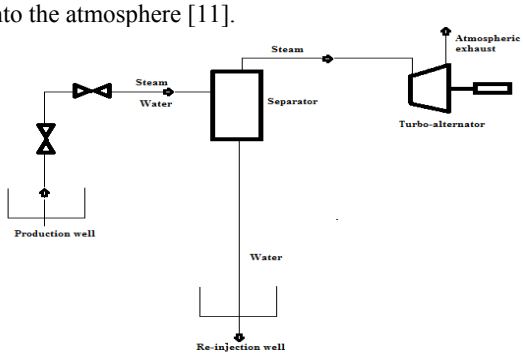

Fig.1 Schematic diagram for simplified atmospheric exhaust cycle

3.2 Wet steam fluid condensing cycle:

Here after the dry steam hits the turbine instead of discharging into the atmosphere it is sent to a condensing chamber. From where it is sent to the cooling towers [11]. Because of pressure drop much more power is produced by a given steam flow.

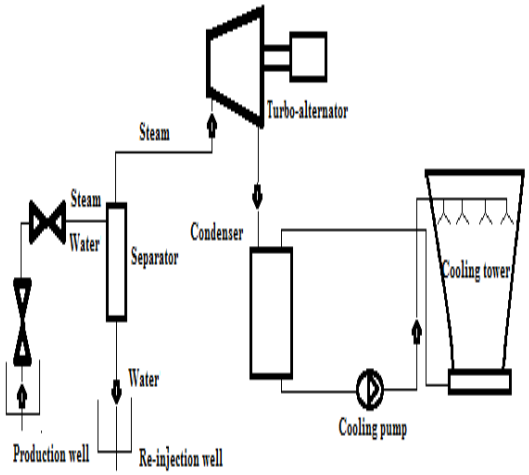

Fig.2 Schematic diagram for wet steam fluid condensing cycle

4. AUTOMATIC CONTROL OF A DRY STEAM GEOTHERMAL PLANT:

4.1 Governor system control:

One contractor, one counter, two NO type switch, and two NC type switch is used. Here tachometer or other rotation sensor [8] which will give input (I002) to the logic model in an abnormal condition is used.I001 is a normally closed switch, as a result the contractor is exited and the counter starts counting till a certain value. After this the switch I001 becomes normally open which will result in the resetting of the counter.

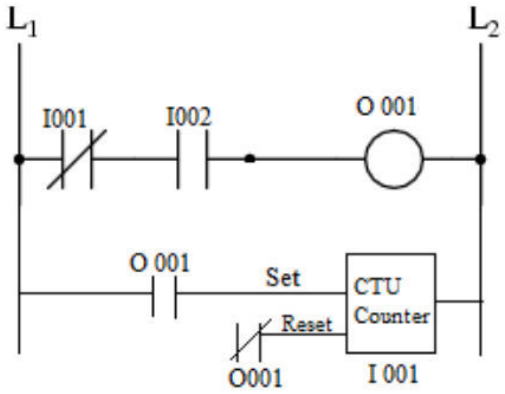

Fig.3 Scheme for Governor System control

4.2 Automatic control of the separator:

Here four normally open switches, five contractor, two normally closed switches are used for the safe and automatic control of the separator in a dry steam power plant. When supply is given,(O000) which refers to the valve V1 in the fig5. is excited. Which then excites (O 001).This (O 001) represents V1 in the following diagram. Till this is the normal operation of the dry steam geothermal power plant. But as the ground water contains a lot of mineral salts, it might happen that the separator gets blocked. In that case the pressure sensor [9] inside the separator will give a signal to (I002).Which causes the coil (O002) to get excited.O002 represents the valve V2 in the following figure. When the pressure P2 inside the second separator goes beyond a certain value,(I003)which is a normally open switch, is closed. This excites the (O003) coil.O003 then ultimately opens the valve T2 (O004) and closes V1 and T1 using normally closed switches O003.

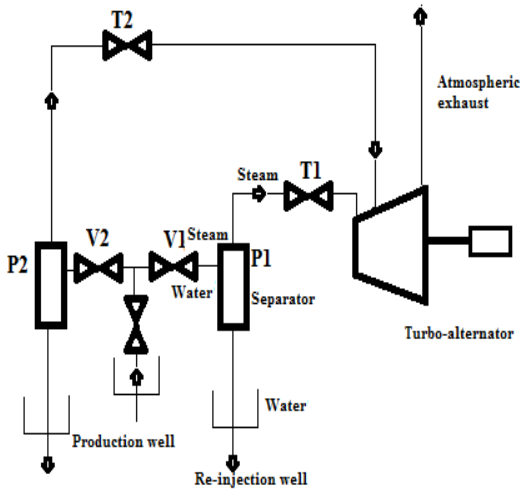

Fig.4 Sch. Dig. for automatic control of separator

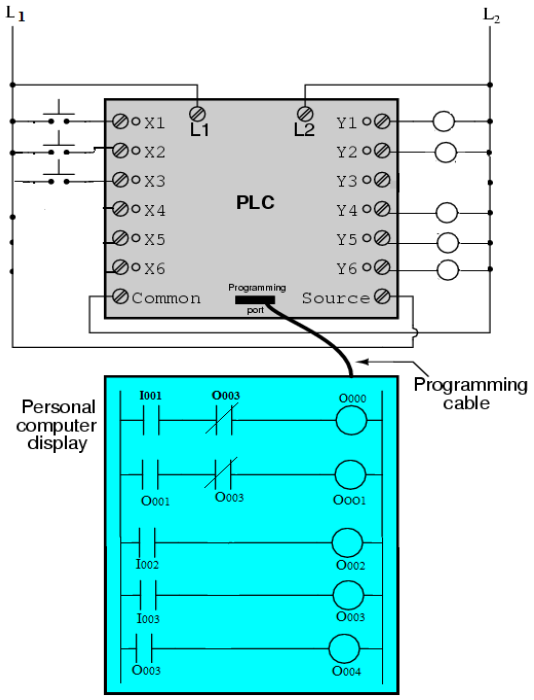

Fig.5 Scheme for automatic control of separator

4.3 Leakage and seal protection:

In a geothermal power plant, if there is any leakage in the pipes may have serious consequences.

For this slide valves are used. To sense any leakage of steam, water or oil proximity sensors [8] can be used. This will give an output signal to the logic model its output is the input (I001) of the logic circuit and it energize the contractor coil (O001) which is connected to the emergency slide valve, and it will provide protection to the system. When the coil O001 is energized normally open switch O001 is closed and it rings an alarm, which is represented by O002 in the fig 6.

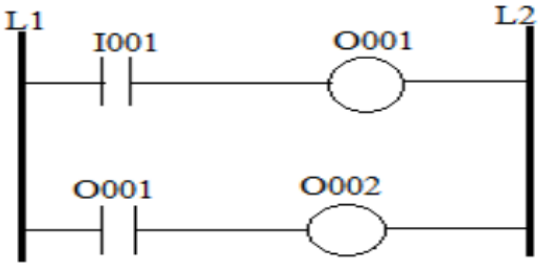

Fig.6 Leakage and seal protection scheme

4.4 Generation system control using programmable logic controller:

In the fig.7 Automatic voltage control scheme is shown. In this diagram it is shown that the voltage that is generated is fed back to the auxiliary transformer which steps down the voltage to a low level. That voltage is rectified to dc using a three phase controlled rectifier. If there is a sudden increase in load, the voltage will drop. Thus to maintain constant voltage the exciter output is controlled using a three phase controlled rectifier. The firing angle can be adjusted so as to maintain constant output voltage from the generator. $V_{err}=V_{ref} - V_{gen}$

Here the error voltage should be reduced to zero. The output voltage is given by the equation (1) [12] used.

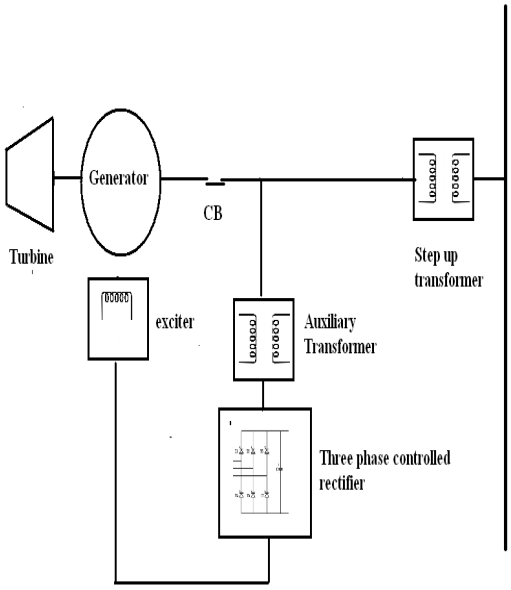

Fig.7 Electrical configuration schematic

$$V_{out} = (3*V_m/pi)*\cos\alpha \qquad (1)$$

The output voltage can be controlled by varying the firing angle α.So such a ladder diagram can be made where the voltage will be sensed, compared and the firing angle be adjusted such that the error voltage be reduced to zero. For the purpose of sensing the voltage, potential transformers and current transformers [7] can be used. PLC component like switch, counter, timer, contractor etc [6] can be used.

5. ADVANTAGE OF AUTOMATIC CONTROL IN A DRY STEAM GEOTHERMAL POWER PLANT:

a) Reduction in total work force, so there is a reduction in running cost of the plant.
b) Flawless operation, Unwanted human errors can be reduced to huge extent [10].
c) Safe operation of the plant.
d) With the use of PLC the plant can be remotely operated.
e) Self rectifying, the system can identify the flaws in the system and can rectify them.
f) Improvement in the performance of the system.

6. CONCLUSION:

The automatic control of a dry steam geothermal power plant, from what has been said till now, can be said as much more economical and efficient than conventional system. For this purpose PLC has been used.

(a) Digital control and automatic control of a dry steam geo thermal power plant has many advantages over conventional operation. Such as safe operation, low running cost, increased efficiency.

(b) It is flexible to future changes. Any kind of changes in the program can be made even when PLC is connected to the system. So there are no interruptions in the operation of the plant.

(c) PLC is having thousands of software relays, so the total number of hardwired relays is reduced. So is the reduction in the total cost.

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TRANSMISSION EXPANSION PLANNING WITH WIND FARM IN DEREGULATED ENVIRONMENT

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Abstract: Nowadays modern electric power systems consist of large-scale and highly complex interconnected transmission systems, therefore, transmission network expansion planning (TNEP) is now a significant power system optimisation problem. The TNEP problem is a large-scale, complex and nonlinear combinatorial problem of mixed integer nature where the number of candidate solutions to be evaluated increases exponentially with system size. The accurate solution of the TEP problem is essential in order to plan power systems in both an economic and efficient manner. In recent years a number of techniques have been proposed to solve this efficiency issue. Such methods include algorithms inspired by observations of natural phenomena for solving complex transmission expansion problems. These algorithms have been successfully applied to a wide variety of electrical power system problem. In recent years, more and more inter connected large scale wind farms and ongoing deregulated environment take many challenges to transmission network expansion planning (TNEP). The renewable energy sources such as wind farms have the privilege to inject their power firstly. The total load demand is subtracted by wind farm output and the remaining load demand is met by the conventional generator power output.

NOMENCLATURE

k : Shape factor
c : Scale factor
σwind : standard deviation of wind speed
Ewind : mean value of wind speed
P : Power

Prate : Rated power of wind turbine
V : Wind Speed
Vci : Cut-in value of wind speed
Vco : Cut-out value of wind speed
Vrate : Rated value of wind speed
Ei : Novel introduced index
Ii : Profit prospect of transmission line i
Ci : Cost of transmission line i
E(Pi) : Expected actual power flow
Di : Distance

1. INTRODUCTION

The purpose of transmission network expansion planning (TNEP) is to determine an optimal network scheme which can satisfy the power transmission demand with minimum investment cost. It is a complex task because there are many uncertainties such as load variations, generator rescheduling, electricity market competitions and availability of system facilities. Consideration of uncertainties in TNEP is of utmost importance so as to obtain a robust transmission scheme and to reduce the risk of system operation. In these years, two noteworthy and larger uncertainties occurred. Firstly, more and more highly variable renewable energy source, such as large-scale wind farm, are connected to power system. Secondly, the ongoing deregulation of power system leads extra operation variations. It is clear these two new uncertainties make TNEP problem more complicated. Wind energy is a source of renewable power which comes from air current flowing across the earth's surface. Wind turbines harvest this kinetic energy and convert it into power. In recent years, many large-scale wind farms are built and connected to power system for hike of fuel price and more concern about greenhouse effect.

However, wind power is variable and intermittent and it therefore introduces an extra factor of uncertainties for power system operation and planning. The variable characteristics of wind power are similar to those of the loads, in that both of them are uncontrollable. The network with large proportion of wind power will have more power flow fluctuations. Therefore, the deterministic TNEP methods, which only account for one operation scenario, are unsuitable for the planning with stochastic power output from wind turbine generators (WTGs). In recent years, more and more inter connected largescale wind farms and ongoing deregulated environment take many challenges to transmission network expansion planning (TNEP). These challenges lie not only on more uncertainties of power flow in network but also on difficulty to compromise behalf of all new key stakeholders of power utilities. TNEP with the consideration of uncertain WTG power generation is important but the problem has not been thoroughly analyzed until now. Only evaluations considering system reliability and different investment schemes have previously been attempted [1]. This paper proposes a

probabilistic approach and analytic algorithm for TNEP [2] consideringWTG output fluctuations.

2. PROBABILISTIC APPROACH

2.1 Probabilistic WTG Output model

Wind speed affects the output ofWT Gand it fluctuates significantly during the operating period of WTG. Owing to unsteady wind speed, the power output of WTG may vary between zero to its rated output and hence leads to fluctuations in the power flow in the network. As both accurate wind speeds and precise WTG outputs are difficult to forecast, they can be better modeled probabilistically. Weibull distributions have been widely used to represent the wind speed [3], [4], and he shape parameter and scale parameter of the distributions can be derived from the mean and standard deviation of wind speed [5].

$$k = (\sigma_{wind}/E_{wind})^{-1.086} \quad \ldots\ldots\ldots\ldots (1)$$

$$c = E_{wind}/\Gamma(1+1/k) \quad \ldots\ldots\ldots\ldots (2)$$

Where Ewind and σwind are mean value and standard deviation of wind speed respectively The power output characteristics of a WTG are nonlinear with respect to the input wind speed. The relationship between wind speed and WTG output can be described by the following equations:

$$P=0 \quad \text{if } (V>=0 \;\&\&\; V<Vci) \ldots\ldots\ldots\ldots\ldots (3.1)$$

$$P = Prate*(V-Vci)/(Vrate-Vci) \quad \text{if } (V>=Vci \;\&\&\; V<Vrate) \ldots\ldots\ldots\ldots\ldots (3.2)$$

$$P=Prate \text{ if}(V>=Vrate \;\&\&\; V<Vco) \ldots\ldots\ldots (3.3)$$

$$P=0 \quad \text{if } (Vco< V) \ldots\ldots\ldots\ldots\ldots (3.4)$$

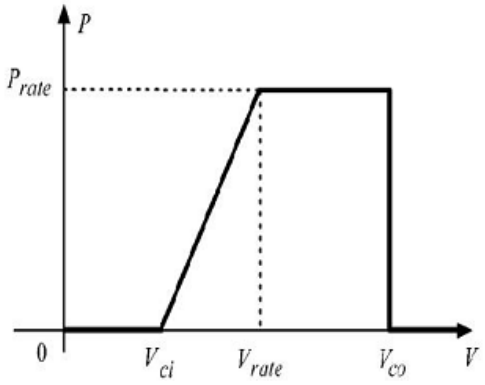

Fig. 1 Relationship between Wind speed V andWTG Output Power P

2.2 Power Output of WTG

The output power of the wind turbine generator (WTG) is calculated as per the formula given in equation (4). The output power of the wind farm is given by the sum of output power of individual WTG.

$$P = \tfrac{1}{2} * \rho * V^3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where, P = wind power [W/m2] ρ = 1.225 (the density of dry air, [kg/m3], the average atmospheric pressure at sea level at 150 C) V = wind speed, [m/s] The probability distribution for the wind power data is carried out by writing a program and by making use of curve fitting in the matlab environment [6]. First of all probability density functions for wind power is obtained. The Probability density function curve of wind power is shown in Fig. 2. Then with the help of curve fitting tool Weibull Probability Distribution Curve for wind power is obtained. The Weibull Probability Distribution Curve for wind power is as shown in Fig. 3

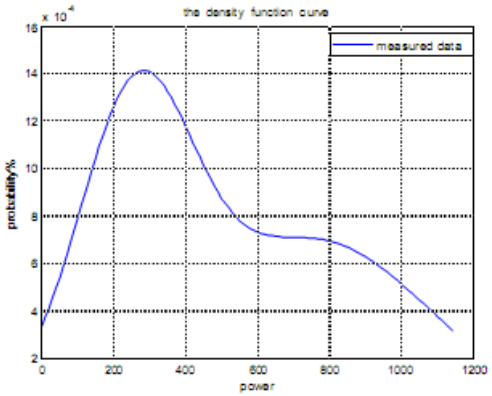

Fig. 2 Probability Density Function Curve of wind power

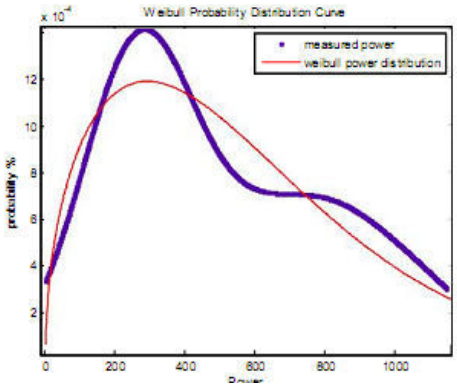

Fig. 3 Weibull Probability Distribution Curve for wind Power

3. ANALYTIC ALGORITHM

The new challenges arising from the power market and inter connected large-scale wind farm are considered which led to the modification of traditional step-by-step retroversion TNEP model [2]. First of all a suppositional network is obtained by adding all alternative lines in transmission. This suppositional network is a redundant network, many

lines in which are of low efficiency from the viewpoint of economy. These low efficient lines are removed from the network in order to obtain the desired network.

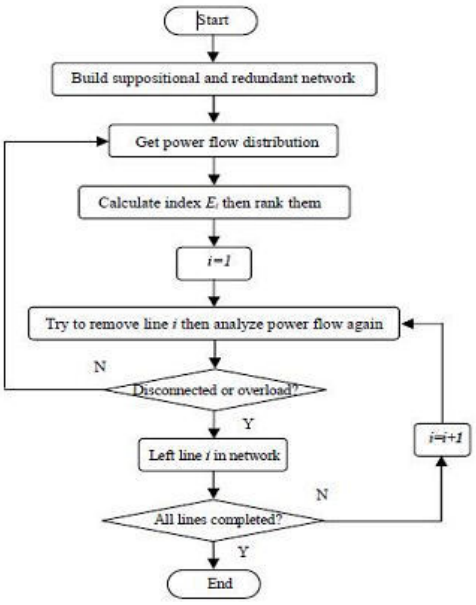

Fig. 4 Flowchart of algorithm for TNEP The main objective of TNEP is to minimize the investment. But in deregulated environment, TNEP would be rather market-oriented, in which investment and profit prospects would be equally concerned. For evaluating the economy efficiency of each alternative line, a novel index Ei is introduced which can be obtained obtained by following equation:

$$Ei = Ii / Ci = [E(Pi)* Di* \rho] / Ci \ldots\ldots\ldots(5)$$

Where, Ii is profit prospect of alternative line i, Pi expected actual power flow, the distance Di, and the pre- determined unit cost ρ of each transmission line. Ci is the cost of transmission line i. If Ei is bigger than Ej, it means line i is more efficient in economic than line j. In order to get optimum expansion scheme, low efficient candidate lines should be removed from redundant network step by step until the final planning scheme is obtained. In this process, some low efficient alternative lines should be held in network for their important roles in insuring system reliability

4. RESULTS

The results are showed in this section to demonstrate the performance of proposed analytic algorithm on the modified Garver six bus test system. Presented in Fig. 5, the original Garver six-bus test system consists of three generators at buses 1, 3 and 6. The forecasting load is 760 MW, distributed unevenly among the buses. Originally, the system has a total of 6 transmission circuits.

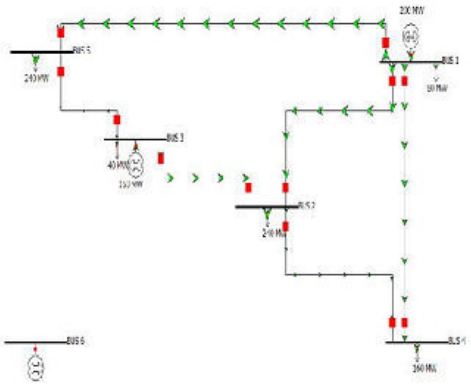

Fig. 5 Initial configuration of Garver six bus test system

Some modifications are carried out to this famous test system. Firstly generator connected to bus 3 is assumed to be a large-scale wind farm, which is consisted of several WTGs subjected to the same wind regime. Then generators connected to bus 1 and 6 are assumed to be thermal units with increasing function cost, whose parameters are shown in Tab.1.

Tab.1 Parameters of thermal units

S. No.	Gen. No.	Capacity
1	1	200
2	6	600

The Redundant Garver's six bus system having all the right of ways (15 ROW) is as shown in Fig. 6 and the parameters of all the transmission lines are shown in Tab.2.

Tab. 2 Parameters of transmission lines

S. No.	Circuit	Resistance (R) Per unit	Reactance(X) Per unit
1.	1-2	0.10	0.40
2.	1-3	0.09	0.38
3.	1-4	0.15	0.60
4.	1-5	0.05	0.20
5.	1-6	0.17	0.68
6.	2-3	0.05	0.20
7.	2-4	0.10	0.40
8.	2-5	0.08	0.31
9.	2-6	0.08	0.30
10.	3-4	0.15	0.59
11.	3-5	0.05	0.20
12.	3-6	0.12	0.48
13.	4-5	0.16	0.63
14.	4-6	0.08	0.30
15.	5-6	0.15	0.61

CASE 1

In this case the capacity of large-scale wind farm connected to bus 3 is 150MW. The optimum TNEP scheme is obtained with proposed algorithm. The best scheme is shown in Fig. 6

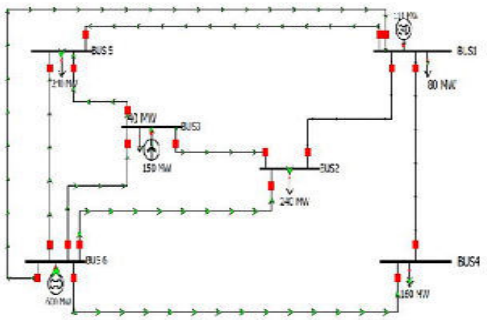

Fig. 6 The optimum scheme for case 1

CASE 2

Different with case 1, capacity of large-scale wind farm connected to bus 3 is amplified to 200MW. The wind regime is similar to case 1. The optimum TNEP scheme is obtained with proposed algorithm. The best scheme is shown in Fig. 7.

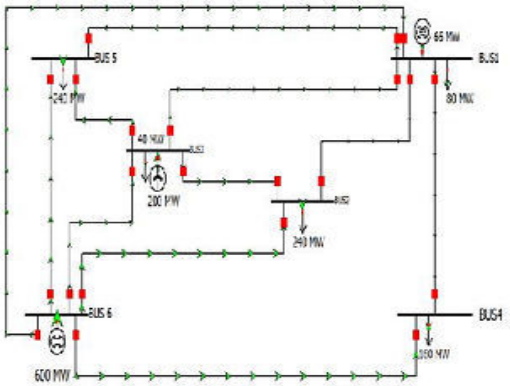

Fig. 7 The optimum scheme for case 2

5. CONCLUSIONS

This paper has proposed a novel algorithm for TNEP formulation with consideration of the uncertainties in WTG power output. First of all the power flow distribution of network is calculated based on WTG output distribution. On this basis, a new index called economic efficiency index is introduced to evaluate the economic efficiency of all transmission lines of the network. Then low efficient lines are removed from the network until an optimum expansion scheme is obtained.

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COMPARATIVE ANALYSIS OF AODV AND DSR TO ACHIEVE GROUP COMMUNICATION IN MANET

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Abstract - Secure group communication is a challenging task with respect to MANET's. Since its introduction as a communication medium, wireless technology found broad application on the battlefield. Robust and reliable group communication plays a major role in developing distributed mobile application in which unannounced disconnections will occur frequently due to the mobility of the nodes which take part in mobile applications. Accompanying dramatic advances in wireless technology and the capabilities associated with small computing devices, the demand for advanced mechanisms to employ wireless technology in the battlefield continues to grow. The main objective here is to achieve robust and reliable group communication in mobile ad hoc network .Performance of the group communication is compared with the given protocols through simulation in NS-2. The analysis is made with respect to the throughput, packet transmission between source and destination. We propose four Ad hoc Routing Protocols AODV, DSR, and have given the comparative study.

Keywords*: Mobile ad hoc networks; group communication system; reliable communication; guarantee protocol.*

I. INTRODUCTION

A mobile ad hoc network is an autonomous collection of mobile nodes that communicate over the wireless link. Due to node mobility, the network topology may change rapidly and unpredictably over time. It does not contain any fixed infrastructure and there is no centralized administration [6]. Each node can act as a router and host. Ad hoc networks are used in wide range of applications like military operations, rescue operations, remote site construction, communication among a group of islands or ships, conferencing without the support of a wired infrastructure, and interactive information sharing [12]. The use of wireless network is exploding as the limiting factors such as sufficient bandwidth, device size and weight, and power concerns are eliminated or mitigated. As a result, we are beginning to see the demand for small, highly mobile devices that utilize wireless communications to organize ad hoc networks that dynamically form, intercommunicate and pass information to other wireless users and to wire-based networks, then dissolve. We provide a model that reflects the salient properties of the network and propose protocols that support this environment.

A. Communication on the dynamic battlefield

The modern battlefield is highly dynamic. Units enter and leave and leave the battlefield continuously. The dynamic battlefield demands several characteristics of communications [8]. Some of them are:

(1) *Fast:* While some limited setup may be tolerated before action starts, the ability to communicate during combat should be immediate in its accessibility to the transmitter and its delivery to the recipient.

(2) *Easy/transparent*: The transmitter must be able to communicate with minimal effort apart from their normal battlefield activities.

(3) *Available:* Parties must be able to communicate whenever they need to.

(4) *Authenticated:* The communication initiator must be able to absolutely identify all intended recipients.

(5) *Private*: The communications passed during combat should not be divulged to anyone not intended for receipt.

(6) *Integrity Protected*: Messages must be protected from modification during transmission.

(7) *Acknowledged*: All parties to the communication must know what the other parties did and did not receive.

We do not contend that this list is all-inclusive. Further, we recognize the impact of interactions of these requirements and posit that these interactions create the bulk of the complexity involved secure battlefield communication.

B. Group communication on the battlefield.

Modern battlefield doctrine is based on mobility, flexibility and rapid response to changing situations, yet also requires close coordination and mutually understood objectives among all members of the [command] group. This demands a group communication paradigm.

Group communication [10] is sometimes thought of as broadcast technology. Broadcast and group communications are related, though not identical. Broadcast technology can provide efficient group communication, though group communication may or may not involve broadcasting messages. The group communications paradigm is preferable over point-to-point connections in such an environment simply from the standpoint of reduced overhead. If the broadcast domains of the group members, the number

of transmissions required to fully delivering a group message is minimized. If the broadcast domains are totally overlapping, group messages can be fully delivered with a single transmission.

C. Challenges to manage secure groups

These criteria are categorized into group membership management, network resource consumption, receiver resource requirements, sender resource requirements and dependency upon particular standards. These categories are elucidated below.

• *Group membership management* criteria address the concerns of who is and is not part of the group, what the group looks like, and what happens if the group changes. Questions to consider when evaluating a solution's membership management capabilities are shown in Table

• *Network resource consumption* criteria are concerned with the load on the network for various stages of the multicast communication process. When analyzing the bandwidth consumption of a solution, it

is important to note how many messages must be transmitted each time a member joins or leaves and how large the control messages (those for managing the group) are in relation to the data messages. Also of importance is the volume of communication that can be effectively dealt with and whether the solution can handle bursty traffic.

•*Receiver and sender resource requirements* consider the following: How many keys must each member or sender store and how large are these keys? What is the processing time involved for the member or sender to, respectively, read or sends messages? Does the solution allow non-members to send data? How many senders are allowed? Must these senders be known in advance of group creation?

• *Dependence upon standards* concern with whether the solution depends up a particular network protocol or network characteristics (such as stability, in order packet delivery, or reliable transmission.

II. CLASSIFICATION OF ROUTING PROTOCOLS IN MANET

A routing protocol is a protocol that specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network. Each router has a priori knowledge only of networks attached to it directly. A routing protocol shares this information first among immediate neighbors, and then throughout the network. This way, routers gain knowledge of the topology of the network.

- Proactive routing protocols
- Reactive routing protocols.

A proactive routing protocol is a protocol that is constantly attempting to keep an up-to date routing table by constantly requesting update information from neighboring nodes and sharing routing tables. This means that when a node wishes to send a packet to a destination the route to that destination is already known.

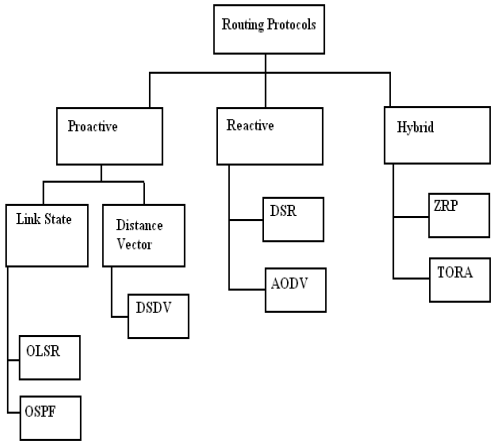


Figure. 1. Classification of routing protocols

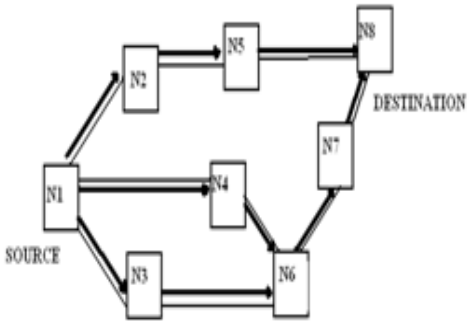
The reactive routing protocol only sends requests for a route from the source to the destination when a node wishes to send a packet and there is not a valid route available in the routing table. Hierarchical routing protocols often use clustering techniques to build hierarchical structures on the flat network, where each cluster has a lead node which looks after the cluster and communications with other clusters.

A. Ad hoc on-demand distance vector routing (AODV)

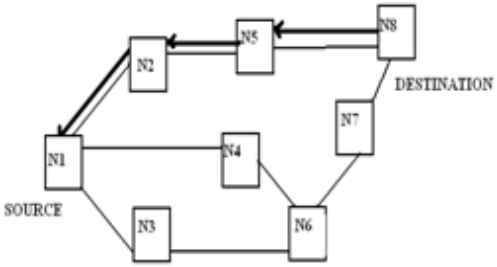
AODV is an improvement [15] on DSDV because it typically minimizes the number of required broadcasts by creating routes on a demand basis, as opposed to maintaining a complete list of routes as in the DSDV algorithm. The AODV [2] routing protocol is a reactive MANET routing protocol. Similar to DSR, AODV [4] broadcasts a route request to discover a route in a reactive mode. The difference is that in AODV [16], a field of the number of hops is used in the route record, instead of a list of intermediate router addresses.

Each intermediate router sets up a temporary reverse link in the process of a route discovery. This link points to the router that forwarded the request. Hence, the reply message can find its way back to the initiator when a route is discovered. When intermediate routers receive the reply, they can also set up corresponding forward routing entries. The authors of AODV [7] classify it as a pure on-demand route acquisition system, since nodes that are not on a selected path do not maintain routing information or participate in routing table exchanges.

Nodes listen for retransmission of data packets to ensure that the next hop is still within reach. If such a retransmission is not heard, the node may use any one of a number of techniques, including the reception of beacon messages, to determine whether



Propagation of the RREQ
the next hop is within communication range.



Path of the RREP to the source
Figure 2. Route discovery process in AODV

The beacon messages may list the other nodes from which a mobile has heard, thereby yielding greater knowledge of network connectivity

B. Dynamic source routing (DSR)

The Dynamic Source Routing protocol (DSR) [9] is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. DSR allows the network to be completely self-organizing and self-configuring, without the need for any existing network infrastructure or administration. When a node generates a packet to a certain destination and it does not have a known route to that destination, this node starts a route discovery procedure.

Therefore, DSR is a reactive protocol. It uses source routing which means that the source must know the complete hop sequence to the destination. Each node maintains a route cache, where all routes it knows are stored. The route discovery process is initiated only if the desired route cannot be found in the route cache. To limit the number of route requests propagated, a node processes the route request message only if it has not already received the message and its address is not present in the route record of the message. DSR [13] uses source routing, i.e. the source determines the complete sequence of hops that each packet should traverse. One advantage of DSR is that no periodic routing packets are required. DSR also has the capability to handle unidirectional links. There are two main operations in DSR,

- route discovery
- route maintenance

1. Route Discovery

During the route discovery procedure, routers maintain ID lists of the recently seen requests to avoid repeatedly processing the same route request. Requests are discarded if they were processed recently since they are assumed to be duplicates. Here a and b shows that DSR [5] route request and reply. First, the source node looks up its route cache to determine if it already contains a route to the destination [11].If the source finds a valid route to the destination, it uses this route to send its data packets.

If the node does not have a valid route to the destination, it initiates the route discovery process by broadcasting a route request message. The route request message contains the address of the source and the destination, and a unique identification number.

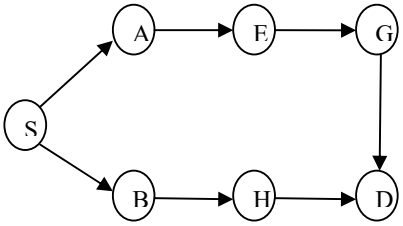


Figure 3. DSR Route Request

2. Route Maintenance

The route maintenance procedure is used when routes become invalid due to the unpredictable movement of routers. Each router monitors [14] the links that it uses to forward packets. Route Maintenance is used to handle route breaks. When a node encounters a fatal transmission problem at its data link layer, it removes the route from its route cache and generates a route error message.

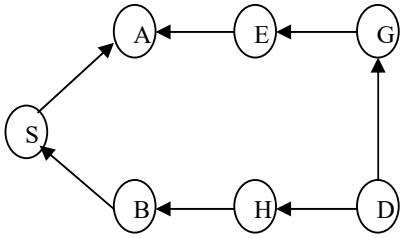


Figure 4. DSR Route Reply.

The route error message is sent to each node that has sent a packet routed over the broken link. When a node receives a route error message, it removes the hop in error from its route cache. Acknowledgment messages are used to verify the correct operation of the route links. In wireless networks acknowledgments are often provided .as e.g. an existing standard part of the MAC protocol [11] in use, such as the link-layer acknowledgment frame defined by IEEE 802.11. If a built-in

acknowledgment mechanism is not available, the node transmitting the message can explicitly request a

DSR-specific software acknowledgment to be returned by the next node along the route.

III. SIMULATION ENVIRONMENT

A. Simulation Model

Here we perform the experiments for the evaluation of the performance of Ad Hoc routing protocol AODV, DSDV, OLSR and TORA. We have 30 simulation run in total out of which 15 trace files has been generated. We tested all performance metrics in our experiment under varying mobility speed of node (10 to 50m/sec) and while other parameters are constant.

B. NS-2 simulator

The network simulations have been done using network simulator NS-2. The network simulator NS-2 is discrete event simulation software for network simulations. It simulates events such as receiving, sending, dropping and forwarding packets. The ns-allinone-2.34 supports simulation for routing protocols for ad hoc wireless networks such as AODV, DSDV and DSR. NS-2 is written in C++ programming language with Object Tool Common Language. Although NS-2. 34 can be built on different platforms, for this paper, we chose a Linux platform i.e. FEDORA 13, as Linux offers a number of programming development tools that can be used with the simulation process. To run a simulation with NS-2.34, the user must write the OTCL simulation script. Moreover, NS-2 also offers a visual representation of the simulated network by tracing nodes events and movements and writing them in a file called as Network animator or NAM file.

IV. SIMULATION RESULTS AND ANALYSIS

The results after simulation are viewed here. The performance of AODV and DSR based on the parameters like packet delivery fraction, average end-to-end delay, normalized routing load and throughput.

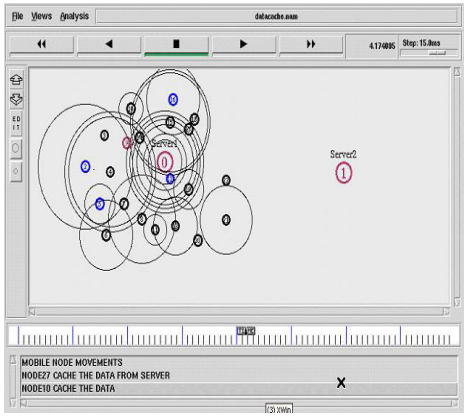


Figure 5. AODV Protocol

Figure 1 shows AODV performs better than OLSR at the lowest speed level because it is on-demand protocol.

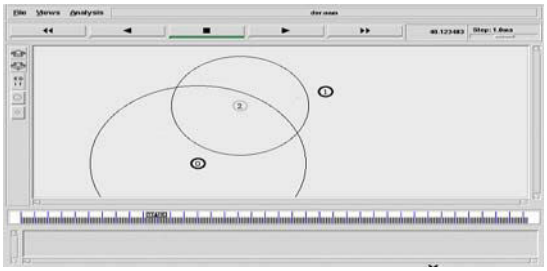


Figure 6. DSR Protocol

Figure 2 shows that the group mobility model and the whole communication process occur between a few groups.

V. CONCLUSION

In this paper, four routing protocols named AODV and DSR have been discussed and compared under specific scenarios with MANET environment. These routing protocols are evaluated in respect to throughput, packet transmission between source and destination in NS-2 simulation environment. However, the simulation results reveal that each protocol has its own advantages as well as its disadvantages making it suitable for some applications and not for others. It is observed that AODV routing protocol performs with satisfactory results of packet delivery ratio but on the cost of some delay and packet loss whereas DSR performs well under high traffic condition. Our future extension is to achieve group communication in an efficient way by adding more parameters with these protocols.

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LOAD FREQUENCY CONTROL INVESTIGATION OF INTERCONNECTED AND ISOLATED POWER SYSTEMS USING ARTIFICIAL DAMPING

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Abstract—Load Frequency Control (LFC) of power system assumes that the local units of an area are running in unison, further it is simulated on the assumption that small duration transients are neglected. Time duration upto several minutes are considered for performance determination of LFC of an area. The tie-line power plays an crucial role in stabilization of the interconnected areas and reliable power transfer. Whenever, system operating conditions change the effect is experienced by the respective area and also by the interconnected area. In the present paper, an attempt has been to made to stabilize the transients in frequency and tie-line power through an artificial damping.

Keywords-*LFC, COI, interconnected areas, artificaial damping, long-term dyamics,*

I. INTRODUCTION

Dynamic energy balance is a technique for power system simulation. It requires about one-tenth the computational efforts of a transient stability study yet gives similar results so far as frequency transients are concerned. The emphasis on dynamic energy balance stems from the fact that, it provides the missing link in the preceding two step approach to dynamic simulation and also it can be applied directly and efficiently to problems arising from the power frequency transients[1-3]. The essential distinction between the two techniques is that, dynamic energy balance method is intended for simulation of power frequency transients while the transient stability study is primarily a simulation of power angle transients. It is true that so called extended transient stability studies does simulate power frequency transients but are quite expensive. Consequently, the approach taken in dynamic energy balance is quite straightforward. Eliminate synchronizing oscillations from the dynamic model, avoid small time constants in representation of subsystems, and increase integration step-size[4-6].

