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Prof.Srikanta Patnaik Mentor
IRNet India, patnaik_srikanta@yahoo.co.in

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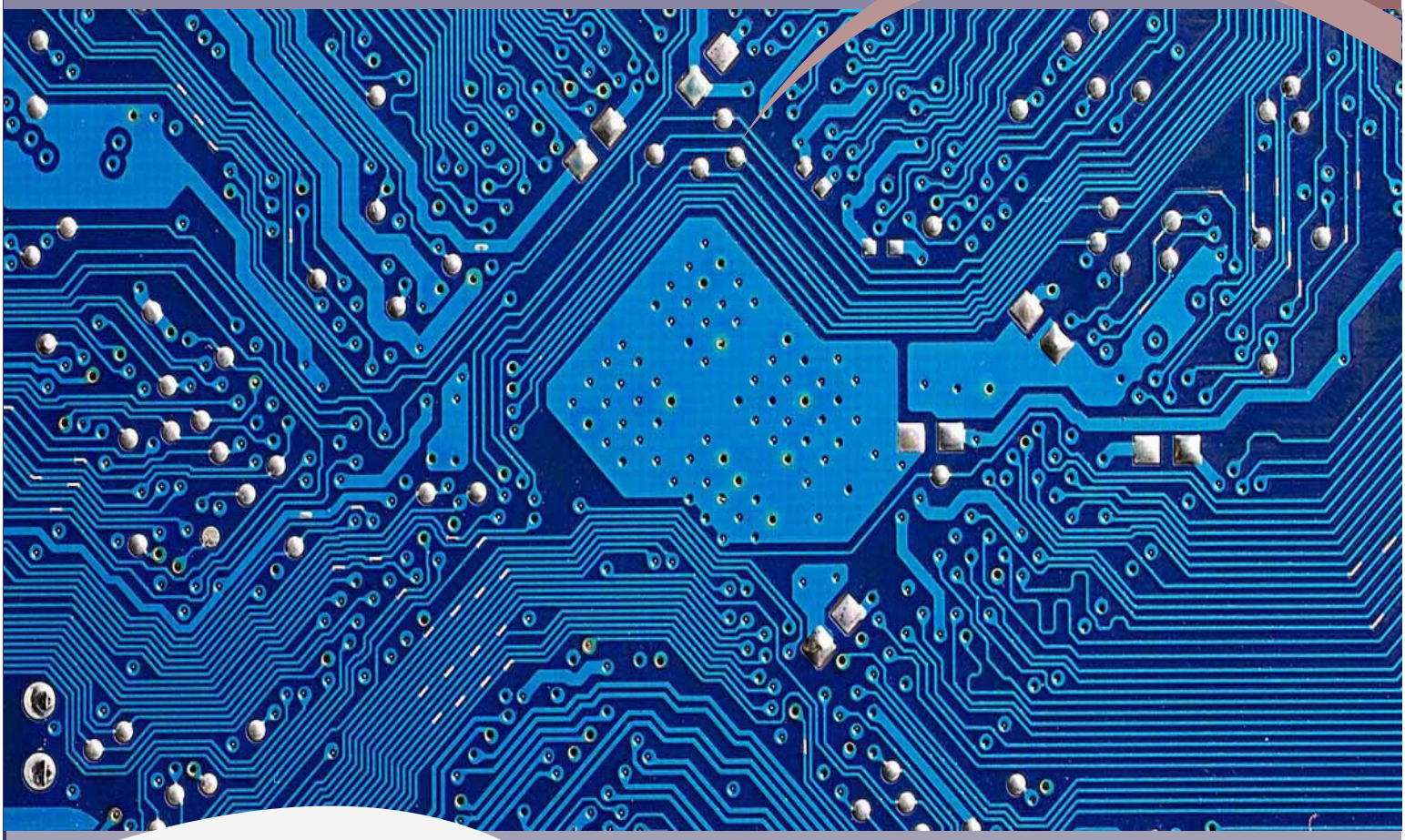

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CHANDIGARH, India

Interscience Research Network (IRNet)
Bhubaneswar, India

Editorial

The mushrooming growth of the IT industry in the 21st century determines the pace of research and innovation across the globe. In a similar fashion Computer Science has acquired a path breaking trend by making a swift in a number of cross functional disciplines like Bio-Science, Health Science, Performance Engineering, Applied Behavioral Science, and Intelligence. It seems like the quest of Homo Sapience Community to integrate this world with a vision of Exchange of Knowledge and Culture is coming at the end. Apparently the quotation "Shrunken Earth, Shrinking Humanity" holds true as the connectivity and the flux of information remains on a simple command over an internet protocol address. Still there remains a substantial relativity in both the disciplines which underscores further extension of existing literature to augment the socio-economic relevancy of these two fields of study. The IT tycoon Microsoft addressing at the annual Worldwide Partner Conference in Los Angeles introduced Cloud ERP (Enterprise Resource Planning,) and updated CRM (Customer Relationship Management) software which emphasizes the ongoing research on capacity building of the Internal Business Process. It is worth mentioning here that Hewlett-Packard has been with flying colors with 4G touch pad removing comfort ability barriers with 2G and 3G. If we progress, the discussion will never limit because advancement is seamlessly flowing at the most efficient and state-of-the art universities and research labs like Laboratory for Advanced Systems Research, University of California. Unquestionably apex bodies like UNO, WTO and IBRD include these two disciplines in their millennium development agenda, realizing the aftermath of the various application projects like VSAT, POLNET, EDUSAT and many more. 'IT' has magnified the influence of knowledge management and congruently responding to social and industrial revolution.

The conference is designed to stimulate the young minds including Research Scholars, Academicians, and Practitioners to contribute their ideas, thoughts and nobility in these two integrated disciplines. Even a fraction of active participation deeply influences the magnanimity of this international event. I must acknowledge your response to this conference. I ought to convey that this conference is only a little step towards knowledge, network and relationship.

The conference is first of its kind and gets granted with lot of blessings. I wish all success to the paper presenters.

I congratulate the participants for getting selected at this conference. I extend heart full thanks to members of faculty from different institutions, research scholars, delegates, IRNet Family members, members of the technical and organizing committee. Above all I note the salutation towards the almighty.

Prof. (Dr.) Savita Gupta
Department of Computer Science and Engineering
University of Engineering & Technology,
Punjab Universitym, Chandigarh

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A Real-Time Focusing Algorithm for Palm Print Recognition

[1]Gaurav Bansal[2] Rajni Bala

[1,2]Department of Electronics and Communication, M.tech Research scholar PTU-GZS, Bathinda, Punjab, India.
[1]gauravbfcet88@gmail.com,[2] rajnigarg77@gmail.com
Contact no: 09501115487, 09463707000

Abstract: Many countries commence to issue E-driving license, E-passports, various communication systems containing biometric data for their society. The European Union has EAC mechanism for E-passports. But, even this solution presents many threats especially in security and privacy. Biometric template recognition is the challenging problem in the real world application. In this paper, a new method for the secured exchange between an E-passport or E-driving license and the Inspection System is provided. The main objective of this proposed method is to create Perfect matching score points from Palm print using Vision Assistant 2009 environment. First template minutiae from Palm prints are extracted. From those templates minutiae, perfect matching is generated by using vision Assistant 2009 cryptography generation algorithm. Thus, matching score on various threshold values calculates it's FRR & FAR rate based on biometric data to validate the identity of the user was created. This analysis confirms that our solution corresponds to the safety goals defined in the paper.

Keywords: Biometrics, Palm data base, Scout camera, image pre-processing Algorithm, Palm Print identification device, NI Vision Assistant 2009.

1. INTRODUCTION

Power electronics has an important role in different industries when influence processing is required such as in computers, telecommunications, E-driving license, E-passports, variable drives, mobiles and alternative electronics systems. To protect the information stored in these consumer devices, conventional ways are used by passwords or PINs (Personal identification number). Although these ways are easy to execute, passwords or PINs have the risk of publicity, and also being forgotten. Therefore, a more reliable and friendly way of identification needs to offer to user. Recently, biometrics, which is the personal identification technology based on human physiological traits, have attracted more and more attention and are becoming one of the most popular and promising alternative to solve these problems.

Any individual physiological and/or behavioural characteristic can be used as a biometric attribute as long as it satisfies the requirements of universality, unique-eness, stability, collectability, recital and acceptability. [1]. In biometrics, there are a number of biometric identification techniques such as fingerprint, palmprint, face and finger-vein or other biometrics combination [1-2]. While fingerprint-based identification technology the system of Palm Print geometry is very simple, relatively easy to use, and inexpensive. Environmental factors such as dry weather or individual anomalies such as dry skin do not appear to have any unenthusiastic effects on the confirmation precision of Palm Print based systems, which is a significant advantage

over hand geometry and fingerprint features, which rely on complicated details making them less vigorous in field. Palm Print measurements are easily collectible due to both the agility of the hand and due to a relatively simple method of sensing. This does not enforce excessive requirements on the imaging optics [3]. From the literature we could find that Palm Print features have been stated not to be very typical. After a study of Palm composition it believe otherwise and it has selected an inclusive set of Palm Print geometry to outperform the less explored Palm Print geometry works and create it as a biometric characteristic which can match the performance of palm print features. Hence it could be a preferred biometric mode in many applications specially the rural areas where a vigorous, satisfactory and

economical recognition and substantiation technology is required. This was the underlying motivation while carrying out the research work.[4]

2. IMAGE ACQUISITION SETUP

The Basler scout family is based on a selection of the best Sony CCD sensors and offers a wide variety of resolutions and speeds. The family also includes a high-performance CMOS sensor from Aptina. With their Gigabit Ethernet (GigE) and FireWire (IEEE 1394b) interface technologies, the cameras in this family are defined by state of the art technology that lets you get the maximum performance from each sensor .A digital scout camera with a resolution from VGA to 2 megapixels has been used for Image Acquisition. This setup is relatively inexpensive as compared to the fingerprint sensors. A database of 100 users has been prepared, taking 4 random scans of the left Palm & right Palm for each user. No pegs or margins were placed on the scanner and the users were free to place their hand as they wish, as long as their fingers remain separated. The image acquisition setup does not employ any special illumination. Figure 1 shows a snapshot of the Enrollment database.

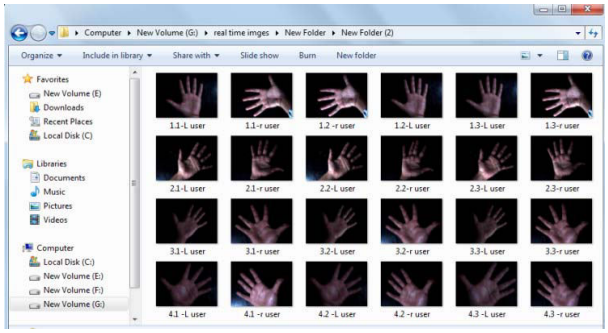


Figure 1: Snap shot of the Enrolment data base

3. PROPOSED SYSTEM

Figure 2 shows the proposed system at block level. Feature Vectors for all images in the database have been calculated in the feature extraction module, and stored in the form of a text file, called the system database. In the matching module feature vector has been calculated from the query image and compared with the system stored database. A decision for verification or recognition is taken as per the problem targeted. Both the aspects (recognition and verification) have been tested and the results have been discussed in this paper.[5]

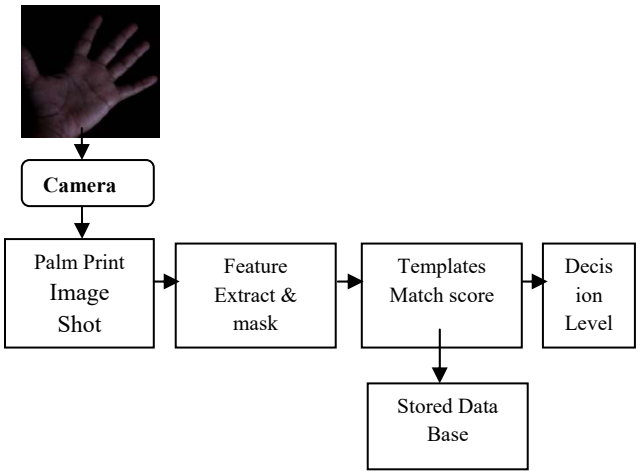


Fig 2: Proposed System of Palm print verification

4. HAND GEOMETRY TECHNIQUE

Its situation to be used is hand must be placed precisely, guide marking have been included and units are mounted so that they are at a comfortable height for majority of the population. The noise factors such as dirt and grease do not pose a serious problem, as only the outline of the Palm shape is important. Palm print geometry doesn't produce a large data set. Therefore, give a large no. of records, Palm Print geometry may not be able to differentiate sufficiently one individual from another. The size of Palm template is often as small as 11.675 bytes is shown in figure 1. Such systems are suitable for identification at all. It shows higher level security application.

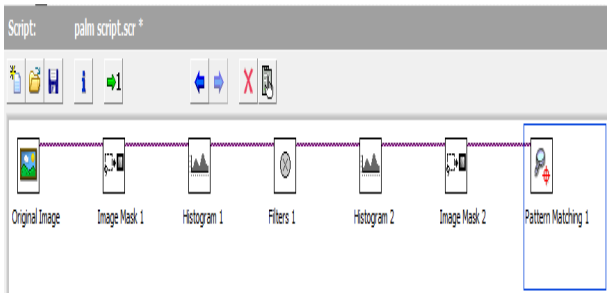


Fig 3: Pre-processing script of palm prints Pattern

The palm print authentication has been designed on image processing -based algorithm. The proposed algorithm has been developed using NI Vision Assistant 2009 and Lab VIEW software. Palm print image enhancement algorithm receives an input palm print image then applies the image enhancement steps on the input image of data base of palm and finally at the output

gives the enhanced image .The pre-processing is required so as to develop the excellence of the acquired palm prints in order to extract the features easily from them [6] [7]. The pre-processing algorithm was developed using NI Vision Assistant 2009. The script is shown in figure 3.

5. EXPERIMENTAL RESULTS AND PERFORMANCE EVALUATION

To evaluate the efficiency of the proposed Palm Print based recognition scheme, we have built a prototype system and also performed simulation experiment by Lab VIEW & Vision Assistant 2009 on a Intel CORETM 2 Due CPU 2.40 GHz processor with 2.0 GB RAM. Fig. 4 (a) shows the prototype of the Palm Print based recognition system. The Palm Print database in our experiment collected a total of 100 images which were organized by acquiring 5 images from right hand & 5 from left hand, from 10 testers through our capturing device. The size of captured images is 1390×1038 pixels with a 16-bit image. To simplify the data of Palm Print pattern, the Palm Print images are cut at 100×100 pixels is shown as in figure 4 (b). [8] To diminish the aspect of characteristic vector, we used 60 Radon transforms. We used two performance measures, namely the false rejection rate (FAR) and the false acceptance rate (FRR). FAR refers to the acceptance rate of unauthorized users and FRR refers to the rejection rate of the justifiable users. In both of the measures, a lower value implies better performance. [9-10]

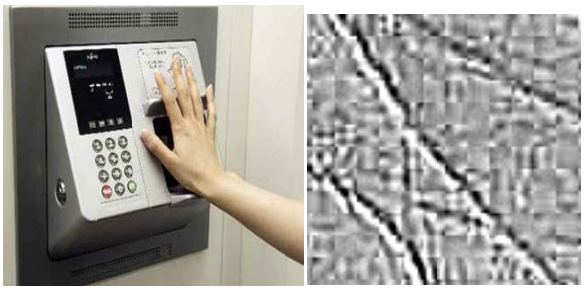


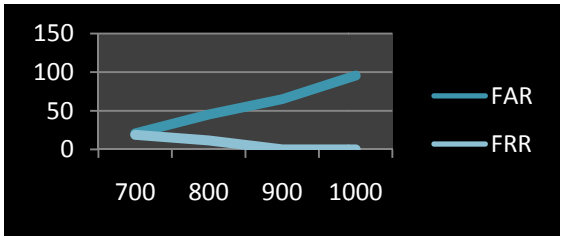
*Fig 4(a) Prototype of Palm print based user identification system (b) 100*100 pixels*

It is based on the fact that nearly every person's Palm Print is twisted in a different way and that the shape of a person's Palm Print does not change after certain age. These techniques include the opinion of length, width, thickness and surface area of the hand. [11-12]

Table 1 & Fig 5: Performance evaluation in terms of FAR and FRR

Distance threshold FAR FRR

THRESHOLD	FAR	FRR
700	20.75	18.75
800	45.12	11.5
900	65.03	0
1000	95.55	0



6. CONCLUSIONS

Best confirmation system can be generated by using the proposed method. In this method, biometric is used for the person identification. Even one system produces false recognition for an authentic person with the help of other system the false rejection rate is condensed. It provides Security and reliability in networks for communication. This method is simple and the efficient. Since most of the existing biometric ID documents like e-Passport and driving license, ATM machine are having storage fields for Palm print, face and iris. In the proposed method Palm Print print used as biometric template. So, in the future we can realize the proposed system without attractive the present method. This project can also be extended to the face, finger print and iris recognition. It can improve the reliability of the real time system. The proposed method can be developed for different applications like image retrieval, military areas, investigation departments, and industrial computerization.

7. ACKNOWLEDGMENT

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Impact of Static Var Compensators on Power System: A Case Study

[1]Guneet Kour, G.S.Brar, [2]Jaswanti

[1]Electrical Engineering Department, Baba Bhanda Singh Bhadur Engineering College, Punjab, India.
[2]Electrical Engineering Department Chd. College of Engg. & Tech, Chandigarh, India.
Vernacular12@gmail.com; gursewak.singh@bbsbec.ac.in; Jaswanti98@yahoo.co.in

***Abstract*:** With increase in load, any transmission, distribution and generating model suffers from disturbances. These disturbances effect the overall stability of the system. Criterias like voltage profile, power flows, losses tell us about the state of the system under study. Load flow analysis of the system under study is capable of providing the insight of the system. The Emergence of FACTS device is really a step forward for the flexible control or Power System Operations. FACTS is the name given to the application of the power electronics devices to control power flows and other quantities in the power system. But when it comes to implementation stage, optimizing the location becomes a great concern because of the high cost involved with FACTS devices especially converter like SVC, STATCOM etc. Static Var Compensator (SVC) is a power quality device, which employs power electronics to control the reactive power flow of the system where it is connected. It is able to provide fast-acting reactive power compensation on electrical systems. SVC is one of the methods and can be applied to obtain a system with least losses, increased power flow and healthy voltage profile. Number, location and size of SVC are the main concerns and they can be optimized to a great extent by Genetic Algorithm (GA) or any other method. Use of SVC in a system has shown considerable increase in voltage profile and power flows while decrease in losses.