A power system may experience large variations in frequency and voltage, and heavy loadings on the transmission system. These abnormal conditions impose stresses on the system and its components which may result in cascading. Cascading is a process of successive failure or outage of major system elements, which in the worst cases ,leads to separation of the large interconnection into two or more areas and the loss of customer load. The process is started by some 'Initiating Event 'and is followed by a sequence of directly or indirectly related 'Consequential Events' which usually occur distant from the point of initiation. Cascading often involves long-term dynamic performance of the network, the loads and the prime-mover systems. Long-term dynamic response of power system and analysis is given by Davidson et al [7-9]. Based on an analysis of the disturbance [7], the following points were revealed :

1) Events which initiate major disturbances may be of natural origin ,involve equipment malfunction or be the result of human factors. Events caused by equipment malfunction or human factors can be more devastating to the system than those of natural origin ,because they involve tripping a number of lines or units in combinations for which no automatic protection has been provided.
2) The cascading disturbances reported all occurred during the day or early evening hours. The periods are characterized by the loads being fairly high or changing most rapidly and by the highest level of maintenance or construction activity.
3) The automatic under-frequency load-shedding is beneficial in preventing the total collapse of system, when the stage of islanding has been reached.
4) Wide variations of voltage, frequency may exist during the progression of a failure.

In the present paper, the concept of artificial damping has been studied through single machine connected to infinite bus. Further the concept has been applied to single area system for the similar operating conditions. After this two-area system, has been studied by creating fault conditions in area one and system response has been presented for damping in both the areas.

II. SYSTEM SIMULATION

Interunit synchronizing oscillations are explicitly modelled so that each unit frequency is distinct and the system frequency is the inertia weighted average of the individual unit frequencies. These unit rotor angle electro-mechanical oscillations typically lie in the 0.25 Hz to 2.0 Hz range and their simulation requires a solution time-step of 1 to 8 cycles [9-12]. These rotor angle oscillation are characterized by the individual unit swing equation .In a system consisting

of 'n' generating units with uniform damping and the individual unit swing equation of unit 'i' relative to an arbitrary synchronous reference frame is [9] :

$$\dot{\omega}_i = \frac{P_{ACC_i}}{M_i} - \alpha_N \omega_i$$

or

$$\dot{\omega}_i = \frac{(P_{ACC_i} - D_i \omega_i)}{M_i} \quad (1)$$

$$\dot{\delta}_i = (2\pi f_o)\omega_i \quad (2)$$

where M_i :inertia constant ,p.u.

ω_i :speed deviation relative to synchronous reference p.u.

P_{ACC_i} :Accelerating power ($P_m - P_{ele}$) ,p.u.

α_N :Ratio of natural damping coefficient(D_i in p.u.) to inertia constant (M_i in p.u.).

δ_i :Rotor angle deviation from synchronous references , radians.

A. Center of Inertia and System Equation of Motion[1,8] :

The concept of center of inertia is the rotational analog of center of mass .It is also referred to as center of angle. The speed of the system center of inertia (COI) is the frequency of electrical interconnection. The angular position coordinate of the COI,

$$\delta_{CI} = \frac{1}{H_{tot}} \sum_{i=1}^{n} H_i \delta_i \quad (3)$$

$$H_{tot} = \sum_{i=1}^{n} H_i \quad (4)$$

$$H_{tot}.\ddot{\delta}_{CI} = H_{tot}.\dot{\omega}_{CI} = \sum_{i=1}^{n} H_i \omega_i \quad (5)$$

The equations of motion of the system COI, assuming the entire system of 'n' units is one electrical interconnection or for one islanded system, are:

$$\dot{\omega}_o = \frac{P_{ACC_T}}{M_T} - \alpha_N \omega_o \quad (6)$$

$$\dot{\delta}_o = (2\pi f_o)\omega_o \quad (7)$$

$$M_T = \sum_{i=1}^{n} M_i \quad (8)$$

$$\omega_o = \frac{1}{M_T} \sum_{i=1}^{n} M_i \omega_i \quad (9)$$

$$P_{ACC_T} = \sum_{i=1}^{n} P_{ACC_i} \quad (10)$$

$$\delta_o = \frac{1}{M_T} \sum_{i=1}^{n} M_i \delta_i \quad (11)$$

where M_T :the total angular momentum of all the units.

ω_o:COI angular velocity (system frequency) deviation relative to synchronous reference ,p.u.

δ_o:COI angular position (angle) deviation relative to synchronous reference ,radians.

f_o:Synchronous frequency ,rad/sec.

B. Inclusion of Artificial Damping[1,4]

The interunit synchronizing oscillations are artificially suppressed. For each generator an artificial damping term is introduced into the rotor swing equation. This term is proportional to the angular frequency of the individual machine minus the angular frequency of center of inertia for the electrical island in which the machine is connected. The terms have the effect of forcing all the units to move in unison. However, they do not significantly affect the overall motion of the COI of the electrical island since they all sum up to zero. This permits simulation of slower power oscillations using a solution time-step of 0.5 to 1.0 second. This system damping-term is relative to the system COI speed and is uniform for all units in the system i.e. $\frac{D_{si}}{M_i} = \alpha_s$ is the same for all units. The unit swing equation is modified by the artificial system damping-term to be:

$$\dot{\omega}_i = \frac{P_{ACC_i}}{M_i} - \alpha_N \omega_i - \alpha_S(\omega_i - \omega_o) \quad (12)$$

$$\dot{\delta}_i = (2\pi f_o)\omega_i \ldots\ldots i=1\ldots\ldots n \quad (13)$$

where α_S :Artificial system damping-term , $\frac{D_{si}}{M_i}$

III. SYSTEM STUDIED

The concept of artificial damping has been studied through single machine connected to infinite bus shown in Fig. 1. The transient response of the machine for a three-phase line to ground fault on one of the parallel line has been obtained. The results obtained are indicative of the improvement as the magnitude of damping is increased. Further the concept has been applied to single area system for the similar operating conditions. After this two-area system, shown in Fig. 2, has been studied by creating fault conditions in area one and system response has been presented for damping in both the areas.

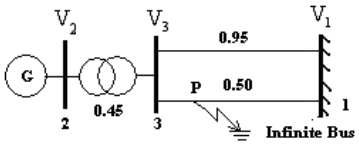

Figure 1. Single Machine Connected to Infinite Bus.

TABLE I. SMIB MACHINE DATA [3]

H	3.01 MW-s/MVA
X_d	1.3125
X_d'	0.1813
X_q	1.2578

R_S	0.003
T_{do}'	5.85 s
K_A	400
T_A	0.01

TABLE II. BUS DATA

Bus No	Voltage p.u.	Angle (degrees)	P_G p.u.	Q_G p.u.
1	0.9008	0.000	0.000	0.000
2	1.0000	28.34	0.900	0.436
3	0.9280	20.34	0.000	0.000

TABLE III. LINE DATA

Bus No	Bus No	Resistance p.u.	Reactance p.u.
1	3	0.000	0.50
2	3	0.000	0.45
3	1	0.000	0.95

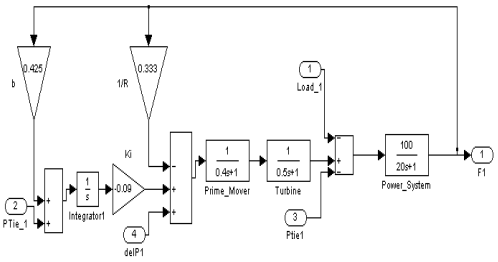

Figure 2. Single Area Power System 1.

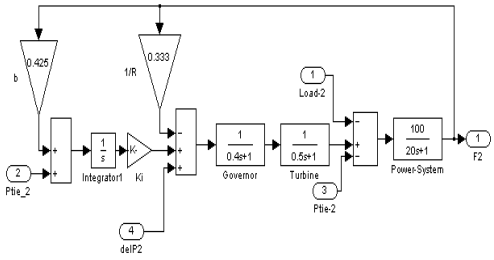

Figure 3. Single Area Power System 2.

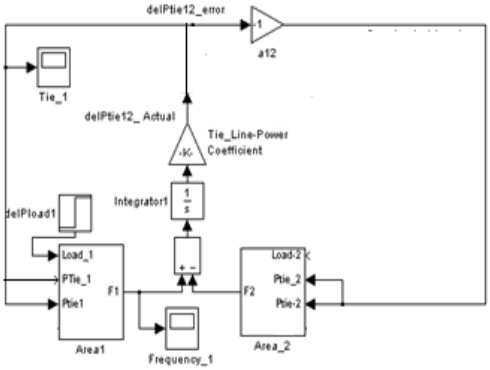

Figure 4. Two Area Power System.

TABLE IV. TWO-AREA SYSTEM DATA [13]

Parameters of Area 1		Parameters of Area 2	
K_P	100	K_P	100
T_P	20	T_P	20
K_{sg}	1	K_{sg}	1
T_{sg}	0.4	T_{sg}	0.4
K_t	1	K_t	1
T_t	0.5	T_t	0.5
R	3	R	3
b	0.425	b	0.425
K_i	0.09	K_i	0.09
a_{12}	1	a_{12}	1
$2\pi T_{12}$	0.05	$2\pi T_{12}$	0.05

IV. SYSTEM RESPONSE

The response of the systems simulated is presented in Fig. 5-10. The transient response of the machine for a three-phase line to ground fault on one of the parallel line has been obtained are shown in Fig. 5-7. The zero-power period in the Fig. 7 has been during the three-phase fault clearing and line reclosure. Further the concept of proposed damping has been applied to single area system for the similar operating conditions and the frequency response is shown in Fig. 8. After this two-area system has been studied by creating fault conditions in area one and system response has been presented for damping in both the areas and the transients in frequency and tie-line power are shown in Fig. 9-19.

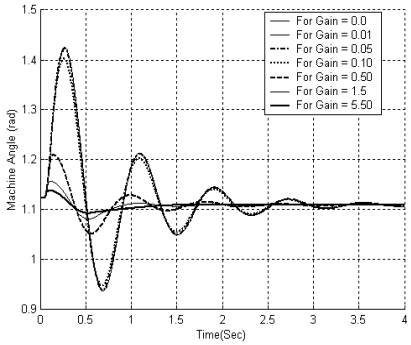

Figure 5. Machine angle of SMIB system.

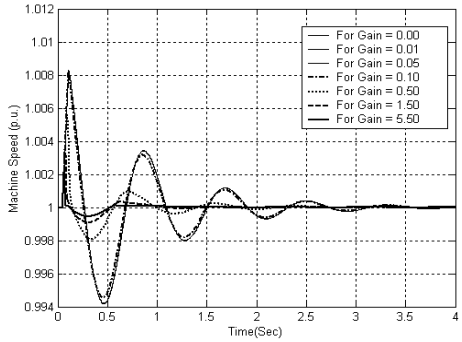

Figure 6. Machine Speed of SMIB system.

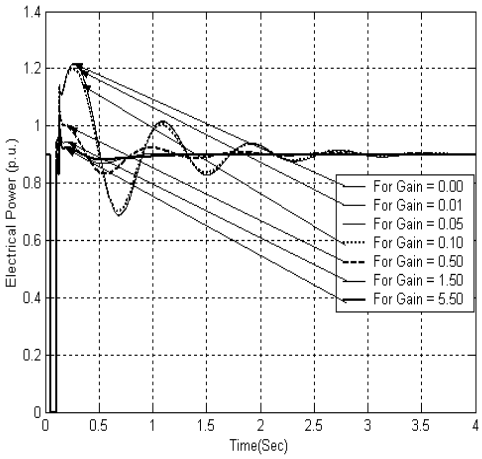

Figure 7. Machine Electrical Power of SMIB system.

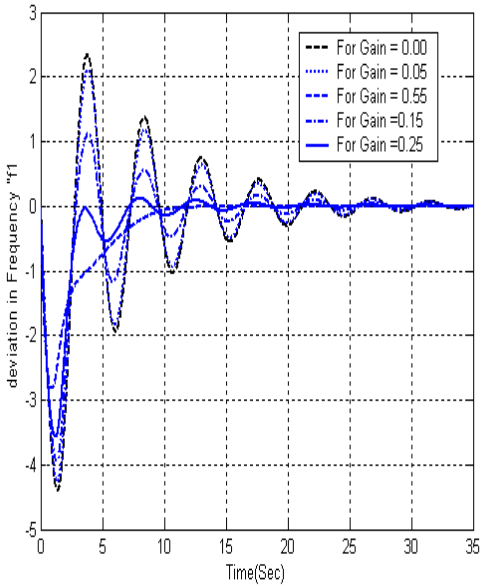

Figure 8. Frequency deviation of single area.

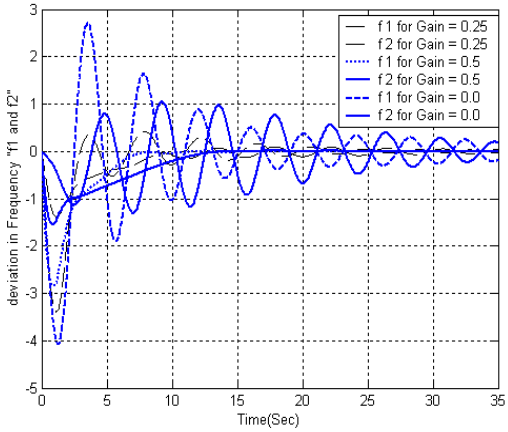

Figure 9. Frequency deviations of interconnected area.

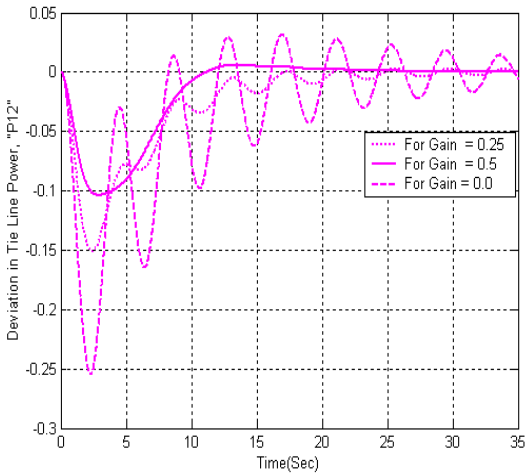

Figure 10. Tie-Line Power Deviations.

V. CONCLUSION

The results obtained for the systems simulated are indicative of the improvement in system variables observed. The proposed concept of artificial damping provides corrective action only during the imbalance as evident from the speed variation shown. The stabilization occurs in transients, settling time overshoots, in all the results reported. The dynamics of the single area are not affected by the proposed damping. Since the cumulative difference in the angular frequency of the individual machines with respect to the system angular frequency sums up to be zero. However, additional area damping proposed at the grid, helps in improving the tie-line power transients and frequency variations.

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DESIGN OF SELF-TUNED PI CONTROLLERS FOR DFIG BASED WIND FARM IN A SMART GRID UNDER VARIABLE WIND SPEED CONDITIONS

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Abstract-The technology of variable-speed wind turbines equipped with Doubly Fed Induction Generators (DFIGs) has been researched extensively due to its higher energy yield, reduced power fluctuation, improved VAR supply and cheaper price as compared to other traditional wind turbine technologies. In DFIGs, the induction generator is grid connected at the stator terminals, but the rotor terminals are connected to the grid via a partial-load, variable frequency AC/DC/AC converter. This increases the efficiency of a DFIG because the Variable Frequency Converter (VFC) requires only a fraction of the total power to achieve full control of the generator. When a fault is introduced, the variable frequency converter (VFC) is the most susceptible part in a DFIG. The VFC is controlled by a set of Proportional Integral (PI) controllers. Parameters of PI controllers are very difficult to tune using traditional methods due to nonlinearity in DFIGs and the increasing complexity of smart grids. This paper presents an approach to use the particle swarm optimization algorithm to design the optimal PI controllers for the rotor-side converter of the DFIG. A new time-domain fitness function is defined to measure the performance of the controllers. Simulation results show that the proposed design approach is efficient to find the optimal parameters of the PI controllers and therefore improves the transient performance of the WTGS over a wide range of operating condition

Keywords:- *DFIG ,VFC, variable speed wind turbines, PI controllers.*

I. INTRODUCTION

Depletion of fossil fuels and increased consumption of electrical power has encouraged to look towards renewable energy sources like solar, geo-thermal, tidal, wind energy etc. In which more money has been invested in wind energy which is cheaper and efficient due to its variable speed DFIG technology. variable speed operation yields 20 to 30 per cent more energy than the fixed speed operation, reduces power fluctuations and improves reactive power supply Falling prices of the power electronics have made the variable speed with Doubly Fed Induction Generators (DFIGs) technology more economical and common.

Wind energy is one of the most available and exploitable forms of renewable energy. Wind blows from a region of higher atmospheric pressure to one of the lower atmospheric pressure. The difference in pressure is caused by the fact that earth's surface is not uniformly heated by the sun and the earth's rotation. Wind energy is the by-product of solar energy, available in the form of the kinetics energy of air. Wind has been known to man as a natural source of mechanical power for long. The technology of wind power has evolved over this long period. Of the various renewable energy sources, wind
energy has emerged as the most viable source of electrical power and is economically competitive with conventional sources. The global electrical energy is rising and there is a steady rise of the demand on power generation, transmission, distribution and utilization. The maximum extractable energy from
the 0-100m layer of air has been estimated to be the order of 10KWh/annum, which is of the same order as hydroelectric potential In DFIGs, the induction generator is grid connected at the stator terminals, but the rotor terminals are connected to the grid via a partial-load variable frequency AC/DC/AC converter and a transformer. This increases the efficiency of a DFIG because the Variable Frequency Converter (VFC) requires only a fraction of the total power to achieve full control of the generator. Power fluctuation reductions and dynamic performance improvements during transient disturbances in DFIGs are achieved through decoupled control of generator active and reactive power . These qualities of the DFIG-based wind turbines make them a preferred technology when compared to other variable speed wind generators and Permanent Magnet Synchronous Generators (PMSGs) with primary converters [1].

However, the VFC of a DFIG and its power electronics (IGBT-switches) are highly sensitive to transient disturbances in a power network. When subjected to faults or voltage sags, the rotor-side converter of the VFC might become blocked to protect from over current in the rotor circuit, and the wind turbine can be tripped from the system . The VFC is controlled by a set of Proportional Integral (PI) controllers. With optimally designed controllers, the wind generator can withstand transient grid disturbances under a range of different wind speed conditions[2].

II. SYSTEM INVESTIGATED

Here test system presented consists of 7.5 KW DFIG placed in a wind farm of smart grid It uses back-to-back PWM converters for variable speed wind power generation. The control objective of the grid side converter is to keep the dc link voltage constant regardless of the magnitude and direction of the rotor power [3]. A stator-oriented vector control approach is used where the direct axis current controls the dc link voltage and the quadrature axis current controls the reactive power, and, in turn, the voltage at the point of common coupling. The objective of the Rotor Side Converter (RSC) is to control the active and reactive power from the stator. This is achieved by putting the d-axis of the rotor reference frame along the stator flux vector. The qaxis current reference is generated directly from the commanded electrical power, and the d-axis current reference is generated from the stator reactive power command. The electrical power command is generated from the optimum operating point tracking strategy [3], when the wind speed is below a certain value. The pitch control does not work at that time, and the wind turbine captures the maximum possible power at the available wind speed. However, if the wind speed goes beyond a certain value, the pitch control limits

When a fault is introduced at the wind farm bus, the resulting voltage drop leads to an imbalance between the turbine input power and the generator output power, thus causing high current in the stator windings of the DFIG. DFIGs have magnetic coupling between the stator and the rotor side of the converter; thus, an increase in current in the stator winding leads to an increase in currents in the rotor windings as well. When this rotor current reaches a threshold, the rotor-side converter of the DFIG stops Switching and wind turbine is severed from the system .so here we require a optimization technique Which tunes the PI controllers and so that continuous switching of rotor side converter takes place[4]-[6].

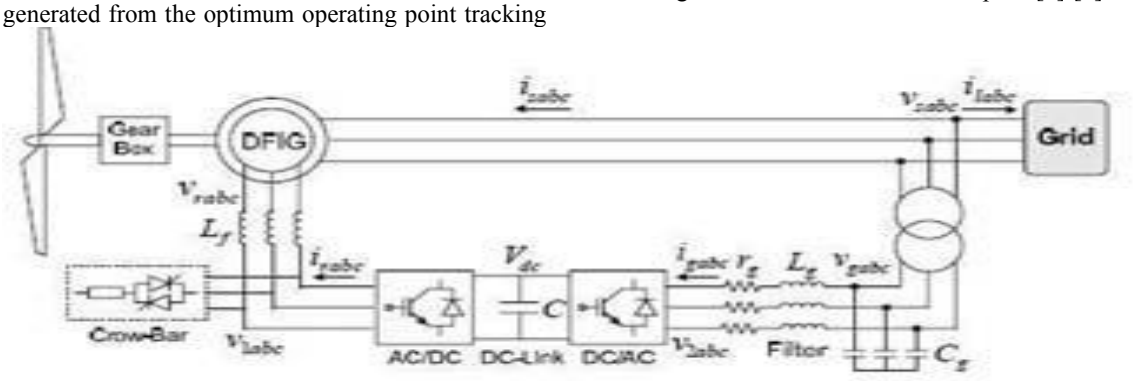


Fig 1 Configuration of a DFIG driven by a wind turbine

III DESIGN OF OPTIMAL PI CONTROLLER

The converter action determines the operation of a DFIG based farm during transient disturbances in a power system . If the PI controllers of the rotor-side converter are tuned properly, it is possible to limit the rotor current and therefore improve the performance of the converter during transient disturbances. Tuning PI controllers using traditional methods is computationally expensive, exhaustive, and difficult due to the nonlinearities in the system. So optimization technique called PSO is used in this paper which tunes the PI controllers under different wind speeds and different dynamic operating conditions

Particle swarm Optimization (PSO) [7] is a simple and effective optimization method. Various new versions have been presented in the last few years. Most PSO algorithms use uniform probability distribution to generate random numbers. However, new approaches using Gaussian and Cauchy probability distributions to generate random numbers to updating the velocity equation of PSO have been proposed [7- 12].

Particle swarm optimization is inspired by the paradigm of birds flocking. It searches for the optimal solution from a population of moving particles. Each particle represents a potential solution and has a position in the problem space represented by a position vector *xi*. A swarm of particles moves through the problem space, with the moving velocity of each particle represented by a velocity vector v_i. At each time step, a fitness function *f* representing a quality measure is calculated by using x_i as input.
Each particle keeps track of its individual best position $x_{i,pbest}$, which is associated with the best fitness it has achieved so far. Furthermore, the best position among all the particles obtained so far in the swarm is kept track of as x_{gbest}. This information is shared by all particles. The PSO algorithm is implemented in the following iterative procedure to search for the optimal solution.

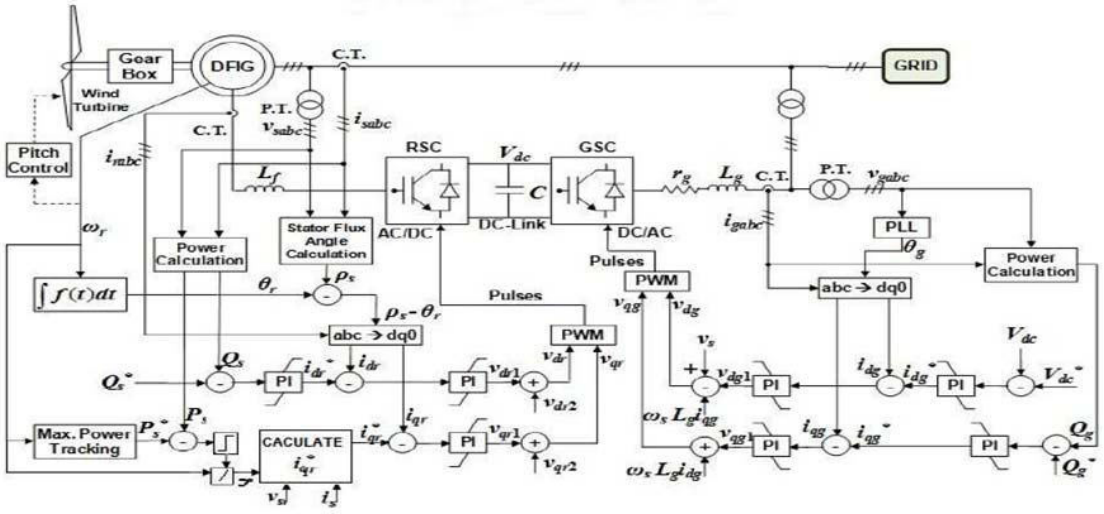


Fig 2 Rotor and stator-side controls of the DFIG-based wind farm

(i) Initialize a population of particles with random positions and velocities of M dimensions in the problem space.
(ii) Define a fitness measure function to evaluate the performance of each particle.
(iii) Compare each particle's present position xi with its $x_{i,pbest}$ based on the fitness evaluation. If the current position x_i is better than $x_{i,pbest,}$ then set $x_{i,pbest} = x_i$.
(iv) If $x_{i,pbest}$ is updated, then compare each particle's $xi,pbest$ with the swarm best position x_{gbest} based on the fitness evaluation. If $x_{i,pbest}$ is better than x_{gbest}, then set $x_{gbest} = x_{i,pbest}$.
(v) At iteration k, a new velocity for each particle is updated by $v_i(k+1) = w \cdot v_i(k) + c_1 \varphi_1(x_{i,pbest}(k)-x_i(k)) + c_2 \varphi_2(x_{gbest}(k)-x_i(k))$ $i = 1, 2, \cdots, N$ (1)
(vi) Based on the updated velocity, each particle then changes its position according to the following equation $x_i(k+1) = x_i(k) + v_i(k+1)$ $i = 1, 2, \cdots, N$
(vii) Repeat steps (iii)-(vi) until a criterion, usually a sufficiently good fitness or a maximum number of iterations is achieved. The final value of x_{gbest} is regarded as the optimal solution of the problem.

In (1), c_1 and c_2 are positive constants representing the weighting of the acceleration terms that guide each particle toward the *individual best* and the *swarm best* positions $x_{i,pbest}$ and x_{gbest}, respectively; φ_1 and φ_2 are uniformly distributed random numbers in [0, 1]; w is a positive inertia weight developed to provide better control between exploration and exploitation; N is the number of
particles in the swarm. The velocity v_i is limited to the range [$-vmax$, $vmax$]. If the velocity violates this limit, it is set to the relevant upper- or low-bound value. The last two
terms in (1) enable each particle to perform a local search around its individual best position $x_{i,pbest}$ and the swarm
best position x_{gbest}. The first term in (1) enables each particle to perform a global search by exploring a new search space

In the RSC control loops , there are three PI controllers and each of them has a proportional gain and an integral time constant. The objective of the PSO is to find the optimal parameters of the three PI controllers, namely, three proportional gains ($K\omega$, KQ,and Kd,) and three integral time constants (T_ω, T_Q,and T_d), to optimize some performance measure function (fitness function). Generally, the PI controller performance in the time domain can be measured by a set of parameters: the overshoot Mp, the rise time t_r, the settling time t_s, and the steadystate error E_{ss}. In this paper, the objective is to reduce the over-current in the rotor circuit during grid faults. Therefore, a new performance measure function is
defined as follows:

$$f(x) = \beta \cdot \Delta Irmax + (1 - \beta)(ts - t0) + \alpha \cdot |Ess|$$

Wherere x = [kw,kq,kd,Tw,Td,TQ]

presents the position vector of each particle; β and α are weighting factors; $JI_{r,max}$ is the maximum rotor current magnitude deviation of the DFIG; t_0 is the starting time of the disturbance; and t_s is the settling time. The weighting factors β and α in the performance measure function $f(x)$ are used to satisfy different design requirements. If a large value of β is used, then the objective is to reduce the over-current in the rotor circuit. If a small value of β is used, then the objective is to reduce the settling time. The factor α is introduced to minimize the steady-state error.The overall design procedure is shown as
the flowchart

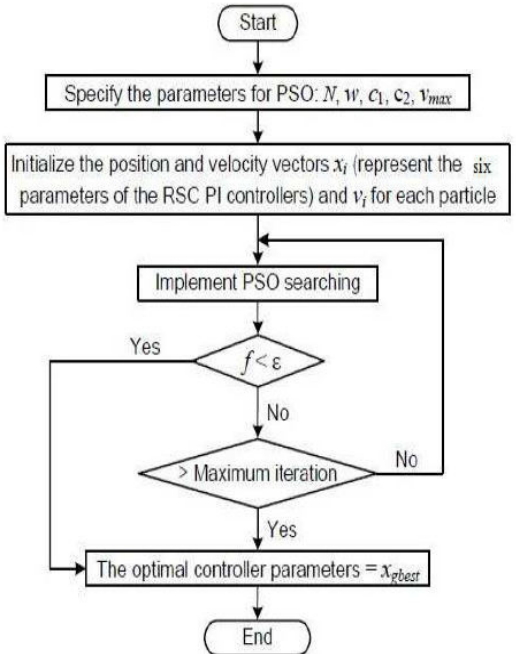


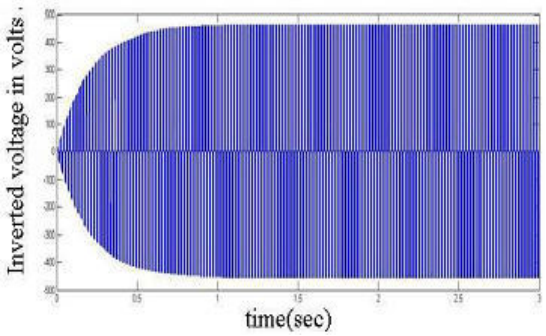
Fig 3 Flow chart for implementation of PSO

IV. RESULTS

Here d-q control theory is used pulses to the converters are generated using reference active and reactive power for rotor side controller and reactive power of grid , DC link voltage references are used for Grid side controller. A three phase to ground fault is introduced and rotor current is observed for a 7.5KW DFIG. The results for WECS with 7.5KW DFIG at different wind speeds are presented with and without using PSO to demonstrate the advantages of PSO over manual tuning of PI controllers on RSC.

Case I: *Performance of 7.5 KW DFIG machine wind speed 12 m/s.*

Initially inverted voltage and rotor current is observed for DFIG without fault and later a fault is applied at time 1.4 sec and results with and without PSO are as shown in fig 5



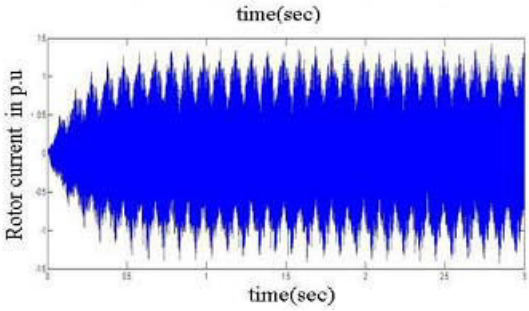


Fig 4 Inverted voltage and rotor current at wind speed 12m/s

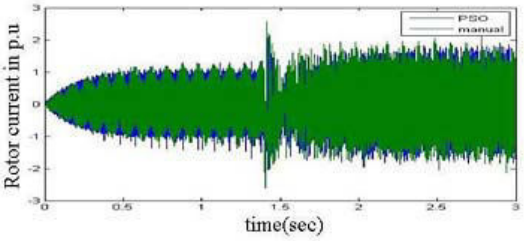


Fig 5 rotor current at wind speed of 12 m/s under three phase to ground fault

Case II: Performance of 7.5 KW DFIG machine wind speed 14 m/s.

Rotor current is observed for DFIG without fault and later a fault is applied at time 1.4 sec and results with and without PSO are as shown in fig 7 here it can be observed that maximum rotor current is minimized with
PSO

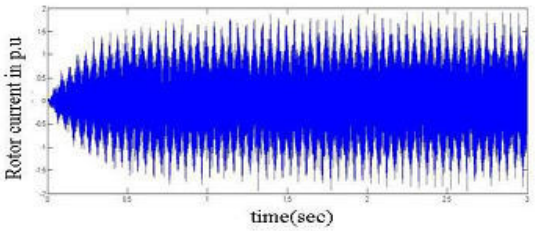


Fig 6 rotor current at wind speed 14m/s

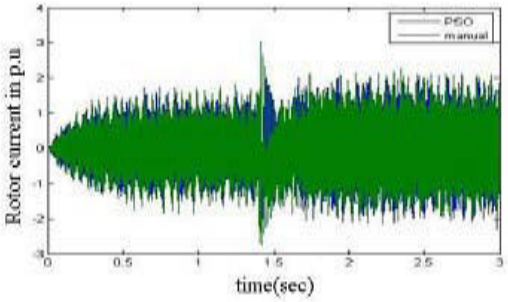


Fig 7 rotor current at wind speed of 14 m/s under three phase to ground fault condition

Case III: Performance Of 7.5 KW DFIG Machine At Variable Wind Speed.

Here wind speed and rotor current is observed under variable wind speed in fig 8 and fig 9 respectively.

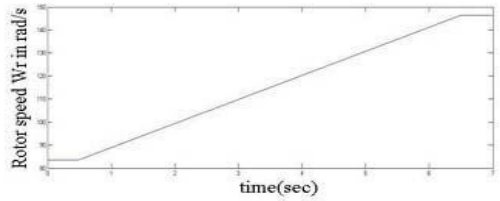


Fig 8 Rotor speed under variable wind speed from 8m/s to 14m/s

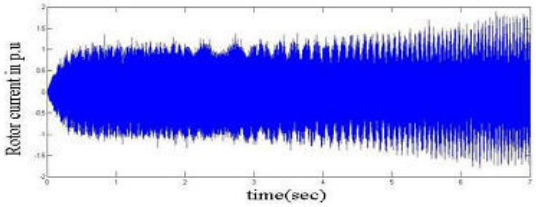


Fig 9 rotor current under variable wind speed from 8m/s to 14m/s

V. CONCLUSION

DFIG based wind farm is more advantageous compared to other machine based wind farm. Here back to back PWM technique used which sends the rotor power back to grid and active , reactive power flow to the grid is controlled by rotor side converter and stator side convertor , its firing angles are generated from reference active and reactive powers.

But tuning of PI controllers manually is tedious process so a optimization technique called PSO is used which not only tunes PI controllers under normal conditions but also in transient conditions effectively under different operating conditions. Here maximum rotor current under different wind speeds for 3 phase to ground fault condition is limited with PSO tuned PI controllers which prevents PI controllers going into saturation and ensures continuous supply of power from DFIG to grid. In normal grid this PI controllers are not self-tuned but PSO makes this PI controllers self-tuned and differentiates it from normal grid making it smart grid which has DFIG in wind farm which supplies power or withdraws power under different operating conditions without any interruption using self-tuned PI controllers.

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SEGMENTATION ALGORITHMS: FOR ULTRASOUND IMAGING

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Abstract-There is a challenge to segment the medical image which is often blurred and consists of noise. The objects to be segmented are always changing shape. Thus, there is a need to apply a method to automated segment well the objects for future analysis without any assumptions about the object's topology are made.In this paper, three segmentation algorithms namely Distance regularized level set , A variational level set algorithm and Radial basis function neural network are discussed along with their comparison and results.

Keywords-US Images, Distance Regularized Level set , variational level set algorithm and Radial basis function neural network.

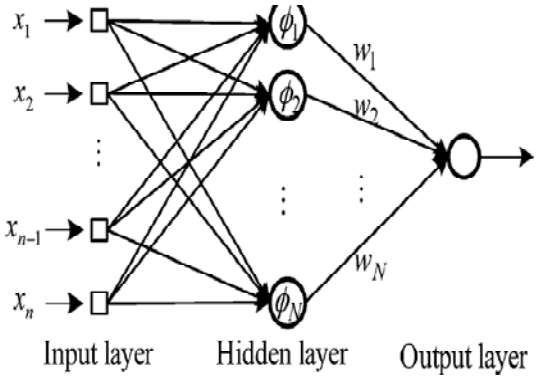
INTRODUCTION

Image analysis usually refers to processing of images by computer with the goal of finding what objects are presented in the image. Image segmentation is one of the most critical tasks in automatic image analysis.
. Image segmentation means to partition an image into meaningful region with respect to a particular application and corresponding to individual surfaces, objects, or natural parts of objects. The purpose of image segmentation is to simplify the representation of an image into something that is more meaningful and easier to analyze. There are some applications of image segmentation which include identify an object in a screen for object based measurements such as size and shape. Image segmentation can be generally categorized into two categories which are parametric and non-parametric image segmentation. Parametric approaches are more generative. Non-parametric method does not require the image regions to have a particular type of probability distribution and does not require the extraction and use of a particular statistic.
Applicability of these segmentation algorithms mainly extends in US image segmentation.As US images are a widely used tool for clinical diagnosis, although it is time consuming for physicians to manually segment the required region. The alternative to analysis of things using CT imaging is expensive and involves hazardous radiation. Thus, a convenient system for segmentation in US images is of interest. The given algorithms segments effectively US images containing noise.

Segmentation Algorithms

RBF Neural Network

RBF neural networks [3] have attracted a lot of attention due to their good reliability in the field of image classification. A RBF neural network includes one hidden layer, which has high dimensionality. A nonlinear transformation is applied from the input layer to the hidden layer. The higher the dimension of the hidden space, the more accurate the approximation will be. The architecture of the proposed RBF neural network is presented in Fig below; it is applied to classify the required region of the US image.



The input data of the RBF neural network can be written in vector form as follows:
$\mathbf{x}i = [fi,1, fi,2, \ldots, fi,m, \ldots, fi,6]$
where fi,m is the mth feature of the ith block of size $M \times M$. All features are normalized before use by subtracting their mean value, and then, dividing the difference by their standard deviation. These normalized feature vectors are then regarded as the training vectors of the RBF neural network. Similar to the training phase, the testing US image is split up into overlapping blocks of size $M \times M$. The overlap is 50%. The normalized feature vectors of the overlapping block are considered as input vectors in the trained RBF neural network. The region obtained of the largest connected component is considered as part of the required region.

Variational Level Set Method

The variational level set method[2] focus the level set function to be close to a signed distance function, and it completely eliminates the re-initialisation

procedure. In the process of the image segmentation, the active contour (dynamic curve) will move towards the boundaries of object. This will be done by the external energy which can move the zero level curves toward the boundaries of interest region. In the variational level set method, that are few parameters need to be considered in order to get the most accurate result. These parameters include the standard deviation of Gaussian distribution, parameter of internal energy, parameter of weighted length term and parameter of
weighted area term. Those parameters played an important role in the evolution of level set method. The value of these parameters needs to be selected correctly to maintain the stability of evolution level set equation.

Distance Regularized Level Set Evolution

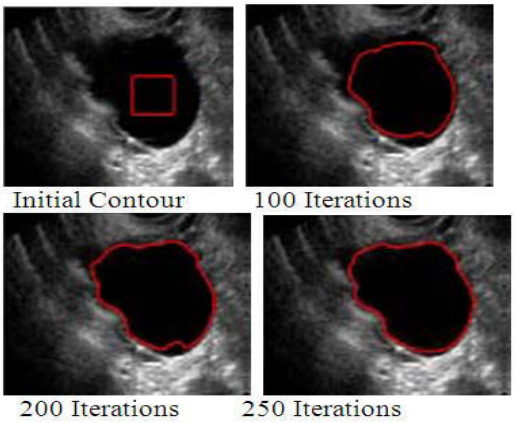
Distance Regularized Level Set (DRLSE) [1], is an edge based algorithm which is sensitive to noise. This algorithm has a unique effect called forward backward effect which maintains the desired shape of the level set function. This algorithm eliminates the need for reinitialization due to its distance regularized term and reduces the numerical errors. It also reduces the number of iterations required for segmentation. The algorithm first filters the image using a Gaussian kernel filter and then calculates the energy function.