Keywords: *SVC; FACTS; distridution system; etap; genetic algorithm*

1. INTRODUCTION

Static Var Compensator (SVC) is an electrical device for providing fast acting reactive power on high voltage electricity transmission networks. It is a power quality device, which employs power electronics to control the reactive power flow of the system where it is connected. In other words, static var compensators have their output adjusted to exchange inductive or capacitive current in order to control a power system variable such as the bus voltage.SVC is based on thyristors without the gate turn-off capability. It includes separate equipment for leading and lagging vars; the thyristor-controlled or thyristor-switched reactor for absorbing reactive power and thyristor-switched capacitor for supplying the reactive power. It is low cost substitute for STATCOM (static synchronous compensator [1]-[2].

Proper placement of SVC and thyristor controlled series compensator (TCSC) reduces transmission losses, increases the available capacity, and improves the voltage profile as suggested in [3]. Sundar and Ravikumar [4] have suggested that the optimal location of SVC is identified by a new index called single contingency voltage sensitivity (SCVS) index. Khandani et al concentrated on optimal placement of SVC controller to improve voltage profile using a novel hybrid Genetic Algorithm and Sequential Quadratic Programming (GA-SQP) method. This algorithm has used to determine optimal placement of SVC controller and solving optimal power flow (OPF) to improve voltage profile simultaneously. The proposed OPF has used to improve voltage profile within real and reactive power generation limits, line thermal limits, voltage limits and SVC operation limits [5]. A modified artificial immune network algorithm (MAINetA) has used for placement of SVC in a large-scale power system to improve voltage stability. To enhance voltage stability, the planning problem has formulated as a multiobjective optimization problem for maximizing fuzzy performance indices for bus voltage deviation, system loss and the installation

cost [6]. Minguez et al addressed the optimal placement of SVCs in a transmission network in such a manner that its loading margin gets maximized. A multi scenario framework that includes contingencies has also considered [7].Mixed Integer Nonlinear Programming (MINLP) used as a useful technique for combinatorial optimization over integers and variables to determine optimal location of SVC in [8].

This paper presents the optimal placement of SVC in power distribution system to obtain system with least losses, increased power flow and healthy voltage profile. The results reveal the effectiveness of the GA method used.

2. PROBLEM FORMULATION

To find the suitable location for SVC device placement in given power system, Genetic Algorithm method is considered which will give set of values of fitness function for each case considered. The highest value of fitness function will be considered for optimum location of SVC in the given power system.

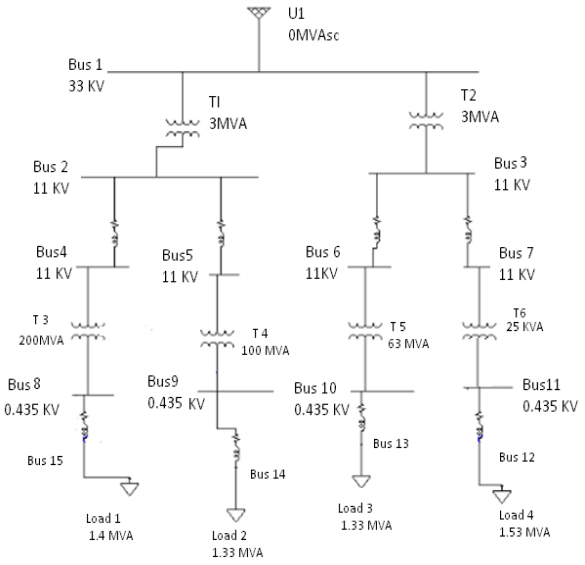

Figure 1. Single Line Diagram

Single line diagram of 33/11 KV Distribution Substation is taken [1] with eleven buses (from Bus 1 to Bus11) as shown in Fig. 1. It consists of two power transformers (T1 and T2), each having capacity of 3 MVA and four distribution transformers (T3, T4, T5 and T6). There are four static loads (from Load 1 to Load 4). There are two out going feeders connected to each of power transformers. Incoming voltage level is 33KV and the distribution voltage level is 11KV. Load receives a voltage of 0.435 KV.

In order to study the effect of Static Var Compensators on all these parameters, first, single SVC is considered and then two SVCs are considered in the same single line diagram and Load flow analysis is performed. The set of values of various parameters so obtained are then, used as data sheet for genetic algorithm for excel. To find the suitable location for SVC device placement in given power system, Genetic Algorithm method is considered. .GA will give set of values of fitness function for each case considered. The highest value of fitness function gives optimum location of SVC in the given power system.

3. LOAD FLOW ANALYSIS

The Load-flow study is an analysis of the voltages of the voltages, currents, and power flows in a power system under steady state conditions.

3.1 Electrical Transient Analyzer Program

ETAP allows load flow analysis in single line diagram. ETAP provides three load flow calculation methods: Newton-Raphson, Fast-Decoupled, and Accelerated Gauss-Seidel. They possess different convergent characteristics, and sometimes one is more favorable in terms of achieving the best performance. Any one of them is selected depending on system configuration, generation, loading condition, and the initial bus voltage. Here, Newton Raphson method is considered with maximum iteration of 1000 and precision of 0.01.

3.2 Newton Raphson Method

The Newton-Raphson method possesses a unique quadratic convergence characteristic. It usually has a very fast convergence speed compared to other load flow calculation methods. It also has the advantage that the convergence criteria are specified to ensure convergence for bus real power and reactive power mismatches. This criterion gives the direct control of the accuracy to specify for the load flow solution. The convergence criteria for the Newton-Raphson method are typically set to 0.001 MW and Mvar. The Newton-Raphson method is highly dependent on the bus voltage initial values.

4. GENETIC ALGORITHM

Genetic algorithm is a search heuristic that mimics the process of natural selection. This heuristic is routinely used to generate useful solutions to optimization and search problems. Genetic Algorithms belong to the larger class of evolutionary algorithms (EA), which generate solutions to optimization problems using techniques inspired by natural selection. Genetic algorithms (GAs) are based on biological principles of evolution and provide an easy interesting alternative to "classic" gradient-based optimization methods [9]-[13]. They are particularly useful for highly nonlinear problems and models, whose computation time is not a primary concern.

The primary usefulness of the GA is that it starts by sampling the entire design space, possibly enabling it to pick points close to a global optimum. It then proceeds to apply changes to the ranked individual design points, which leads to an improvement of the population fitness from one generation to another. To ensure that it doesn't converge on an inferior point, mutation is randomly applied which perturbates design points and allows for the evaluation and incorporation of remote points.GA gives output in terms of fitness function value. The Fitness Function [Beromi *et al*. (2007)] made in GA, by considering all objectives is given by Eq. (1).

$$f_x = \frac{1}{n}\left[\begin{matrix}\sum_{diff} \boldsymbol{voltage} + \sum_{diff} \boldsymbol{losses} \\ + \sum_{diff} \boldsymbol{active\ power} + \sum_{diff} \boldsymbol{reactive\ power}\end{matrix}\right] \quad (1)$$

Although a large number of modified algorithms are available, a GA typically proceeds in the following order:

- Start with a finite population of randomly chosen chromosomes ("design points") in the design space. This population constitutes the first generation ("iteration").
- Evaluate their fitness ("function value").
- Rank the chromosomes by their fitness.
- Apply genetic operators (mating): reproduction (reproduce chromosomes with a high fitness), cross-over (swap parts of two chromosomes, chosen based on their fitness to create their offspring) and mutation (apply a random perturbation to parts of a chromosome). All of these operators are assigned a probability of occurrence.
- Assemble the new generation from these chromosomes and evaluate their fitness.
- Apply genetic mating as before and iterate until convergence is achieved or the process is stopped.

5. RESULTS

After load flow analysis, values of various parameters so obtained are the inputs to genetic algorithm. The variation of fitness with respect to location of SVC at various buses can be represented in the form of graphs as under, where the highest value of fitness function gives optimum location for SVC. It can be seen that the value of fitness when single SVC is connected at Bus-10 is high ie.**0.035677** as shown Fig.2. Therefore, a SVC of inductive rating of 2.5 Mvar and capacitive rating of 5 Mvar must be placed at this location.

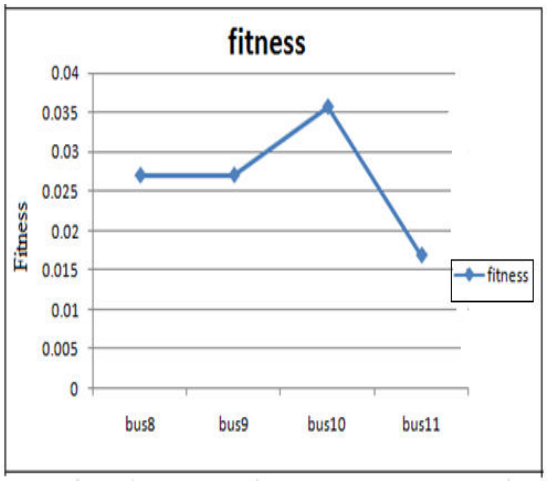

Figure 2. Fitness values attained when one SVC is taken

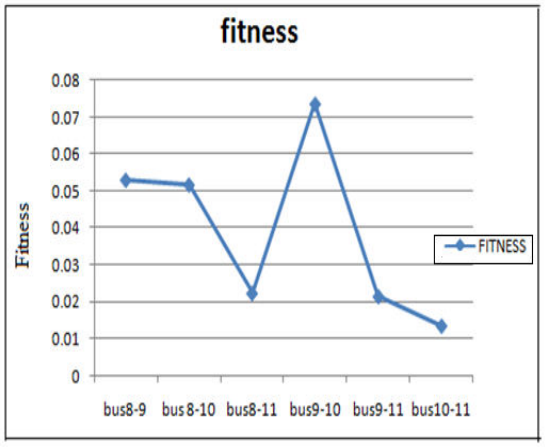

Figure 3. Fitness values attained when two SVCs are taken

When two SVCs are considered, the value of fitness is high at SVC location bus9-10 i.e. **0.073585** as shown in Fig.3. Therefore, two SVCs of inductive rating of 2.5 Mvar and capacitive rating of 5 Mvar must be placed at

these two locations i.e. one SVC at bus 9 and other SVC at bus 10.