Results and Discussions

Different experiments were performed to show the capability of the given algorihms.For RBF neural network the experiment results show in Fig 2 that it can be used to segment the region from US images. RBF method offers two significant performance of the Variational Level Set compare to manually improvements: 1) it can automatically segment the region from US images and 2) it can accurately
estimate the volume of the region from US images.. The difference percentages of the Variational Level Set Algorithm segmentation result are very small compare to the manually segmentation result. Thus, the Variational Level Set Algorithm is suitable to be used in foetus ultrasound image segmentation shown in Fig 1. It is observed that Distance Regularized Level Set Evolution algorithm depends on noise so the image should be filtered before applying the segmentation algorithm shown in Fig 3. A comparison of these algorithms is made basedon various parameters. shown in Table 1. From the comparison it is evident that each algorithm has its own advantages and disadvantages

Table 1: Comparison of Segmentation Algorithm

Parameters	Distance Regularized Level Set Evolution	Variational level set algorithm	Radial basis function neural network
Nature	Edge base	Region based	Region based
Noise sensitivity	Yes	No	No
Advantage	Does not need reinitialization and less numerical error	Level set curve can be flexible implemented in different object shapes	It can automatically segment the region from US images accurately
Disadvantage	Noise sensitivity	Segments homogeneous objects	Segments homogeneous objects



RESULT

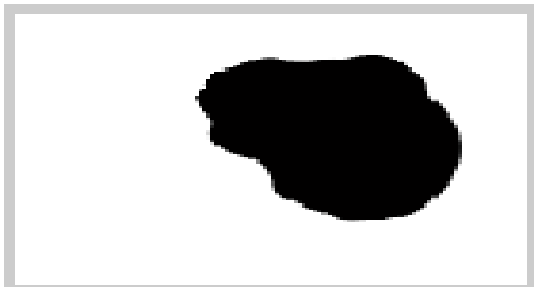
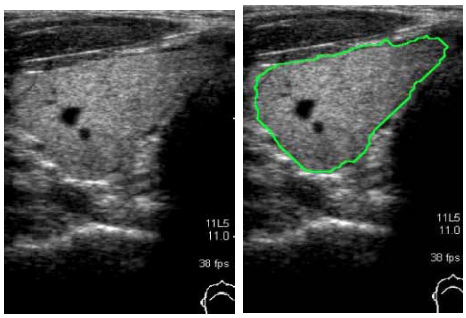
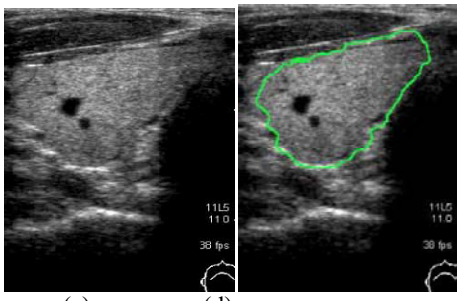


Figure 1: Result for evolution level set on ultrsound image



(a) (b)

Fig 2:-Segmentaton by RBF method



(c) (d)

Fig 3 :-Segmentaton by Distance Regularized Level Set Evolution

CONCLUSION

In this paper, several algorithms for US image segmentation were presented such as Distance Regularized Level set,variational level set.algorithm and Radial basis function neural network. Furthermore, the results of images are presented and the algorithms were compared. The best algorithm is Radial basis function neural network as it segments after training the network thus produces more accurate results i.e segment images and does not depend on noise.

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REVIEW ON LOW VOLTAGE MICROGRID

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Abstract – In this paper, we have done a literature survey work of the present condition of microgrid research going on. Recent research shows that 20%–30% of building energy consumption can be saved through optimized operation and management without changing the building structure and the hardware configuration of the energy supply system. Therefore, there is a huge potential for building energy savings through efficient operation. Microgrid technology provides an opportunity and a desirable infrastructure for improving the efficiency of energy consumption in buildings. The objective function is to minimize the overall cost of electricity and natural gas for a building operation over a time horizon while satisfying the energy balance and complicated operating constraints of individual energy supply equipment and devices. The uncertainties are captured and their impact is analysed. The survey results show that significant energy cost savings can be achieved through integrated scheduling and control of various building energy supply sources. It is very important to fully utilize solar energy, wind energy and optimize the operation of electrical storage. It is also shown that precooling is a simple way to achieve energy savings. So we have done a part of simulation work on solar and wind energy. The principles and the proposed algorithm would be verified by PSCAD simulation.

Index Terms*—microgrid, distributed generation (DG), high quality power), droop control method, microgrid, parallel inverter CHP, uninterruptible power supply (UPS), Load sharing.*

I. INTRODUCTION TO MICROGRID

Microgrids are a peer to peer self-sustaining, community managing, local generation storage, loads, and with exclusively grid connectivity. Microgrid offers easier use and integration of renewable energy sources with increased reliability which covers all blackouts and free up peak capacity which leads faster path to innovation of alternative energy trends. The new ways of power generation and delivery requires new methodologies of system modelling and control. Smart microgrids are a transformational and game changing solution that has had a significant future energy growth. Developing a micro grid for India's power sector is a worthy challenge. It will provide revolution in the electric supply and increase the probability of achieving the Government of India's electricity goals sooner and more efficiently. The smart microgrid, as applied to the Indian context toward mass adaptation. Consumer will need to

embrace the alternate technology. With the advent of smart grid, concepts such as delivery optimization in lines, load smoothing, load forecasting, smart metering, peak load management, wide area protection, monitoring and measurement also gained priority. Smart microgrid crops up as an alternative clean energy trend which will make world unleash cleaner, greener and most abundant energy.

Figure: Layout of Microgrid

II. LITERATURE REVIEW ON MICROGRID

2.1 Low-Voltage Bipolar type DC Microgrid

ENERGY and environmental problems are remarkably concerned in recent years, such as greenhouse gas, growth of energy demand, and depletion of energy resources. Against the background of these problems, a large number of distributed generations (DGs) are being installed into power systems. It is well known that if many DGs are installed into a utility grid, they can cause problems such as voltage rise and protection problem. To solve these problems, new conceptual electric power systems were proposed .The New Energy and Industrial Technology Development Organization (NEDO). Four popular NEDO's projects (Aichi Expo, Kyotango, Hachinohe, and Sendai) were undertaken from FY2003 to FY2007 (Sendai: FY2004-FY2007), and the details are reported in [9] and [10]. In this case, dc output type sources, such as photovoltaic (PV) system, fuel cell, and energy

storages (e.g., Li-ion secondary battery and super capacitor) need inverters. In addition, some gas engine elations (GECs) and wind turbines also need inverters because the output voltages and the frequencies are different from those of the utility grids.Therefore, dc distribution-type microgrids (dc microgrids) were also proposed and researched in order to reduce conversion losses from the sources to loads

The output is a number of feeders. Distribution voltages are typically medium voltage, between 2.4 KV and 33 KV depending on the size of the area served and the practices of the local utility.

The advantages of dc microgrids are summarized as follows.

1) The system efficiency becomes higher because of the reduction of conversion losses of inverters between dc outputs

sources and loads.

2) There is no need to consider about synchronization with the utility grid and reactive power.

On the other hand, there are some drawbacks to put dc microgrid to practical use as follows.

1) It is needed to construct private dc distribution lines for dc microgrid.

2) The protection in dc system is more difficult than that of the ac system because there is no zero cross point of voltage in dc system.

3) The loads adapted for dc power supply are required for high system efficiency.

the system described in adopted dc 380 V as dc bus voltage. The system has PV systems (2*10 kW), wind generator systems (10 kW + 2 kW), and storage battery (97 kW), but there are no controllable DGs such as gas engine or fuel cell. The system is normally operated in islanding mode. When the storage energy becomes low, the system is supplied power from the utility grid, and charges the battery. On the other hand, high-quality power is essential for some customers such as banks, hospitals, and semiconductor factories because the downtime related to voltage sag or blackout becomes a great concern.

To satisfy high efficiency and high-quality power supply, we

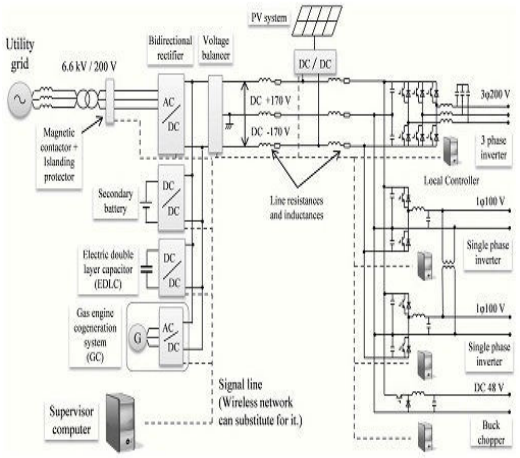


Figure1: Concept of low-voltage bipolar-type dc microgrid

System, dc power is distributed through three-wire lines, and it is converted to required ac or dc voltages by load-side converters. When blackout or voltage sag occurs in the utility grid, the dc microgrid can supply high-quality power stably, while inverters of DGs in ac microgrids should be tripped unless they have fault-ride-through capability.

Concept of the low-voltage bipolar-type dc microgrid. The utility grid voltage 6.6 kV is converted into dc 340 V by a transformer and a rectifier. It is the characteristic of the system to adopt three-wire dc distribution that consists of +170 V line, neutral line, and−170 V line. The three-wire composition contributes that the voltage to ground becomes low, and one of the single-phase 100-V output lines becomes a grounded neutral line.

System operation: The total generated power is controlled by changing the number of running **CGS**s. When the system connects to the utility grid, the deficient power is compensated from the utility grid.

2.2 Power Control Strategy for Power Electronics Interfaced Distributed Generation Units

With the increased concerns on environment and cost of energy, the power industry is experiencing fundamental changes with more renewable energy sources (RESs) or

microsources such as photovoltaic cells, small wind turbines, and microturbines being integrated into the power grid in the form of distributed generation (DG). These RES-based DG systems are normally interfaced to the grid through power electronics and energy storage systems. A systematic organization of

these DG systems forms a microgrid. Compared to a single DG, the microgrid has more capacity and control flexibilities to fulfil system reliability and power quality requirements. The Microgrid also offers opportunities for optimizing DG through the combined heat and power (CHP) generation, which is currently the most important means of improving energy efficiency. By presenting itself to the utility as a dispatch able load, the microgrid could "behave" well and avoid problems caused by single DG units. Furthermore, the microgrid can operate in grid-connected mode.

This method is subject to a few problems, which are as follows:

1) The method is developed based on the predominantly inductive line impedance. In a low-voltage microgrid, as the distribution feeder is mainly resistive, this droop method is subject to poor transient (or even poor stability) due to the real and reactive power coupling among DG units when no additional inductance is present.

2) The unequal line impedances and DG output impedances significantly affect the accuracy of reactive power control during grid-connected operation mode and the reactive power sharing during islanding mode due to the unequal voltage drops.

3) The reactive power sharing accuracy is further deteriorated

if there are local loads at DG output.

To avoid the power control coupling, the virtual real and re-active power frame transformation was recently proposed.

However, this method cannot directly share the actual real and

Reactive powers. Another way to avoid the power coupling is

to properly control the interfacing inverter with virtual output

Impedance.

A power control strategy is developed for the low-voltage microgrid. The strategy comprises a virtual inductor at the interfacing inverter output and an accurate reactive power control and sharing algorithm with consideration of impedance voltage drop and DG local load effects. The microgrid can operate in grid-connected mode or is-landing mode. In grid-connected operation, the microgrid is connected to the utility, and the DG systems in the Microgrid provide heat and power support for the nearby loads.

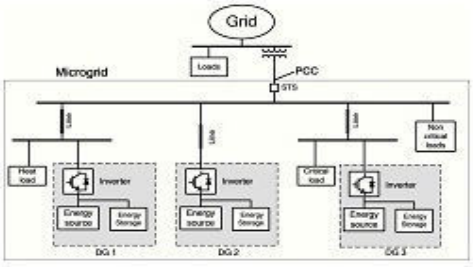


Figure2: Distributed Generation Units Operating in a Low-Voltage Multibus Microgrid

Traditional frequency and voltage droop method:

A. Frequency and Voltage Droop Control
B. Power Coupling at Low-Voltage Microgrid
C. Inaccuracy of Reactive Power Control Due to Line Impedance

2.3: CERTS Microgrid Laboratory Test Bed

CERTS Microgrid concepts were first formulated in 1998 as a micro generators and storage with the ability to separate and isolate itself from the utility seamlessly with little or no disruption to the loads . Key concepts include controllers based on local terminal quantities only, fast load tracking, and the use of frequency droop methods to ensure load sharing between micro sources.

The objective of the CERTS Microgrid Laboratory Test Bed project was to demonstrate the ease of integrating small energy sources into a microgrid. The project accomplished this objective by developing and demonstrating three advanced techniques, collectively referred to as the CERTS Microgrid.

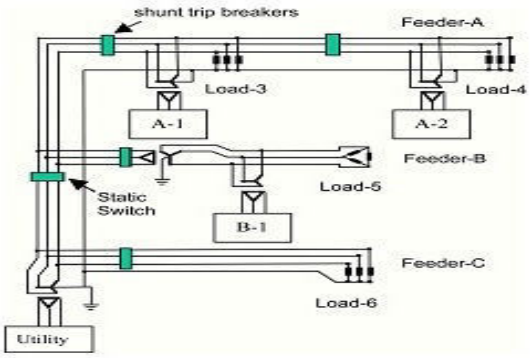


Figure 3: CERTS/AEP Microgrid Test Model

Concepts are: 1) a method for effecting automatic and seamless Transitions between grid-connected and islanded modes of operation; 2) an approach to electrical protection within the micro-grid that does not depend on high fault currents; and 3) a method for microgrid control that achieves voltage and frequency stability under both grid and islanded conditions without requiring high-speed communications.

CERTS Microgrid control is designed to facilitate an intelligent network of autonomous units. The concept has three critical components, the static switch, the micro sources and loads. The static switch has the ability to autonomously island the microgrid from disturbances such as faults. The CERTS Microgrid has no "master" controller or source. Each source is connected in a peer-to-peer fashion with a localized control scheme implemented for each component. This arrangement increases the reliability of the system in compar-is on to having a master-slave or centralized control scheme. In the case of master-slave controller architecture the failure of the master

controller could compromise the operation of the whole system. The CERTS Test bed uses a central communication system to dispatch DG set points as needed to improve overall system operation. However this communication network is not used for the dynamic operation of the Microgrid.

There are three feeders (A, B, and C) with loads and three micro sources. Two micro sources are on Feeder-A, (A-1 and A-2) with the third, B-1, on Feeder-B. Feeder-A uses a four-wire cable with a common ground point. The cable between A-1 and A-2 is 100 yards providing impedance to verify the plug and play feature and local stability. The second feeder (B) with a single load and source is a three-wire system with an isolation transformer. Feeders-A and B can be islanded from the utility using a static switch. The static switch hardware consists of back-to-back thyristors with local implementation of the CERTS Microgrid islanding and re-synchronization procedures. The four load banks, Load-3 through Load-6, can be remotely controlled from 0–90 kW and 0–45 kVar. Each load bank also has remote fault loads which range from bolted faults to high impedance faults (60 kW and 83 kW). Other loads include an induction motor 0–20 HP. The other equipment includes: protection relays, shunt trip breakers and a complete digital acquisition system. Viewing detailed voltage and current waveforms for each phase conductor, including the neutral. The objective of the CERTS Microgrid Laboratory Test Bed project was to demonstrate the ease of integrating distributed energy sources into a microgrid. This includes autonomous sources with peer-to-peer and plug-and-play functionality.

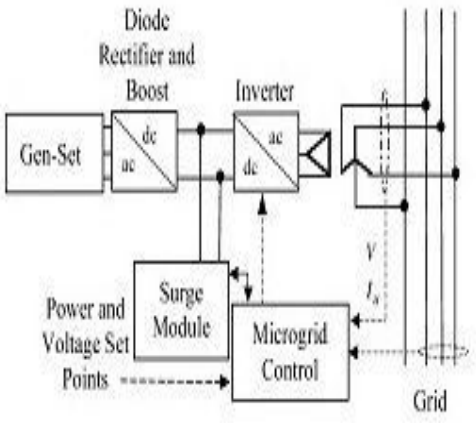


Figure 4: Power condition system.

2.4 Energy-Efficient Buildings Facilitated by Microgrid

In this paper it is shown that according to a recent research shows 20%–30% of building energy consumption can be saved through optimized operation and management without changing the building structure and the hardware configuration of the energy supply system. Therefore, there is a huge potential for building energy savings through efficient operation. Microgrid technology provides an opportunity and a desirable infrastructure for improving the efficiency of energy consumption in buildings. The key to improve building energy efficiency in operation is to coordinate and optimize the operation of various energy sources and loads. In this paper, the scheduling problem of building energy supplies is considered with the practical background of a low energy building. The objective function is to minimize the overall cost of electricity and natural gas for a building operation over a time horizon while satisfying the energy balance and complicated operating constraints of individual energy supply equipment and devices. The uncertainties are captured and their impact is analyzed by the scenario tree method. Numerical testing is performed with the data of the pilot low energy building. The testing results show that significant energy cost savings can be achieved through integrated scheduling and control of various building energy supply sources. It is very important to fully utilize solar energy and optimize the operation of electrical storage. It is also shown that precooling is a simple way to achieve energy savings.

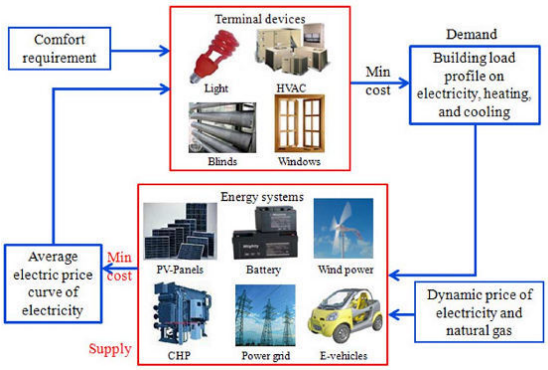


Figure 5: The integrated optimization of demand & supply.

2.5 Load sharing and power quality enhanced operation of a distributed microgrid

The interconnection of distributed generators (DGs) to the utility grid through power electronic converters has raised concern about power quality and proper load sharing between different DGs and the grid. Microgrid can generally be viewed as a cluster of DGs connected to the main utility grid, usually through some voltage source converter (VSC)-based interfaces. Concerning the interfacing of a microgrid to the utility system, an important area of study is to investigate the overall system performance with unbalanced and non-linear loads, as these are common in distribution levels. A common practice is to isolate the microgrid from the utility grid by an isolator if the voltage is seriously unbalanced. However, when the voltages are not critically unbalanced, the isolator will remain closed, subjecting the microgrid to sustained unbalanced voltages at the point of common coupling (PCC), if

no compensating action is taken. Unbalance voltages can cause abnormal operation particularly for sensitive loads and increased losses in motor loads. Many innovative control techniques have been used for power quality enhanced operation as well as for load sharing. A microgrid that supplies to a rural area is widely spread and connected to many loads and DGs at different locations. In general, a DG may have local loads that are very close to it. There may be loads that are not near to any of the DGs and they must be shared by the DGs and the utility. These are termed as common load in this paper. The most common method of local load sharing is the droop characteristics. Parallel converters have been controlled to deliver desired real and reactive power to the system. Local signals are used as feedback to control the converters, since in a real system, the distance between the converters may make an inter-communication impractical. The real and reactive power sharing can be achieved by controlling two independent quantities – the power angle and the fundamental voltage magnitude. The system stability during load sharing has been explored by many researchers. Transient stability of power system with high penetration level of power electronics interfaced (converter connected) distributed generation is explored in .In the operation of parallel-connected inverters with resistive output impedance of in an island microgrid is explored. The control loops are devised and analysed, taking into account the special nature of a low-voltage microgrid. The feasibility of control strategies to be adopted for the operation of a microgrid when it becomes isolated is investigated in. An evaluation of the need of storage devices and load shedding strategies is included in this paper. The aim of this paper is to set up power electronics-interfaced microgrid containing DGs. It is assumed that the common load is supplied solely by the utility in the grid-connected mode. However, when an islanding occurs, this load will be shared by the DGs through traditional droop method. Furthermore, each DG will supply part of its local load in grid-connected mode, while at the same time, compensating for their unbalance and non-linearity's. However, in the islanded mode, each of the DGs supplies its local load and shares the common load through droop characteristics.

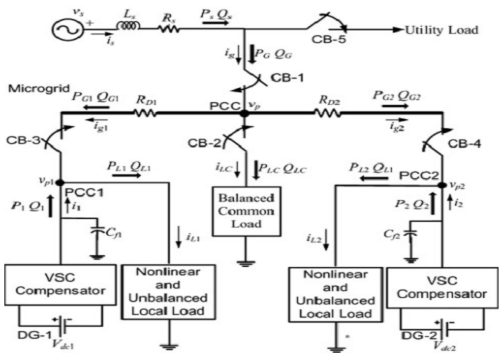


Figure 6: The microgrid and utility system under consideration

III. DISCUSSION

After survey of the above five papers we have come to a conclusion that in all the above papers only the way to connect different renewable energy sources like wind mill, solar energy, biogas, etc… have been discussed. This helps in solving the energy crisis to a certain extent because of the availability of these resources. Wind energy is generated only at certain time of the day and cannot be totally depended upon. Because of this low availability the main thermal plants cannot be shut down hence there is wastage of energy resources. The same goes with the case of the solar energy because the sun rays are not available throughout the day. During the night the sun rays are not available and the electricity is not generated during the night, also during the rainy season or during the cloudy weather the sun rays are not available so there is less amount of energy generation. So these sources can be depended upon but only to a certain extent.

We have provided a solution to this problem so that energy can be used efficiently and we can contribute positively to some extent so that the problem of load shedding can be lowered or completely eliminated.

For the above context we have completed some amount of simulation work with respect to our project work.

IV. PROPOSED WORK

At present we are only having single or one way flow of electricity and whatever electricity we generate is not fully utilized. So my project gives the solution to these problems which can help prevent load shedding and prove economically beneficial.

Our concept is that we would be connecting renewable energy sources like wind mill, solar cells, fuel cells, etc. to a two bedroom house (for simulation purpose).If the generation is in surplus amount which is more than the requirement of the house then we would sell electricity to the grid and when we are having deficiency of power because of non-generation of power from the renewable sources then we would consume power being supplied by the power grid.

So for the same we would be simulating various sources like solar models, wind models, etc. in PSCAD (Power System Computer Aided Design) and then we would be designing a controller which would decide when we need to consume energy from the grid supply and when we can supply or sell power back to the grid and make money.

At present the simulation work of wind mill, solar array has been done and simulation work for two bedroom house wiring is being carried out.

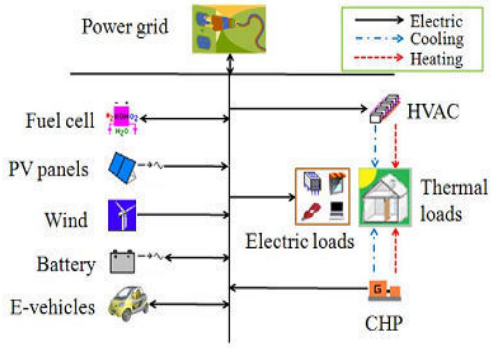


Figure 7: Proposed layout

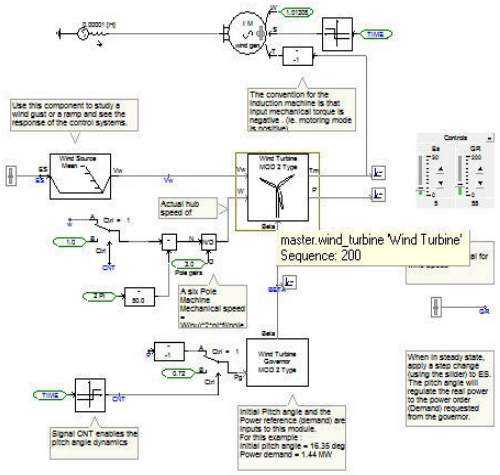


Figure 10: Wind Modelling

V. EXECUTED WORK

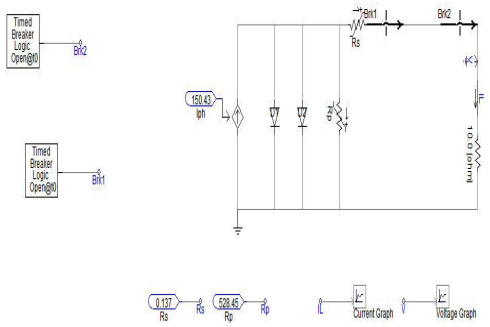


Figure 8: Solar simulation work

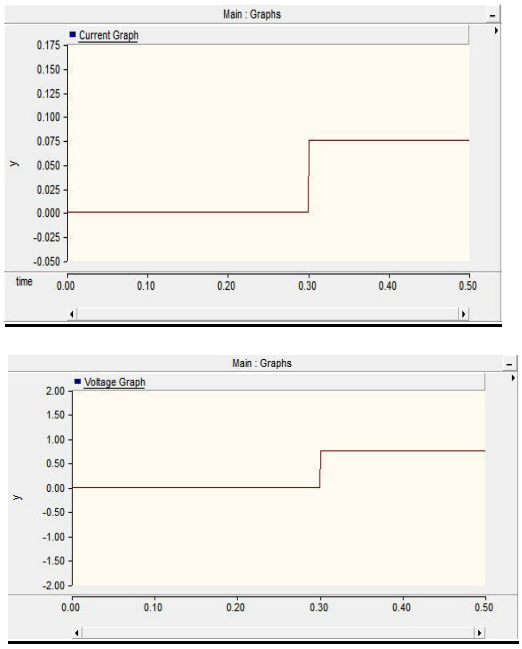
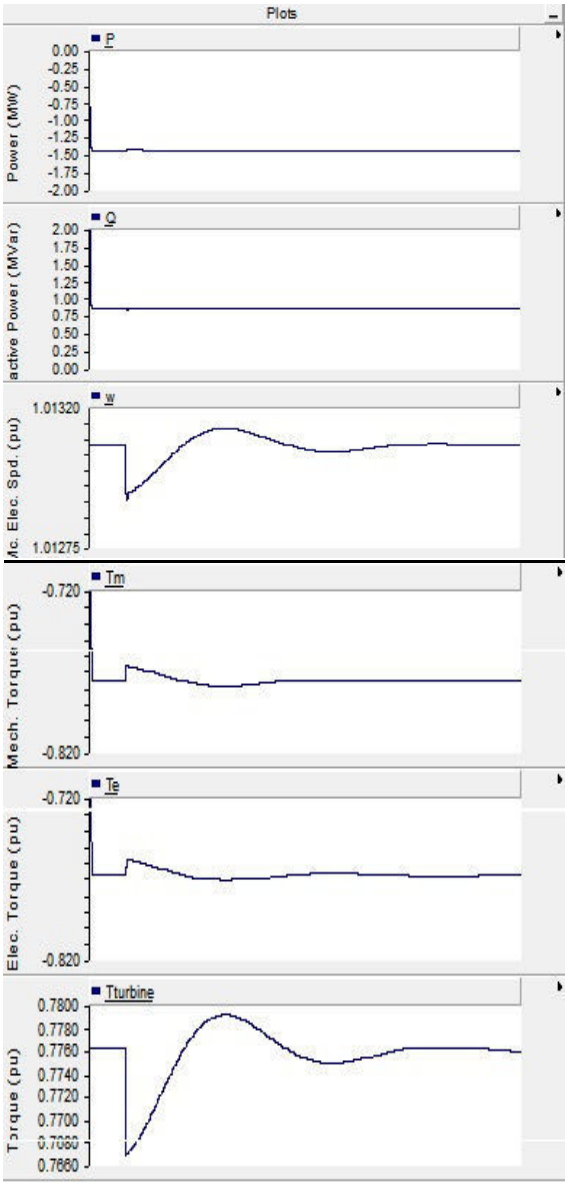


Figure 9: Solar simulation graph



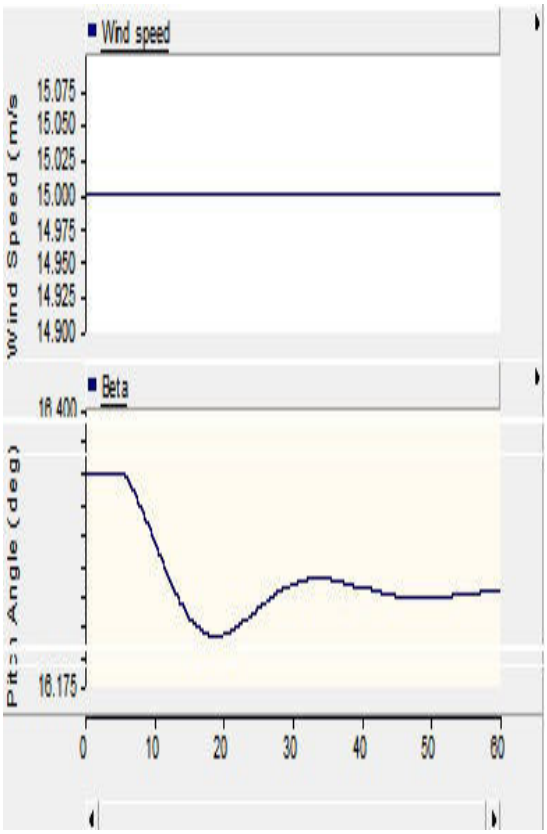


Figure 11: Wind Simulation Graph

VI. CONCLUSION

A study has been done and we have come to a conclusion that Recent research shows 20% – 30% of building energy consumption can be saved through optimized operation and management without changing the building structure and the hardware configuration of the energy supply system. Therefore, Microgrid is one of the new conceptual power systems for smooth installation of many distributed generations (DGs). Conventional power systems, microgrids are proposed and researched for the good connection with dc output type sources such as photovoltaic (PV) system, fuel cell, and secondary battery.

Our proposed work is that we would be connecting a few of the renewable sources of low generating capacity to a double bedroom house. When the renewable sources are generating more amount of power than the required amount then we would be supplying the extra amount of energy to the grid and when the house is facing deficiency then we would be consuming energy which is being supplied by the grid.

So in this context we propose to design a controller which would check the amount of energy being generated by the renewable sources and accordingly consume energy from the grid or supply back energy to the grid through a bi-directional electricity flow network.

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SIMULATED TRANSMISSION OF FIVE USERS WITH 5 WDM × 4 TDM × 5 CODE AT 50 GBPS 3D OCDMA SYSTEM BASED ON MODEL B USING GF (5).

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Abstract-we present transmission of five users with 5 WDM × 4 TDM × 5 CODE channel at 50 Gbps 3D OCDMA system based on Model B using GF (5) with varying receiver attenuation on optsim .

Keywords: *OCDMA, OOC, cubic congruent operator, linear congruent operator, Galois field (5), 3 Dimensional, Model B.*

1. INTRODUCTION

For practical implementation of OCDMA system, there is a need to implement coding schemes that have good performance. Since 1980's many codes have been proposed by researchers till today the work is going on. Coding schemes are classified based on Dimensions, working principle, polarity, construction mechanism [2]. In this direction, we have proposed 3D codes based on Model A and Model B. In this paper we have used the OPTSIM simulation tool to evaluate the performance of transmission of five users at 50 Gbps data rate based on Model B using optical orthogonal codes, Cubic Congruent Operator and Linear Congruent Operator from algebra theory.

The paper is organized as follows. In Section II, Mathematical Modeling of 3D OCDMA system along with Model B is discussed. Section III implements 3D Codeset. Section IV calculates the system parameters required for simulation. Section V shows the implementation details on the simulation software along with the results for five users with 5 WDM × 4 TDM × 5 CODE channel at 50 Gbps 3D OCDMA system based on Model B using GF (5) with varying attenuation at the front end of the receiver. Finally conclusion is drawn in section VI.

2. MATHEMATICAL MODEL

In Model B, OOC code is used to spread in time domain, coding scheme of cubic congruent operator based on Table 1 is used for spreading in spectral domain and coding scheme of linear congruent operator is used for spreading in spatial domain. Cubic and linear Algebraic Congruent operators are defined by following equations [6]

$$s_m(n,a,b) = \left(m\left(a+n\right)^3 + b\right)\left(\text{mod } p\right)$$

a= b=0 Cubic Congruent Operator Equation 1

$$s_m(n,a,b) = \left[m.(n.a+b)\right]\left[(\text{mod } p)\right]$$

a=1 and b=0 Linear Congruent Operator Equation 2

Where n and m are the indexes and elements of the Galois field and their values are expanded in Table 1 along with their multiplicative inverses for GF (5) is also shown.

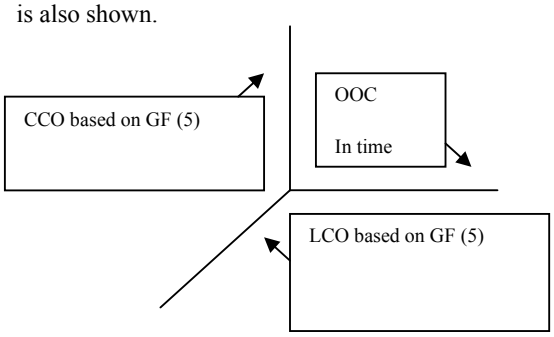

Fig1: Model B [1]

Table 1: Multiplicative Inverses for GF (5) and Sequences over GF (5) using cubic Algebraic Congruent operator and linear algebraic congruent operator

×	0	1	2	3	4
0	0	0	0	0	0
1	0	1	2	3	4
2	0	2	4	1	3
3	0	3	1	4	2
4	0	4	3	2	1

m,n	0	1	2	3	4
0	0	0	0	0	0
1	0	1	3	2	4
2	0	2	1	4	3
3	0	3	4	1	2
4	0	4	2	3	1

m,n	0	1	2	3	4
0	0	0	0	0	0
1	0	1	2	3	4
2	0	2	4	1	3
3	0	3	1	4	2
4	0	4	3	2	1

3. 3D CODESET

In accordance with Model B shown in Fig 1, the signature sequence is spreaded as follows. For temporal spreading: Optical orthogonal code is taken from literature C= 1011000100000 is a (13,4,1) code with c={0,2,3,7} where n=13,w=4 and λa = λc =1.here, n denotes length of the codeword, w denotes

BLOCK 0			
SET 0	SET1	SET2	SET3
$\lambda_0 S_0 \lambda_0 S_0 \lambda_0 S_0 \lambda_0 S_0$	$\lambda_0 S_0 \lambda_1 S_1 \lambda_3 S_2 \lambda_2 S_3$	$\lambda_0 S_0 \lambda_2 S_2 \lambda_1 S_4 \lambda_4 S_1$	$\lambda_0 S_0 \lambda_3 S_3 \lambda_4 S_1 \lambda_1 S_4$
$\lambda_0 S_1 \lambda_0 S_1 \lambda_0 S_1 \lambda_0 S_1$	$\lambda_0 S_1 \lambda_1 S_2 \lambda_3 S_4 \lambda_2 S_3$		
$\lambda_0 S_2 \lambda_0 S_2 \lambda_0 S_2 \lambda_0 S_2$	$\lambda_0 S_2 \lambda_1 S_3 \lambda_3 S_0 \lambda_2 S_4$		
$\lambda_0 S_3 \lambda_0 S_3 \lambda_0 S_3 \lambda_0 S_3$	$\lambda_0 S_3 \lambda_1 S_4 \lambda_3 S_1 \lambda_2 S_0$		
$\lambda_0 S_4 \lambda_0 S_4 \lambda_0 S_4 \lambda_0 S_4$	$\lambda_0 S_4 \lambda_1 S_0 \lambda_3 S_2 \lambda_2 S_1$		
BLOCK 1			
SET 0	SET1	SET2	SET3
	$\lambda_1 S_0 \lambda_2 S_1 \lambda_4 S_3 \lambda_3 S_3$		
BLOCK 2			
SET 0	SET1	SET2	SET3
	$\lambda_2 S_0 \lambda_3 S_1 \lambda_0 S_2 \lambda_4 S_3$		
BLOCK 3			
SET 0	SET1	SET2	SET3
	$\lambda_3 S_0 \lambda_4 S_1 \lambda_1 S_2 \lambda_0 S_3$		
BLOCK 4			
SET 0	SET1	SET2	SET3
	$\lambda_4 S_0 \lambda_0 S_1 \lambda_2 S_3 \lambda_1 S_3$		

weight of the codes and λa &λc denotes auto correlation and cross correlation constant. For spectral hopping: codes from cubic congruent operator as calculated in Table 1, from algebra theory are taken based on GF (5) using Model B. For spatial encoding: codes from linear congruent operator from algebra theory are taken based on GF (5) using Model B. These codes are expanded in Table 2.

4. OCDMA SYSTEM PARAMETERS

Simulation parameters: The data rate or bit rate is taken as 10 Gbps for each channel and time slot is the length of the temporal codes. In this simulation (13, 4, 1) OOC is taken for spreading in time domain.

Thus the bit period is calculated [3,4] as:

Bit Period=1/Bit Rate =1/10e9= .1e-9 and

Chip period=Bit Period/Time Slot

=.1e-9/13

= .0076e-9.

Now the time delay lines for temporal code (1011000100000) are calculated as

Time Delay lines for Encoder

$\mathbf{t_0}$ = 0×.0076e-9=0; $\mathbf{t_2}$=2×.0076e-9=.0152e-9;

$\mathbf{t_3}$= 3×.0076e-9=.0228e-9; $\mathbf{t_7}$= 7×.0076e-9=.0532e-9

Inverse delay lines for Decoder

$\mathbf{t_{13}}$= 13×.0076e-9=.0988e-9; $\mathbf{t_{11}}$= 11×.0076e-9=.0836e-9;

$\mathbf{t_{10}}$=10×.0076e-9=.076e-9; $\mathbf{t_6}$=6×.0076e-9=.0456e-9

Table 2: Code Sequences

Table 3: System Parameters

S.No.	Parameter	value
1)	Bit rate	10e9
2)	Bit period	.1e-9
3)	Chip period	.1e-9 e-9/13 = .0076 e-9
4)	Time slot	13
5)	Laser wavelength	λ_1= 1550.0e-9m λ_2= 1550.8e-9m λ_3= 1551.6e-9m λ_4= 1552.4e-9m λ_5= 1553.2e-9m
6)	Rep rate of source	10e9
7)	Peak power of laser	1.0e-3w
8)	Delta[2]	.8e-9(DWDM)
9)	No. of lasers	5
10)	Combiner/ Mux	5×1
11)	Combiner loss	3dB
12)	Pattern type	PRBS
13)	Pattern length	7 bits
14)	Fiber Attenuator	Variable in dB

5. SIMULATION AND RESULTS

Table 3 shows the practical parameters that were taken while simulating the proposed 3D codeset based on Model B using cubic and linear congruent operator with GF (5).Proposed System have 5 Operating wavelengths in C band i.e. λ_1= 1550.0e-9m, λ_2= 1550.8e-9m, λ_3= 1551.6e-9m, λ_4= 1552.4e-9m and λ_5= 1553.2e-9m with repetition rate=10e9 and peak power= 1.0e-3 w of MLL (Laser). And Delta =.8e-9 (i.e. spacing between the wavelength) is based on Dense Wavelength Division Multiplexing. Fig 2 &3 shows the snapshots of 3D OCDMA, encoder, decoder and star coupler internal view in OPTSIM Simulation Software.

This schematic evaluates the 3D OCDMA link with encoding/ decoding based on Model A with 4 users each transmitting at 5 Gbps data rate coding based on Galois field GF (5) with cubic congruent operator and optical orthogonal codes.