Thus, we have two choices for optimum location of SVCs in given power system.

5.1 Single SVC

Comparison of base case with cases when a SVC is at bus location 10 is taken in terms of all parameters are discussed as below.

Voltage Profile

When SVC is connected at Bus-10, we have improved voltage profile as shown in Fig.4. The Average voltage is increased by 1.17272 units i.e. from 94.99273 to 96.16545.

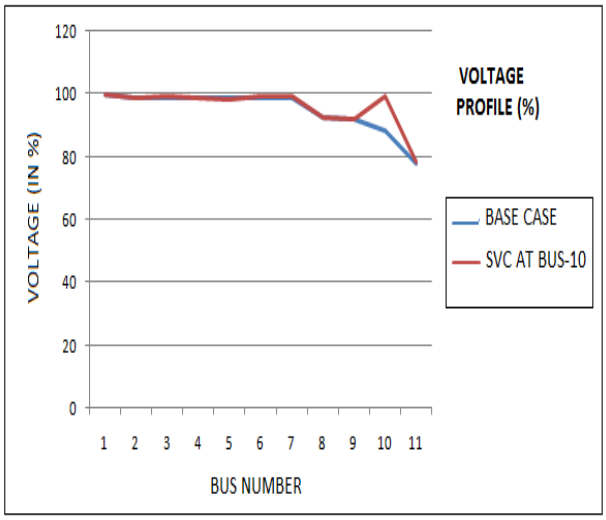

Figure 4. Comparison of voltage profile between base case and SVC at BUS-10

Losses

When SVC is connected at Bus-10, we have reduction in overall losses as shown in Fig.5. The Average losses decreased by 1.48182 units i.e. from 11.88182 to 10.40.

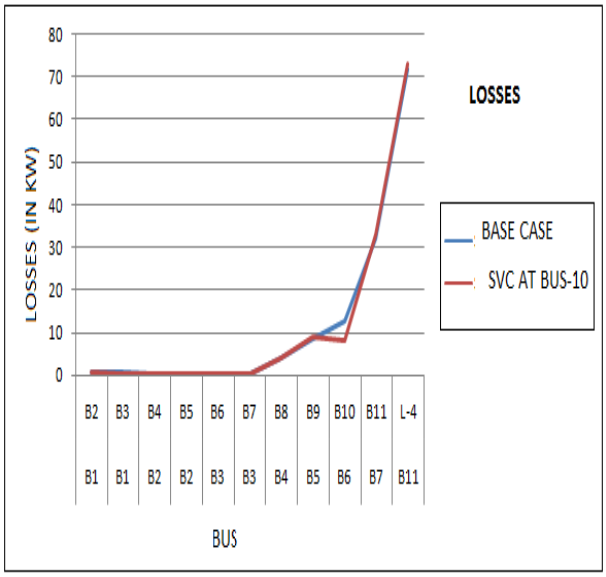

Figure 5. Comparison of losses between base case and SVC at BUS-10

Active Power

SVC connection at Bus-10 resulted in increase of average active power from 175.0909 to 184.8182 i.e. increment by 9.7273 units as shown in Fig.6.

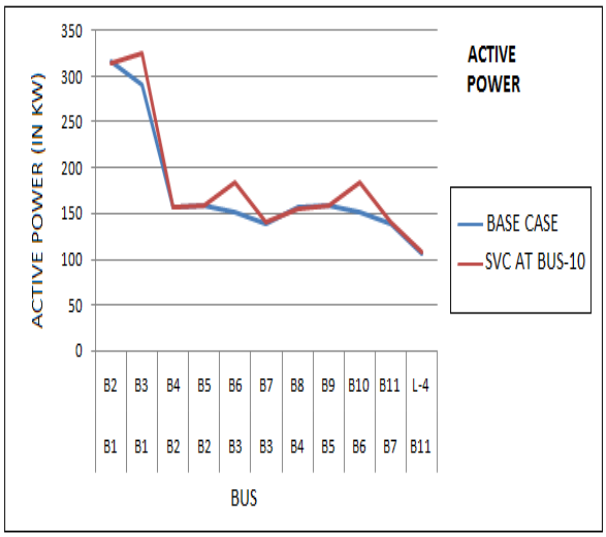

Figure 6. Comparison of active power between base case and SVC at BUS-10

Reactive Power

Average reactive power is decreased from its base average value by 47.18 units with single SVC .i.e. from 235.8182 to 188.6364 as shown in Fig.7.

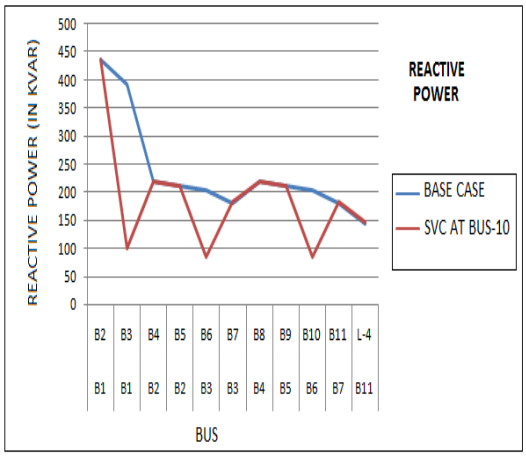

Figure 7. Comparison of reactive power between base case and SVC at BUS-10

5.2 Double SVC

Comparison of base case with cases when double SVC are at bus locations 9-10 is taken in terms of all parameters are discussed as below.

Voltage Profile

By using two SVCs, average value of voltage is changed from 94.99273 to 96.95273 i.e. increased by 1.96 units as shown in Fig.8.

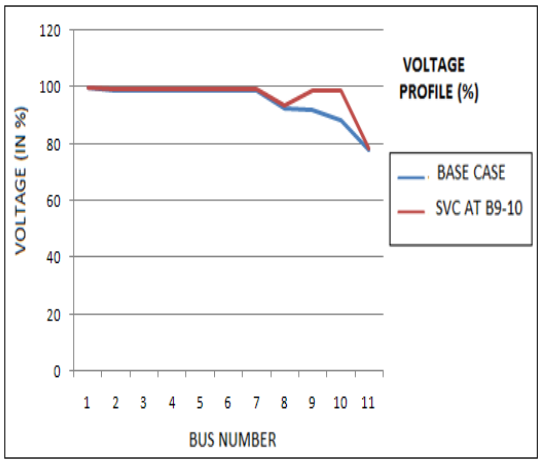

Figure 8. Comparison of voltage profile between base case and two SVCs at BUS 9-10

Losses

When one SVC at bus 9 and other SVC at bus 10, Average losses are reduced by 0.84546 units as it is altered from 11.88182 to 11.03636 as shown in Fig.9.

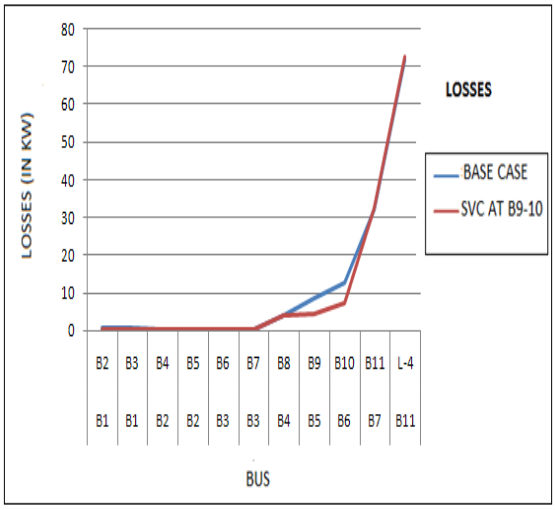

Figure 9. Comparison of losses between base case and two SVCs at the BUS 9-10

Active Power

Two SVCs case gives increase of average active power from 175.0909 to 225.3636 .i.e. increments by 50.2727 units as shown in Fig.10.

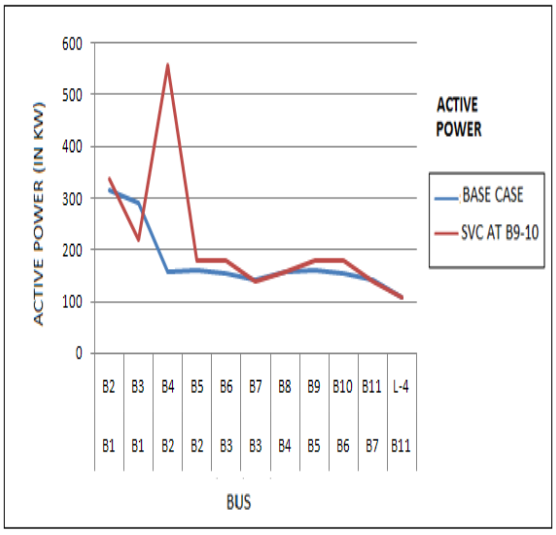

Figure 10. Comparison of active power between base case and two SVCs at the BUS 9-10

Reactive Power

By using two SVCs, there is decrease of average reactive power from its base average by 101.4546 units .i.e. from 235.8182 to 134.3636 as shown in Fig.11.

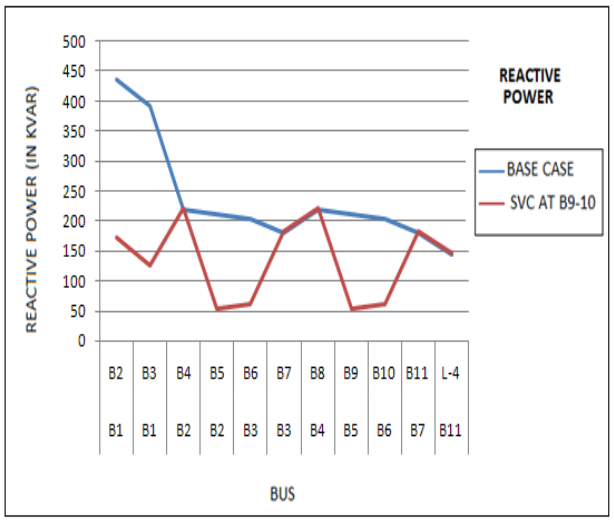

Figure 10. Comparison of active power between base case and two SVCs at the BUS 9-10

6. CONCLUSION

This paper presents a new approach using Genetic algorithm with excel for the optimal location of SVC in power distribution system. On the induction of SVC and genetic algorithm to find its location, it has found that SVC installed at all following buses where static load is present, Bus 10 gives us increased voltage profile as shown by figure 4, reduced losses as shown by figure 5 and increased active power transfer capability as shown by figure 6.

Using two SVC in the same single line diagram at different locations where static load is present, it has found that SVCs installed at Bus 9-10 gives us increased voltage profile as shown in figure 8, reduced losses as shown in figure 9 and increased active power transfer capability as shown by figure 10. Comparing this with case having single SVC, it can be said that there is appreciable increase in voltage profile, decrease in losses and increase in power transfer capability of case.

Reduction of losses, increase of power transfer capability and voltage profile can also be optimized by number of other optimization methods and instead of having ETAP as a power system solution, the same system can be simulated and the results of various indices like voltage profile, reactive power, active power and losses can be done with the help of Matlab, PSPICE and PSCAD softwares.

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The authors would like to express their special thanks to Mr. Neeraj Sharma for his valuable guidance and encouragement in the work related to ETAP (Electrical Transient Analyzer Program) software and to Mr.K.P.Singh for his contribution on preparing the final version of this paper. They would also like to acknowledge Department of Electrical Engineering, Baba Banda Singh Bahadur Engineering College, Fatehgarh Sahib, Punjab, India for their constant support.

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Bloom Energy for Producing Electricity

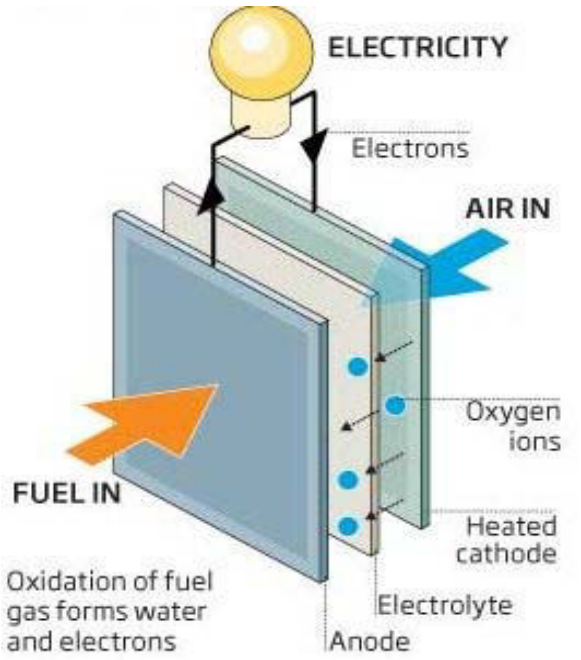
Sandeep singh[1], Jaspreet Singh Ghuman[2], Rakesh kumar[3]
[1]sandeeptind@yahoo.com; [2]jasghuman@live.com; [3]*raj5sept@rediffmail.com*

Abstract: The primary purpose of this paper is to examine the technical implications of the Bloom Box fuel cell. Secondly the report evaluates the Bloom Box as a potential electricity source for homes and private businesses based on the economic advantage that it may provide. It also compares the Bloom Box to other off grid electricity options. Lastly, based on the compiled data, the report provides a group opinion of the Bloom Box's potential.

Keywords: *Bloom energy, Bloom box, Bloom box fuel cell, SOFC,*

1. INTRODUCTION

The most prominent modern application of the solid oxide fuel cells is the "Bloom Box" whose history stems from Dr. K. R. Sridhar's research group for the NASA Mars exploration program. The group was looking to develop a sustainable, yet efficient, energy source at the Space Technologies Laboratory at the University of Arizona, but later moved on to form the current company, Bloom Energy in 2001-2002, after securing funding from a few venture capital firms (Bloom Energy Website, 2010). The latest Bloom Box model, the Bloom Energy ES-5000 which can intake natural gas, hydrogen, or even garbage dump gas costs $700,000-800,000 (Bloomberg, 2010). It is capable of generating 100kW, enough electricity for approximately 100 homes. Since its entrance into the market in July 2008, it has been bought several Fortune 500 firms including Google, Staples, Wal-Mart, FedEx, Coca-Cola, and Bank of America. Its proven reliability and economic efficiency has been shown in eBay's decision to use this SOFC fuel source in generating 15% of the electricity consumed in its main San Jose, California headquarters (Christian Science Monitor, 2010). Such widespread use of this product is no mistake as it is highly economical, generating electricity at 8 to 10 cents a kilowatt hour, albeit with subsidies from the state of California, much lower than the usual commercial cost of electricity at 14 cents/kilowatt hour (New York Times, 2010). This seemingly miraculous technology does come with a few disadvantages and hurdles however. Besides the high upfront capital costs, solid oxide fuel cells also relies on extremely high operating temperatures, around 800-1000 degrees Celsius. As a result, Bloom Boxes may be vulnerable to breaking down if not managed and serviced properly. Furthermore, this technology requires a slow start up as it needs to heat up to the high operating temperature before being able to fully run (Scientific American, 2010). Most of the dangers of such a high operating temperature are harnessed, but it still causes some hindrances when it comes to efficient operation.



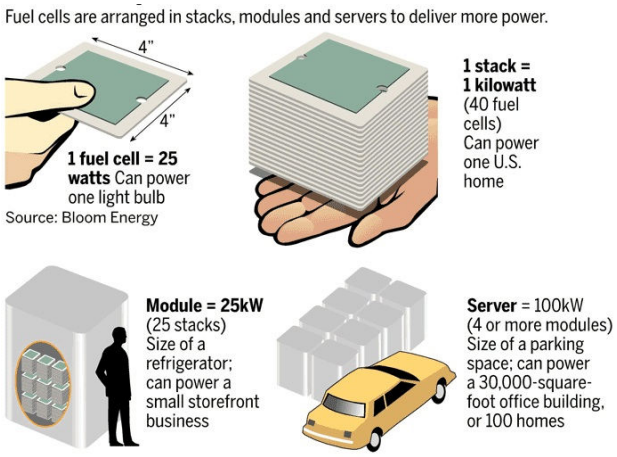
Fuel cells are devices that convert fuel into electricity through a clean electro-chemical process

without any combustion. This conversion technique gives much higher conversion efficiencies than conventional thermo-mechanical methods. The operating principles of fuel cells are similar to those of batteries; i.e., includes an electro-chemical combination of reactants to generate electricity—a combination of a gaseous fuel (hydrogen) and an oxidant gas (oxygen from the air) through electrodes and via an ion-conducting electrolyte. However, unlike a battery, a fuel cell does not run down or require recharging. A fuel cell operates as long as both fuel and oxidant are supplied to the electrodes, and the influence it exerts on the surrounding environment is negligible.

2. SOLID OXCIDE FUEL CELL

A SOFC is a type of fuel cell valued for its potential market competitiveness, with high efficiency in fuel input and electricity output. A SOFC is like a rechargeable battery that always runs. It consists of three parts: an electrolyte, an anode, and a cathode. In Bloom's SOFC, the electrolyte is a solid ceramic square made from a common sand-like "powder.‖ According to Bloom's patent description, these thin white ceramic plates are Scandia stabilized Zirconia (ScSZ). The anode and cathode are made from special inks that coat the electrolyte on each side. One side of the ceramic electrolyte plate is coated with a green nickel oxide-based ink that works as an anode; the other side, which works as a cathode, is coated with black ink (most probably Lanthanum Strontium Manganite—a non-radioactive substance). The Bloom server does not require chemicals, such as the corrosive acids used in conventional fuel cells. Instead, it uses inexpensive metal alloy plates for electric conductance between the two ceramic fast-ion conductor plates, as opposed to the use of costly precious metals like Gold or Platinum that are used for high conductance in other fuel cells.