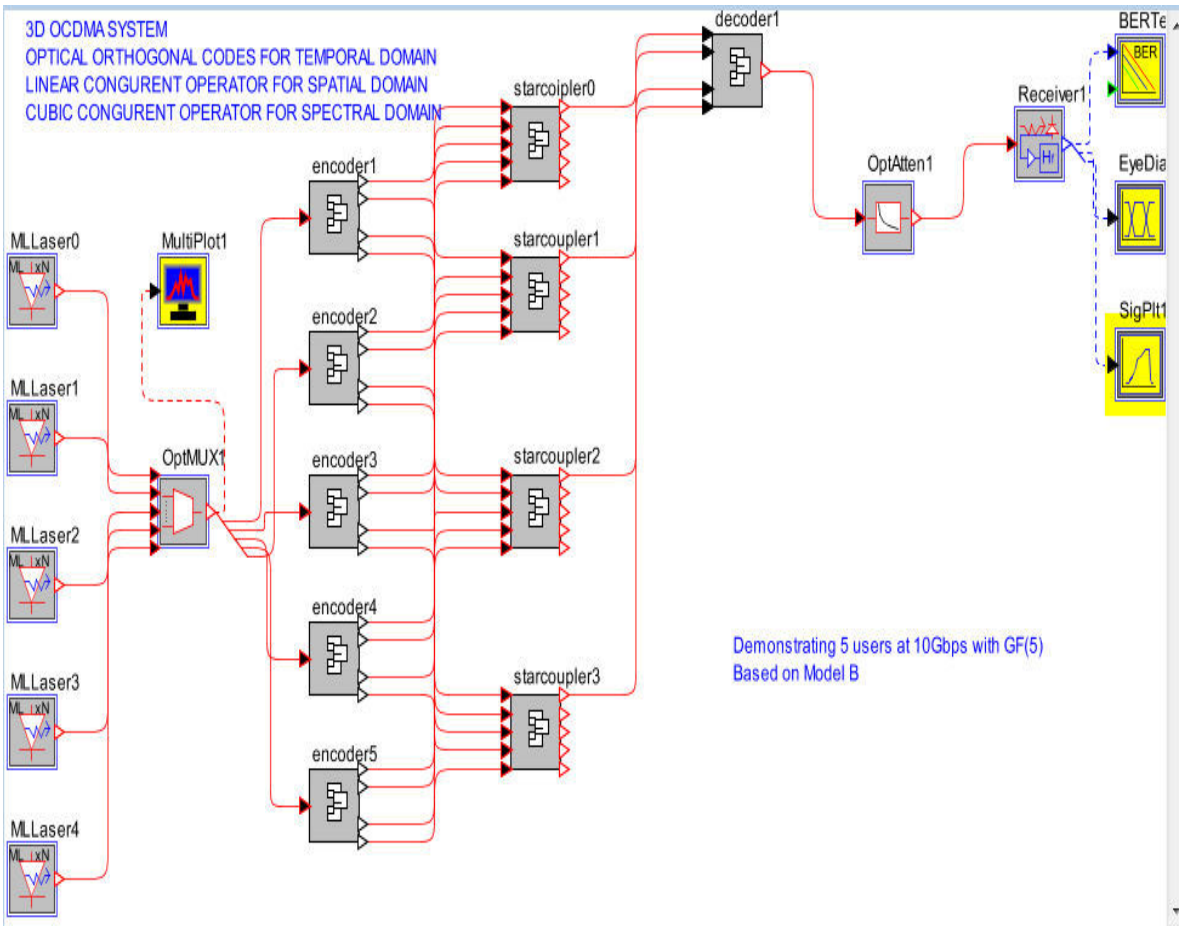

Fig 2: Technology Demonstrator of 3D OCDMA system based on Model B

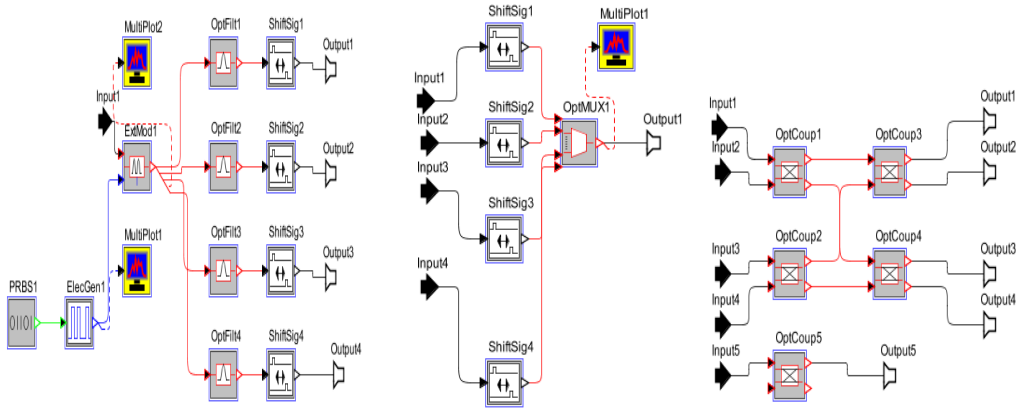

Fig 3: Snapshot of Encoder, Decoder and Star Coupler.

1) **Cardinality:** Cardinality is defined as the number of users supported by the OCDMA system. As shown in the Table users are defined based on the cubic and linear congruent operator for Model B.

$$C = p^2 \times w^2 \times (w-1)$$

Equation 3

Here in Equation 3, c is the cardinality, p is the prime number as given by Galois field GF (p) and w is the weight of the temporal domain codes. In this simulation work, p=5 and w is 4 so the cardinality in

this case is 1200 .Fig 4 shows the cardinality c v/s p with varying weight.

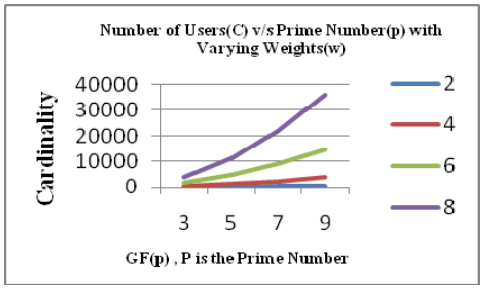

Fig 4: No. of Users(C) v/s Prime Number (p) with Varying Weights (w)

2) **BER v/s varying Attenuation.** Table 4 shows BER v/s Variable Attenuation at the front end of the receiver. Codes based on Model B are analyzed and it is shown that 5 users each with 10Gbps data rate are successfully transmitted with varying attenuation. The codes used for 5 users are shown in red color in Table 2.

3) **Graphs for Signal Spectrum, Eye Diagram and Autocorrelation Function**. Fig 5 shows the diagram for Signal Spectrum, Eye Diagram and Autocorrelation Function at the input and Fig 6 shows the diagrams for the Signal Spectrum and Eye Diagram for attenuation with -.2db and -2.5db respectively. And it's clear from the eye diagram that performance of the proposed codes is good till attenuation of -2.5 db at the front end of the receiver.

Table 4: BER v/s variable Attenuation

5 user	-.2	-.25	-.5	-.1	-1	-2	-2.5
BER	3.1738e-013	3.7543e-013	9.2242e-013	2.2391e-013	5.8913e-012	2.6864e-010	1.8277e-009

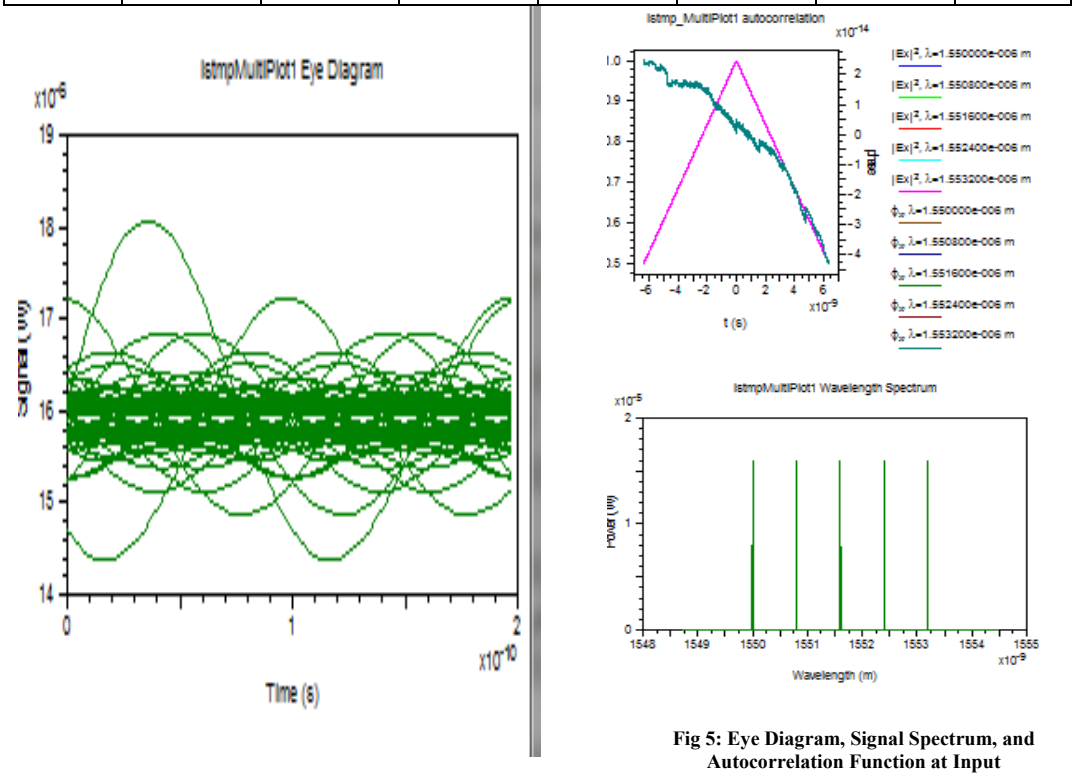

Fig 5: Eye Diagram, Signal Spectrum, and Autocorrelation Function at Input

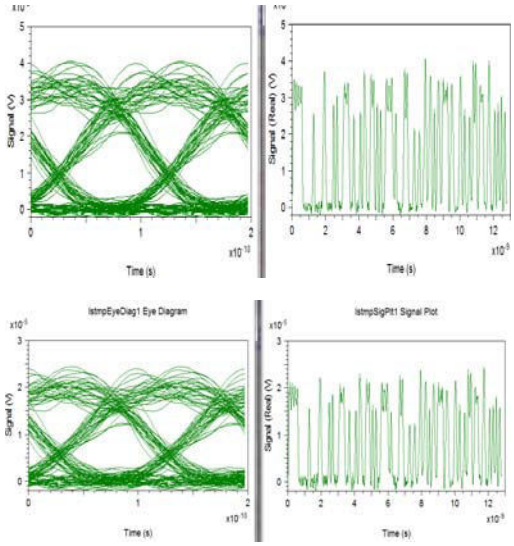

Fig 6: Eye Diagram and Signal Spectrum at the output with -.2dB and -.25 dB attenuation at the front end of the receiver

CONCLUSION

We analyze and present the demonstration of an incoherent OCDMA system. The performance analysis shows significant scalability improvement and system performance for 50 Gbps using 5-wavelength x 4-time-slot x 5-code WDM-TDM-CODE of 3D OCDMA system. En/Decoder is designed based on Model B. The simulation results shows OCDMA Transmission system validates the feasibility of the extended reach.

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ACKNOWLEDGEMENT

We Acknowledge the Optical Communication Lab at Department of Electronics Electrical and Communication Engineering, PEC University of Technology, Sector 12, Chandigarh was this work has been carried out.

BIOGRAPHY

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RAPTOR CODE BASED SECURE STORAGE IN CLOUD COMPUTING

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Abstract:-The end of this decade is marked by a paradigm shift of the industrial information technology towards a pay-per-use service business model known as cloud computing. Cloud data storage redefines the security issues targeted on customer's outsourced data. To ensure the correctness of users' data in the cloud, we propose an effective and flexible distributed scheme with two salient features, opposing to its predecessors. By utilizing the homomorphic token with distributed verification of raptor coded data, our scheme achieves the integration of storage correctness insurance and data error localization, i.e., the identification of misbehaving server(s).Using this new scheme it further support security and dynamic operations on data block. Our result shows that, our proposed model provides a secure storage for data in cloud.

Keywords: *raptor code, homomorphic token, dependable distributed storage, error localization,data dynamics.*

I. INTRODUCTION

Several trends are opening up the era of Cloud Computing, which is an Internet-based development and use of computer technology. The ever cheaper and more powerful processors together with the software as a service (SaaS) computing architecture, are transforming data centers into pools of computing service on a huge scale. The increasing network bandwidth and reliable yet flexible network connections make it even possible that users can now subscribe high quality services from data and software that reside solely on remote data centers.
Moving data into the cloud offers great convenience to users since they don't have to care about the complexities of direct hardware management. The pioneer of Cloud Computing vendors, Amazon Simple Storage Service (S3) and Amazon Elastic Compute Cloud (EC2) [1] are both well known examples. While these internet-based online services do provide huge amounts of storage space and customizable computing resources, this computing platform shift, however, is eliminating the responsibility of local machines for data maintenance at the same time. As a result, users are at the mercy of their cloud service providers for the availability and integrity of their data.

From the perspective of data security, which has always been an important aspect of quality of service, Cloud Computing inevitably poses new challenging security threats for number of reasons. Firstly, traditional cryptographic primitives for the purpose of data security protection cannot be directly adopted due to the users' loss control of data under Cloud Computing. Therefore, verification of correct data storage in the cloud must be conducted without explicit knowledge of the whole data. Considering various kinds of data for each user stored in the cloud and the demand of long term continuous assurance of their data safety, the problem of verifying correctness of data storage in the cloud becomes even more challenging. Secondly, Cloud Computing is not just a third party data warehouse.

The data stored in the cloud may be frequently updated by the users, including insertion, deletion, modification, appending, reordering, etc. To ensure storage correctness under dynamic data update is hence of paramount importance. However, this dynamic feature also makes traditional integrity insurance techniques futile and entails new solutions. Last but not the least, the deployment of Cloud Computing is powered by data centers running in a simultaneous, cooperated and distributed manner. Individual user's data is redundantly stored in multiple physical locations to further reduce the data integrity threats. Therefore, distributed protocols for storage correctness assurance will be of most importance in achieving a robust and secure cloud data storage system in the real world. However, such important area remains to be fully explored in the literature.

Recently, the importance of ensuring the remote data integrity has been highlighted by the following research works [3]–[7]. These techniques, while can be useful to ensure the storage correctness without having users possessing data, cannot address all the security threats in cloud data storage, since they are all focusing on single server scenario and most of them do not consider dynamic data operations. As an complementary approach, researchers have also proposed distributed protocols [8]–[10] for ensuring storage correctness across multiple servers or peers. Again, none of these distributed schemes is aware of dynamic data operations. As a result, their applicability in cloud data storage can be drastically limited.

In this paper, we propose an effective and flexible distributed scheme with explicit dynamic data support to ensure the correctness of users' data in the cloud. We rely on rateless erasure correcting

code in the file distribution preparation to provide redundancies and guarantee the data dependability. This construction drastically reduces the communication and storage overhead as compared to the traditional replication-based file distribution techniques. By utilizing the homomorphic token with distributed verification of rateless erasure-coded data, our scheme achieves the storage correctness insurance as well as data error localization: whenever data corruption has been detected during the storage correctness verification, our scheme can almost guarantee the simultaneous localization of data errors, i.e., the identification of the misbehaving server(s).

The rest of the paper is organized as follows. Section II introduces the system model, adversary model, our design goal and notations. Then we provide the detailed description of our scheme in Section III. Finally, Section IV gives the concluding remark of the whole paper.

II. PROBLEM STATEMENT

A. System Model

A representative network architecture for cloud data storage is illustrated in Figure 1. Three different network entities can be identified as follows:

• User: users, who have data to be stored in the cloud and rely on the cloud for data computation, consist of both individual consumers and organizations.

• Cloud Service Provider (CSP): a CSP, who has significant resources and expertise in building and managing distributed cloud storage servers, owns and operates live Cloud Computing systems.

• Third Party Auditor (TPA): an optional TPA, who has expertise and capabilities that users may not have, is trusted to assess and expose risk of cloud storage services on behalf of the users upon request.

In cloud data storage, a user stores his data through a CSP into a set of cloud servers, which are running in a simultaneous, cooperated and distributed manner. Data redundancy can be employed with technique of erasure-correcting code to further tolerate faults or server crash as user's data grows in size and importance. Thereafter, for application purposes, the user interacts with the cloud servers via CSP to access or retrieve his data. In some cases, the user may need to perform block level operations on his data. The most general forms of

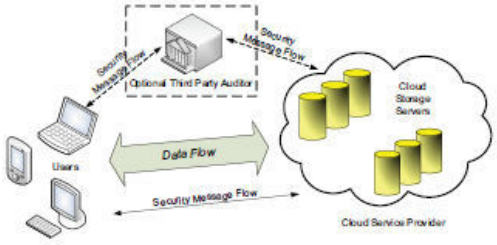

Fig. 1: Cloud data storage architecture

these operations we are considering are block update, delete, insert and append.

As users no longer possess their data locally, it is of critical importance to assure users that their data are being correctly stored and maintained. That is, users should be equipped with security means so that they can make continuous correctness assurance of their stored data even without the existence of local copies. In case that users do not necessarily have the time, feasibility or resources to monitor their data, they can delegate the tasks to an optional trusted TPA of their respective choices. In our model, we assume that the point-to-point communication channels between each cloud server and the user is authenticated and reliable, which can be achieved in practice with little overhead. Note that we don't address the issue of data privacy in this paper, as in Cloud Computing, data privacy is orthogonal to the problem we study here.

B. Adversary Model

From user's perspective, the adversary model has to capture all kinds of threats toward his cloud data integrity. Because cloud data do not reside at user's local site but at CSP's address domain, these threats can come from two different sources: internal and external attacks. For internal attacks, a CSP can be self-interested, untrusted, and possibly malicious. Not only does it desire to move data that has not been or is rarely accessed to a lower tier of storage than agreed for monetary reasons, but it may also attempt to hide a data loss incident due to management errors, Byzantine failures, and so on. For external attacks, data integrity threats may come from outsiders who are beyond the control domain of CSP, for example, the economically motivated attackers. They may compromise a number of cloud data storage servers in different time intervals and subsequently be able to modify or delete users' data while remaining undetected by CSP.

Therefore, we consider the adversary in our model has the following capabilities, which captures both external and internal threats toward the cloud data integrity. Specifically, the adversary is interested in continuously corrupting the user's data files stored on individual servers. Once a server is comprised, an adversary can pollute the original data files by

modifying or introducing its own fraudulent data to prevent the original data from being retrieved by the user. This corresponds to the threats from external attacks. In the worst case scenario, the adversary can compromise all the storage servers so that he can intentionally modify the data files as long as they are internally consistent. In fact, this is equivalent to internal attack case where all servers are assumed colluding together from the early stages of application or service deployment to hide a data loss or corruption incident.

C. Design Goals

To ensure the security and dependability for cloud data storage under the aforementioned adversary model, we aim to design efficient mechanisms for dynamic data verification and operation and achieve the following goals: (1) Storage correctness: to ensure users that their data are indeed stored appropriately and kept intact all the time in the cloud. (2) Fast localization of data error: to effectively locate the malfunctioning server when data corruption has been detected. (3) Dynamic data support: to maintain the same level of storage correctness assurance even if users modify, delete or append their data files in the cloud. (4) Dependability: to enhance data availability against Byzantine failures, malicious data modification and server colluding attacks, i.e. minimizing the effect brought by data errors or server failures. (5) Lightweight: to enable users to perform storage correctness checks with minimum overhead.

III. ENSURING CLOUD DATA STORAGE

In cloud data storage system, users store their data in the cloud and no longer possess the data locally. Thus, the correctness and availability of the data files being stored on the distributed cloud servers must be guaranteed. One of the key issues is to effectively detect any unauthorized data modification and corruption, possibly due to server compromise and/or random Byzantine failures. Besides, in the distributed case when such inconsistencies are successfully detected, to find which server the data error lies in is also of great significance, since it can be the first step to fast recover the storage errors.

To address these problems, our main scheme for ensuring cloud data storage is presented in this section. The first part of the section is devoted to a review of basic tools from coding theory that is needed in our scheme for file distribution across cloud servers. Then, the homomorphic token is introduced. The token computation function we are considering belongs
to a family of universal hash function [11], chosen to preserve the homomorphic properties, which can be perfectly integrated with the verification of erasure-coded data [8] [12]. Subsequently, it is also shown how to derive a challenge response protocol for verifying the storage correctness as well as identifying misbehaving servers. Finally, the procedure for file retrieval and error recovery based on erasure-correcting code is outlined.

A. File Distribution Preparation

It is well known that rateless erasure-correcting code may be used to tolerate multiple failures in distributed storage systems. In cloud data storage, we rely on this technique mainly raptor code to disperse the data file F redundantly across a set of n= m+k distributed servers. Raptor codes pre-encode the source symbols using a fixed length block code, and then encode these new symbols with an LT code. The main advantage is that, for correct decoding, it is no longer necessary that the LT decoding succeeds for all the symbols. Thus, it is possible to use a simpler degree distribution that does not recover all the symbols but makes the decoding process faster. The decoding algorithm is composed of two steps. The inner LT decoder returns a hard bit-reliability vector. This latter is processed by the outer LDPC decoder, based on belief propagation algorithm.

B. Challenge Token Precomputation

In order to achieve assurance of data storage correctness and data error localization simultaneously, our scheme entirely relies on the pre-computed verification tokens. The main idea is as follows: before file distribution the user pre-computes a certain number of short verification tokens on individual vector G(j) (j □ {1, . . . , n}), each token covering a random subset of data blocks. Later, when the user wants to make sure the storage correctness for the data in the cloud, he challenges the cloud servers with a set of randomly generated block indices. Upon receiving challenge, each cloud server computes a short "signature" over the specified blocks and returns them to the user. The values of these signatures should match the corresponding tokens pre-computed by the user. Meanwhile, as all servers operate over the same subset of the indices, the requested response values for integrity check must also be a valid codeword determined by secret matrix P. Suppose the user wants to challenge the cloud servers t times to ensure the correctness of data storage. Then, he must pre-compute t verification tokens for each G(j)(j□ {1, . . . , n}), using a PRF f(·), a PRP Φ(·), a challenge key K_{chal} and a master permutation key K_{PRP}. After token generation, the user has the choice of either keeping the pre-computed tokens locally or storing them in encrypted form on the cloud servers. In our case here, the user stores them locally to obviate the need for encryption and lower the bandwidth overhead during dynamic data operation which will be discussed shortly. The details of token generation are shown in Algorithm 1.

Algorithm 1 Token Pre-computation

1: procedure
2: Choose parameters l, n and function f, ϕ;
3: Choose the number t of tokens;
4: Choose the number r of indices per verification;
5: Generate master key K_{prp} and challenge k_{chal};
6: for vector $G^{(j)}$, $j \leftarrow 1, n$ do
7: for round $i \leftarrow 1, t$ do
8: Derive $\alpha_i = f_{k_{chal}}(i)$ and $k_{prp}^{(i)}$ from K_{PRP}.
9: Compute $v_i^{(j)} = \sum_{q=1}^{r} \alpha_i^q * G^{(j)}[\phi_{k_{prp}^{(i)}}(q)]$
10: end for
11: end for
12: Store all the v_is locally.
13: end procedure

C. Correctness Verification and Error Localization

Error localization is a key prerequisite for eliminating errors in storage systems. However, many previous schemes do not explicitly consider the problem of data error localization, thus only provide binary results for the storage verification. Our scheme outperforms those by integrating the correctness verification and error localization in our challenge-response protocol: the response values from servers for each challenge not only determine the correctness of the distributed storage, but also contain information to locate potential data error(s). Once the inconsistency among the storage has been successfully detected, we can rely on the pre-computed verification tokens to further determine where the potential data error(s) lies in. Algorithm 2 gives the details of correctness verification and error localization.

Algorithm 2 Correctness Verification and Error Localization

1: procedure CHALLENGE(i)
2: Recompute $\alpha_i = f_{k_{chal}}(i)$ and $k_{prp}^{(i)}$ from K_{PRP};
3: Send $\{\alpha_i, k_{prp}^{(i)}\}$ to all the cloud servers;
4: Receive from servers:
$\{R_i^{(j)} = \sum_{q=1}^{r} \alpha_i^q * G^{(j)}[\phi_{k_{prp}^{(i)}}(q)] | 1 \le j \le n\}$
5: for $(j \leftarrow m+1, n)$ do
6: $R^{(j)} \leftarrow R^{(j)} - \sum_{q=1}^{r} f_{k_j}(s_{I_q,j}) \cdot \alpha_i^q, I_q = \phi_{k_{prp}^{(i)}}(q)$
7: end for
8: if $((R_i^{(1)}, \ldots, R_i^{(m)}) \cdot \mathbf{P} == (R_i^{(m+1)}, \ldots, R_i^{(n)}))$ then
9: Accept and ready for the next challenge.
10: else
11: for $(j \leftarrow 1, n)$ do
12: if $(R_i^{(j)} != v_i^{(j)})$ then
13: return server j is misbehaving.
14: end if
15: end for
16: end if
17: end procedure

D. File Retrieval and Error Recovery

Since our layout of file matrix is systematic, the user can reconstruct the original file by downloading the data vectors from the first m servers, assuming that they return the correct response values. Notice that our verification scheme is based on random spot-checking, so the storage correctness assurance is a probabilistic one. However, by choosing system parameters (e.g., r,l,t) appropriately and conducting enough times of verification, we can guarantee the successful file retrieval with high probability. On the other hand, whenever the data corruption is detected, the comparison of pre-computed tokens and received response values can guarantee the identification of misbehaving server(s), again with high probability, which will be discussed shortly. Therefore, the user can always ask servers to send back blocks of the r rows specified in the challenge and regenerate the correct blocks by rateless erasure correction, shown in Algorithm 3, as long as there are at most k misbehaving servers are identified. The newly recovered blocks can then be redistributed to the misbehaving servers to maintain the correctness of storage.

Algorithm 3 Error Recovery

1: procedure
% Assume the block corruptions have been detected among
% the specified r rows;
% Assume $s \leq k$ servers have been identified misbehaving
2: Download r rows of blocks from servers;
3: Treat s servers as erasures and recover the blocks.
4: Resend the recovered blocks to corresponding servers.
5: end procedure

IV. CONCLUSION

In this paper, we investigated the problem of data security in cloud data storage, which is essentially a distributed storage system. To ensure the correctness of users' data in cloud data storage, we proposed an effective and flexible distributed scheme with explicit dynamic data support, including block update, delete, and append. We rely on raptor code in the file distribution preparation to provide redundancy parity vectors and guarantee the data dependability. By utilizing the homomorphic token with distributed verification of raptor coded data, our scheme achieves the integration of storage correctness insurance and data error localization, i.e., whenever data corruption has been detected during the storage correctness verification across the distributed servers, we can almost guarantee the simultaneous identification of the misbehaving server(s). Through detailed security and performance analysis, we show that our scheme is highly efficient and resilient to Byzantine failure, malicious data modification attack, and even server colluding attacks. We believe that data storage security in Cloud Computing, an area full of challenges and of paramount importance, is still in its infancy now, and many research problems are yet to be identified. We envision several possible directions for future research on this area. The most promising one we believe is a model in which public verifiability is enforced. Public verifiability, supported in [6] [4] [11], allows TPA to audit the cloud data storage without demanding users' time, feasibility or resources. An interesting question in this model is if we can construct a scheme to achieve both public verifiability and storage correctness assurance of dynamic data. Besides, along with our research on dynamic cloud data storage, we also plan to investigate the problem of fine-grained data error localization.

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IMPROVED SECURITY SYSTEM IN MOBILE CLOUD ACCESS THROUGH FUZZY INTRUSION DETECTION TECHNIQUE

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Abstract - Mobile phones are playing a vital role in every one's life. The computing strategy of mobile internet usage is lower than the mobile usage, this may due to the security threat. In general mobility and cloud computing initializing the global marketing, sales and development activities using mobile platforms to market and sell products and services. Mobile/Cloud computing is about improving internal efficiencies and productivity and improving your sales and marketing channels and reach. So we need to provide the security for the efficient mobile cloud access. In this proposal, a fuzzy based intrusion detection technique. This enhances the vulnerable security system for the mobile cloud users.

Keywords: *Mobile Cloud, Fuzzy, Vulnerable, Mobile platforms*

I. INTRODUCTION

Computing resources are owned and managed by a cloud service provider (CSP). Using virtualization techniques, these virtualized resources, such as hardware, platforms, or services, are dynamically allocated to scale on demand according to customers' needs. If a CSP fails to offer the demand, the CSP may outsource to other CSPs[2]. It's easy to see that cloud computing is simply the next immense step in the evolution of the internet. We, as consumers of information services, have moved from mainframe to desktops to mobile devices such as tablets, smart phones. An emerging computer paradigm where Content and services reside in massively scalable Content centers in the cloud and can be accessed from any connected devices over the internet. The concept of Mobile Cloud Computing (MCC) be going to make the advantages of Cloud Computing available for mobile users but will provide additional functionality to the cloud as well.

1).General Model of Cloud Computing

a. Software as service

Customer rents computing resources instead of buying and installing them in their own data center[3].

Advantages: Rapid start-up, maintenance and upgrades performed by the vendor, scalable.

Risks: Minimal customization, data integration, security and privacy, no control over upgrades, exit strategy, Proliferation.

Examples: Salesforce.com, Google Apps.

•Amazon's Elastic Compute Cloud (Amazon EC2)

b.Platform as a Service

Solution stack - An integrated set of software that provides everything a developer needs to build an application for both software development and runtime.

Advantages: Focus on high value rather than infrastructure, economies of scale, Provides Scalable go-to-market capability.

Risks: Exit strategy, pricing model, upgrade issues.

Examples: force.com, Microsoft Azure, web and e-mail Hosting, Google App Engine, AppJet, Etelos, Qrimp, and Force.com

c.Infrastructure as a Service

Business applications that are hosted by the provider and delivered as a service.

Advantages: Scalable, rapid start-up, peak leveling.

Risks: Pricing model, potential lock-in, security and privacy, proliferation

Examples: Amazon EC2, Rack space, Sales force .com

2).Comparison of Grid Computing and Cloud Computing

Both are scalable & shareable the Resources and usability of the resource is high. Grid is used for batch-style job execution, such as a scientific calculation, whereas the cloud serves long-lasting services and X as a service (XaaS).Loose coupled cloud infrastructure empowers developers to unfold their creativity.

3).Comparison of cluster computing, Grid Computing and Cloud Computing in security

Cluster	**Grid**	**Cloud**
Traditional login/password-based.	Public/private key pair based authentication and mapping a user to an account.	Each service provided with a virtual machine.
Medium level of privacy depends on User privileges.	Limited support for privacy.	High security/privacy is guaranteed. Support for setting per-file access control list (ACL).

Table1: Cluster Vs Grid Vs Cloud

4).Intrusion Detection System

An intrusion detection system monitors network traffic and/or monitors host audit logs in order to determine whether any violations of an organization's security policy have taken place. IDS can detect intrusions that have circumvented or passed through a firewall or that are occurring within the local area network behind the firewall. A networked system's security policy should require that designated system and network administrators and response team members are trained in the use of intrusion response tools and environments. Also, the policy should require that the inventory of all applications software[4], operating systems, supporting tools, and hardware be kept up to date, and quick access to backups in an emergency is required, even if they are stored at a remote site. This may include defining procedures that give specific managers the responsibility to authorize such access.

Intrusion detection (ID) processes must be planned and implemented to help organizations detect and respond to incidents before they occur. It's important to respond to incidents in an efficient and effective manner. For example, the information system security officer (ISSO) must determine how the organizations going to monitor the intrusion detection system[5], who will monitor it, how alerts will be processed, and how the incident is remediated and with what level of response.

The most common approaches to ID are statistical anomaly detection (also known as behavior-based) and pattern-matching (also known as knowledge-based or signature-based) detection.

II.SIGNIFICANT AREAS FOR CLOUD COMPUTING

1. cloud Security Challenges

Areas for security concerns in cloud computing are[2,3]

a. Securing data at rest.

Cryptographic encryption is certainly the best practice in worldwide, it's the law for securing data at rest at the cloud provider. Auspiciously, hard drive manufacturers are now shipping self encrypting drives that implement the TCG's(Trusted Storage standards). Self-encrypting drives build encryption hardware into the drive, providing automated encryption with minimal cost or performance impact. Software encryption can also be used, but it is slower and less secure since the encryption key can be copied off the machine without detection.

b Securing data in transit.

Encryption techniques should also be used for data in transit. In addition, authentication and integrity protection ensure that data only goes where the customer wants it to go and is not modified in transit. Well-established protocols such as SSL/TLS should be used here. The tricky part is strong authentication, as described next.

c Access Control and Authentication.

User authentication is often the primary basis for access control, keeping the bad users out while allowing authorized users in with a minimum of fuss. In the cloud environment, authentication and access control are more important than ever since the cloud and all of its data are accessible to anyone over the Internet. The TPM[6] can easily provide stronger authentication than username and passwords. TCG's IF-MAP standard allows for real-time communication between the cloud provider and the customer about authorized users and other security issues. When a user is fired or reassigned, the customer's identity management system can notify the cloud provider in real-time so that the user's cloud access can be modified or revoked within seconds. If the fired user is logged into the cloud, they can be immediately disconnected. Trusted Computing enables authentication of client PCs and other devices, which also is critical to ensuring security in cloud computing.

d.Separation between customers.

One of the more obvious cloud concerns is separation between a cloud provider's users (who may be competing companies or even hackers) to avoid inadvertent or intentional access to sensitive information. Typically a cloud provider would use virtual machines (VMs)[4,5] and a hypervisor to separate customers. TCG technologies can provide significant security improvements for VM and virtual network separation. In addition, the TPM can provide hardware-based verification of hypervisor and VM integrity. The TNC architecture and standards can provide strong network separation and security.

e. Cloud legal and regulatory issues.

To verify that a cloud provider has strong policies and practices that address legal and regulatory issues, each customer must have its legal and regulatory experts inspect cloud provider policies and practices to ensure their adequacy[7]. The issues to be considered include data security and export, compliance, auditing, data retention and destruction, and legal discovery. In the areas of data retention and deletion, Trusted Storage and TPM access techniques can play a key role in limiting access to data.

f. Incident response.

As part of expecting the unexpected, customers need to plan for the possibility of cloud provider security breaches or user misbehavior. An automated response or at least automated notification is the best solution. TCG's IF-MAP (Metadata Access Protocol) specification enables the integration of different security systems and provides real-time notification of incidents and of user misbehavior.

III.RELATED WORK

A. Trusted data sharing over untrusted cloud storage providers

Fig 1 specifies the specific security requirements for securing data storage in the cloud can be summarized as follows:

1. Data stored on the cloud should be kept private and the cloud storage provider should not be able to compromise the data Confidentiality by any means.

2. The data owner has full control over authorization of data sharing. With authorization given by the owner, the designated user can then access the data kept on the cloud. Nevertheless, the process should not give the cloud provider any right to access the data.

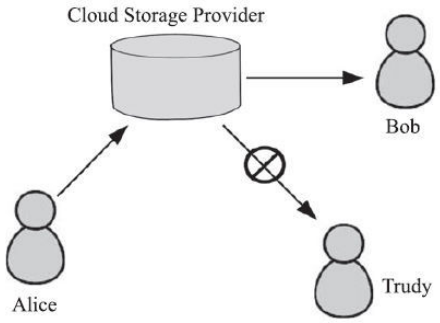

Fig1: Secure sharing on cloud [4].

There are still some grey areas that need to be addressed, such as security and privacy of user's data stored on cloud server(s), security threats caused by multiple virtual machines, and intrusion detection. As MCC is based on cloud computing so all the security issues are inherited in MCC with extra limitation of resource constraint mobile devices. Due to resources limitation, the security algorithms proposed for cloud computing environment cannot be directly run on mobile device[8]. There is a need of lightweight secure framework that provides security with minimum communication and processing overhead on mobile devices.

B. A Security Framework for Efficient and Secure Data Storage Services in MCC

Zhou et al. [5] proposed a privacy preserving framework called Privacy Preserving Cipher Policy Attribute-Based Encryption (PP-CP-ABE) for lightweight mobile devices. The proposed scheme offloads the processing and storage intensive encryption and decryption operations on

cloud without revealing any information about data contents and security key

Fig 2 represents the Data Owner (DO) can be a mobile device or a sensor that may request to store and retrieve data from cloud. To increase the processing capability of DO, major portion of encryption and decryption operations are outsourced on cloud. Encryption Service Provider (ESP) encrypts the file for DO without having knowledge about the security keys.

Decryption Service Provider (DSP)[8] decrypts the file for DO without getting any information about data contents. The encrypted data is stored on storage service provider. Authors assume that Trusted Authority (TA) is responsible to generate and distribute keys among DOs.

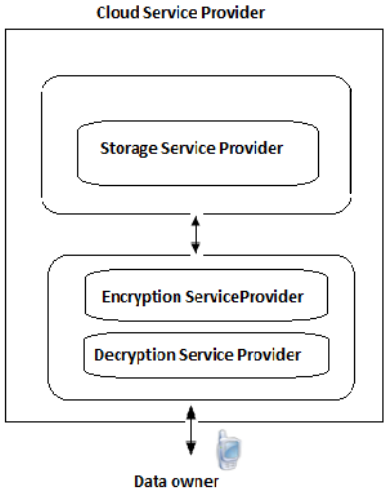

Fig 2: Traditional Cryptography

For example, Soghoian [7] believes that the likely reason Google took several years to offer HTTPS (Hypertext Transfer Protocol Secure), an industry standard encryption protocol, by default is the issue of cost because encryption takes processing power and memory. Plainly download all the encrypted data, decrypt and search on local computers is not practical.

IV. FURTHER WORK

The advantages of cloud computing can become disadvantages. Although the cloud providers can afford and might implement better security mechanism into their systems than the common end-users, like hiring security experts and installing anti-virus software, the facts of remote access, virtualization, platform sharing, border crossing, lack of data control, and massive use of third party services and infrastructures all make security and privacy a major worry.

Fig 3 represents, a Rule-based intrusion detection system, an attack can either be detected if a rule is found in the rule base or goes undetected if not found. The attacks that are found by the RIDS are blocked here.

Fuzzy Intrusion Detection System is used in order to make accurate predictions from the results of Rule-based IDS. In a Rule-based intrusion detection system, an attack can either be detected if a rule is found in the rule base or goes undetected if not found.

The output of the RIDS goes to the Fuzzy component of FASIDS[9] for further analysis (Susan M. Bridges 2002) (Ambareen Siraj et al 2001) using fuzzy Cognitive Mapping(FCM).

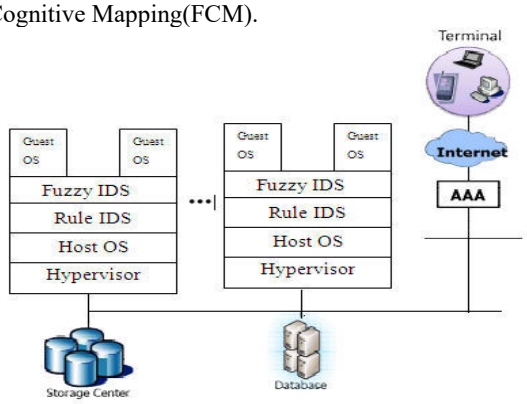

Fig 3: Security through using FIDS

A. Algorithm for Fuzzy Intrusion Detection System

Step 1 : Let x= number of login failures and t= time interval

Step 2 : x=normalization of (x)=(x-*min*)/(*max*-*min*) where,

min is the minimum value for the attribute that x belongs to

max is the maximum value for the attribute that x belongs to

Step 3 : The output of the fuzzification is given to FCM which has the Fuzzy rules in the form: IF condition THEN consequent Suspicious event

Where,

Condition is a complex fuzzy expression i.e., that uses fuzzy Consequent is an atomic Expression

V.CONCLUSION

In this rule based semantic intrusion detection system Misuse detection uses rule based IDS that follow a signature-match approach which is time consuming. Proposed has an efficient memory usage since the amount of memory needed for working of the IDS depends on the rule table size. The complexity ratio of the memory usage and data consumption is very lower in this proposed technique. In further, we will enhance this in the all the kinds of cloud based applications in the mobile environment.

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DYNAMIC RESOURCE MANAGEMENT IN LARGE CLOUD ENVIRONMENTS USING DISTRIBUTED GOSSIP PROTOCOL

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Abstract- Resource management poses particular challenges in large-scale systems, such as server clusters that simultaneously process requests from a large number of clients. We mainly focus on the dynamic resource management in large scale cloud environment. Our core contribution centers around outlining a distributed middleware architecture and presenting one of its key elements, a gossip protocol P* that meets our 3 main design goals: (1) fairness of resource allocation with respect to hosted sites (2) efficient adaptation to load changes and (3) scalability in terms of both the number of machines and sites. We first present a protocol that maximizes the cloud utility under CPU and memory constraints and also minimizes the cost for adapting an allocation. Then, we extend that protocol to have a management control parameter, which can be done with the help of profiling technique. A particular challenge is to develop a gossip protocol that is robust against node failures. In this paper, we present P*, a gossip protocol for continuous monitoring of aggregates, which is robust against discontiguous failures (i.e., under the constraint that neighboring nodes do not fail within a short period of each other)

Index Terms - *Cloud computing, distributed management, resource allocation, gossip protocol, profiling, robust aggregation*

I. INTRODUCTION

We focus the problem of resource management for a large-scale cloud environment. Such an environment includes the physical infrastructure and associated control functionality that enables the provisioning and management of cloud services.
Dynamic resource management can be explained with the help of IaaS and PaaS perspectives. The perspective we take is that of a cloud service provider [1], which hosts sites in a cloud environment and the stakeholders for this use case are depicted in Fig 1.