The electro-chemical process within SOFC requires a high operating temperature (600-10000C) for its reactions to take place. At a high temperature, warm air enters the cathode side of the fuel cell. The resulting steam mixes with the fuel to produce reformed fuel; this reformed fuel enters the anode side, and a chemical reaction takes place. As the reformed fuel crosses the anode side, it attracts oxygen ions from the cathode. Oxygen ions combine with the reformed fuel to produce electricity, water, and a small amount of carbon dioxide gas. Water is recycled into the cell to produce steam to generate reformed fuel, and this process also generates the heat required for the functioning of fuel cells. The continuous supply of fuel, air, and heat constantly generates the electricity from the cell.



Each Bloom Energy fuel cell is capable of producing about 25W of energy, which is enough to power a light bulb. For more power, multiple cells are mounted together, along with metal interconnect plates, to form a fuel cell stack. A few stacks together (about the size of a loaf of bread) are enough to power an average U.S. home. In an Energy Server multiple stacks are aggregated into a "power module"; and multiple power modules, along with a common fuel input and electrical output, are assembled as a complete system. When more power is required—for example, for commercial or industrial sites—multiple Energy Serve systems can be deployed side by side. The current Energy Server in the market has the capacity to generate 100kW of electricity, which would power a 30,000 sq. ft. office building or 100 average-sized U.S. homes.

3. CONCLUSIONS

The costs should come down over time to the point where Bloom boxes really can be used in homes. One potentially disruptive feature of the technology is that it works both ways: fuel can produce electricity, but it can also go the other way so that electricity produces fuel. Sridhar foresees the killer app for his technology becoming practical in about a decade: a Bloom home energy server combined with solar panels or some other renewable energy. The electricity from the solar panels

could produce fuel, which can be used to produce electricity to power the house or even to gas up your (modified) car.

To determine the implications of the Bloom Energy Server as a whole, the individual aspects of the technical, economic, and social implications must be considered together. Additionally it needs to be compared to other equivalent renewable technologies.

From a technical standpoint the Bloom Box appears to perform as claimed. It contains some improvements to the basic SOFC design, and can achieve efficiencies higher than typical coal and natural gas power plants. As stated in the technical information section, Bloom Energy has some advantages over other fuel cell companies, primarily that they have been increasing their production rate over the past two years, and have a method to guarantee a continuous level of performance as the fuel cell ages. Going forward, other companies could easily have a better product than Bloom Energy.

When similar technologies are competing one variable that can determine the value of one product compared to another is the price. Price can not only be a determining factor in what product people buy but also who the product is available to. The cost of a 100 kW Bloom Box has been previously stated to be between $700,000 and $800,000. This initial price is much higher than that for an equivalent wind turbine installed which from one distributer costs 495 thousand dollars. This price is comparable to an equivalent installation of solar panels, which in 2005 cost the city of Oakland roughly 800 thousand dollar to have installed before any federal or state incentives. It is important to remember that a Bloom Box is able to produce constant electricity twenty four hours a day, seven days a week, unlike either solar or wind technologies. Although the Bloom Box costs significantly more, depending on a customer's particular needs it could certainly be a wiser investment than either 100 kW of wind or solar power.

On the other hand, a Bloom Box requires a constant supply of fuel, meaning it not only has a higher initial cost than wind, it also has an operating cost that is not present in either wind or solar electricity generation systems. In order to take this into account, the return on investment in each technology was considered. As previously discussed, the average ROI of an unsubsidized Bloom Box in California is slightly sooner than a wind turbine if run on natural gas, but much longer if it is being run on directed biogas. In both cases the unsubsidized Bloom Box has a better ROI than solar power. From a strictly monetary point of view, a Bloom Box appears to be the best option for commercial customers seeking to reduce their carbon footprint.

Another important economic aspect to consider when analyzing energy technologies is federal and state government subsidies. Applied subsidies can greatly reduce initial costs to the consumer allowing for much quicker ROI. As previously stated, subsidies allow a Bloom Box in California run on directed biogas to quickly save a customer money compared to all other analyzed technologies.

Since the Bloom Energy Corporation only sells their servers within the state of California and has not announced any plans to change this, it is rather difficult to suggest the Bloom Box monetarily to any companies outside of California. Companies that operate within the state of California, however, appear to have a product worth considering; assuming current subsidy levels remain in place.

Overall the Bloom Box has potential as an alternative energy source for businesses as long as the current levels of subsidies remain in place. Additionally the Bloom Electrons Service is an extremely beneficial program for consumers, but the economics of the current system do not seem profitable over the long term for Bloom Electrons, although it is providing Bloom Energy with an immediate profit. From a technical standpoint a Bloom Box seems to have an advantage over traditional generators if cost is not considered. It produces less noise and fewer pollutants than a traditional generator due to the fact that it operates at a higher efficiency. It has some advantages over alternative systems such as solar and wind generators, and in some cases is preferable to solar or wind systems. Although the Bloom Box still produces emissions when run on natural gas, it still appears advantageous over solar and wind systems in place. The carbon neutral nature of running a Bloom Box on biogas cannot be taken into account because of the current availability of biogas. The major question is if Bloom Energy can reduce the cost of a Bloom Box to a reasonable amount without the government subsidizing over 67% of the cost, which in turn is passed on to

electricity companies (who pass the cost on to customers) and taxpayers. However considering the cost has remained static for the past two years despite improvements in production, and the recent suspension of state subsidies in California, the Bloom Box does not seem to be likely to have a significant impact without additional improvements to the technology.

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Optimal Placement of Flexible Alternating Current Transmission System (FACTS) Devices for Static Voltage Stability Enhancement

Anju Gupta, P. R. Sharma

Department of Electrical and Electronics Engg., YMCA university of Science & Technology, Faridabad, Haryana (India).

anjugupta112@gmail.com; prsharma1966@gmail.com

***Abstract*:** This Voltage stability problems increasing day by day because of demand increase. It is very important to analyze the power system with respect to voltage stability. Location of FACTS devices is important for the enhancement of voltage stability. This paper investigates the voltage stability analysis of 14 bus systems by optimally locating Flexible AC Transmission System (FACTS) devices. Shunt and series FACTS controllers are introduced in the weakest bus and its effectiveness is assessed by comparing voltage profile and loading margins enhancement. It is shown that best location for static voltage stability margin is the "weakest bus" of the system. Continuation power flow (CPF) is done with PSAT (power system stability analysis Toolbox).

Keywords: *CPF, FACTS, PSAT.FACTS*

1. INTRODUCTION

In planning and operating today's stressed power systems, the ability to maintain voltage stability has become a growing concern. Voltage stability is the ability of a electrical power system to maintain acceptable voltages at all buses of system being subjected to disturbance from a given initial operating conditions. The expansion of the conventional power system allows for indices where unexpected contingencies to go unconsidered. It is important to maintain the stability, security and efficiency of power systems. Due to disturbances in the system, the power consumed by loads tends to be restored and this increases the stress on the high voltage network by increasing power consumption beyond the capacity of transmission network for power transfer and voltage support lead to most common form of voltage instability. The voltage drop of some buses may lead to voltage collapse. The major reasons of voltage collapse are based on increasing loads, line disturbance and line outage.

A number of methods for voltage stability analysis have been suggested such as P-V curve, V-Q curve, and Modal analysis. The application of P-V curve is to evaluate the voltage stability of a power system for various loading conditions.

FACTS are new devices emanating from recent innovative technologies that are capable of altering phase angle, voltage at particular points in power systems. Their fast response offers a high potential for power system stability enhancement apart from steady state flow control. Among the FACTS controllers, Static Var Compensator (SVC) provides fast acting dynamic compensation for voltage support during contingency events which would otherwise depress the voltage support for a significant length of line. SVC also dampens power swings and reduces system losses by optimized reactive power control. Unified Power Flow Controller (UPFC) plays a important role in improving voltage stability compared to SVC and Static Synchronous Compensator (STATCOM). The best location for reactive power compensation for improving steady state voltage stability margin is the weakest bus in the system. The performance of shunt FACTS controller connected to the weakest bus is assessed by comparing

voltage profile and steady state stability margin of the system.

2. CONTINUATION POWER FLOW

The conventional power flow has a problem in the Jacobian matrix which becomes singular at the voltage stability limit. This problem can be overcome by using continuation power flow. Figure1 shows the predictor – corrector scheme used in continuation power flow

From the Newton-Raphson, load flow equations can be written as:

$$P_i - \sum_{j=1}^{n} Y_{ij}\ V_i V_j \cos(\delta_i - \delta_j - \theta_{ij}) = 0 \quad (1)$$

$$Q_i - \sum_{j=1}^{n} Y_{ij}\ V_i V_j \sin(\delta_i - \delta_j - \theta_{ij}) = 0 \quad (2)$$

The new load flow equations consist of load factor(λ) are expressed as:

$$P_{Li} = P_{L0} + \lambda(K_{Li} S_{\Delta base} cos\emptyset_i) \quad (3)$$

$$Q_{Li} = Q_{L0} + \lambda(K_{Li} S_{\Delta base} sin\emptyset_i) \quad (4)$$

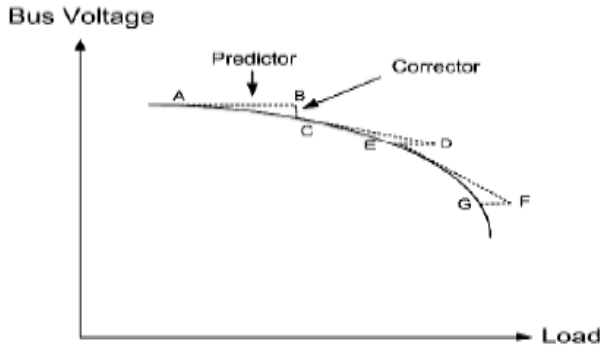

Figure 1: The predictor – corrector scheme

Where

P_{L0}, Q_{L0}=original load at bus i, active and reactive power respectively

K_{Li}= multiplier to designate the rate of load change at bus i as λ changes

$S_{\Delta base}$=a given quantity of apparent power which is chosen to provide appropriate scaling of λ

$$F(\delta, V, \lambda) = 0 \quad (5)$$

Then the active power generation term can be modified to

$$P_{Gi} = P_{GO}\ (1 + \lambda K_{Gi}) \quad (6)$$

Where

P_{GO} =The initial value of active power generation

P_{Gi} =The active power generation at bus i

K_{Gi} =the constant of changing rate in generation

To solve the problem, the continuation algorithm starts from a known solution and uses a predictor-corrector scheme to find subsequent solutions at different load levels.