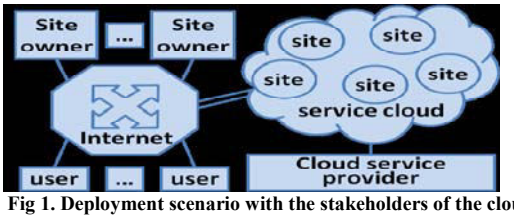

Fig 1. Deployment scenario with the stakeholders of the cloud environment considered in this work

This work [2] contributes towards engineering a middleware layer that performs resource allocation in a cloud environment, with the following design goals:
1) Performance objective: We consider computational and memory resources and the objective is to achieve reasonable fairness among sites for computational resources under memory constraints.
2) Adaptability: The resource allocation process must dynamically and efficiently adapt to changes in the demand from sites.
3) Scalability: The resource allocation process must be scalable both in the number of machines in the cloud and the number of sites that the cloud hosts. This means that the resources consumed per machine in order to achieve a given performance objective must increase sub linearly with both the number of machines and the number of sites.

This paper also addresses a fundamental problem in virtual machine (VM) resource management [3]: how to effectively profile physical resource utilization of individual VMs. Our focus is on extracting the utilization of physical resources by a VM across time, where the resources include CPU (utilization in CPU cycles), memory (utilization in memory size). Correct VM resource utilization information is tremendously important in any autonomic resource management that is model based. Hence, resource management is completely based on resource mapping across virtual machines.

Profiling is a hard problem because mapping virtual-to-physical (V2P) resource activity mapping is not always one to one and may depend on application workload characteristics. In this paper we extend the factor graph model [5] with directionality and factoring generalization, and design a directed factor graph (DFG) that models the multivariate dependence relationships among different resources and across virtual and physical layers.

Gossip protocols, also known as epidemic protocols [12], can be characterized by asynchronous and often randomized communication among nodes in a network [7]. Originally, they have been proposed for disseminating information in large dynamic environments and more recently, they have been applied for various tasks, including constructing robust overlays, estimating the network size [8] [6], etc.

A gossip protocol [4] for monitoring network-wide aggregates executes in the context of decentralized management architecture. Fig 2. shows an example of such an architecture, which we propose using for this purpose. In this architecture, monitoring nodes with identical functionality organize themselves into a management overlay. The aggregation protocol (in this case, the gossip protocol) runs in the monitoring nodes, which communicate via the overlay. Each monitoring node collects data from one or more network devices. A management station can access the monitoring layer at any node. Node or link failures—on the physical network or the management overlay—trigger a re-organization of the management overlay, thereby enabling continuous operation.

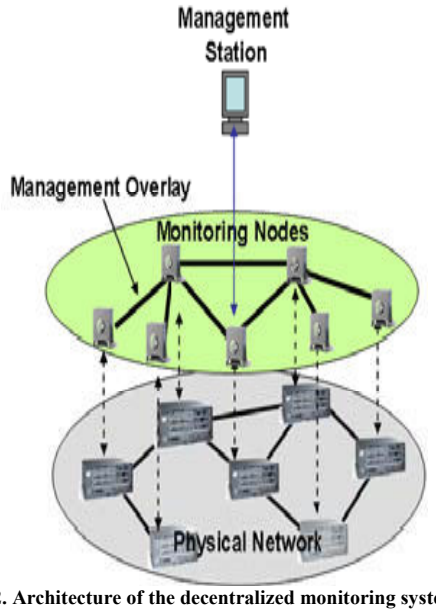

Fig 2. Architecture of the decentralized monitoring system. Gossip protocols run in the management overlay (middle layer)

Hence, gossip protocol can be formally applied to dynamic resource management in large cloud environments with a focus of overcoming discontiguous failures and also using a management control parameter for the protocol actions to take place securely.

II. SYSTEM ARCHITECTURE

A cloud environment spans several datacenters interconnected by an internet. Each of these datacenters contains a large number of machines that are connected by a high-speed network. Users access sites hosted by the cloud environment through the public Internet. A site is typically accessed through a URL that is translated to a network address through a global directory service, such as DNS. A request to a site is routed through the Internet to a machine inside a datacenter that either processes the request or forwards it.

Fig 3. (left) shows the architecture of the cloud middleware [1] [2]. The components of the middleware layer run on all machines. The resources of the cloud are primarily consumed by module instances whereby the functionality of a site is made up of one or more modules.

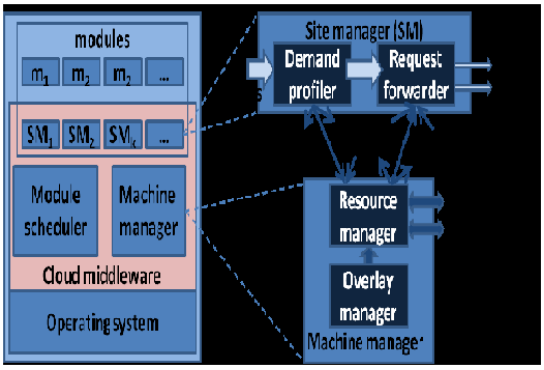

Fig 3. The architecture for the cloud middleware (left) and components for request handling and resource allocation (right).

Each machine runs a *machine manager* component that computes the resource allocation policy, which includes deciding the module instances to run. The resource allocation policy is computed by a protocol P* that runs in the *resource manager* component. This component takes as input the estimated demand for each module that the machine runs. The computed allocation policy is sent to the *module scheduler* for execution, as well as the *site managers* for making decisions on request forwarding. The *overlay manager* implements a distributed algorithm that maintains an overlay graph of the machines in the cloud and provides each resource manager with a list of machines to interact with.

Our architecture associates one site manager with each site. A site manager handles user requests to a particular site. It has two components: (1) The *demand profiler* estimates the resource demand of each module of the site based on request statistics. This demand estimate is forwarded to all machine managers that run instances of modules belonging to this site. (2) The *request forwarder* sends user requests for processing to instances of modules belonging to this site. Request forwarding decisions take into account the resource allocation policy and constraints such as session affinity. Fig 3. (right) shows the components of a site manager and how they relate to machine managers.

Profiling [3] can be done with the help of Directed Factor Graph (DFG) which can be explained with the help of an example as shown below.

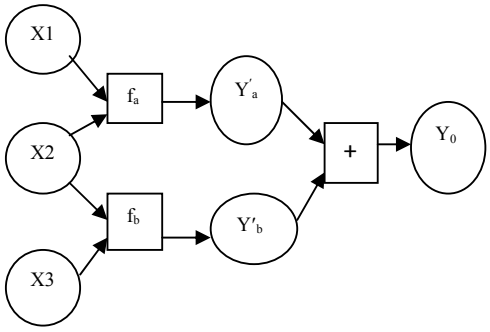

Fig 4. A directed factor graph example

Fig 4. shows the directed factor graph for a global function $Y_0 = g(x1, x2, x3)$ with decomposition given as,
$g(x1, x2, x3) = f_a(x1, x2) + f_b(x2, x3)$
The new variable nodes Y'_a, Y'_b are two temporary variables recording the output of the functions f_a and f_b.

DFG can be used for resource mapping across virtual machines, which serves as the management control parameter, so as to increase the efficiency of gossip protocol. Also, the choice of using gossiping is motivated by achieving robustness [4]. In case a parent node fails, an elected child node can replace the parent instantly. The goal for our protocol is to give a continuous estimate of a global aggregate in near real-time and with high accuracy and it address the problem of mass loss in gossip protocols.

III. FORMALIZING THE PROBLEM OF RESOURCE ALLOCATION AND PROFILING BY THE ROBUST GOSSIP PROTOCOL

Hence, formalizing the resource allocation problem in dynamic large cloud environment is a tedious process but making this process to be efficient, we need a robust gossip protocol to perform dynamic resource management by satisfying performance objectives.

For this work, we consider a cloud as having computational resources (i.e., CPU) and memory resources, which are available on the machines in the cloud infrastructure [1] [2]. We formulate the resource allocation problem as that of maximizing the cloud utility under CPU and memory constraints [14]. The solution to this problem is a configuration matrix that controls the module scheduler and request forwarder components. At discrete points in time, events occur, such as load changes, addition and removal of site or machines, etc. In response to such an event, the optimization problem is solved again, in order to keep the cloud utility maximized. We add a secondary objective to the optimization problem, which states that the cost of change from the current configuration to the new configuration must be minimized.

For the above model, we consider a cloud with CPU capacity $\boldsymbol{\Omega}$, memory capacity $\boldsymbol{\Gamma}$, and demand vectors $\boldsymbol{\omega}$, $\boldsymbol{\gamma}$. We first discuss a simplified version of the problem. It consists of finding a configuration A that maximizes the cloud utility U^c:

$$\text{maximize} \quad U^c(A,\boldsymbol{\omega})$$
$$\text{subject to} \quad A \geq 0, \ \mathbf{1}^{\mathbf{T}}\mathbf{A} = \mathbf{1}^{T}$$
$$\hat{\Omega}(A,\boldsymbol{\omega})\mathbf{1} \leq \boldsymbol{\Omega}$$

Our concept of utility is max-min fairness and our goal is to achieve fairness among sites. This means that we want to maximize the minimum utility of all sites, which we achieve by maximizing the minimum utility of all module instances.

Second, we consider the fact that the system must adapt to external events in order to keep the cloud utility maximized. Therefore, the problem becomes one of adapting the current configuration $A(t)$ at time t to a new configuration $A(t + 1)$ at time $t + 1$ which achieves maximum utility at minimum cost of adapting the configuration.

$$\text{maximize} \quad U^C(A(t+1), \boldsymbol{\omega}(t+1))$$
$$\text{minimize} \quad c^*(A(t), A(t+1))$$
$$\text{subject to} \quad A(t+1) \geq 0, \ \mathbf{1}^{\mathbf{T}}\mathbf{A}(t+1) = \mathbf{1}^{\mathbf{T}}$$
$$\hat{\Omega}(A(t+1),\boldsymbol{\omega}(t+1))\mathbf{1} \leq \boldsymbol{\Omega}$$
$$\mathbf{sign}(A(t+1))\boldsymbol{\gamma} \leq \boldsymbol{\Gamma}.$$

P* is an asynchronous protocol. This means that a machine does not synchronize the start time of a protocol round with any other machine of the cloud. At the beginning of a round (more precisely, at the start of the loop of the active or passive thread), a machine reads the current demands of the modules it runs. At the end of a round (more precisely, at the end of the loop of the active or passive thread) a machine updates its part of the configuration matrix A. The matrix A thus changes dynamically and asynchronously during the evolution of the system [13].

The work in [9], which has been extended by [10] presents a distributed middleware for application placement in datacenters. As in this paper, the goal of that work is to maximize a cluster utility under changing demand, although a different concept of utility is used. The choice of utility functions in that work is such that service differentiation works very well under overload conditions, with the risk of starving unpopular applications. In contrast, our approach guarantees that every module receives its fair share of the CPU resources of the cloud, and that in underload conditions all modules are guaranteed to have satisfied demands. The proposed design in [9],

[10] scales with the number of machines, but it does not scale in the number of applications.

The modeling process of DFG [3] consists of the following steps:
1. Host a single VM in a server.
2. Run a benchmark for a specific virtual resource (e.g., a CPU-intensive benchmark).
3. Apply statistics analysis to find out the set of physical resources on which the benchmark incurs non-negligible utilization and learn the models for the function nodes.
The benchmark based modeling process [11] aims at capturing the stable causality relationships between virtual and physical resource demands. We carefully select a fixed set of benchmark applications to cover the two resources (CPU and memory)

Then, our main aim is to develop a distributed protocol for continuously computing aggregation functions in a scalable and robust manner [4]. G-GAP is based on "Push-Synopses", a gossip protocol for computing aggregates proposed by Kempe et al. [7]. Here we consider Push-Synopses applied only to the computation of averages, although we don't envisage any problems in adapting our results to more general synopses, such as those discussed in [7]. Our main contribution in this paper is to extend the Push-Synopses protocol with a scheme to provide accurate estimates in the event of node failures of different types. These extensions are introduced in two steps; first, for the case of fully synchronized rounds with guaranteed, timely message delivery; then, for the more general, asynchronous case.

In the Push-Synopses protocol, each node i maintains, in addition to the local management variable x_i , a *weight* w_i and a *sum* s_i . The local estimate of the aggregate is computed as $a_i = s_i / w_i$. The protocol is given for the case of a complete (i.e. fully connected) network graph of n nodes. However, the protocol is easily adapted to graphs where only adjacent nodes are allowed to communicate directly with each other. This is the relevant case in practice, for scalability reasons. The protocol executes in synchronized rounds, assuming reliable and timely communication, such that a message sent within a given round is guaranteed to be delivered within that round.

The protocol relies on five rather strong assumptions which makes it robust:
1. *Reliable and timely message delivery*: There is a maximum communication delay $t_d < t_r$ (the round duration) such that a message sent from a node i to a node j at time t is delivered to j no later than $t + t_d$
2. *Synchronized rounds*: Rounds are globally synchronized to within some bound $t_{\Delta r}$. That is, all live nodes start a round within $t_{\Delta r}$ of each other.
3. *Round atomicity*: All protocol cycles are executed as atomic statements.
4. *Discontiguous crash failures*: No two nodes fail within two rounds of each other. When running this protocol on a network graph, this assumption translates to condition that adjacent nodes cannot fail within a period of two rounds.
5. *Connectedness*: No failure will cause a node to become disconnected.

IV. DISCUSSION AND CONCLUSION

With this paper, we make a significant contribution towards engineering a resource management middleware for a site-hosting cloud environment. We identify a key component of such a middleware and present a protocol that can be used to meet our design goals for resource management: fairness of resource allocation with respect to sites, efficient adaptation to load changes and scalability of the middleware layer in terms of both the number of machines in the cloud as well as the number of hosted sites.

Also, we present the design and evaluation of a VM monitoring information calibration mechanism. We formulate our problem as a source separation problem and base our solution on a directed factor graph. We show how to build a base DFG model through benchmarking and design a run-time remodeling solution which is adaptive and guided by the base DFG model. Our evaluation shows that the proposed methodology is robust as it successfully calibrates the VM monitoring information and compares well to baseline measures.

This paper also makes a major contribution by presenting a gossip protocol, P*, which enables continuous monitoring of network-wide aggregates. The hard part is making the protocol robust against node failures. Applying gossip protocols to continuous monitoring is not possible without solving the problem of mass loss due to node failures.

Pursuing this goal, we plan to address the following issues in future work: (1) Develop a distributed mechanism that efficiently places new sites. (2) Extend the middleware design to span several clusters and several datacenters, while keeping module instances of the same site "close to each other", in order to minimize response times and communication overhead. (3) Extend P* to allow the memory demand to change over time. (4) Extend P* to consider additional resource types, such as storage and network resources.

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AMORPHOUS EVENT PREVENTION IN WIRELESS SENSOR NETWORK

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Abstract -In many applications wireless sensor can be used to detect the events in those applications. With the advances in sensing, communication, and computation, there is an increasing need to track mobile events such as air pollutant diffusion, toxic gas leakage, or wildfire spreading using mobile sensors such as robots. Lots of existing work use control theory to plan the path of mobile sensors by assuming that the event evolution is known in advance. This assumption has severely limited the applicability of existing approaches. In this paper we aim to design a detecting, tracking and preventing approach that is capable of identifying multiple events with dynamic event signatures and providing event evolution history that may include event merge, split, create and destroy. We also focused on the power consumption.

1. INTRODUCTION

Mobile sensor networks are very powerful when being used to detect and track mobile events such as air pollutant diffusion, toxic gas leakage, or wildfire spreading. However, existing work like assumes that event evolution is known in advance so that events can be modeled formally and robots can be controlled according to track the events. This assumption has severely limited the applicability of existing approaches, especially in a general scenario containing multiple dynamic events with different evolving patterns. To save energy resource and thus extend the network lifetime, it is desirable that only the nodes that surround the mobile target are responsible for observing the target. For example, when the target passes through the t1 point as shown in Fig. 1, all nodes do not need to join in the task for tracking a mobile target. Instead, it is more energy efficient for only the nodes S1 around the mobile object to join in collecting information of the target and performing collaborative work among them. Other nodes located far from the target do not need to waste their powers to monitor the target. If we can predict the next location of the mobile object in advance, we can organize the group membership dynamically which should join in tracking mission. As shown in Fig.1 for example, the number of participating nodes may be minimized, which allows us to further extend the whole network lifetime if we predict future location of the mobile target accurately As the mobile object moves, the tracking nodes may migrate to the moving direction of the target to keep on monitoring as shown in Fig. 1, where a thick line indicates the moving path of the mobile target and the blacked circles inside the dotted circle are tracking nodes at time t1 . Thus, sensor nodes need to control their states by themselves based on prediction of target's movement. We assume a sensor network where N sensors with the same communication and sensing range are distributed randomly in the environment that is being monitored. We also assume that each node knows its own location by using GPS or other location awareness techniques. And we utilize triangulation for localization of a mobile target. Consequently, at least 3 sensors join the target detection and tracking with surveillance. Also each node keeps information about its neighbors such as location through the periodically message change. And each individual sensor node is equipped with appropriate sensory devices to be able to recognize the target as well as to estimate its distance based on the sensed data. Further, we assume that we predict the location of the mobile targets every one second (or minute), and each sensor records the movement pattern of the mobile object. Basically, we use a moving average estimator to predict the future location of the mobile target based on the measurement of direction and the velocity of the mobile target. WIRELESS sensor networks have been considered very useful for event detection and tracking in various applications such as oil spill detection or ground water contaminant monitoring. The challenge here is to devise a method for the sensors to recognize and follow these events as they travel through the network. This identification and tracking capability forms a critical foundation for various higher level processing tasks such as predicting an event's evolution or conducting queries on the affected area. For instance, for some applications like monitoring the dispersion of fluids, classic numerical fluid transport models for fluid prediction are extremely computationally intensive and require hours to run to completion. In order to monitor events in real time, the model should be decomposed and computation should be distributed among the sensor nodes to exploit computational parallelism. By identifying and tracking each event in a distributed manner, one node for each identified event can be designated as an interface point for running the model. Typical examples include establishing survivable military surveillance systems, environmental and industrial monitoring, personnel and wildlife monitoring systems requiring tracking schemes, capable of deducing kinematic characteristics such as position,

velocity, and acceleration of single or multiple targets of interest. The basic idea of our tracking approach is as follows. An entity that intends to track a target is called a tracker. A tracker is assumed to be a single generic source such as a mobile user or a respective authority. A target can be any mobile entity such as enemy vehicle or an intruder. Each sensor in the network has the capability of sensing, communicating, and computing. Consider again the chemical spill as it diffuses below ground. If the fluid is pouring out from more than one site, the separate plumes may meet and mix together. In so doing, they lose their individual shapes in a single large cloud. Conversely, changes in the medium through which it permeates may cause the fluid to follow a few preferred paths and break up into separate, smaller concentrations. In practice, keeping track of the dynamic expanding, shrinking, dividing, and merging of contaminant is essential to making treatment decisions. In edge detection-based region event tracking, the challenge is to devise a method for nodes to be identified as "edge nodes" that are near the boundary of a region and from that, calculate an approximate boundary for the region in question. Three methods guided by statistics, image processing techniques, and classifier technology are developed and compared in. A novel method for edge detection of region events makes use of the duel-space principle. The algorithm is fundamentally centralized. Identify several critical points in a given event region and periodically check the criticalness of these points, but the scheme can only work for an event whose shape remains convex. Therefore, we have the realization of the aforementioned intuition that if a high concentration of an event's readings is moving far off the event center, then that concentration should be recognized as an autonomous event. Merges are symmetric in logic. The node momentum is the decision variable that controls whether two events should remain logically distinct or instead be folded into one entity. The possible outcomes of this decision control the event splitting and merging powers unique to our proposed solution. In a naive approach, a split occurs when a group of nodes have momenta with magnitudes above a certain value. This, however, is insufficient. In real situations, nodes will have high magnitude momenta naturally if an event is simply very large. A simple momentum threshold limits the size of events that can be detected. What needs to be determined instead is if a node's momentum is large relative to the event's overall size. First, we present some concepts that illuminate the distributed nature of our protocol. If an event is entirely contained within one cluster, then that clusters head can run DRAGON locally in a centralized manner. A foremost need is to allow cluster heads to take counsel with each other for cases where an event spans multiple clusters. Also, there is a need for global orchestration when deciding which existing events may be merged. To this end, we discuss the concept of the backbone tree to facilitate cooperation and to control DRAGONs execution throughout the network.

2. RELATED WORK

DRAGON proposes general purpose event detection and tracking algorithm that is capable of identifying dynamic events even in the presence of event splits and merges. However, DRAGON works for stationary wireless sensor networks, which are not practical for some applications such as contaminant cloud monitoring where sensors become mobile due to winds. Also, a large number of sensor nodes will be needed when the detection area grows larger and larger. To address these issues, this work investigates the use of mobile sensor networks for dynamic event detection and tracking. DRAGON employs two physics metaphors: event center of mass, to give an approximate location to the event; and node momentum, to guide the detection of event merges and splits. Both detailed theoretical analysis and extensive performance studies of DRAGON's properties demonstrate that DRAGON's execution is distributed among the sensor nodes, has low latency, is energy efficient, is able to run on a wide array of physical deployments, and has performance which scales well with event size, speed, and count. They will use sensors and robots interchangeably in the same way which we are going to use.

Disadvantages:
1) DRAGON does cost more energy than R-DCTC due to the nature of the expanded problem.
2) DRAGON cannot easily compete directly with R-DCTC in terms of time complexity
3) There is no prevention method in the previous system.

3. FOUNDATION CONCEPT

This paper presents MEMS—a novel pipelined approach for dynamic event detection and tracking. With rapid advances in sensor fabrications, recent sensors are designed to be power aware, changing their condition (e.g., shut down sensing processor or radio) when they do not need to run the components to perform a given task in a sensor field. Most sensors can operate under the three different conditions: Active, Idle and Sleep. It is important to completely shut down the radio rather than put it in the idle mode when it needs not sensing. Power management of sensor components is very important because energy consumption depends on their duties. In the detection phase, each detection robot follows a certain path in their detection units to check any new event regions (i.e., consecutive sensing cells that are detected with events). At the end, all the information resides in one detection robot and that particular robot will be responsible for sharing the event region with other

robots in the future. In the tracking phase, detection robots assign each event region to several tracking robots, where the number of tracking robots is determined by the event region size and the robot speed. We also implement prevention method.

4. APPROACHES

4.1 Detection robots in a distributed way Each detection robot follows a certain path in their detection units to check any new event regions (i.e., consecutive sensing cells that are detected with events). For instance, the robot first moves rightwards all the way to the boundary of the detection unit, then downwards to the adjacent sensing cell, and then leftwards all the way to the boundary of the detection unit, and then downwards to the sensing cell below. After this step, the detection robots have clear ideas which sensing cells are within the event regions. If an event region is only inside one detection unit, then the corresponding detection robot has the complete information of the event region in terms of the space the event region occupies. Otherwise, if the event region spans several detection units, the corresponding detection robots in those units need to consolidate their information about the event region and designate one detection robot to hold the complete information of the event region. MEMS accomplish this by gathering the information from all relevant detection units in a clock-wise fashion. At the end, all the information resides in one detection robot and that particular robot will be responsible for sharing the event region with other robots in the future. During the simulation, the events move individually with varying direction and speed no larger than the maximum speed in the detection area until merges or splits happen. Once a merge happens, the events merged into one event will have the same movement pattern. Once a split happens, the events will have individual movement patterns. Also, there are certain chances of event creation and event destroy in each round. Energy detection uses minimal a priori information about the target. The detector essentially computes a running average of the signal power over a window of pre-specified length. The output of the detector is sampled at a pre-specified rate. The window duration and sampling rate are determined by target characteristics, such as the signature bandwidth and the expected signature duration in the particular sensing modality. An event is detected when the detector output exceeds a threshold. Due to the inherent signal averaging, the noise component in the output of the detector may be modeled as a Gaussian random variable whose mean and variance can be determined from the statistics of the background noise.

4.2 The minimal number of tracking robots as needed The detection of robots assign each event region to several tracking robots, where the number of tracking robots is determined by the event region size and the robot speed. Further, detection robots plan the tracking path according to the consecutive event regions assigned to the tracking robots. Tracking robots sense the events along their tracking paths, and find event entry and exit boundary point and send the information to detection robots. A O(nlog(n)) plane sweep algorithm is applied to the boundary point pairs to separate the individual events in each event region. The problem of tracking targets with sensor networks has received attention from various angles. We consider the case where a set of k targets need to be tracked with 3 sensors per target from the resource requirement viewpoint. They show that the
probability that all targets can be assigned 3 unique sensors shows phase transition properties as the level of communication between the sensors increases. In an information driven sensor collaboration mechanism is proposed. In this mechanism, measures of information utility are utilized to decide future sensing actions. Collaborative signal processing aspects for target classification in sensor networks is addressed. Tracking based on relations in the targets. Techniques for locating targets using a variety of mechanisms have been proposed. However, current literature does not address the issue of a scalable architecture for coordinating a sensor network for the purpose of target tracking. Nor is there any existing work which deals with the feasibility, minimization of computation and communication overheads and understanding the tradeoffs in such systems. In this paper we address these issues. To be effective, the tracking system should be accurate and the likelihood of missing a target should be low. Additionally, the dynamic range of the system should be high while keeping the response latency, sensitivity to external noise and false alarms low. The overall architecture should also be robust against node failures. Tracking multiple targets via a wireless sensor network is a very challenging, multi-faceted problem and several research groups have tackled various aspects of it. We consider the signal processing aspects of this problem under the constraints imposed by limited capabilities of the nodes as well as those associated with networking and routing. Consequently, in the present form, all our algorithms are based on processing a single sensing modality, such as seismic or acoustic. Furthermore, current detection and classification algorithms are based on single-node processing, whereas localization and tracking algorithms require collaboration between nodes. Our main emphasis in this paper is on target classification that is arguably the most challenging signal processing task in the context of sensor networks. We provide some numerical results based on real data that lend useful insights into the problem and help identify key issues and challenges. Finally, based on our findings we identify some promising directions for future research.

4.3 Identifies multiple events with dynamic event signatures Identifying multiple events with dynamic event signatures and providing event evolution history that may include event merge, split, create and destroy. MEMS provides event signature with a label consisting of round number, detection robot ID, and the group ID of the corresponding tracking robots. If multiple targets are sufficiently separated in space or time, that is they occupy distinct space-time cells. It may be used: a different track is initiated and maintained for each target. Sufficient separation in time means that the energy detector output of a particular sensor exhibits distinguishable peaks corresponding to the CPAs of the two targets. Similarly, sufficient separation in space means that at a given instant the spatial target signatures exhibit distinguishable peaks corresponding to nodes that are closest to the targets at that instant. The assumption of sufficient separation in space and/or time may be too restrictive in general. In such cases, classification algorithms are needed that operate on spatio-temporal target signatures to classify them. This necessarily requires a priori statistical knowledge of typical signatures for different target classes. In this paper, we focus on single-node (no collaboration between nodes) classification based on temporal target signatures: a time series segment is generated for each detected event at a node and processed for classification. Some form of temporal processing, such as a fast Fourier transform (FFT), is performed and the transformed vector is fed to a bank of classifiers corresponding to different target classes. The outputs of the classifiers that detect the target, active classifiers, are reported to the manager nodes as opposed to the energy detector outputs. The object corresponds to tracking the location of the spatial peak over time. To enable such tracking in a sensor network, the entire space-time region must be divided into space-time cells to facilitate local processing. The size of a space-time cell depends on the velocity of the moving target and the decay exponent of the sensing modality. It should approximately correspond to a region over which the space-time signature field remains nearly constant. In principle, the size of space-time cells may be dynamically adjusted as new space-time regions are created based on predicted locations of targets.

4.4 Event evolution

Event evolution contains a series of records of the dynamic event signatures and the event merge/split/create/destroy actions in each round. Event evolution tree is constructed to evolution. Based on the event evolution tree, we can conduct event queries to show the events evolution history.

This allows us to take the data distribution models of two different sensors in the network and construct a single model that describes the behavior of the data of both sensors. Our kernel estimators can be easily combined, and thus are well suited for our framework. There are two quantities that we have to combine, the sample set, R, and the bandwidth of the kernel function, B. We can combine the sample sets just by taking their union. We may then reduce the size of the resulting set by re-sampling, if necessary. In order to combine the bandwidths of two kernel functions, we only need to combine the two standard deviations upon which the bandwidths depend. This is accomplished using the same techniques as the ones for computing the standard deviation in a sliding window of streaming data. This method demands high amounts of energy since it requires transmission of the kernel samples and the bandwidth from each sensor to the sink. Moreover, it incurs high latency in transmission due to the large number of packets sent across the network. We propose a distributed technique, where we detect homogeneous regions at each cell in the grid, and then communicate only the summary information of each cell to the leader in the next higher level in the network.

5. AMORPHOUS EVENT PREVENTION

Once a split happens, the events will have individual movement patterns. Also, there are certain chances of event creation and event destroy in each round. Amorphous events happened at the time of splitting hence we prevent that event. Search engine speeding: Almost all webmasters value any and all attention they receive from search engines. Some businesses run solely on search engine rankings and the visitors they get from those sources. So, these techniques should in no way affect the ability of these “automated spiders” to spider the website effectively. Since the scanners and these search engine spiders would be automated, differentiating them would be difficult. Sure, the user agents would give away their identities, but then again forging user agents isn’t a very difficult task, thus rendering that method useless. However a very big difference in the way search engines and scanners spider is their intent. Search engines, aim to please webmasters and thus follow the instructions in the “robots.txt” file, as opposed to scanners which tend to use the robots.txt as a place to find hidden and sensitive links. This would be a perfect way to create a honey pot for these scanners while allowing the search engines to spider harmlessly.

6. CONCLUSIONS

In this work, we have presented MEMS, general purpose event detection and tracking algorithm that is able to operate in the presence of event splits and merges. MEMS has been shown to be highly accurate across a wide range of scenarios. It consistently finds the right number of events and

outlines the right event shapes regardless of deployment type, and regardless of event size, speed, or count. MEMS's energy efficiency scales well with problem size and complexity. The energy cost's order of growth is always shown to be linear or better with respect to the number of events. DRAGON's execution time is projected to be well within the constraints necessary to keep up with virtually any kind of event. Overall, DRAGON is promising for applications using wireless sensor networks for phenomena monitoring.

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SECURED CLOUD ENVIRONMENT WITH A NEW APPROACH

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Abstract - Cloud computing is the technology of resource sharing in the present setup, where in the users never look to buy a resource in terms of software, hardware, and many as such only in the name of pay for use it is being used but they have to face big issue in this is the security of their data in cloud environment. Many users may hesitate to migrate into cloud for their usage because of this issue, which in turn reduces cloud users. This paper analyses the issues in the security challenges in cloud and comes out with a solution. Finally it provides a secured cloud environment which could not be hacked by any unauthorized users. Categories and Subject description Security and protection- access control, authentication and cryptographic controls, General Terms
Security, Verification and Management.

Keywords— *Digital signature, Virtual Machines, and Message authentication, iris, data protection and security.*

INTRODUCTION

The new approach to security in the cloud Environment provides a technique to make Csp to satisfy their customer by providing a Highly secured virtual machine to each user With unique identification at each level of The security.

WHAT'S CLOUD?

Researchers of cloud computing domain have widely given many definition for this term "Cloud computing" in simple as "Pay for use", "Resource Provider",etc One such universally accepted definition of cloud is that Cloud computing is a model for enabling the global, convenient, on-demand network access to a shared pool of configurable computing resource(eg: service, storage, and application) that can be rapidly provisioned and released with minimal management or service provider community. It also possess some of these characteristics On demand self service, Global network access, Resource pooling-location independence, Rapid elasticity, Measured Service.

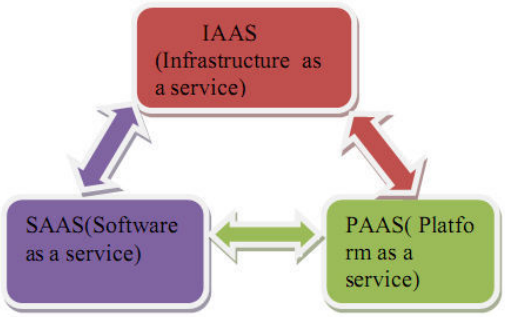
TYPES OF CLOUD

The cloud computing is the only area which is widely distributed as

Private Cloud
Accessible within the organization or closed community, Secured.

Public Cloud
Accessible by public, Huge resource.

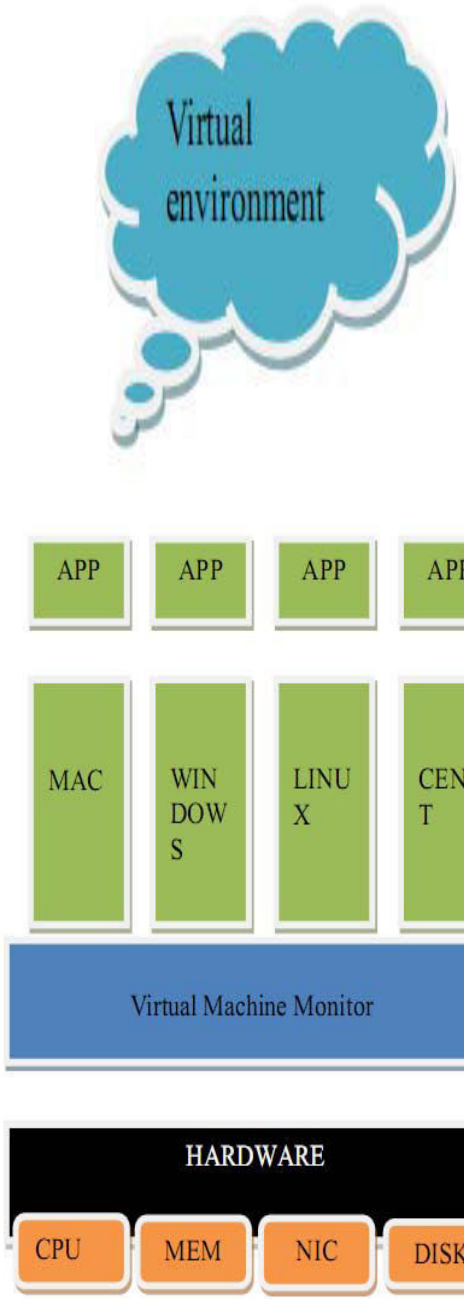
Hybrid Cloud
Combination or collaboration of both the private cloud and public cloud which is called as cloud burst. The services of a cloud are in three forms, it is represented diagrammatically as follow,



All these service combining together make an environment which we call it as cloud. This term comes into use by the usage of Middleware and most importantly the Hypervisors, and virtual machines.

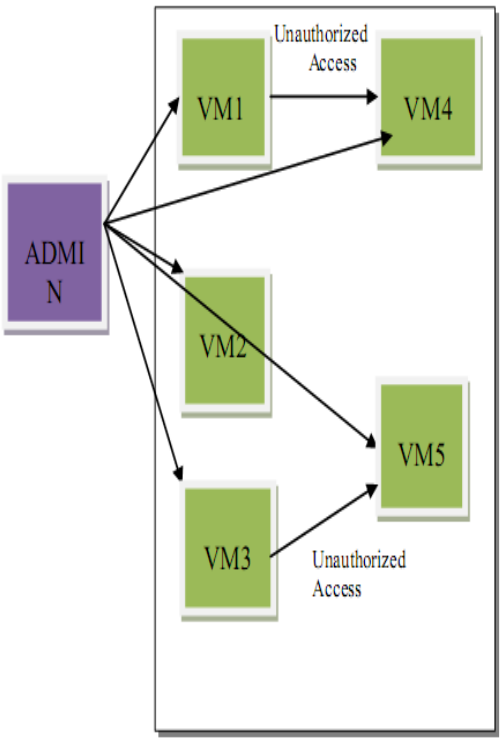
VIRTUALIZATION

Virtualization is the creation of virtual(rather than actual) version of something, such as an operating system, server, storage device or network resources. It also provides some of the benefits like Running heterogeneous and conflicting environments, Isolation, Fully utilize hardware resources, Manageability, Reduced Power requirements, Reduced Ownership cost. There are
many types of virtualization which include Hardware such as Full and Para virtualization, desktop, storage and network. It has some benefits such as full utilization of hardware resource, running heterogeneous environment, isolation, manageability, reduced power requirements, and reduced ownership cost. One such VM hypervisor is XEN for IA-32, IA-64 Architecture. It allows several guest operating systems to be executed on the same computer hardware concurrently. Here comes the problem of losing the data by different users on the same environment.



PROBLEMS IN PRIVATE CLOUD:

In cloud we have many type of environment one such environment is the private cloud environment. Private cloud has limited numbers of users only. Private clouds is supposed to use for single environment. Third parties are able to access in this type cloud and hack the data. There is also an issue that users can hack the other users data. So we the cloud provider want provide a security for these problems. And every one of the steps in the paperraises security issues that must be addressed in order to avoid serious vulnerabilities.



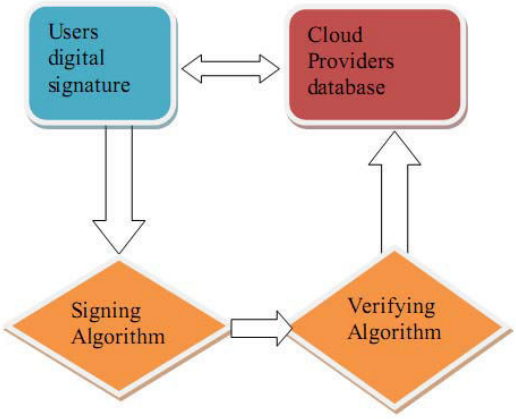
In this figure we have five virtual machines that are splitted from a single hard disk so one vm user can modify the other users data so in that instances, there is a chance for third party to hack the data. So the data becomes unsecured so then any user can easily insert, modify and delete any other users data. So data loss is very big issues in the private cloud environment. So the customers have may be scared to store a data in the private cloud environment. At the same instance public cloud also have a big issue than private cloud from the unauthorized users. So this paper also deals with public cloud security. Private cloud is created by any organization or any individual. So that organization splits a space for their employee, in such instances there is no guarantee to the data that it is safe in their allocated cloud environment. We provide solution for this problem in three ways In this paper we are using a three security mechanisms. Such as

- Digital signature
- Message authentication
- Iris scanning

Using these three security mechanisms we are able to provide security to private cloud as well as public cloud environment. First one is digital signature that is useful for first level that is viewing the data. Second level is message authentication that is useful for vm users which provides the users to modify the data and the final level is iris scan that is used deleting any data in the virtual machines. In this below section we give a brief details about these three security levels.

DIGITAL SIGNATURE :

It is the first level of security in this paper. The digital signature is one of the major technique used in cryptographic security algorithms, here the cloud environment users are provided with a digital signature, and it is been stored in the database of the cloud providers. It verifies each users digital signature during the process of signing up to view the data in the virtual machine. It mainly focuses on the two key issues, they are signing and verifying algorithm. (ie) the signers signs with their private key and the verifier verifies with the signer's public key. A digital signature provides some of these features as message authentication, message integrity and non-repudiation can also be provided by a trusted third party,. A digital does not provide privacy, this makes an issue. If you think there is a need for privacy, an another layer of encryption/decryption must be applied

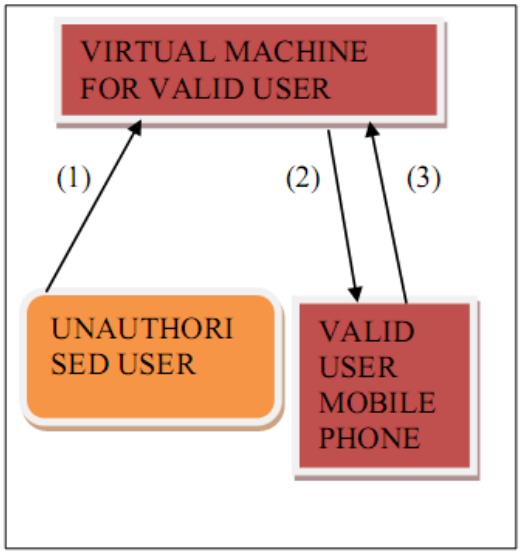


The method of using the digital signature is the first level of security where the users are allowed only to view their data within their virtual machine. It provides a more secured feeling to the cloud users that their data is being secured. The signer signs with his/her digital sign along with their private key and applied with a modulus function. The verifier uses the public key which is been provided by the cloud provider to the signer and decrypts the signature and verifies for the same digital signature in the database to authenticate the valid user and to view their data.

MESSAGE AUTHENTICATION:

It is an second level for the security in this paper, this security mainly used for unauthorized users cannot access authorized virtual machine user's data. Why because if other users access our data in the sense, it creates a lot more issues. For this reason we have a first level of security which provides access only for viewing our data. But this level gives a permission for revising/modifying our data and so on. Example we can consider a hard disk and virtual machines are partitioned into many parts. So in cloud it don't avail a much level of security so it is an very big issue in cloud environment. So we give a solution for this problem is that is message authentication. Some cloud users thinks it is old level of security but it is totally different. Message authentication level of security is represented diagrammatically as such

(1) Unauthorized access
(2) Request send to valid user
(3) Request accepted or rejected



UNAUTHORIZED ACCESS:

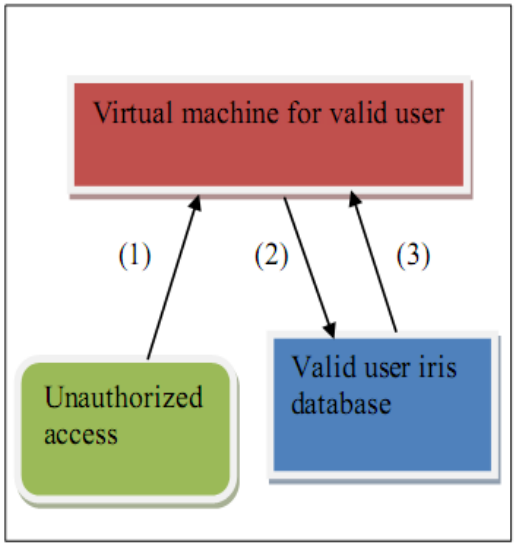
Virtual machine is splitted into many parts in one hard disk, in such circumstances data may be modified or other actions are performed by any other users.(As in the figure1.1(1) shows detail. So the data are not safe, so we give a security by using a message sending technique, which means if the user want to hake other users data means at that instance a security message will be sent to valid user mobile phone. The message authenticates even if the user is authenticated user or not, in such time if the user will accept a request, the user will modify or access a data (As in the figure1.1(2)) otherwise the user will not give a permission or reject a request in such instance, the user cannot modify or access a data.(As in the figure1.1(3)) shows detail).

IRIS SCANNING:

It is a third security level of this paper. We have a big issue in cloud is hackers can have a chance of deleting the users important data. So the users loses a very their data. This is a reason for creating a third level of security. In this level we have to use a iris scanning, in this scanning we can scan a users iris. It cannot be changed so the unauthorized users cannot enter or delete a data . This is a one kind of security, scanning device may seems to be costlier, but it provide s a high security than all others levels. Initially while purchasing a Virtual machine we have

to get a valid user iris and store in the database of cloud provider. So any one who is entering into a virtual machine and performs some operations must be valid vm user to erase any type of data. In this level third parties are also be protected. So this is an very good security in final level. Data deletion is the important level and then the data protection also have a importance. This level gives a solution for all clarifications and problems. It is depicted diagrammatically as

(1)-un authorized access
(2)Verification
(3)Authorization



CONCLUSION AND FUTURE DIRECTIONS

All these combined features of security provide a highly secured, environment for cloud users as well as the cloud providers. Finally this papers provides an overview of security in the cloud environment. On this new security approach for cloud environment, may be basement for the CSP's to build their cloud system to be more secure and sophisticated which provides more benefits to both cloud users and CSP's. Also this paper enables CSP's to provide a highly secured environment. In the future the system may be extended with various security algorithms in cryptography, Algorithm used in future may yield a better result in the cloud computing field.

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ANALYSIS OF KNOWLEDGE SHARING PRACTICES IN DISTRIBUTED AGILE ENVIRONMENT

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Abstract-Knowledge plays a key role in the software development process. Knowledge is necessarily required at all the phases of software development life cycle. Knowledge is the core resource, so organizations are now attempting to manage it in more efficient and systematic way. Knowledge sharing plays a very important role in the successful development of software. Knowledge sharing in distributed agile team is helpful in achieving the goals like better quality of products delivered on time and at lower cost. Our research analyzes the knowledge sharing practices in distributed environment and found the best implicit and explicit knowledge sharing practices.

Keywords*: distributed agile environment, implicit knowledge sharing practices, explicit knowledge sharing practices.*

1. INTRODUCTION

Software engineering tends to adopt better practices for development so that they achieve better heights and stability in their produced products .In traditional approach or heavy weight methodologies the work starts with discussion about requirements of development, documentation of a complete set of requirements, after that the design is developed according to the given requirements and project goes on to completion. The main disadvantage found in traditional approach was fixing the product functionality in very early phase of the project and plan everything in advance then following it, which affect its use in unplanned and complex environment, due to this, the approach was known as Plan Driven. Project failure rate is quite high in traditional approach because of upfront planning. During the mid nineties, group of practicing software engineers grouped together some of the existing software practices into a new software development methodologies which was known as Agile Methodologies. These methodologies are developed to overcome the limitations of heavy weight approach. Unlike traditional methods, agile methodologies employ small iterations and pass tacit knowledge within the development team. A true agile process will have the characteristics like iterative, incremental and self organized by team members.

Nowadays software's are developed by the teams which are distributed in different geographical locations. When the development teams are distributed then we need to create a proper communication channel for the success of project because communication is the major issue in distributed projects and it creates gaps between the developer and user. Distributed projects require a proper knowledge sharing structure for the completion of products on time and according to the given requirements so they can achieve the success criteria. Knowledge sharing is the core for the success of products. Knowledge sharing involves the processes through which knowledge is passed between a source and a recipient.

In traditional practices we found that there is no proper mechanism for knowledge sharing in distributed teams, these practices are only effective for non-distributed teams. For making knowledge sharing possible between distributed teams the agile methodologies are adopted. The early advocates of agile said that these methods were not applicable for knowledge sharing in distributed environment. But now the agilists prove that sometimes it is difficult but if great care is taken then it is possible to adopt the agile methodologies for knowledge sharing in distributed environment.

2. KNOWLEDGE SHARING

Knowledge sharing is an activity through which knowledge is exchanged between people, friends, or members of a family, a community or an organization. Knowledge is related to particular subject, which is not a commodity that can be passed freely and easily to anyone. Knowledge sharing is not a technique of communication but it is related to communication in some ways. For knowledge sharing there must be a relation between at least two parties, one that share knowledge and the other that acquire knowledge.

that is very much powerful because it is relevant and gained from experience. It is directly applied without any change to the activities that will need to be done in future. With tacit knowledge people are not often aware of the knowledge they possess or how it can be valuable to others. Effective transfer of tacit

2.1 Types of knowledge shearing:-

1. Implicit (Tacit) knowledge sharing
2. Explicit knowledge sharing

Implicit knowledge sharing: This knowledge is difficult to transfer by means of writing it down. It is based on observation and experience. It is something

knowledge generally requires personal contact and trust of people.

Explicit knowledge sharing: This knowledge is easy to transfer by means of writing it down. It is opposite of implicit knowledge. This type of knowledge can be quantified. It is tangible in nature. This is not gained from experience. Specific laws and procedures are defined for this knowledge. This knowledge can be expressed in words and numbers and can be easily communicated and shared in the form of hard data.

3. KNOWLEDGE SHARING PRACTICES

Knowledge sharing practices includes the factors, plans, methods and techniques that the organization has to use in their daily operations for better productivity. These practices can be categorized as either those that transfer explicit (easily-codified) knowledge or those that transfer implicit (fact-based, cognitive) knowledge.

3.1 Methods for sharing Explicit knowledge:

Documentation: Documentation is a technique that is used to represent explicit knowledge. It is used for codification and documentation of processes in the organization. Documented data is used by the individuals when they required that data. In this technique there is no need to concern with another person because everything is available in written form. Documented procedures and policies are the most profitable for transferring knowledge to individuals and it provides clear instructions for performing repetitive tasks and duties. The individual with procedural knowledge have left organization but, these documented procedures always help employees in every condition [32].

Interview and Videotaping: Interview is a technique of explicit knowledge that is used for capturing information from those who participate in interview session. Knowledge capture interviewing elaborates a procedure for obtaining crucial tacit knowledge by conducting video interviews of knowledgeable staff. These interviews are managed by dividing it into short, retrievable video clips or other formats such as interview transcripts. Video tapping and interview transcripts are explicit knowledge methods that are used for providing the knowledge among staff members. Videotaping interviews are widely used in private sector for capturing the critical tacit knowledge from employees. Knowledge capturing interviews are often used as a short term approach to capture the knowledge of individuals those who wants to leave the organization. This technique is useful to capture the knowledge of those employees who plays very important role in all the processes of the organization. The benefit of this technique is that the captured knowledge is reused by the other staff members in future [32].

Training: This technique includes the development program, qualification and formal training. Formal training and development program describes a method for defining, obtaining and widening the knowledge of employees that is required to carry out day to day tasks for a specific operation. It is a procedure for ensuring that specific organizational knowledge and experiences are transferred to replacement staff in a reliable and systematic way. Many effective and well established formal training, qualification and development programs are used in organization for enhancing the knowledge of employees[32].

Training Courses and Technical Seminars: Training courses and Technical seminars are designed to elaborate the important skills and knowledge of the organization staff. These courses are developed using both internal and external subject matter experts to capture their unique knowledge and experience and to spread these widely throughout the organization. These courses and seminars are used to transferring knowledge from experienced to less experienced employees for improving their knowledge and skills [32].

Knowledge Management Overview Training: Staff members need to understand the vision and expectations of higher management for knowledge capture, fetching, transfer and sharing. Managers and supervisors need to understand their roles and responsibilities under organizational knowledge management program and learn how the tools are used that they need to meet their responsibilities. All employees required an effective training on how and when to use the organizational KM practices and techniques. Organizations designed many courses which gives training to employees regarding knowledge management practices and techniques.

3.2 Methods for sharing Implicit knowledge:

Storytelling: Stories are the real life situations that are faced by someone. Normally it is finding that sharing stories an easy, interesting and effective way of illustrating solutions to problem situations and lessons learned. This is a method for experienced staff to share their knowledge and experience with others, so that the less experienced employees are learn from their experiences and able to face the abnormal conditions. This technique is available for sharing experience and it is use without constraints. It is used in work groups meetings, unit meetings, team projects, in some training courses and in some development assignments for sharing experiences.

Mentoring: Mentoring is a mutually agreed-upon relationship in which mentors advice and assist their mentees. This technique allows individuals to pair with experts as needed to learn ways to improve their skills. The use of this technique is very effective in individual cases because it allows mentors to share

their knowledge with individuals who need to obtain advice and guidance to enhance their knowledge and skills. Currently the organizations have very well elaborated career mentoring programs for less experienced staff [32].

Early Replacement Hiring: Organization uses the early-replacement hiring method to provide salaries and benefits funding for up to one year for the purpose of transferring critical skills, competencies, and institutional memory from an employee who is planning to leave the organization to a replacement employee. Under this the experienced employees share their experiences and knowledge with new employees appointed on their places, and helps in improving the skills of new staff members [32].

Rotational, Detail and Exchange Assignments: Organization uses rotating and assignments as developmental opportunities. From other view of knowledge transfer, these methods give individuals experience in performing the jobs of current employees and employees who are leaving an organization. Moreover, they are an effective way to transfer critical skills [32].

Teamwork: Work teams provide perfect environments for transferring technical knowledge on essential subjects and procedures. This is especially correct when teams are used to review and recommend improvements in key agency processes. Teams are generally created by management to work on projects and tasks so this Knowledge Management tool is already available and has widespread use [32].

4. OBJECTIVES

- To identify knowledge sharing strategies in distributed agile teams.
- Quantitative analysis of knowledge sharing in traditional and agile practices through questionnaires. (IT companies)
- To find the mostly used agile practices in distributed environment.
- To find the mostly used implicit and explicit technique of knowledge sharing in distributed environment.

5. QUESTIONNAIRE

To achieve the set of objectives, survey questionnaire are presented to the respondents with the criteria to assess the knowledge sharing techniques in organizations. Questionnaires are filled by the various employees from various departments of the companies.

It is divided into six parts:

1. About organization: Collecting information about the participated company.
2. General awareness: Collecting information regarding potential knowledge sharing policies.
3. Perception on Implicit knowledge sharing techniques: collecting information regarding awareness of these techniques.
4. Perception on Explicit knowledge sharing techniques: collecting information regarding awareness of these techniques.
5. Gaps: identify gaps in existing techniques.
6. Future line of research: information about the adaption of new techniques for betterment of products.

6. RESULT

6.1 Reliability test

The consistency of a score from a measurement scale is assessed with reliability test. In this research for checking the reliability of questionnaire the Cronbach's alpha is used. The value of Cronbach's alpha lies between 0 and 1. A higher value of this shows the greater consistency in variance of the sample test score. Usually the value of Cronbach's alpha more than 0.6 is considered to be reliable in survey research, but some statisticians considered 0.7 to be reliable.

Reliability Statistics

Cronbach's Alpha	N of Items
.845	43

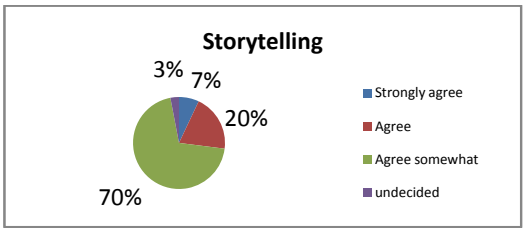
From the above test we find the Cronbach's alpha is .845, which is more than 0.7 (.845>0.7). Hence we can say that the questionnaire formed is reliable.

6.2 Analysis of Implicit Knowledge Sharing Technique

Through the questionnaire we are able to know that how many employees are aware about these techniques properly and on the other hand we get to know about those employees those who have no ideas about these techniques. Formal interviews are conducted with respondents of questionnaire to collect their ideas regarding these techniques which help us to find the best or mostly used implicit knowledge sharing techniques.

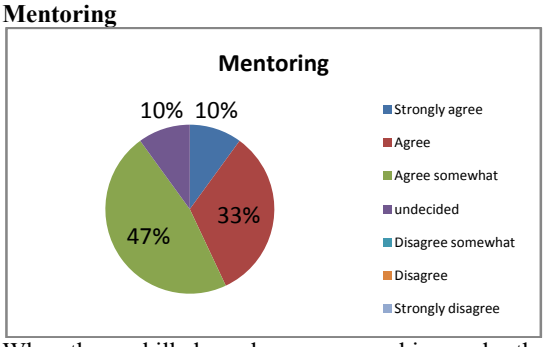
Storytelling

This technique is helpful for unskilled employees to have knowledge from their senior's experiences. Through this technique the new employees get knowledge in advance that how they have to tackle with abnormal conditions if they ever faced these conditions in future. This is useful only when seniors want to share their experiences with juniors.



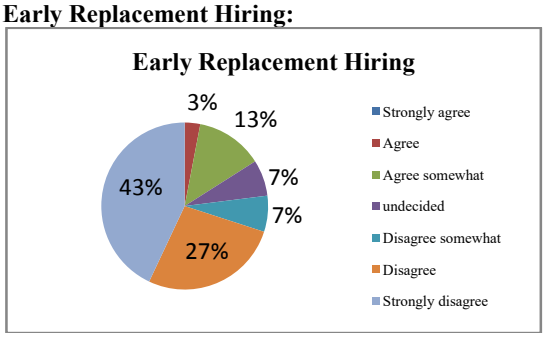
In distributed environment teams are located at different locations. The geographical differences between different teams create a big problem in the efficient use of this technique.

Mentoring



When the unskilled employees are working under the supervision of well skilled employee then they get knowledge from the senior skilled employee. This technique is helpful only when senior employee give right directions to the unskilled new employees. This increases the responsibility of senior employees because they are responsible for the every task performed under their supervision.

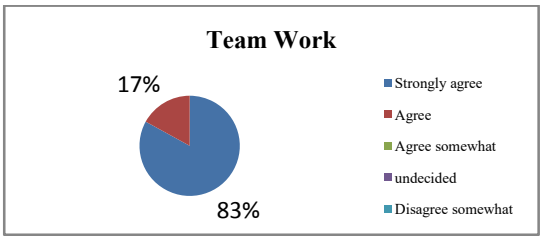
Early Replacement Hiring:



Through this technique the employees get all the skills of the leaving skilled employee. Use of this technique disturbs the leaving person emotionally. Therefore this technique is harmful for the future carrier of leaving employee.

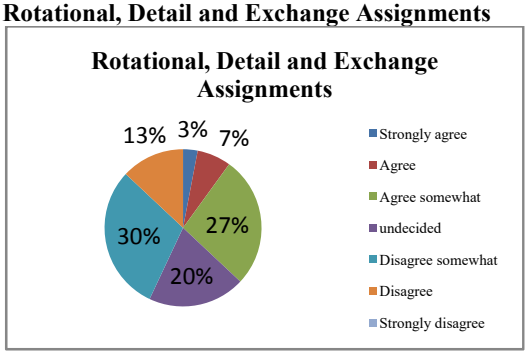
Team Work

When the unskilled employees are working with the experienced and well skilled employee then they get knowledge from the senior skilled employees. Through the use of this technique the team members not only get knowledge and skills from team leader but also gain the knowledge of team members indirectly. This technique is helpful for increasing the creativity level of employees and they learn how to face the abnormal conditions.



The use of teamwork improves the productivity of the company and further improves the quality of the produced software. This is easy to adopt and cheapest technique of knowledge sharing.

Rotational, Detail and Exchange Assignments

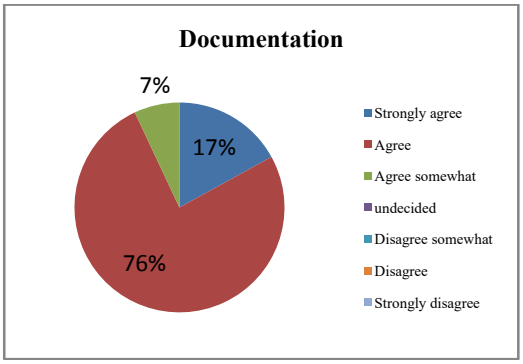


This technique allows the individuals to share their ideas among employees of the company. Some respondents are undecided because they don't use this knowledge sharing technique in their company. Some are disagreeing with this technique because they think that the use of this technique does not increase the skills of employees and it does not play any role in improving the productivity of company.

6.3 Analysis of Explicit Knowledge Sharing Technique

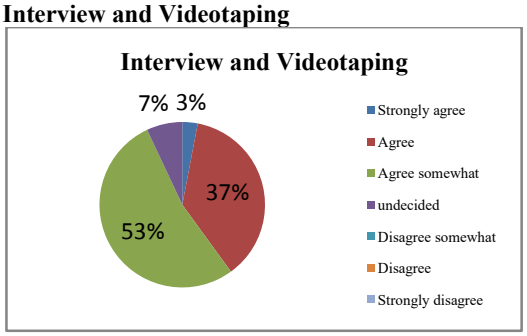
Through the questionnaire we are able to know that how many employees are aware about the techniques properly and on the other hand we get information about those employees who have no ideas about the techniques. Formal interviews are conducted with respondents of questionnaire to collect their ideas regarding these techniques which help us to find the best or mostly used explicit knowledge sharing techniques.

Documentation



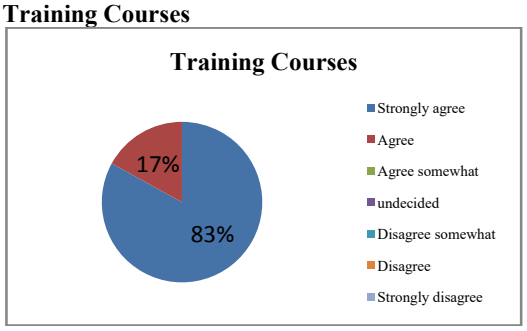
This is the oldest technique of explicit knowledge sharing. This technique is helpful for new employees because they easily get information about the produced products of the company. This is helpful for employees in re-engineering of products. This is effective if the documents are quickly updated. In distributed environment this technique is useful only when electronic data base is used.

Interview and Videotaping



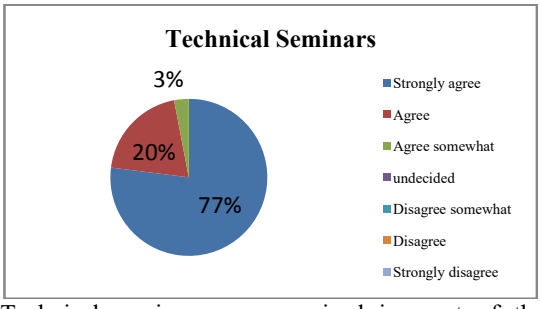
The use of this technique is helpful for new employees because from this they are able to get knowledge of old and oldest employees of the organization. This technique is mostly used in the large scale companies. This is useful for future if these videotaping are properly maintained and stored safely.

Training Courses



Training courses are organized in most of the companies for their employees. These courses are helpful in improving the skills of the employees.

Technical Seminars



Technical seminars are organized in most of the companies for their employees. These seminars are helpful in improving the skills of the employees and give knowledge about the new technologies.

7. CONCLUSION

Knowledge sharing is the vital part of any organization as per the effectiveness of management and products are concern. Many products fail to achieve the success rate due to lack of information sharing. This is the important part of software industry as knowledge sharing is known to be the core of successful development. The early advocates of agile said that these methodologies were not applicable in distributed environment. But now the agilists prove that sometimes it is difficult but if great care is taken then it is possible to adopt these methodologies. For making knowledge sharing possible between distributed teams the agile methodologies are adopted. Through this distributed teams are trying to achieve better quality of products on time and at lower cost & risk. In this survey based research it is analyzed that most companies are trying to create knowledge sharing culture for betterment of software products.

From the responses of the respondents it is concluded that 'Teamwork' is mostly used Implicit knowledge sharing technique and 'Training courses' & 'Technical seminars' are mostly used Explicit knowledge sharing techniques in distributed agile environment.

The result of this research helps the globally distributed teams to prefer the agile methodologies for software development. Through this research the distributed teams are able to select the best knowledge sharing techniques for the better quality of products.

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SPACE VECTOR PWM SIGNAL GENERATION FOR ANY MULTILEVEL INVERTER BY USING REVERSE MAPPING TECHNIQUE

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Abstract—This paper proposes a generalized method for the generation of space vector pulse width modulation (SVPWM) signals for multilevel inverters. In the proposed method, the actual sector containing the tip of the reference space vector need not be identified. A method is presented to identify the center of a sub hexagon containing the reference space vector. Using the center of the sub hexagon, the reference space vector is mapped to the innermost sub hexagon, and the switching sequence corresponding to a two-level inverter is determined. A new technique is proposed in this paper, by which these two-level vectors are translated to the switching vectors of the multilevel inverter by adding the center of the sub hexagon to the two-level vectors. The proposed method can be extended to any *n*-level inverter, and a generalized algorithm is proposed. The scheme is explained for a five-level inverter, and experimental results are presented for a three-level inverter and seven-level Inverter.

Index Terms—*multilevel inverter, reverse mapping, space vector pulse width modulation (SVPWM).*

I. INTRODUCTION

IN THE FIELD of medium- and high-power applications, multilevel inverters have emerged as an attractive choice [1]–[3]. The output waveforms of the multilevel inverters are smoother than those of a two-level inverter as the output voltage is synthesized from multiple levels of dc voltage. The most widely used techniques for implementing the pulse width modulation (PWM) strategy for multilevel inverters are sine-triangle PWM (SPWM) and space vector PWM (SVPWM) [4]–[24]. In multilevel SPWM, the reference sine wave is compared with a number of level-shifted carriers to decide the switches to be turned on [5]. In the SVPWM scheme, the sampled value of the reference voltage space vector which is the combined effect of the three-phase voltages is realized by switching the nearest voltage space vectors among the inverter voltage vectors [6]. There are different techniques available for implementing SVPWM for multilevel inverters [7]–[24]. In general, the SVPWM implementation involves the sector identification, switching-time calculation, switching-vector determination, and optimum-switching-sequence selection for the inverter voltage vectors [7]–[20], [23].

The sector identification can be done by coordinate transformation [8], [9], [16] or by repeated comparison of the three phase reference voltages [7], [15]. The lookup tables can be used for determining the switching vectors in optimum switching sequence [6]–[20]. The calculation of the duration of the switching vectors can be simplified using the mapping technique, in which the identified sector of the multilevel inverter is mapped to a corresponding sector of the two-level inverter [13]–[15], [23].

The SVPWM methods using the principle of equivalence with SPWM can generate the SVPWM signals directly from the instantaneous reference phase voltages for multilevel inverters without using lookup tables [21], [22]. The fractal-based approach for SVPWM generation using a triangularization scheme to generate the voltage space vectors also does not require lookup tables [23].

This paper proposes a new approach to generate SVPWM signals for multilevel inverters. The proposed method uses sec-tor identification only at the two-level. In the proposed method, the actual sector (where the tip of the instantaneous reference space vector lies) in the space vector diagram of a multilevel inverter is not required to be identified. A method using the principle of mapping is proposed for generating the switching vectors corresponding to the actual sector and the optimum switching sequence of a multilevel inverter from that of the two-level inverter. An algorithm is proposed for generating SVPWM for any *n*-level inverter. The proposed method can be used for an inverter with an even number of levels also. The scheme is explained with a five-level inverter, and experimental results for a three-level inverter are presented.

II. PRINCIPLE OF THE PROPOSED METHOD

Fig. 1 shows the space vector diagram of a five-level inverter. The redundant vectors are not shown for simplicity. The small triangles formed by the adjacent voltage space vectors are called sectors. Such six sectors around a voltage space vector forms a hexagon called sub hexagon [14], [15]. The space vector diagram of a multilevel inverter can be viewed

as composed of a number of such subhexagons. The shaded regions in Fig. 1 show two subhexagons. They are represented as "subhexagon I" (referred as inner subhexagon) having the vector 000 as the center and "subhexagon II" having the vector 330 as the cen-ter. The inner subhexagon can be viewed as a space vector diagram of a two-level inverter whose inverter voltage vectors switch between the lowermost levels. Subhexagon II can be also viewed as a space vector diagram of a two-level inverter,

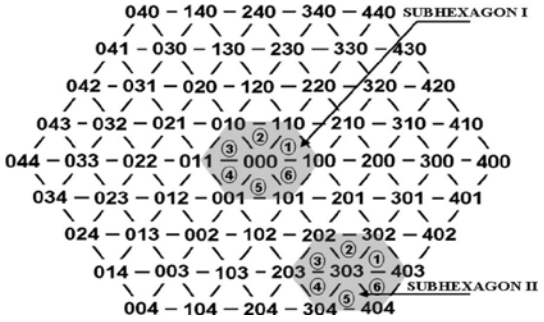

Fig. 1. Space vector diagram of a five-level

whose voltage vectors involve higher levels. The shifting of the subhexagons in the space vector diagram of a multilevel inverter to the zero vector 000 simplifies the switching time cal-culations associated with multilevel inverters [13]–[15], [23]. The shifting of subhexagon II in the space vector diagram of a multilevel inverter toward the zero vector 000 involves the mapping of the sectors of subhexagon II to the sectors of the inner subhexagon. This is done by subtracting the vector at the center of subhexagon II from its other vectors.In a reverse approach of mapping, the inner subhexagon can be mapped to subhexagon II by adding the voltage space vector at the center of subhexagon II to the vectors of the inner subhexagon. Consider the voltage space vectors 000, 001, 101, and 111 associated with sector 5 of the inner subhexagon and the voltage space vector 303 which is the vector at the center of subhexagon II. Adding the voltage space vector 303 to the voltage space vectors associated with sector 5 of the inner subhexagon gives the vectors 303 (000 +303), 304 (001+303), 404 (101+303), and 414 (111+303) which are the vectors associated with sector 5 of subhexagon II. Similarly, the voltage space vectors associated with any subhexagon can be generated by adding the vector at the center of the particular subhexagon to the voltage space vectors of the corresponding sectors in the inner subhexagon. In this paper, the mapping of the inner subhexagon to any other outer subhexagon (referred as *reverse mapping*) is used to generate the vectors associated with any sector in the space vector diagram of the multilevel inverter.

Fig. 2 shows the instantaneous reference space vector OT . The tip of the reference space vector OT lies in sec-tor 1 of subhexagon III. The vector 330 is the center of subhexagon III which contains the tip of the reference space vector. By subtracting this vector at the center of the sub-hexagon, the reference space vector can be mapped as OT_3 into sector 1 of the inner subhexagon. The vectors 000, 100, and 110 are associated with sector 1 of the inner subhexagon. By adding these vectors with the vector located at the center of subhexagon III, the actual switching vectors 330, 430, and 440 for the reference space vector can be generated. Therefore, the actual sector that contains the reference space vector need not to be identified for determining vectors to be switched by the inverter to realize the reference space vector.

In the proposed scheme, the vector at the center of the sub-hexagon is to be determined for the mapping of the reference whose voltage vectors involve higher levels. The shifting of the subhexagons in the space vector diagram of a multilevel inverter to the zero vector 000 simplifies the switching time cal-culations associated with multilevel inverters [13]–[15], [23]. The shifting of subhexagon II in the space vector diagram of a multilevel inverter toward the zero vector 000 involves the mapping of the sectors of subhexagon II to the sectors of the inner subhexagon. This is done by subtracting the vector at the center of subhexagon II from its other vectors.

In a reverse approach of mapping, the inner subhexagon can be mapped to subhexagon II by adding the voltage space vector at the center of subhexagon II to the vectors of the inner subhexagon. Consider the voltage space vectors 000, 001, 101, and 111 associated with sector 5 of the inner subhexagon and the voltage space vector 303 which is the vector at the center of subhexagon II. Adding the voltage space vector 303 to the voltage space vectors associated with sector 5 of the inner subhexagon gives the vectors 303 (000 +303), 304 (001+303), 404 (101+303), and 414 (111+303) which are the vectors associated with sector 5 of subhexagon II. Similarly, the voltage space vectors associated with any subhexagon can be generated by adding the vector at the center of the particular subhexagon to the voltage space vectors of the corresponding sectors in the inner subhexagon. In this paper, the mapping of the inner subhexagon to any other outer subhexagon (referred as *reverse mapping*) is used to generate the vectors associated with any sector in the space vector diagram of the multilevel inverter.

Fig. 2 shows the instantaneous reference space vector OT . The tip of the reference space vector OT lies in sec-tor 1 of subhexagon III. The vector 330 is the center of subhexagon III which contains the tip of the reference space vector. By subtracting this vector at the center of the sub-hexagon, the reference space vector can be mapped as OT_3 into sector 1 of the inner subhexagon. The vectors 000, 100, and 110 are associated with sector 1 of the inner subhexagon. By adding these vectors with the vector located at the

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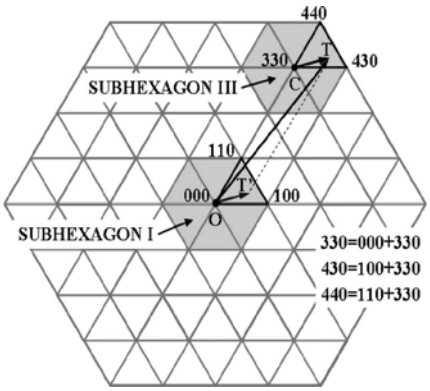


Fig. 2. Generating switching vectors through reverse mapping.

space vector to the inner subhexagon and for switching vector generation. A new approach is proposed to identify the center of the subhexagon by generating candidate voltage space vectors for the center of the subhexagon.

This vector at the center of the subhexagon is used to map the reference space vector to the inner subhexagon. Once the reference space vector is mapped to the inner subhexagon, the situation is that of generating the switching vectors and the sequence for a two-level inverter [13]–[15], [23]. The switching vector and the sequence of the inner subhexagon can be translated to the switching vector and sequence of the multilevel inverter by the proposed principle of reverse mapping. The principle of the proposed method in this paper can be summarized as follows:

1) identification of the center of the subhexagon that contains the tip of the reference space vector;

2) mapping of the reference space vector to a sector of the inner subhexagon;

3) determination of the duration of switching vectors and optimum switching sequence using a two-level algorithm;

4) generation of the actual switching vectors for the mul-tilevel inverter by adding the vector at the center of the subhexagon to the vectors obtained in 3).]

III. IDENTIFYING THE CENTER OF SUBHEXAGON

The space vector diagram of a five-level inverter, shown in Fig. 3, can be viewed as formed of four layers. These are the innermost layer (layer 1), the layer outside of layer 1 (layer 2), the next outer layer (layer 3), and the outermost layer (layer 4). These layers are represented as L_1, L_2, L_3, and L_4 in Fig. 3, and the instantaneous reference space vector *OT* is in layer 4 (L_4). Layer 1 is the same as the inner subhexagon mentioned in section II. Fig. 3 also shows the six 60° regions S_1, S_2, S_3, S_4, S_5, and S_6. The subhexagon associated with the instantaneous reference space vector can be considered as centered on the inner side of layer 4. Among the vectors on the inner side of the ayer, the vectors which belong to the 60° region S_3 are the most suitable vectors (*candidate vectors*) for the center of the sub-hexagon since this region contains the reference space vector. In this paper, these candidate vectors are automatically generated from the vectors of the inner subhexagon, and the candidate

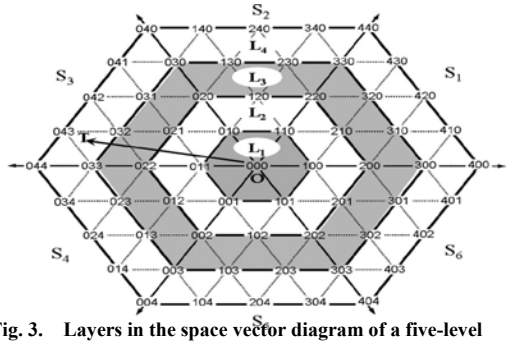


Fig. 3. Layers in the space vector diagram of a five-level inverter.

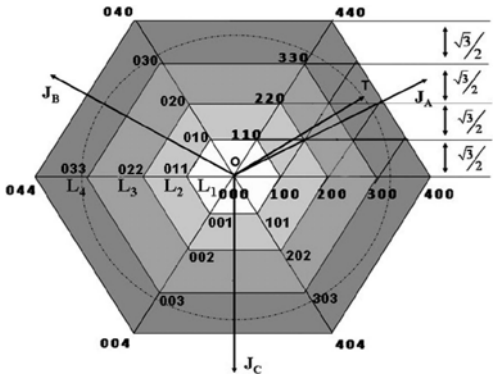


Fig. 4. j_a, j_b, and j_c axes and width of each layer for a five-level inverter

vector which is closest to the tip of the reference space vector is chosen as the center of the subhexagon. Therefore, in this paper, depending upon the layer of operation of the instantaneous reference space vector, all the candidate vectors for the center of the subhexagon are generated, and the vector which is closest to the reference space vector is taken as the center of the subhexagon.

A. Identifying the Layer of Operation

The instantaneous reference space vector can be resolved into the axes j_a, j_b, and j_c (Fig. 4) using the following where v_a, v_b, and v_c are the instantaneous amplitudes of the three

$$v_{ja} = \sqrt{3}/2(v_a - v_c) \quad (1)$$

$$v_{jb} = \sqrt{3}/2(v_b - v_a) \quad (2)$$

$$v_{jc} = \sqrt{3}/2(v_c - v_b). \quad (3)$$

The axis lying in the 60° region which contains the instanta-neous reference space vector will have maximum magnitude among these resolved values.

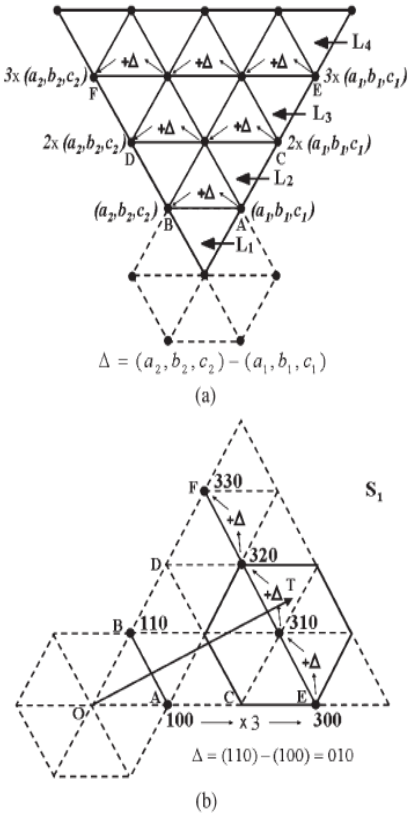


fig. 5. (a) Generating candidate vectors for the center of the subhexagon.
(b) Generating candidate vectors for the center of the subhexagon.

Let $v_{j\ max}$ be the maximum magnitude among the three resolved components. It may be noted that the width of each layer in the case of an n-level inverter is $((\sqrt{3}/2)(V_{DC}/n - 1))$. Therefore, the layer number can be easily obtained as

$$m = 1 + \text{int}\left\{ \frac{v_{j\max}}{\left(\frac{\sqrt{3}}{2}\frac{V_{DC}}{n-1}\right)} \right\} \quad (4)$$

Where m is the layer number

B. Generating Candidate Vectors for the Subhexagon Center

As already mentioned, in this paper, if the instantaneous reference space vector is in a particular layer m, then the can-didate vectors for the center of the subhexagon are the vectors lying on the inner side of that particular layer. Fig. 5(a) shows a 60° region in the space vector diagram of a five-level inverter. In the figure, the lines AB, CD, and EF are part of the inner sides of layers 2, 3, and 4, respectively. It may be noted that AB, which is the inner side of layer 2, is Let the vectors on the inner side of layer 2 for any 60° region be (a_1, b_1, c_1) and (a_2, b_2, c_2) and the *end vectors* on the inner side of layer m be (a_{m1}, b_{m1}, c_{m1}) and (a_{m2}, b_{m2}, c_{m2}). Then, the *end vectors* on the inner side of layer m can be generated as

$$(a_{m1}, b_{m1}, c_{m1}) = (m - 1) \times (a_1, b_1, c_1)$$

$$(a_{m2}, b_{m2}, c_{m2}) = (m - 1) \times (a_2, b_2, c_2). \quad (5)$$

The other vectors between the *end vectors* can be generated by repeatedly adding a *difference vector* " " (the difference between the end vectors of the inner subhexagon) to the first end vector. The difference vector can be found out by subtracting the first end vector from the last end vector of the inner subhexagon

$$\Delta = (a_2, b_2, c_2) - (a_1, b_1, c_1). \quad (6)$$

Repeated addition of the difference vector with the firstend vector on the inner side of layer m for $m - 1$ times can generate all vectors on the inner side of the layer m.

Thus, all the vectors on the inner side of a particular layer can be automatically generated from the vectors of the inner subhexagon. Of these candidate vectors, the vector which is closest to the reference space vector is chosen as the center of the subhexagon containing the instantaneous reference space vector. The closest candidate vector can be easily determined by calculating a distance term "d" with respect to each of the candidate vector. The distance term indicates the distance of the candidate vector from the reference space vector. The distance term for the ith candidate vector can be calculated as

$$d_i = |v_\alpha - \alpha_{cv}| + |v_\beta - \beta_{cv}| \quad (7)$$

where the (v_ω, v_β) and $(\alpha_{cv}, \beta_{cv})$ are the coordinates of the reference space vector and candidate vector, respectively. The candidate vector with the smallest distance term is the vector closest to the reference space vector and hence taken as the center of subhexagon.