2.1 Modeling of Unified Power Flow Controller (UPFC)

The UPFC consists of two switching converters operated from common DC link. Series converter injects an AC voltage with controllable voltage and phase angle in series with the transmission line. Shunt converter injects or absorbs an independently reactive power to bus. UPFC schematic diagram is shown in figure 2.

The active and reactive power equations can be written as

At bus k

$P_k=V_k^2G_{kk}+V_kV_m\ [G_{km}\ cos(\theta_k-\theta_m) + B_{km} sin\ (\theta_k-\theta_m)] + V_k\ V_{cr}\ \ [G_{km}cos(\theta_k-\delta_{cr})+B_{km}sin(\theta_k-\delta_{cr})+V_kV_{vr}[G_{vr}cos(\theta_k-\delta_{vr}) +B_{vr}sin(\theta_k-\delta_{vr})]$

$Q_k=-V_k^2B_{kk}-V_kV_m[G_{km} sin(\theta_k-\theta_m) - B_{km} cos\ (\theta_k-\theta_m)] + V_k\ V_{cr}\ \ [G_{km}sin(\theta_k-\delta_{cr})-B_{km}cos(\theta_k-\delta_{cr})+V_kV_{vr}[G_{vr}sin(\theta_k-\delta_{vr}) +B_{vr}cos(\theta_k-\delta_{vr})]$

At bus m

$Pm= V_m^2G_{mm} +V_kV_m[G_{mk} cos(\theta_m-\theta_k) + B_{mk} sin\ (\theta_m-\theta_k)] +V_m\ V_{cr}[G_{mm}cos(\theta_m-\delta_{vr})\ +B_{mm}sin(\theta_m-\delta_{cr})]$

$Qm= -V_m^2B_{mm} +V_kV_m[G_{mk} sin(\theta_m-\theta_k) - B_{mk} cos\ (\theta_m-\theta_k)] +V_m\ V_{cr}[G_{mm}sin(\theta_m-\delta_{vr})\ -B_{mm}cos(\theta_m-\delta_{cr})]$

Series converter

$$Pcr= V_{cr}^2G_{mm} +VcrVk[G_{km}\cos(\delta_{cr}-\theta_k) + B_{mk}\sin(\delta_{cr}-\theta_k)] +V_mV_{cr}[G_{mm}\cos(\delta_{cr}-\theta_m) +B_{mm}\sin(\delta_{cr}-\theta_m)]$$

$$Qcr= -V_{cr}^2B_{mm} +VcrVk[G_{km}\sin(\delta_{cr}-\theta_k) - B_{mk}\cos(\delta_{cr}-\theta_k)] +V_mV_{cr}[G_{mm}\sin(\delta_{cr}-\theta_m) -B_{mm}\cos(\delta_{cr}-\theta_m)]$$

Shunt converter

$$P_{vr}= -V_{vr}^2G_{vr}+V_{vr}V_k[G_{vr}\cos(\delta_{vr}-\theta_k)+(B_{vr}\sin(\delta_{vr}-\theta_k))$$

$$Q_{vc}=V_{vr}^2B_{vr}+V_{vr}V_k[G_{vr}\sin(\delta_{vr}-\theta_k)-B_{vr}\cos(\delta_{vr}-\theta_k)]$$

2.2 Modeling of Static Synchronous Compensator (STATCOM)

STATCOM is a self commutated switching power converter supplied from an appropriate energy source and operated to produce a set of adjustable multiphase voltage, which may be coupled to an AC power system for the purpose of exchanging independently real and reactive power. STATCOM schematic diagram is shown in figure 3

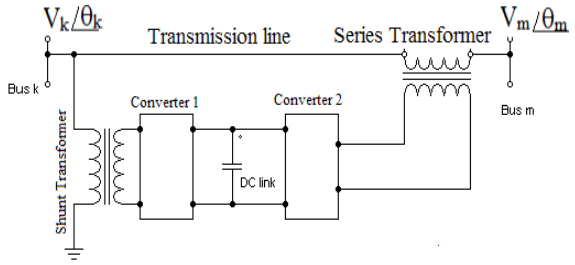

Figure 2

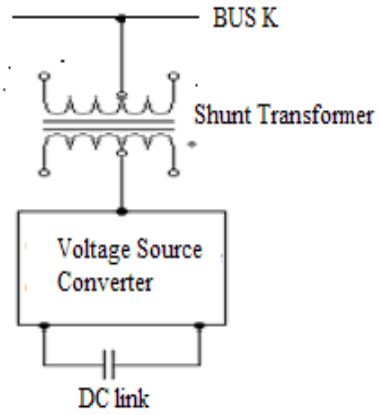

Figure 3

The following active and reactive power equations are obtained for the converter at bus k

$$P_{vr}= V_{vr}^2G_{vr} + V_{vr}V_k[G_{vr}\cos(\delta_{vr}-\theta_k)+B_{vr}\sin(\delta_{vr}-\theta_k)]$$

$$Q_{vr}=-V_{vr}^2B_{vr}+V_{vr}V_{vr}V_k[G_{vr}\sin(\delta_{vr}-\theta_k)-B_{vr}\cos(\delta_{vr}-\theta_k)]$$

$$P_{k=}V_k^2G_{vr}+V_kV_{vr}[G_{vr}\cos(\theta_k-\delta_{vr})+B_{vr}\sin(\theta_k-\delta_{vr})]$$

$$Q_k=-V_k^2B_{vr}+V_kV_{vr}[G_{vr}\sin(\theta_k-\delta_{vr})-B_{vr}\cos(\theta_k-\delta_{vr})]$$

3. CASE STUDIES

An IEEE 14 bus system is modeled in PSAT software shown in Figure 4.

4. SIMULATION RESULTS

Simulation is done using PSAT software and the results are compared with MATLAB M-file outputs. It was found from PV curve analysis that and bus 14 was the weakest bus for IEEE 14 bus system.