To illustrate this technique, Fig. 5(b) shows the instantaneous reference space vector lying in layer 4 (m = 4) and within the S_1 region. The inner side of

layer 4 is EF. The vectors on the inner side of layer 2 in this case are 100 and 110, and the difference vector is 110 − 100 = 010. The end vectors of EF can be determined as 300 and 330 by multiplying 100 and 110 with 3 as per (5). The repeated addition of the difference vector three times to the first end vector 300 will generate the vectors 310 (300+010), 320 (310+010), and 330 (320+010) for the inner side of layer 4.

Of these candidate vectors on the inner side of layer 4, the closest vector to the reference space vector *OT* is 310, and it is chosen as the center of the subhexagon associated with *OT* .

IV. GENERATION OF SWITCHING VECTORS AND OPTIMUM SEQUENCE

In the proposed method, the actual vectors to be switched by the inverter are generated through the principle of mapping. subhexagon that contains the tip of the reference space vector is mapped to the inner subhexagon by subtracting the vector located at the center of the subhexagon.

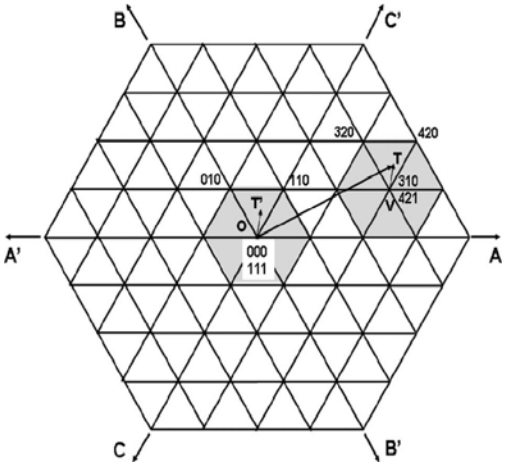


Fig. 6. Switching vector generation through *reverse mapping*.

For an *n*-level inverter,if v_α and v_β are the coordinates of the instantaneous reference space vector *OT* and (α_c , β_c) is the coordinate of the center of the subhexagon containing *OT* , the coordinates (v_α^3, v_β^3) of the mapped vector OT^3 are

$$v_\alpha^3 = v_\alpha - \alpha_c$$
$$v_\beta^3 = v_\beta - \beta_c. \quad (8)$$

Since the inner subhexagon corresponds to the basic two-level structure, the switching vectors of the two-level inverter can be generated from the instantaneous amplitude of the phase voltages [25].

The vectors of the two-level inverter can be translated to the actual switching vectors (corresponding to the multilevel inverter) by reverse mapping the inner subhexagon to the sub-hexagon containing the tip of the reference space vector. This reverse mapping can be easily done by adding the vector at the center of the subhexagon to the instantaneous switching vectors of the two-level inverter. If (a_0, b_0, c_0) is the instantaneous switching vector corresponding to the two-level inverter and (a_c, b_c, c_c) is the vector at the center of the subhexagon, then the actual switching vector of the multilevel inverter is

$$(a_m, b_m, c_m) = (a_0, b_0, c_0) + (a_c, b_c, c_c). \quad (9)$$

Equation (9) defines the reverse mapping proposed in this paper whereby the two-level inverter vectors are translated to the vectors of the multilevel inverter. Therefore, the actual vec-tors to be switched and the optimum sequence are automatically generated without using lookup tables.

Continuing with the previous example, Fig. 6 shows the reference space vector *OT* mapped as OT^3 to the inner sub-hexagon by subtracting the vector 310. Once the reference space vector is mapped to the inner subhexagon, two-level SVPWM techniques can be employed for generating the two-level vectors in optimum sequence The two-level inverter switching vectors in optimum sequence are determined using a two-level SVPWM technique, which will be similar to that of a conventional two-level inverter, i.e., 000 => 010 => 110 => 111 (Fig. 6). These two-level inverter vectors can be translated to the actual inverter voltage vectors of the multilevel inverter by the reverse mapping defined by (9). Since the center o. the subhexagon is 310, the actual inverter voltage vectorsto be switched are 310(000 + 310)=> 320(010 + 310)=>420(110 + 310)=> 421(111 + 310).

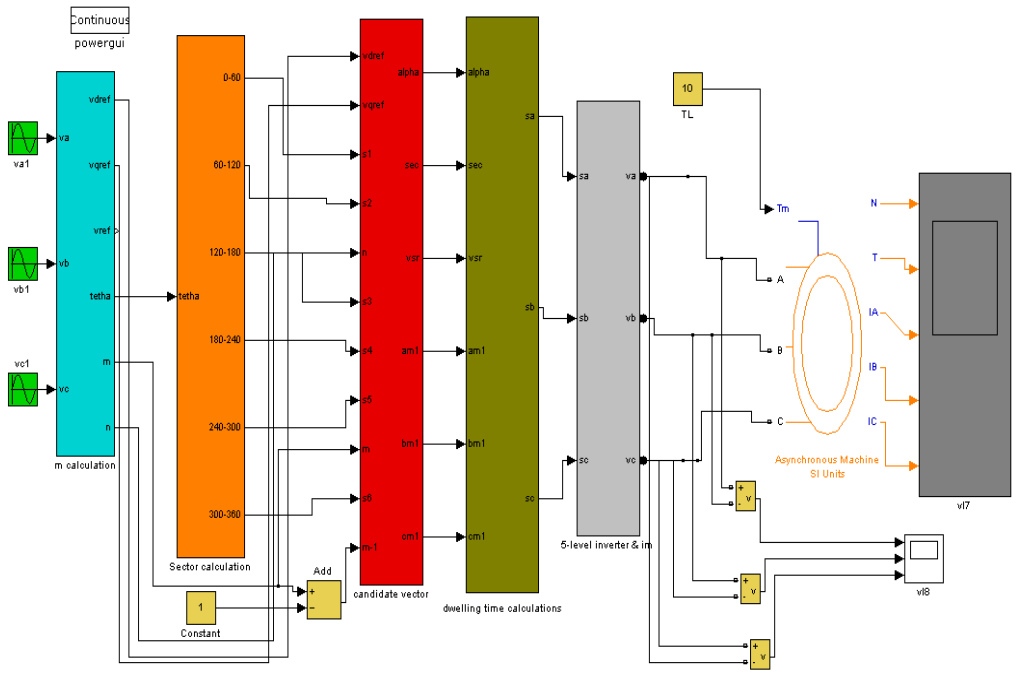
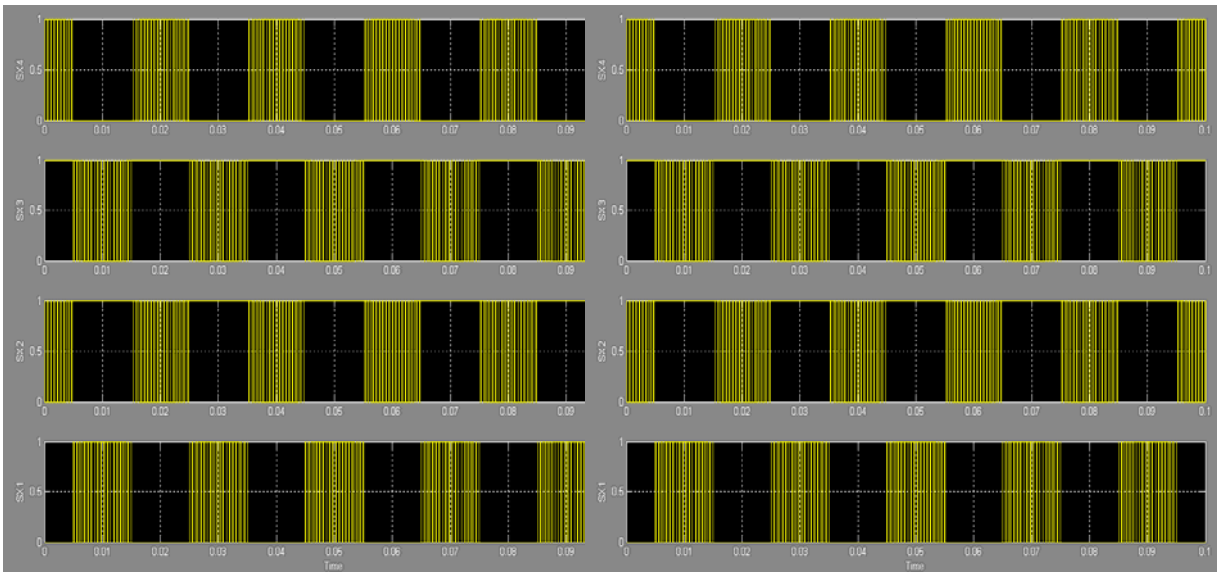


Fig 7: Main block diagram

Experimental Results

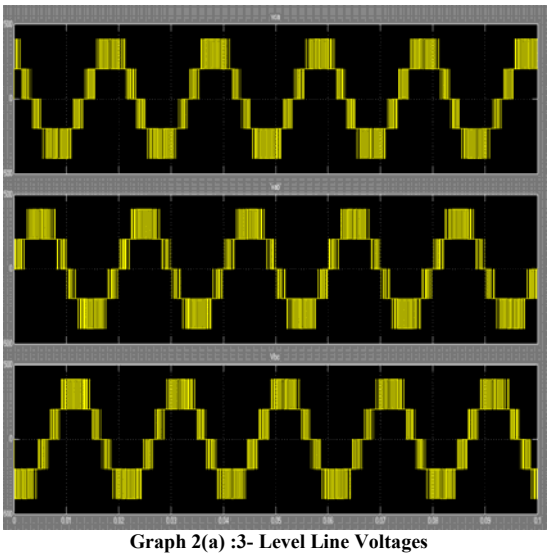
3- Level Results

5- Level Results

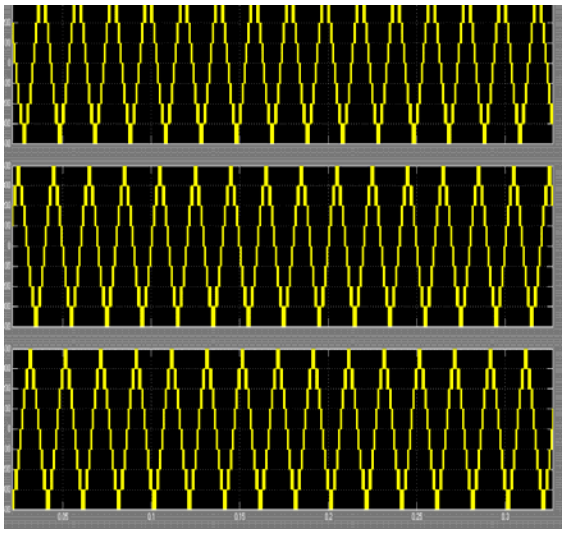


Graph 1(a): Gate Pulse for 3 level inverter

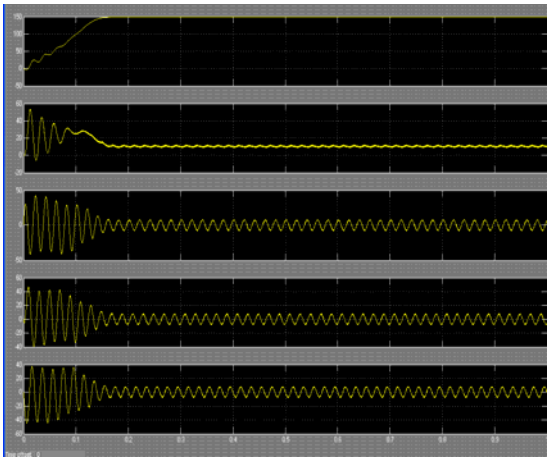
Graph 1(b): Gate Pulse for 5 level inverter



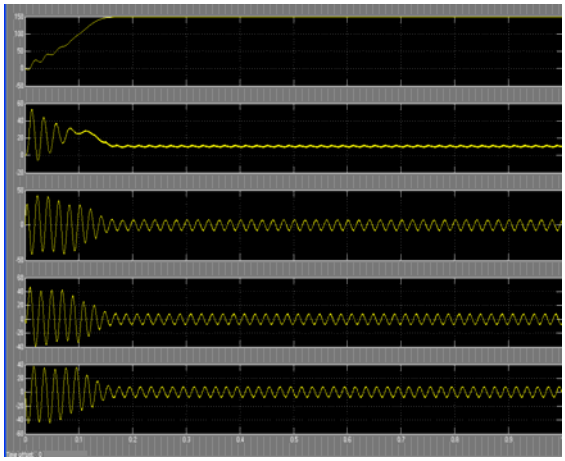
Graph 2(a) :3- Level Line Voltages



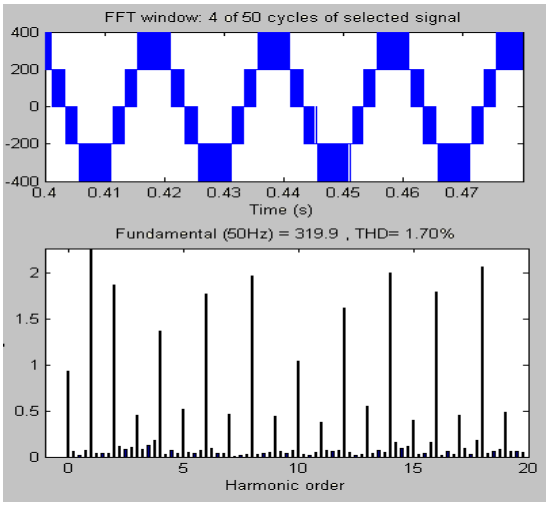
Graph 2(b): 5- Level Line Voltages



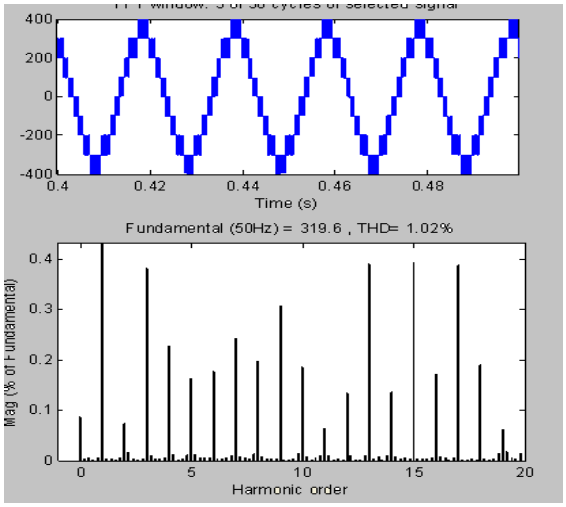
Graph 3(a) : Induction Motor Paramiters(ω_n, T_e, I_a, I_b,I_c)



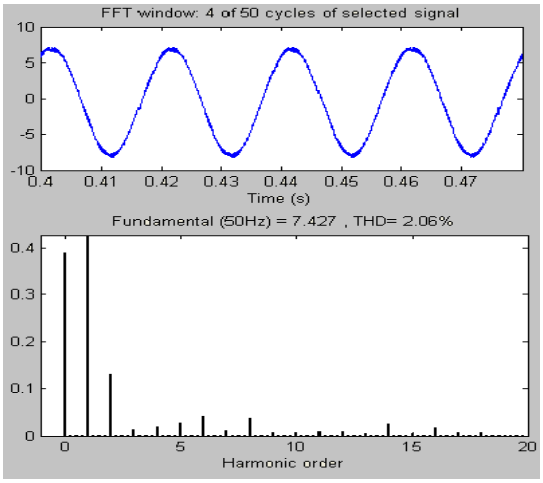
Graph 3(b) : Induction Motor Paramiters(ω_n, T_e, I_a, I_b,I_c)



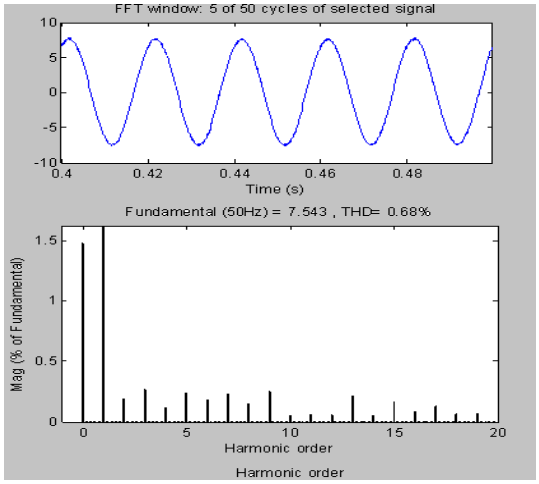
Graph 4(a): 3-Level Voltage THD



Graph 4(b): 5-Level Voltage THD



Graph 5(a): 3-Level Current THD



Graph 5(b): 5-Level Current THD

V. CONCLUSION

A novel SVPWM scheme has been presented for multilevel inverters. The switching vectors and optimum switching se-quence are automatically generated by the principle of map-ping. The vector at the center of the subhexagon containing the reference space vector was directly identified in this paper reference space vector is mapped to the innermost subhexagon, and the switching vectors for the two-level inverters are gener-ated. The two-level inverter vectors are translated to the vectors of the multilevel inverter by the principle of *reverse mapping* proposed in this paper. The SVPWM for any *n*-level inverter including an inverter with an even number of levels can be implemented without any additional complexity. The proposed method does not identify the sector containing the reference space vector and eliminates the need of lookup tables for determining the switching vectors and the optimum sequence for a multilevel inverter. The proposed SVPWM scheme is im-plemented on a MATLAB platform, and experimental results are presented for a three-level inverter and five level inverter.

Induction Motor Details

Drive : Three phase squirrel cage induction motor

Specifications:

Horse Power	:	5.4 (4 KW)
Line to line voltage	:	400V
Frequency	:	50Hz,
Speed	:	1430 RPM

Block Parameters of three phase squirrel cage induction motor :

APPENDIX

Proposed Algorithm for an n-Level Inverter

1) Obtain the instantaneous values of three phase reference voltages v_a, v_b, and v_c.
2) Resolve the reference space vecor into the axes j_a, j_b, and j_c using (1), (2), and (3).
3) Determine the layer of operation m using (4).
4) *If* $(m > n - 1)$.
   Overmodulation operation: $m = n - 1$, *go to step 5). else*: *Normal operation*: *go to step 5).*
5) Identify the 60° region "*S*" of the multilevel inverter by comparing the amplitudes of the three phase reference voltages and determine the end vectors (a_1, b_1, c_1) and (a_2, b_2, c_2) in the inner side of layer 2.
6) Calculate the first end vector (a_{m1}, b_{m1}, c_{m1}) of the inner side of layer m using (5).
7) Find the difference vectored as the difference of the vectors obtained in step 5) as in (6)
8) Starting from the first end vector, generate other vectors in the inner side of layer m by adding the difference vector repeatedly for "$m - 1$" times to get the candidate vectors.
9) Choose the vector which is closest to reference space vector as the center of the subhexagon (a_c , b_c , c_c) by calculating the distance term d as in (7).
10) Map the reference space vector to the inner subhexagon and calculate the three instantaneous phase reference voltages of the mapped reference space vector by (8).
11) Generate the two-level switching vectors and the opti-mum switching sequence for the mapped reference space vector with the two-level SVPWM method.
12) Add the center of the subhexagon (a_c, b_c, c_c) obtained in step 9) to the two-level vectors to generate the switch-ing vectors and optimum sequence for the multilevel inverter.

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APPLICATION AND SIMULATION OF ROUTE OPTIMIZATION IN MOBILE IP

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Abstract-Mobile Internet Protocol has been proposed by Internet Engineering Task Force (IETF) to support portable IP addresses for mobile devices that often change their network access points to the Internet. In the basic mobile IP protocol, datagrams sent from wired or wireless hosts and destined for the mobile host that is away from home, have to be routed through the home agent. Nevertheless, datagrams sent from mobile hosts to wired hosts can be routed directly. This asymmetric routing, called "triangle routing," is often far from optimal and "route optimization" has been proposed to address this problem. In this paper, we present the deep description and implementation of "route optimization", Authentication extension to mobile IP in the ns-2 simulator. We illustrate simulations of the mobile IP with route optimization with simulation scenarios, parameters, and simulations results.

1. INTRODUCTION

Physical effects such as variable bandwidth make it impossible for roaming to be completely transparent to applications, but such effects are forgivable since they are inevitable. Other problems such as routing anomalies and faulty congestion control are more difficult to understand, more difficult to diagnose, and less likely to be tolerated by typical users. Route Optimization is an attempt to solve the former problem, by reducing or eliminating the routing anomalies introduced by the base Mobile IP specification [1].

In this paper, we define the problem and give the details of one possible approach towards a solution. As with any routing problem, a robust solution needs to incorporate good security techniques, to avoid the possibility that a malicious network entity might introduce fraudulent routing information and thus disrupt communications. Not solving the problem is better than solving the problem in a way that offers opportunities for corrupting the integrity of the routing tables of computers which need to communicate with mobile nodes.

This paper Section 2 gives a brief overview of Mobile IP and the Route Optimization extensions to it, describing their component parts and design, Section 3 describes the process of binding cache maintenance and details each of the messages used by Route Optimization for this purpose, Section 4 the application of this cache maintenance for providing smooth handoffs as a mobile node moves from one foreign agent to the next is presented, Section 5 Simulation scenarios and results are discussed, Section 6 application in the protocol design for mobility support in IPv6, the new version of IP now being designed in the IETF and At last, in Section 7, we summarize and present conclusions.

2. OVERVIEW

We first provide an overview of mobile Internet Protocol (MIP) , including the "triangle routing" problem and the route optimization in mobile IP. Mobile IP, the mobility support for IP, enables a mobile host (MH) to send datagrams to the correspondent host (CH) directly, outer by its home agent (HA) and foreign agent (FA) (figure 2). However, packets from CH to MH have to be routed through three different (sub) networks: the CH's subnet, the

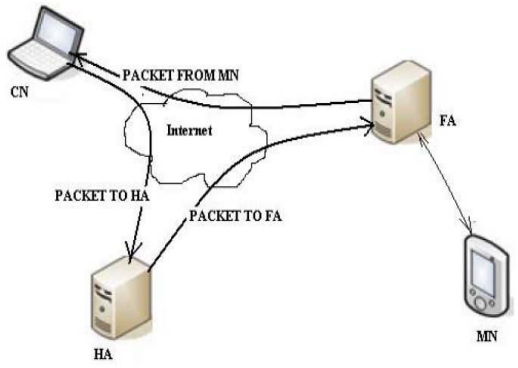

Figure 1. Triangle routing problem.

HA's subnet, and the FA's subnet where the MH is currently located. Therefore, packets destined to the MH are often routed along paths that are significantly longer than optimal. This redundant routing in mobile IP is known as "triangle routing" (figure 1). Route optimization addresses this problem by requiring all hosts to maintain a binding cache containing the care-of address of MHs. The binding cache is a cache of mobility bindings of mobile nodes, maintained by a node to be used in tunneling datagrams to mobile nodes. Route optimization extension to mobile IP

includes four messages: binding update, binding warning, binding request, and binding acknowledgment. A binding update message is used to inform the CH of the MH's current mobility binding. The binding warning message is used to transmit warnings that a binding update message is needed by one or more correspondent hosts. We employed ns-2 network simulator to implement the route optimization extension in mobile IP. Two (out of four) route optimization messages have been implemented: binding update and binding warning. We have compared end-to-end packet delays in the basic routing scheme in mobile IP with and without optimization. We show that mobile IP with the route optimization has smaller end-to-end packet delay than the basic mobile IP.

The development of powerful computers with medium-speed wireless communications adapters has been the driving motivation for the

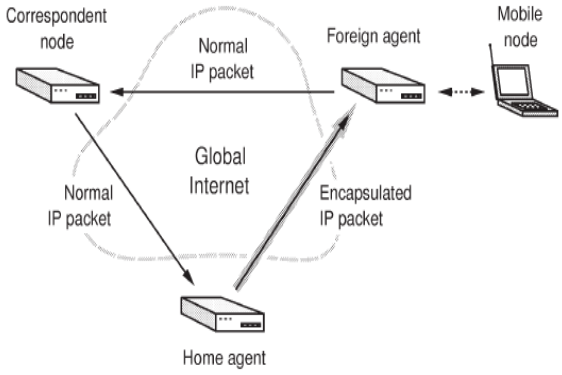

Figure 2. Overview of the base Mobile IP protocol.

creation of new protocols. Mobile IP enables a mobile node to move from place to place in the internet, maintaining active connections and presenting to typical Internet nodes the illusion that it remains present on its home network. Communications with the mobile node proceed by use of the mobile node's home address, which does not depend on the node's current point of attachment to the Internet[2]. At each point of attachment, the mobile node acquires a care-of address, which it must report to its home agent on its home network by a process called registration.

In all situations considered in the rest of this paper, the mobile node obtains the care-of address by interaction with a foreign agent on the foreign network. The foreign agent offers the care-of address using ICMP by including it as part of a specially modified Router Advertisement, which is then known as an Agent Advertisement. The Agent Advertisement also includes a maximum time duration, or lifetime, for which the mobile node may consider the care of address valid, and which bounds the lifetime permissible within the mobile node's Registration Request that is subsequently transmitted to the home agent. When a mobile node which is using a care-of address detects that it is no longer receiving the Agent Advertisements from its current foreign agent, or in some other way detects that it no longer is in contact with that foreign agent, it assumes that the care of address is no longer valid. The mobile node then begins to search for a new care of address, presumably from another foreign agent.

Figure 2 shows an overview of the base Mobile IP protocol, including the relative placement of Mobile IP agents and networks. A correspondent node is any IP host or router that communicates with a mobile node. A correspondent node, itself, may be either mobile or stationary. To send a packet to a mobile node, a correspondent node transmits the packet to the mobile node's home address, which causes the packet to be routed toward the mobile node's home network. There, the packet is intercepted by the mobile node's home agent. The home agent then tunnels the packet to the mobile node's current foreign agent, using the care-of address as the tunnel destination. The foreign agent decapsulates the packet and delivers it locally to the mobile node. If a mobile node sends a packet to a correspondent node, it simply sends it in the same way as if it was at home, but uses its foreign agent as the default router for delivering the packet. The foreign agent, simply acting as a router, then forwards the packet directly to the correspondent node.

3. BINDING CACHE MAINTENANCE MESSAGES

A correspondent node may create or update a binding cache entry for a mobile node only when it has received and authenticated the mobile node's mobility binding. The binding cache is a cache of mobility bindings of mobile nodes, maintained by a node to be used in tunneling datagram to mobile nodes. In addition, a node may use any reasonable strategy for managing the space within its binding cache. When a new entry needs to be added to the binding cache, the node may choose to drop any entry already in the cache, if needed, to make space for the new entry. For example, a least-recently used (LRU) strategy for cache entry replacement is likely to work well. This is in contrast to the way that a home agent should manage the registrations for mobile nodes registered with it. A home agent should not drop a registration until the expiration of the lifetime of the binding established during the registration process.

3.1. Binding Warning message

A Binding Warning message is used to advise a mobile node's home agent that another node appears to have either no binding cache entry or an out-of-date binding cache entry for some mobile node. When any node receives and decapsulates a tunneled packet for which it is not the current foreign agent for the destination mobile node, if it forwards the packet to a new care-of address based on an entry

in its own binding cache, it should send a Binding Warning message to the mobile node's home agent indicated in that binding cache entry. No authentication of the Binding Warning message is necessary, since it does not directly affect the routing of IP packets to the mobile node.

3.2. Binding Request message

A Binding Request message is used by a node to request a mobile node's current mobility binding from the mobile node's home agent. A node wanting to provide continued service with a particular binding cache entry may attempt to reconfirm that mobility binding before the expiration of the registration lifetime. Such reconfirmation of a binding cache entry may be appropriate when the node has indications (such as an open transport-level connection to the mobile node) that the binding cache entry is still needed. This reconfirmation is performed when the node sends a Binding Request message to the mobile node's home agent, requesting a new Binding Update message with the mobile node's current mobility binding. The node maintaining the binding cache entry should also keep track of the home agent's address, to be able to fill in the destination IP address of future Binding Requests.

3.3. Binding Update message

The Binding Update message is used for notification of a mobile node's current mobility binding. It should be sent by the mobile node's home agent in response to a Binding Request message or a Binding Warning message. It should also be sent by a mobile node, or by the foreign agent with which the mobile node is registering, when notifying the mobile node's previous foreign agent that the mobile node has moved.

3.4. Binding Acknowledgement message

A Binding Acknowledgement message is used to acknowledge receipt of a Binding Update message. It should be sent by a node receiving a Binding Update message if the acknowledge (A) bit is set in the Binding Update.

3.5. Route Optimization Authentication extension

The Route Optimization Authentication extension is used to authenticate Binding Update and Binding Acknowledgement messages. It has the same format and default algorithm support requirements as the three authentication extensions defined for base Mobile IP , but is distinguished by its message type value. The authenticator value is computed from the stream of bytes including the shared secret, the UDP payload, all prior extensions in their entity (that is, the Route Optimization management message), and the type and length of this extension, but not including the authenticator field itself nor the UDP header.

For implementations that can support more than the mandatory base authentication algorithm, other optional authentication algorithms such as the more secure HMAC authenticator could also be used if specified in the mobility security association.

4. SMOOTH HANDOFFS

This section provides a description of the proposed operation of smooth handoff(figure 3) from a mobile node's previous foreign agent to its new foreign agent when the mobile node initiates a new registration.

4.1. Smooth handoff overview

When a mobile node moves and registers with a new foreign agent, the base Mobile IP protocol does not notify the mobile node's previous foreign agent. IP packets intercepted by the home agent after the new registration are

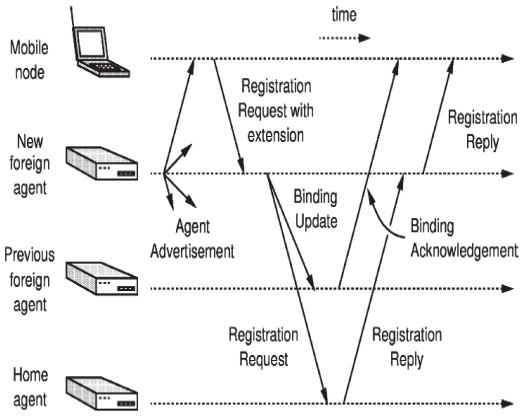

Figure 3. Smooth handoff.

tunneled to the mobile node's new care-of address, but packets in flight that had already been intercepted by the home agent and tunneled to the old care-of address when the Mobile node moved is likely to be lost and are assumed to be retransmitted by higher-level protocols if needed. The old foreign agent eventually deletes its visitor list entry for the mobile node after the expiration of the registration lifetime[5].

Route Optimization provides a means for the mobile node's previous foreign agent to be reliably notified of the mobile node's new mobility binding, allowing packets in flight to the mobile node's previous care-of address to be forwarded to its new care-of address. Any packets tunneled to the mobile node's previous foreign agent, from correspondent nodes with out-of-date binding cache entries for the mobile node, can also be recovered in this way. Finally, this notification allows any resources consumed by the mobile node at the previous foreign agent (such as an allocated radio channel) to be released immediately, rather than waiting for its registration lifetime to expire.

5. SIMULATION SCENARIOS AND RESULTS

The simulation scenario is shown in Figure 4. It consists of one mobile host, one home agent, two foreign agents, one correspondent host, and one wired node representing a public network (PN). The simulation results (figure 5,6), which are based on NS2 simulator, show that the proposed

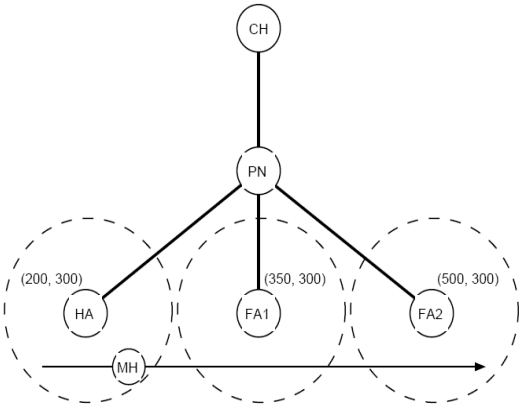

Figure 4. Simulation scenario with two foreign agents.

approach has a better performance compared to both the original MIP and the one level up technique.

We use simulation results to verify the effectiveness of our implementation. End-to-end packet delay and average end-to-end packet delay with (solid) and without (dashed) route optimization in mobile IP are shown in Figures 5 and 6, respectively[6].

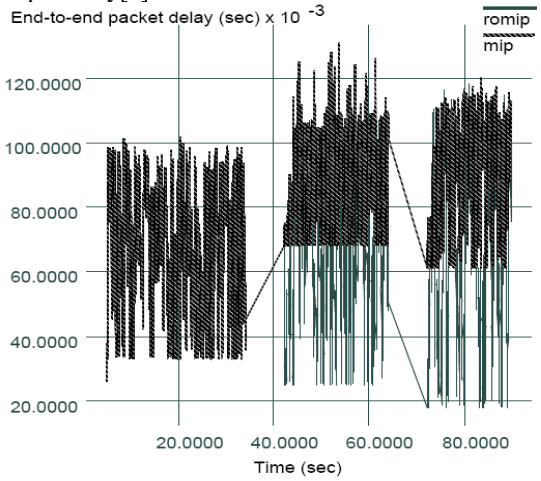

Figure 5. End to end packet delay with (solid) and without (dashed) route optimization in mobile IP.

We can observe that packets loss begins at approximately 35 sec, when MH moves out of the wireless home network. Packet flow resumes when the MH successfully registers in the foreign network FA1. Packet loss occurs again at approximately 65 sec when the MH leaves foreign network FA1 and enters foreign network FA2. Packet flow resumes again at approximately 70 sec.

With the route changes, the end-to-end packet delays change accordingly. In the case of mobile IP without route optimization, we notice that when the MH is in the foreign network, the end-to-end packet delay is always larger than the delay when MH is in the home network, no matter what the link delay is from the CH to the MH. When the MH moves to the foreign network, the minimum end to end packet delay with route optimization (Figure 5) is much smaller than the end-to-end packet delay without route optimization. When the MH moves to the foreign network, the average end-to-end packet delay, shown in Figure 6, retains the same level as the average delay when the MH remains in the home network. These simulation results illustrate the effectiveness of route optimization in the mobile IP protocol. The network efficiency and utilization have been improved by eliminating the "triangle routing."

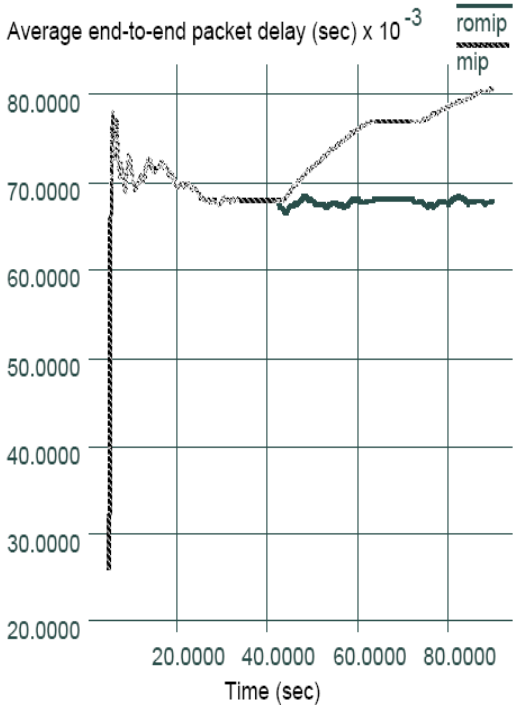

Figure 6. Average end to end packet delay with (solid) and without (dashed) route optimization in mobile IP.

6. ROUTE OPTIMIZATION IN IPV6

The development of Route Optimization techniques for IPv4 has played an important role in the development of mobility support for IP Version 6 (IPv6). Most IPv4 correspondent nodes will not support the processing of Binding Updates for years. IPv6 correspondent nodes, on the other hand, should be able to support the analogous features in IPv6 much sooner. There are three reasons for the difference:

- There is not a sizable deployment of IPv6 nodes to impede the introduction of appropriate protocol features.

- Efficient support of mobility was mandated by the IPng Directorate and the IESG (Internet Engineering Steering Group).
- The base IPv6 protocol support sobility more naturally than IPv4, so that there is less work needed overall to create products that implement the standard.

One of the main features of IPv6 that is most useful for mobility support is the requirement that all IPv6 nodes support authentication. Since the nodes have to perform authentication, APIs have been developed to enable the functions at the network protocol layer, and the APIs can be used to do key management. With keys distributed to the correspondent nodes, the mobile node can expect its correspondents to accept authenticated Binding Updates. When the correspondents are able to keep track of the mobile node's care-of addresses, they can (just as in IPv4 Route Optimization) cause packets to go directly to the mobile node without ever passing through the home network or home agent.

7. CONCLUSIONS

In this paper, we have presented the current proposed protocol definition for Route Optimization, by which is meant the elimination of triangle routing whenever the correspondent node is able to perform the necessary protocol operations. The Route Optimization protocol definition is largely concerned with supplying a Binding Update to any correspondent node that needs one (and can process it correctly). The Binding Update message is also used in conjunction with the Previous Foreign Agent Notification extension to allow for smooth handoffs between foreign agents.

Furthermore, we have presented some methods for establishing registration keys for use by mobile nodes and foreign agents supporting smooth handoffs. We also modified ns-2 and extended the mobile IP packets to enable the route optimization. Simulation results verified the effectiveness and efficiency of route optimization in mobile IP. Although we implemented only two route optimization messages, our implementation proved effective and sufficient to demonstrate the significance of route optimization in mobile IP. Finally, the essential features of Route Optimization, as realized in IPv6, have been identified. We have discussed the differences between IPv4 and IPv6, with the hope that in so doing, the design space for Route Optimization will be more fully understood, and that IPv6's ability to support mobility will be more fully appreciated.

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DIGITISED HUMAN LIFE FORM ISOMORPHIC ALGORITHM

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Abstract-ISOs are "isomorphic algorithms", which are life forms that emerged-- unplanned--from the artificial environment of the grid.Isomorphic Algorithms (better known as ISOs) are a race of programs that spontaneously evolved on the Grid, as opposed to being created by users. ISOs differ from standard programs with distinctions in their appearance and capabilities, but where they are truly unique is in their code base. While regular programs conform to the rigid structure defined by their users, ISOs have evolved, complete with a genetic code of sorts.. This inner structure of their code has allowed ISOs to develop beyond the capabilities of regular programs.. These miraculous algorithms had the capacity to evolve and change and grow at tremendous rates utilizing genetic algorithms, whereas normal programs that were intentionally written by users could only change slowly in anticipated fashions. What's REALLY important about the isomorphic algorithms id, it is revealed that indeed programs can escape the grid into the real world, essentially raising questions of what is life, sentience, the soul, etc. that humanity is no longer confined to humans, but has essentially arisen out of our digital dust and the real and digital world can become interchangeable This kind of human life form is made possible for ISOs because of digital DNA and object recognition which is made possible in isomorphic algorithms.. In this paper we aregoing to describe how an algorithm can be emergedinto human life form.

Requestors:

- A Graph Isomorphism Algorithm for Object Recognition and creation
- DNA pattern that synchs with algorithm
- Memory and processing engine for each algorithm

Isomorphism Algorithm for Object Recognition and creation: Why do we go for Isomorphic Algorithms: In Graph Theory:

Results from experiments on a wide variety and sizes of graphs are reported. Results are also reported for experiments on recognizing graphs that represent protein molecules. The algorithm consists of three phases: preprocessing, link construction, and ambiguity resolution. Object creation is done by Pattern Recognition, Graph Matching, Labeled Graphs, Random Graphs, Local Consistency.. as graph matching in general, is a difficult task. The subclass of graph matching that we will be interested in is called graph isomorphism1. The graph isomorphism (GI) problemis defined as follows: given two graphs, determine if a one-to-one mapping exists from the nodes of the first graph to the nodes of the second such that if two nodes in the first graph are connected by an edge, then their corresponding mapped nodes in the second graph must also be connected by an edge.- Solution:
The design of our algorithm is inspired by the Dynamic Link Architecture (DLA) [21, 22]. Given an input labeled graph and a database of model labeled graphs, the DLA constructs links from nodes in the input graph to all nodes in the database that have the same label, regardless of which model graph they belong to. In later stages, if a similar model graph to the input graph exists in the database, the algorithm attempts to prune spurious links with the goal of leaving only the correct links connected to the recognized model graph. The compatibility of nodes is based on just their labels. Since the DLA uses just labels for determining compatibility of nodes, it can lead to erroneous results since it does not explicitly include neighborhood information. As we show below, we have enhanced this concept of local compatibility by including the neighborhood structure of the nodes to create new labels for the nodes. The algorithm then creates links according to these new labels. When a node in the first graph is compatible with (is linked to) more than one node in the second graph, we have ambiguities. The proposed algorithm then attempts to prune the incorrect links by disambiguating these ambiguous links. We have translated the local compatibility and disambiguating process into a solution to the GI problem as follows. Any two nodes, u in the first graph and v in the second one, are linked to each other if there is a similarity between their neighborhood structures of at least one level deep, i.e. there is an isomorphism between the following subgraphs: the first consisting of node u and its children, the second consisting of node v and its children. This idea is applied recursively and is shown to be sufficient to

determine the existence of any isomorphism between the two graphs being compared (except for the highly ambiguous cases to be discussed later). Since we are dealing in this paper with labeled graphs (there are labels attached to the nodes of the graphs), we refer to this problem as Labeled Graph Isomorphism (LGI)..ALG:

The Algorithm for Human structure modeling: In these graph phase, the algorithm works with each strand of DNA pattern to construct the human structure..

Phase 0: [Preprocessing] In this phase, we compute the degrees of nodes and other related information to be included in the new labels that will be used in the following two phases. New labels are created for each node in both of the graphs. In addition to the original labels, the new labels contain the degree of the node itself and degrees and labels of each child (or immediate neighbor) of this node. To eliminate any confusion, we use \labels" to refer to the original labels that are given with the graphs and \new labels" to denote the labels generated by the preprocessing phase.

Phase 1: **[**Link Construction] Links are constructed across the two graphs between all pairs of nodes that have identical new labels. An. In this figure, where original labels are assumed to be \black" or \white", node u in graph G is linked to node v in graph H. The link is constructed because the new label of u matches the new label of v, i.e. label and degree of node u match those of node v and each child of u, namely i, j, and k, has a corresponding child of node v that matches its label and degree. Here, the children i, j, and k in G correspond to the children x, y, and z in H respectively. Clearly, the graphs G and H in Figure 1 are not isomorphic.

Phase2:[Ambiguity Resolution] The resolution phase is the computationally dominant portion of the algorithm. This phase attempts to resolve ambiguities that mayhave resulted from the link construction phase. The goal of this phase is to try anddecide whether a one-to-one mapping from nodes in the rst graph to nodes in the Figure 1: Node u 2 G is locally compatible ith node v 2 H. second is possible.

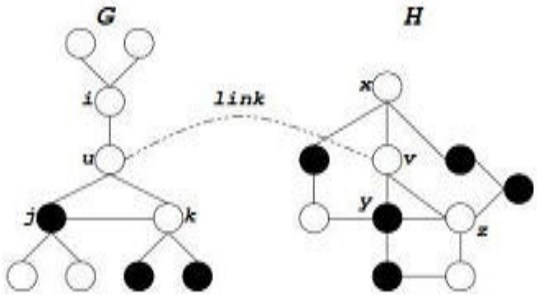
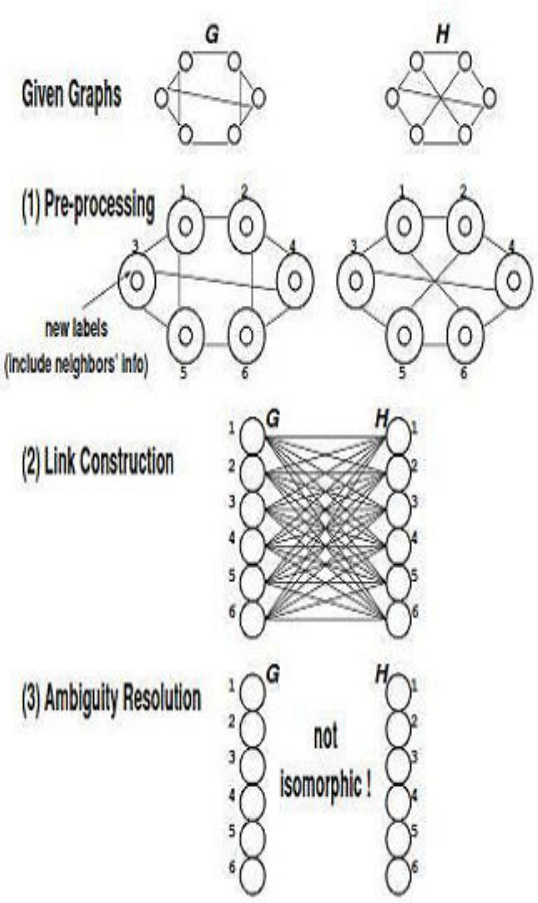


Figure 2 shows the phases of the algorithm pictorially. After the pre- processing stage,the nodes are represented by stylized \inflated" nodes to represent the extra information contained in the new labels. Each inflated node will contain the original label, the degree of the node, and the extra information about the neighborhood around it constituting the new label. Also notice that in this example, all the nodes in G have the same new label and all the nodes in H have the same new label. In addition, the new labels are the same in both graphs because the original labels are the same and the graphs are regular graphs. Before explaining the details of the algorithm, we will definene needed terminology.

ASSUMPTIONS AND DEFINITIONS

Even though our approach works for disconnected graphs, we assume that all graphs used in this paper are connected. The number of nodes in each graph is n unless mentioned otherwise. The first graph is denoted by G = (V1; E1), and the second graph is denoted by H = (V2; E2). Children of node u or equivalently neighbors of node u denote the set of nodes connected to u by edges. Note that most algorithms would find it hard to compare these kinds of graphs while our algorithm handles them well. Figure 2: Given graphs G and H, the three phases of the algorithm are shown. Inthis example, each node in G is linked to every node in H by the link construction phase, and later all the links are disconnected after the ambiguity resolution phase since the graphs are not isomorphic. 8Definition 1 (Graph Isomorphism) Given two graphs G = (V1; E1) and H = (V2; E2) where jV1j = jV2j, is G isomorphic toH? In other words, is there a one-to-one



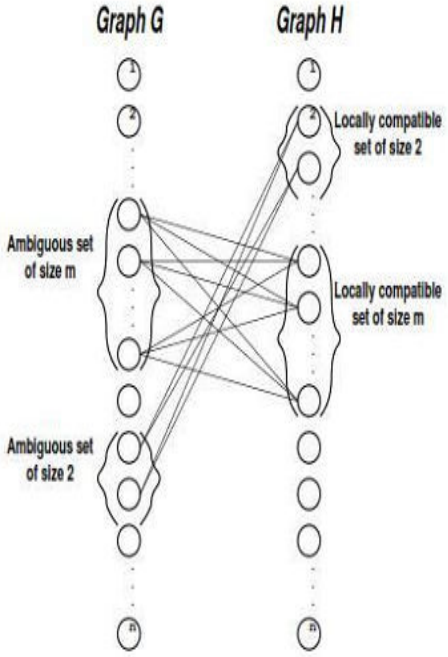
mapping f : V1 ! V2 such that (u; v) 2 E1 i(f (u); f (v)) 2 E2? It has been a convention in the literature to use unlabeled and unweighted graphs with GI. We would like to expand the graphs used in GI to any graph, specifically node-labeled graphs. Therefore, we need to define the Labeled Graph
Isomorphism (LGI) problem by adding one more requirement to the definition of GI. In addition to the edges that must be compatible, we demand that the mapped nodes must have the same labels. The following is the formal definition of the LGI problem.]

Definition2(Labeled Graph Isomorphism)

Given graphs G = (V1; E1) and H = (V2; E2) where jV1j = jV2j and node labels are assigned from a set of labels F by the function l : V1 (or V2) ! F , is there a one-to- one function f : V1 ! V2 such that l(u) = l(f (u)) 8u 2 V1 and (u; v) 2 E1 I (f (u); f (v)) 2 E2 ? The link construction phase of our algorithm may produce a many-to-many relation. Consequently, we may have ambiguities, a case which makes LGI
difficult. If the link construction phase produces a one-to-one mapping, we can safely declare the existence of an isomorphism between the two graphs Next, we will describe how the algorithm works, especially how the resolution process operates. The ambiguity resolution phase attempts to discover a one- to-one mapping, if it exists..

Graph Isomorphism Detection Process

As shown in Section 2.1, the first step of the algorithm embeds the DNA STRUCTURE in the nodes as new labels. So, in addition to the original label of a node u, the preprocessing phase creates a new description of the node that contains the following information: degree of u and degrees and labels of all the children of u. We will refer to the original label as label of u or l(u).The link construction phase is a straightforward process. Given the information produced in the preprocessing phase, any two nodes: u in the graph G and v in the graph H, are linked if u is locally compatible with v. All possible links are constructed in this manner. The resolution phase starts with the following check: if the links from the link construction phase result in a one-to-one
mapping, then we stop and declare the existence of an isomorphism. Otherwise we go through the disambiguating process. We find the first node, say u, where degAmbig(u) = g > 1 and compose the corresponding locally compatible set B and the ambiguous set A that includes u. We perform another test here to make sure that an isomorphism is still feasible. A necessary condition for an isomorphism to exist is that the sizes of the ambiguous set A and the corresponding locally compatible set B must be equal and the links from nodes in A must



be connected exclusively to the nodes in B. Therefore, our test is based on making sure that A is of size g and that the locally compatible set corresponding to
each node in A is in fact B. If this is not the case, we stop and declare the absence of any isomorphism since the necessary condition is not satisfied. Otherwise, we try to find a one-to-one mapping between nodes in A and nodes in B by resolving the ambiguities. Three outcomes are possible after the resolution process has been applied to A and B. First, if a one-to-one mapping cannot be produced, then we stop and declare the absence of an isomorphism between the two graphs.
The second possibility is that we are able to find a one-to-one mapping unambiguously between nodes in A and nodes in B. Third, it is possible that each node in A can be mapped to any node
in B, a case of full ambiguity that may lead at the end of the algorithm in the inability to conform the existence of isomorphism between the two graphs (details are given later); a flag is set to reflect this case. If the outcome is one of the latter two, then the degree of ambiguity of all nodes in A is set to 1 and the algorithm continues. If we need to continue, we find the next node with degAmbig > 1 and repeat the process. Figure 4 shows an example where degAmbig(u) = 2 and an isomorphism is still feasible while processing the ambiguous set A = fu; vg.

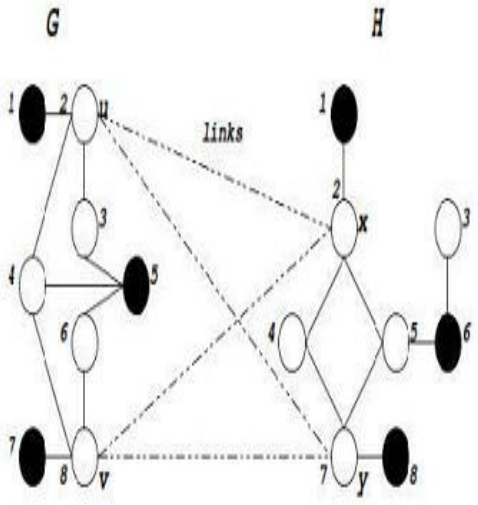


Figure 4: Shows that degAmbig(u) = 2 = degAmbig(v). The ambiguous set A = fu; vg and the corresponding locally compatible set B = fx; yg.

ACKNOWLEDGMENT:

This is where the DNA pattern is given a human structure..

DNA PATTERN:

1. DNA to construct a biological human race with artificial intelligence only results in creation of artificial, designed nanostructures out of nucleic acids, such as this DNA tetrahedron.Each edge of the tetrahedron is a 20 base pair DNA double helix, and each vertex is a three-arm junction. The 4 DNA strands that form the 4 tetrahedral faces are color coded. 2. Each strand consists of millions of
nodes… 3. The nodes from the dimensional strands are made up of reflector semi partialised parts and trillions of instructions to process a function.

PROCESSOR:

On developing an e Hierarchical Processor and Memory Architecture: A Petaflop Point Design Study The objective of this project was to investigate the feasibility of a new architecture concept that can yield very high performance, in the range of 100 Tflops, at a reasonable cost. The proposed Hierarchical Processor And Memory architecture (HPAM) consists of a heterogeneous collection of processors organized as a multilevel hierarchy. Each level of the hierarchy has a different implementation and is intended to efficiently execute appropriate portions of the application. The higher levels can efficiently execute serial and low parallelism sections of the application. The
low levels of the hierarchy have a large number of slower processors and can efficiently execute portions of the code with high degree of parallelism. This work entailed developing the initial infrastructure of a simulator (HPAM-Sim) and conducting in-depth studies of complete industrial applications as well as benchmark applications.

SOLUTION TO THE PROCESSOR:

The Silicon Graphics Fuel visual workstation maximizes the performance of your desktop applications while offering you unprecedented price/performance value. A premium blend of industry-leading technology from SGI, Silicon Graphics Fuel features the latest MIPS® R16000™ processor and the unparalleled VPro™ 3D graphics system for IRIX® in a new high-bandwidth architecture. Drive your creativity and productivity to a new level with Silicon Graphics Fuel. Tezro is powered by up to four MIPS® processors in an advanced high-bandwidth architecture leveraged from the SGI® 3000 family of high-performance supercomputers and delivers industry-leading visualization, digital media, and I/O connectivity on the desktop. Tezro is designed to help topflight individuals and teams deliver cutting-edge results in ever-shorter production cycles--
whether the algorithm is a innovative designer, scientist, engineer, defense specialist, film producer, or geophysicist as same as in real world..

MEMORY ARCHITECHTURE:

Memory in digitized human life form is always represented as memory cycles where each cycle should be the least time due by comparison with their processor cycles…

SOLUTION:

Memory architecture is merged with processor base configuration.. Thus memory cycles are synchronized with processor throughput cycle and this gives an edge where processor would not have to work hardly on retrieving and storing on memory
rather it would concentrate on expanding DNAs instructions..

STRUCTURE:

- Memory is totally inter related with processors working.. so,it is pre planeed to obtain a structure with nano particles for storage..
- Nanoparticle Design:

APPLICATIONS:

Processor and memory cycle with female interface..

Preformed human architecture without graphical interface.

Super massive system building structure..

Core Building formation

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DATAPREFETCHING FRAMEWORK FOR MOBILE BEHAVIOR MINING USING CO-SMART-CAST METHOD

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Abstract*:* Data Mining is a widely used technique for discovering valuable information in a complex data set. In this paper we discussed the main issues about Mobile User Behavior Mining. In mobile transaction database, users in the different user groups may have different behaviors. So that we proposed parameter-less clustering algorithm named **CO-Smart-CAST**. This behavior mining can produce better accuracy of predicting the mobile user information using that algorithm and to provide efficient mining of sequential access in mobile patterns. Here, the clustering method provides a way to calculate the time interval between one transaction to another transaction. We have predicted the behavior of mobile user using CO-Smart-CAST method. This method of process can be done by following ways. 1. Movements and transaction time measurements, 2. Discovering sequence patterns during transaction using clustering and classification. The behavior using communication model can be classified as following three ways. 1. Angry chat, 2. Happy chat, 3. Chat with deep thoughts. To our best knowledge, this work on mining and prediction of mobile behavior with user relation are done simultaneously. Finally, the methods in proposed system will deliver the better performance.

Keywords**:** Data Mining, Mobile User Behavior, Mining Techniques, Sequential Patterns, Communication Model.

INTRODUCTION

Due to a wide range of potential applications, research on mobile commerce has received a lot of interests from both of the industry and academics. Among them, one of the active topic areas is the mining and prediction of users' mobile commerce behaviors such as their movements and transactions. The time interval segmentation method helps we find various user behaviors in different time intervals.

For example, users may request different services at different times (e.g., day or night) even in the same location. If the time interval factor is not taken into account, some behaviors may be missed during specific time intervals. To find complete mobile behavior patterns, a time interval table is required. Although some studies used a predefined time interval table to mine mobile patterns, the data characteristic and data distribution vary in real mobile applications. Therefore, it is difficult to predefine a suitable interval table by users. Automatic time segmentation methods are, thus, required to segment the time dimension in a mobile transaction database.

In this paper, we propose a novel data mining algorithm named Cluster-based Temporal Mobile Sequential Pattern Mine (CTMSP-Mine) to efficiently mine the Cluster-based Temporal Mobile Sequential Patterns (CTMSPs) of users. Then, novel prediction strategies are proposed to effectively predict the
user's subsequent behaviors using the discovered CTMSPs. To mine CTMSPs, we first propose a transaction clustering algorithm named Cluster-Object-based Smart Cluster Affinity Search Technique (CO-Smart-CAST) that builds a cluster model for mobile transactions based on the proposed Location-Based Service Alignment (LBS-Alignment) similarity measure. Then, we take advantage of the Genetic Algorithm (GA) to produce a more suitable time interval table. Based on the produced user clusters and the time interval table, all CTMSPs can be discovered by the proposed method.

To our best knowledge, this is the first work on mining and prediction of mobile sequential patterns by considering user clusters and temporal relations in LBS environments simultaneously. Finally, through experimental evaluation on various simulated conditions, the proposed method is shown to deliver excellent performance in terms of precision, recall, and F-measure.

The main contributions of this work are that we propose not only a novel algorithm for mining CTMSPs but also two nonparametric techniques for increasing the predictive precision of the mobile users' behaviors. Besides, the proposed CTMSPs provide information including both user clusters and temporal relations. Meanwhile, user profiles like personal information are not needed for the clustering method and time segmentation method proposed in this study.

PROPOSED WORK

In this section, we review and classify relevant previous studies into three categories: 1) similarity measures, 2) mobile pattern mining techniques, and 3) mobile behavior predictions.

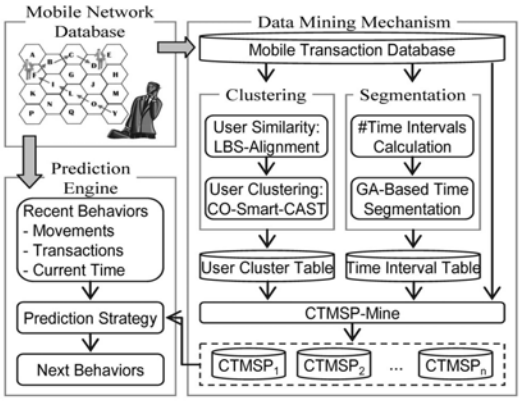
Similarity Measure: There have been many studies on measuring the similarity between two objects. The first one is based on multiple-level hierarchical structures. The concept of set similarity is to apply Measure to calculate the similarity of two sets. Let S1

and S2 be two sets, the set similarity set similarity (S1; S2) is defined as (1). However, set similarity is not applicable to store similarity in mobile commerce.

Mobile Pattern Mining: Here to propose the TMSP-Mine for discovering the temporal mobile sequence patterns in a location-based service environment. To propose a prediction approach called Hybrid Prediction Model for estimating an object's future locations based on its pattern information. This paper considers that an object's movements are more complicated than what the mathematical formulas can represent. However, there is no work consider user relations in the mobile pattern mining.

Mobile Behavior Prediction: The studies on mobile behavior predictions can be roughly divided into two categories. The first category is a vector-based prediction that can be further divided into two types: 1) linear models, and 2) nonlinear models. The nonlinear models capture objects' movements with sophisticate regression functions. Thus, their prediction accuracies are higher than those of the linear models. Recursive Motion Function (RMF) is the most accurate prediction method in the literature based on regression functions. The second category is a pattern-based prediction.

The idea of Collaborative Filtering (CF) may be applied to the prediction of user's behavior. Collaborative filtering can be divided into two types: 1) user-based collaborative filtering and 2) item-based collaborative filtering. The user-based collaborative filtering is based on the behaviors of other similar users.



Four important research issues are addressed here:

1. Clustering of mobile transaction sequences.
2. Time segmentation of mobile transaction sequences.
3. Discovery of CTMSPs.
4. Mobile behavior prediction for mobile users.

Clustering of Mobile Transaction Database:

In a mobile transaction database, users in the different user groups may have different mobile transaction behaviors. The first task we have to tackle is to cluster mobile transaction sequences. We proposed a parameter-less clustering algorithm CO-Smart-CAST.

EVALUATION

In this section, we conducted a series of experiments to evaluate the performance of the proposed CTMSP-Mine, under various system conditions. Experiments can be divided into three parts: 1) user clustering, 2) time interval segmentation, and 3) precision of prediction. All of the experiments were implemented in Java on a 3.0 GHz machine with 1 GB of memory running Windows XP.

We compare the proposed CTMSP Mine method with four other methods:
1. Recursive Motion Function.
2. Markov Model.
3. Hybrid Prediction Model.
4. Mobile Sequential Pattern.

In this series of experiments, our major purpose is to measure the precisions and recalls of mobile behavior predictions by various methods.

CONCLUSION

In this paper, we have proposed a novel method, named CTMSP-Mine, for discovering CTMSPs in LBS environments. Furthermore, we have proposed novel prediction strategies to predict the subsequent user mobile behaviors using the discovered CTMSPs. In CTMSP-Mine, we first propose a transaction clustering algorithm named CO-Smart- CAST to form user clusters based on the mobile transactions using the proposed LBS-Alignment similarity measurement. Then, we utilized the genetic algorithm to generate the most suitable time intervals. To our best knowledge, this is the first work on mining and prediction of mobile behaviors associated with user clusters and temporal relations. A series of experiments were conducted for evaluating the performance of the proposed methods. The experimental results show that CO-Smart-CAST method achieves High-quality clustering results and the proposed CBSS strategy obtains highly precise results for user classification. Meanwhile, our GA-based method obtains the most proper and correct time intervals. For behavior prediction, CTMSP is shown to outperform other prediction methods in terms of precision and F-measure. The experimental results demonstrate that our proposed methods are efficient and accurate under various conditions.

FUTURE WORK

In future work, we will apply our method to real data sets. We will also try to integrate CTMSP-Mine with HPM or RMF as a hybrid scheme and design more sophisticated strategies. In addition, we will apply the CTMSP-Mine to other applications,

such as GPS navigations, with the aim to enhance precision for predicting user behaviors.

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AUTHOR INDEX

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EASYC -AN INTERACTIVE TEXT EDITOR FOR C

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Abstract*:* EasyC is an interactive text editor for C language. It is developed using PHP and JavaScript. So we can upload it as online web application .The basic idea is that instead of making the user to type all the lines of program let them to click options, so that the corresponding syntax will be pasted. EasyC reduces the typing work up to 90% and thus saves the time up to 75%.EasyC provides things which are all related to typing reduction but the compilation area is separate which is standard in TurboC compiler. EasyC removes 99% of syntax errors before submitting the program to the compiler.

I. INTRODUCTION

Most of compilers are strong in compilation side but not in editing side. (i.e.) we have to type the entire program by manually unreasonably it takes too much time. This means typing time is more than the thinking time. To reduce the typing time and also to reduce the errors we require one solution. Our tool is EasyC is designed based on the error reduction and less time consumption concept. We implemented many algorithms for error reduction. The errors we remove from the source program are as follows

- Semi colon missing
- Argument missing
- Type mismatch
- Parenthesis mismatch
- Lvalue required
- Linker errors
- Header file not found

The method of removing the errors stated above are explained in the below section.

A.SEMI COLON MISSING:

To remove semi colon missing error, first we have to analyze what are the places where the semicolon is must. In C,following are the places where semicolon is must.

- Function declaration
- Function call
- Variable declaration
- Assignment operation
- Looping and control statements

(1). Function declaration and function call:
If ‘)’ is found and the next character is not ‘{‘ then it automatically adds ‘;’ as next character to ‘)’.

(2). Variable declaration:

Only certain keywords a variable in C program . While the user program through this EasyC if those keywords are found and the Semicolon is missed before the next keyword is found then it automatically insert ‘;’.

(3).Assignment operation:

If the type of variable followed by “=” operator is found and the next immediate character should be any type of value (int,float,string or any type) but if the “;” is missed at end of those statement it automatically insert it.

(4).Looping and control statements:

Control statements such as “break , continue” is found then it automatically inserts “;”.Control statement such as “goto” is found and it shows then next statement should be label.

II. ARGUMENT MISSING

Argument missing error is fully reduced because if user clicks an predefined function it automatically shows the number of arguments and type of argument..When any pre-defined function is clicked, not only the name of the function is pasted but also the datatype of arguments separated by commo’s.Thus the user knows number of arguments.

III.TYPE MISMATCH

If the user gives type of variable or arguments in function, it automatically shows what type of value should to give. Through this we can reduce the type mismatch.

When the user doesn’t pass right arguments to a function, then there are two possibilities.

Case 1: If the datatype are compatible then the user given values will be converted to desired type values.

Case 2: If the data types are not compatible then swapping between the arguments will be tried for right order.

IV.PARANTHESIS MISMATCH

Immediately user clicks an compile button, before it starts compilation EasyC counts the number of parenthesis opened and closed if there is no equal number of parenthesis it shows mismatch and also we user have to insert the parenthesis.

If the number of open and close braces is not equal, then there are two possibilities.

Case 1: If the user program is in structured manner then it is easy to find the position of the missed parenthesis.

Case 2: If the user program is not structured then the only way is to add the missed parenthesis at the end of the program.

V. LVALUE REQUIRED

Users suppose to give value to a variable. That variable is declared at the beginning so that the variable is used for particular type is represented .So EasyC reduces the Lvalue require error.

VII. LINKER ERRORS

When the function is miss spelled, the linker error occurs. In EasyC when a function is clicked the appropriate word is pasted correctly. So it is no chance for typing the function misspelled

VIII. HEADER FILE NOT FOUND ERROR

The predefined functions are used only the user clicks the corresponding header file. If the user clicks the header file button then the corresponding functions are loaded then by clicking the required function automatically the header file is added. So there is no chance for header file require error.In EasyC, initially the function list will be empty. If the user selects any header file then only the corresponding list of functions will be loaded.So it is no chance for using function before the corresponding header file is imported.

A. Some of the snapshots of our EasyC tool:
Main page:

This page includes only the option to create a file and to open the already created file.

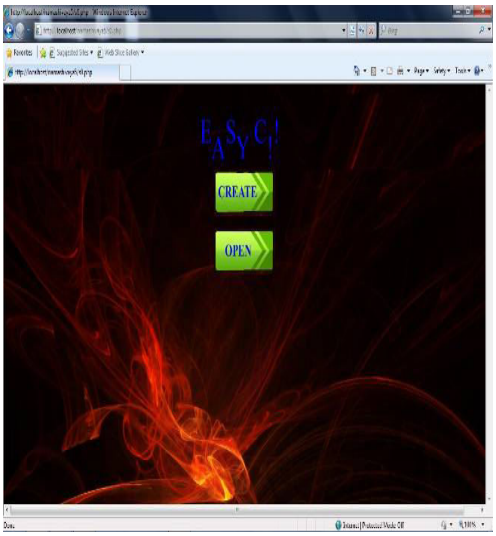

Fig 1: Page to create a new file & open the existing file.

In this page we can create new file is created by using "create" button. Also we can open the already created file by using "open" button. Once the user click the create button the page to create file will open and that is shown in fig 2,

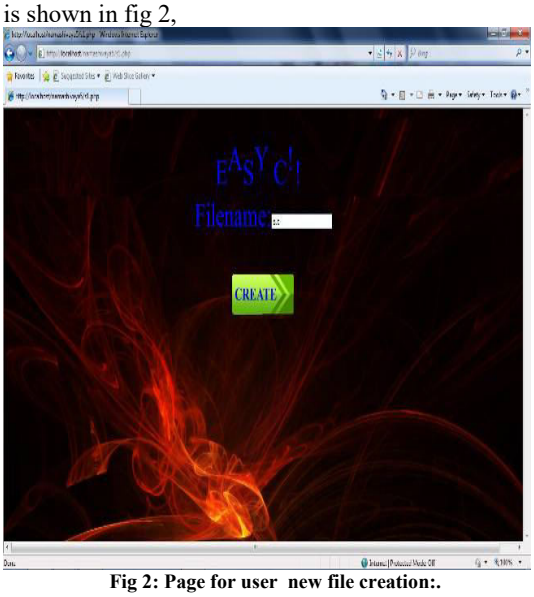

Fig 2: Page for user new file creation:.

Here user can create a new file by giving the file name in textbox. Once the file is created it will be stored in our BIN folder and the file name will be stored in separate table and that can be accessed using "MYSQL".

Fig 3: The page where the user can program.

In this page we included four combo boxes one for "header files" another for "functions" another one for "keywords" and another one for "loops" and "finish" button which loads the file into compiler and "home" Button which makes the user to go home page.

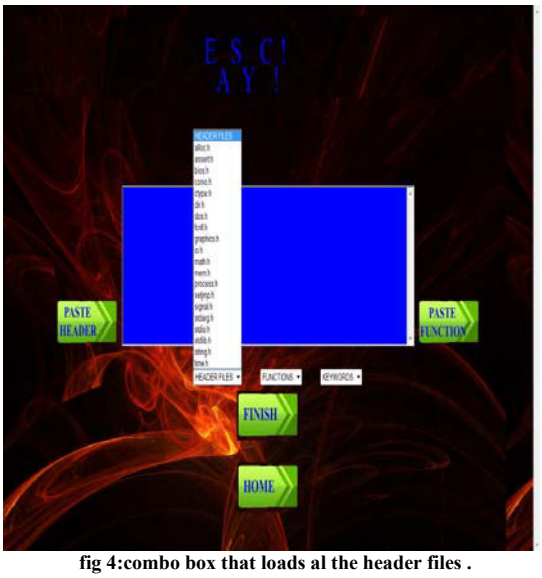

fig 4:combo box that loads al the header files .

Once the user click the header file combo box all the header files available in C will be loaded. The corresponding functions will be loaded in "functions" combo box.

X. LOGICAL CONCEPTS

It is impossible to remove a logical error which deals with programmer's understanding of the problem. So in logical side we planned to create animated trace over of program execution and corresponding values updation of variables inside and outside the loop and it will implemented in future using "Flash ActionScript".

XI. CONCLUSION

All of the concepts of EasyC are implemented using JavaScript expect file handling which is the only concept implemented using PHP. The main principle behind the implementation of EasyC is text processing. The tool has complete control over the source program developed by the user.

We added the above logical concept principle (i.e.),"animative trace if variable value updation"as our future extension. We planned to do this using Flash ActionScript.Runtime error handling will also our future extension.

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ENERGY CONSERVATION AND DEMAND SIDE MANAGEMENT IN PRESENT INDIAN POWER SECTOR SCENARIO

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Abstract: Economy of any country is dependent upon its Power Consumption. Hence, a large amount of power is required to make India a self reliant economic power. In India there is a huge gap between the Power generated and the Power required. It is not possible to realize this gap by increasing the installed capacity, as the resources are limited and also due to economic constraints. So, the energy being generated should be conserved to the utmost.

In this paper, the responsibility and the areas of the power sector in conserving the Energy being produced have been discussed in detail. This would definitely lead to marginalizing the gap between demand and supply.

INTRODUCTION

India has 16% of world's population, but less than 1% of the world's energy resources. There is a huge deficit in the demand and availability of energy. The total installed capacity is 207006MW and the present peak demand is 217000MW. The real challenge for the power sector is to narrow this gap. This can be done by increasing the installed capacity; which has its own limitations. Hence, going by the dictum Energy saved is Energy Generated. It's a big challenge for the Power Sector to save the energy to narrow the gap between demand and supply. There is a huge potential to save energy in various sectors of economy – industrial, agriculture and domestic up to 25% in each of them.

Energy conservation can be achieved by both, a promotional and a regulatory role by the authorities concerned. Promotional role includes awareness campaigns, education, training, demonstration projects and feasibility studies.

Regulatory role includes mandatory energy audits of large consumers, devising norms of energy consumption for various sectors and sub sectors, provision of fiscal and financial incentives and implementation of standards.

Areas of Energy Conservation

Supply Side

- Improving existing thermal power station performance
- Grid management
- Improvement in transmission and distribution system

Demand Side

- Industrial Sector
- Domestic Sector
- Commercial Sector
- Agriculture Sector

Supply Side

The major areas where energy conservation drive can be undertaken in a thermal power plant are

- Specific consumption of coal and fuel oil
- Optimum consumption of water
- Reduction in Auxiliary Power Consumption

Increase in PLF of existing Thermal Power Stations can be achieved by better utilization of existing equipments and conservation of energy. Thermal Power Plants consume about 74% of the coal as main fuel and overall efficiency of Thermal Power Plants is about 40%. The auxiliary power consumption in Thermal Power Plant varies from 8.5% to 11% of gross generation. The following causes lead to increase in auxiliary power consumption.

- Not running the unit at full load due to system problem.
- Improper size of auxiliary equipment.
- Running of drives in excess of requirement especially in cooling water pumps & cooling tower fans.
- Lighting and ventilation equipments not switched off when not required.
- Frequent start up of the units due to operation and maintenance problems.

Maximization of generation during peak-load hours can be achieved by following techniques

- Load curtailment equal to remaining deficit.
- Putting all generators on free-governor mode.
- Installation of capacitors to address low voltage problems.
- Absorption of VARs during off-peak hours.
- Incorporation of effective automatic load-shedding.

Transmission & Distribution Losses

Our Transmission & Distribution losses of 21-22% are exorbitantly high when compared to that of the advanced countries like USA and Japan, where they are around 7-8%.

If this lost energy is brought into the billing net, it will lead to additional revenue of several billion. Alternatively, it could save a capacity addition of about 10,000 MW operating at a PLF of about 70%.

The growing need for electricity has resulted in difficulty in meeting the peak demand. Increase of supply side in proportion to the demands is not

feasible due to the depleting rate of resources. Hence energy conservation/reducing losses is now recognized to be the only viable option to balance energy. T&D losses can be broadly classified as

a) Technical Losses
b) Commercial Losses

Technical Losses

These losses occur due to flow of electrical power through transformer, transmission & distribution lines, cables and other equipments. The main reasons for high technical losses are

- Multiplicity of Transformations.
- Extension of T&D Network of 95,329 Ckt. km EHT, HT & low voltage lines.
- Growth of Rural Electrification.
- Inadequate reactive compensation and poor voltage regulation.
- Corona Losses
- Over loading of transmission lines
- Improper location of power & distribution transformers.
- Inappropriate rating of distribution transformers
- Inappropriate choice of voltages.
- Ratio of HT to LT lines
- Unbalanced loading of the transformer, transmission lines & LT system
- Over frequency of the system
- Low power factor and low system voltages
- Lack of system planning
- Lower conductor sizes
- Poor Construction and Maintenance practices.

The transformation losses can be reduced by using amorphous transformer and reduction in stages of transformation.

Amorphous Transformers:

Amorphous metal alloy having composition Fe-78 B-13 Si-19 used in amorphous core transformer possesses properties of high electrical resistivity, annealing temperature, low noise level and lower core losses. Due to these properties, no load losses are reduced by 60% to 70%.

Reduction in stages of Transformation:

Each level of transformation whether step-up or step-down entails transformation losses to the extent of about 1.0% to 1.5% in case of power transformers and a much higher level of losses in case of distribution transformers. The stages of transformation at each substation should be reduced to the minimum.

The main reasons for high T&D losses are :

Incorrect selection of feeder cross-section:

Incorrect selection of feeder cross-section results in higher losses. The conductor material and the correct size plays an important role in reducing these losses. AAAC can be used instead of conventional ACSR. .

Over Loading of lines/feeders:

The over-loading of lines/feeders may be due to low power factor and low transmission voltage and also due to consumer's demand. Corrective measures are

- Vulnerable links should be strengthened by constructing additional parallel lines.
- Network reconfiguration through load flow studies i.e. to determine the minimum loss path of the transmission system through computer aided simulation.

Reactive compensation:

Installation of Shunt capacitors of suitable rating at the terminal end of the EHV lines or at bus or both with lines and bus. Switch type bus reactors or thyristor-controlled reactors should be used for highly inductive loads.

Series compensation:

The performance of a transmission system is characterized by the Voltage control at the feeding buses, Voltage regulation at all load taps, Power factor control at utilities end and Line/feeder losses. Series compensation provides the following:

- The sending end power factor is improved thus improving the voltage.
- Feeder losses are reduced.
- The power transfer capability of transmission link is increased.

Automatic voltage boosters/Regulators: The benefits of using AVR are:

- It improves the voltage profile. Voltage profile can be improved by 10% by using AVRs.
- It reduces losses in transmission system, improving the voltage profile.

Line length ratio:

The length of distribution lines/feeders should be reduced. Some of the SEB's have already developed system consisting of pure HV system. Consumers are directly fed by stepping-down from 11 KV to LT by a single phase transformer .

Corona losses:

In extra high voltage system, losses take place due to excessive corona. These losses can be reduced by using HVDC transmission for a minimum length of 250 km to 300km. **Commercial Losses:**

These losses occur mainly at distribution level. The main causes of commercial losses are

- Meter tempering
- Unauthorized connections
- Un-metered power supply

Meter Tempering

This is frequently done by some unscrupulous consumers and this can be done easily because very poor quality meters are installed at consumer premises. Also there is a lack of supervision and meters are not enclosed in metal/wooden boxes.

Unauthorized Connections

A huge amount of distribution losses occur due to unauthorized consumption of power through hooking and tapping.

This is a complex problem and can be tackled by following measures.

- Public awareness about the impact of theft on electricity tariff and quality of supply.
- Simplification of the procedures for giving temporary connection.
- Quick connection to prospective consumers by introducing "Tatkal schemes".
- Speed supply of meters should be ensured to all the prospective consumers, so that they are not tempted to adopt illegal means.
- Extensive help from the local police will have to be taken, to nab and punish the offenders.
- Theft/pilferage of electricity should be made a cognizable offence.

Un-metered Power Supply

Huge quantum of loss is occurring due to un-metered power supply to irrigation Pump sets and Public Lighting System. These losses can be overcome effectively by adopting following measures.

- No supply without a correct meter should be a policy decision.
- Higher accuracy electro magnetic meters.
- Installation of static energy meters.
- Introducing automatic metering for bulk consumers with computerized monitoring at manufacturer's end.
- The static energy meters for domestic and commercial metering should be temper proof, vibration proof and accurate under adverse loading conditions.

Demand Side:

Domestic & Commercial Sector

Though small amount of power is used in Domestic & Commercial Sector but it plays a vital role where energy can be saved. Energy savings in these sectors can be promoted by educating the consumer to use energy efficient equipments. Education in energy conservation should be introduced at school level. Some of measures are mentioned below

- Use of fluorescent tube and CFLs in place of incandescent lamp.
- Switching off light when not in use particularly during lunch hours and during leaving offices.
- Good quality of wiring and appliances.
- Frequent opening of fridge-door be avoid.

Agriculture Sector

The demand of energy in this sector is increasing rapidly. Energy Conservation in this sector can be promoted by following techniques.

- It is a fact that the motors and pumps used in this sectors are inefficient (i.e. 30% efficiency) whereas the recommended scope for operational efficiency is 55%.Mandatory regulations may be imposed on agricultural pump set owners to resort to modernization of their working systems so as to raise the overall efficiency not below 55%. Special jet pumps are one of the possible solution for tube wells.
- The main aspect of the flat rate tariff gives opportunity to the purchaser for buying big pump sets and user avoid switching off the power. Hence metered supply is essential.
- Shunt capacitors should be used to improve power factor.
- Periodical maintenance of transformers & use of proper size of fuse.

Industrial Sector

The pattern of energy consumption in this sector is around 40% and therefore this sector should be the priority area of energy conservation. Energy conservation in this sector can be promoted by following measures

- Avoid use of over size motors.
- Avoid non-standard welding set as it consumes more power.
- Avoid lower size/improper cable as it leads to increase in losses.
- Proper lubrication of motor
- Avoid pulley drive. Use of direct coupling is effective.
- Instead of shutting down the feeder as a whole, it is desirable to allot quota of units during power cut programme.

CONLUSION

A few of the methods and measures have been suggested in this paper at the Power Supplier and consumer end both to conserve the energy and hence enhance the net available power for consumption at the consumer end. If followed, these measures would definitely help to reduce the gap between demand and supply and also help the power system operation economically by increasing the net billed energy.

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