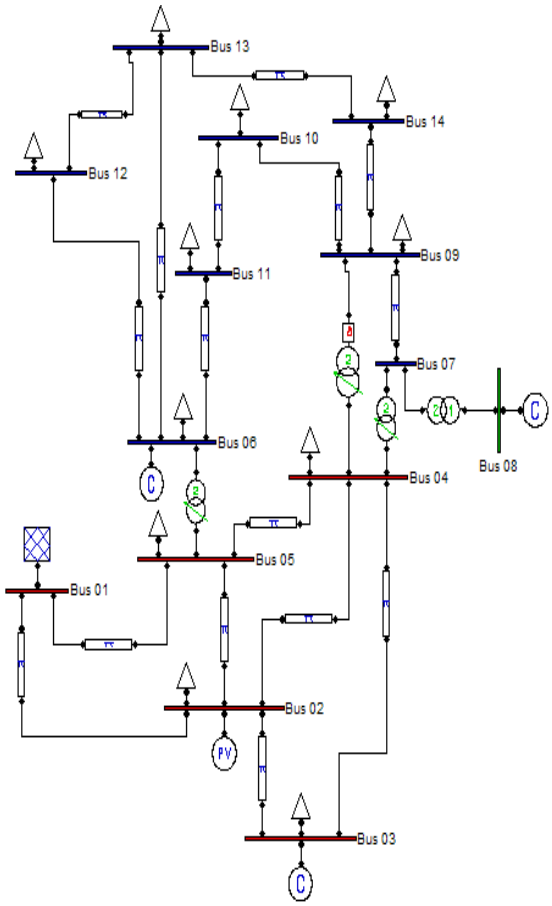

Figure 4 IEEE 14 bus system

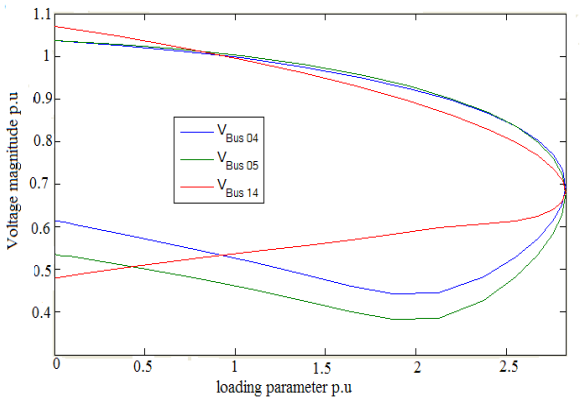

Figure 5. Lowest three voltage P-V curve for IEEE 14 bus system without FACTS

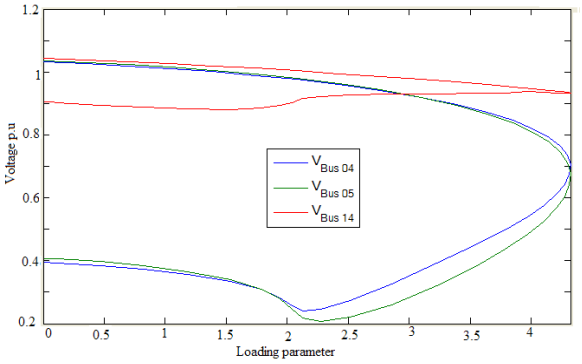

Figure 6 voltages with UPFC at Bus 14

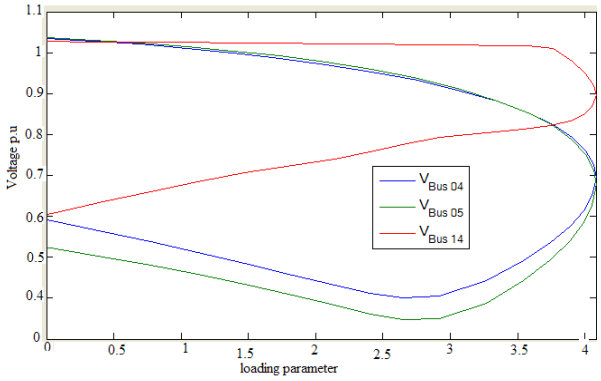

Figure 7 Voltages with STATCOM at Bus 14

UPFC gives better results as compared to SVC and STATCOM. UPFC is connected between 14 and 9 bus and STATCOM is connected at weakest bus 14. Voltage magnitude and angles are shown in Table1 and system losses are shown in Table2 .Voltage magnitude at bus 14 is increased using UPFC as compared to STATCOM. System losses are also get reduced much more with the insertion of UPFC as compared to STATCOM when located at the weakest bus in the system. P-V curves for the voltages with and without FACTS controller are shown in Figure 5, 6 and 7.

5. CONCLUSION

Static voltage stability analysis of IEEE 14 bus system is done. Continuation power flow technique is used identify weakest bus in the system. UPFC and STATCOM are employed and voltage profile of the system is enhanced. The transmission losses are also reduced using UPFC and load ability margin is also increased. Further research will be done on the optimal location of FACTS devices using Artificial Intelligence like neural and GA.

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Bus No	Voltage magnitude p.u (without FACTS)	Angle (rad) without FACTS	Voltage p.u with UPFC	Angle (rad) with UPFC	Voltage p.u with STATCOM	Angle(rad) with STATCOM
1	1.06	0	1.06	0	1.06	0
2	1.045	-0.135	1.045	-0.087	1.045	-.354
3	1.01	-0.331	1.01	-0.222	1.01	-0.0331
4	.9977	-0.263	1.0117	-0.178	1.0022	-0.264
5	1.0024	-0.227	1.0159	-0.152	1.0041	-0.227
6	1.07	-0.379	1.07	-0.250	1.07	-0.376
7	1.034	-0.353	1.048	-0.231	1.042	-0.355
8	1.09	-0.353	1.09	-0.231	1.09	-0.355
9	1.011	-0.401	1.046	-0.259	1.027	-0.402
10	1.010	-0.404	1.054	-0.262	1.023	-0.405
11	1.034	-0.395	1.0468	-0.288	1.041	-0.393
12	1.046	-0.401	1.0545	-0.264	1.052	-0.399
13	1.0362	-0.403	1.0498	-0.265	1.047	-0.405
14	.9956	-0.428	1.0282	-0.2767	1.045	-0.444

Table I Voltage magnitude and angles of IEEE 14 bus system

Losses	System losses p.u without FACTS	System losses p.u With UPFC	System losses with p.u STATCOM
Active losses	0.294	0.134	0.292
Reactive losses	0.9157	0.473	0..9009

Table II System losses

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Design and Comparison of a PID and Fuzzy Logic Controller for a Higher Order System

Vini Malik[1], Sujata Arora[2], Leena G. Jeevan[3]

[1-2]Research Scholar, [3]Professor, Manav Rachna International University, Faridabad, Indi.
vinimalik@rediffmail.com, sujata_khurana@yahoo.com, leenag.fet@mriu.edu

***Abstract*:** This paper presents design of a PID controller using Ziegler Nichols (ZN) technique for a higher order system. The Fuzzy Logic technique using simple approach and smaller rule set is proposed. Fine –tuning technique for PID controller is also proposed. Simulation results are performed. A performance comparison between Ziegler-Nichols tuned PID controller and the Fuzzy Logic Controller has been presented. The performance results show the effectiveness of fuzzy logic controller over ZN tuned PID controller and Fine-Tuned PID controller.

***Keywords**: PID controller, Ziegler-Nichols tuning, Fuzzy logic controller, Simulation.*

1. INTRODUCTION

The proportional–integral–derivative (PID) controller operates the majority of the control systems in the world and is extensively used for industrial automation, instrumentation and process control. It has been reported that more than 95% of the controllers in the industrial process control applications are of PID type as no other controller matches the simplicity, clear functionality, applicability, inexpensive maintenance, low cost, effectiveness for most linear systems and ease of use [1]. PID controller provides robust and reliable performance if they are properly tuned. Among the Tuning method, Ziegler- Nichols (ZN) technique has been very influential. Ziegler-Nichols presented two tuning method- Step response and Frequency Response method. In this paper, we are using Frequency Response Ziegler-Nichols technique.

Fuzzy logic provides a certain level of artificial intelligence to the conventional PID controller. FLC is not based on mathematical models and is widely used to solve problems under vague environment [2].

This paper has two main contributions. Firstly, a PID controller has been designed for higher order system using Ziegler-Nichols method and its performance has been observed. Then Ziegler-Nichols tuned parameters are fined-tuned to get satisfactory closed loop performance. Second, for the same system FLC is proposed with simpler approach and smaller rule set. Simulation results for a higher order system are presented. A performance comparison between the ZN-tuned PID controller, Fine-tuned PID controller and Fuzzy logic controller is verified. The paper has been organized as follows: Section II reviews the Generalized PID controller. Section III presents the design of PID controller using ZN tuning method. Section IV presents design of fuzzy logic controller using smaller rule set. Section V includes the comparison and Section VI finally concludes the paper.

2. PID CONTROLLER

A proportional–integral–derivative controller (**PID controller**) is a generic control loop feedback mechanism that calculates an error value as the difference between a measured process variable and a desired set-point. The controller attempts to minimize the error by adjusting the process control inputs. However, for best performance, the PID parameters used in the calculation must be tuned according to the nature of the system – while the design is generic, the parameters depend on the specific system [3].

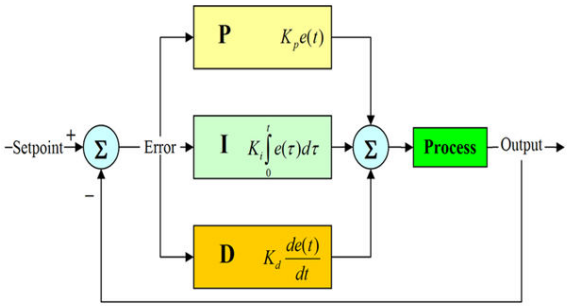

Fig. 1 Block diagram of a PID Controller.

The PID controller calculation (algorithm) involves three term control: Proportional, Integral and Derivative values, denoted by *P, I,* and *D.*

$$G_c(s) = P + I + D$$

$$= K_p + K_i/s + K_d\, s$$

$$= K_p\,(1 + 1/T_i s + T_d s)$$

The proportional value determines the reaction to the current error, the integral value determines the reaction based on the sum of recent errors, and the derivative value determines the reaction based on the rate at which the error has been changing. The weighted sum of these three actions is used to adjust the process via a control element such as the position of a control valve or the power supply of a heating element.

3. DESIGN OF PID CONTROLLER

A PID controller is designed for a higher order system with transfer function:

$$G(s) = 10 / [s\,(s2 + 6s + 10)]$$

Fig.2 shows the Simulink model of PID controller with unity feedback.

The proposed design of (i) PID controller using Z-N technique (ii) fuzzy controller so that the closed loop system exhibits small overshoot Mp and settling time Ts with zero steady state error Ess (steady state error).

The unit step responses for different values of gain Kp were observed [3].

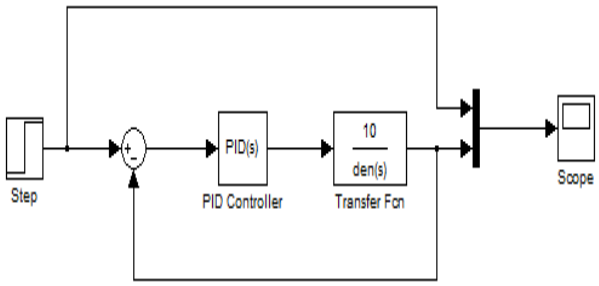

Fig. 2 Model of PID Controller.

Frequency response method suggested by Ziegler-Nichols is proposed for the design of PID controller. By setting $T_i = \infty$ and $T_d = 0$ and using the proportional control action only, the value of proportional gain is increased from 0 to a critical value Ku at which the output first exhibits oscillations [4].

T_u is the corresponding period of oscillations. The step response for $K_p = 6$ is observed.

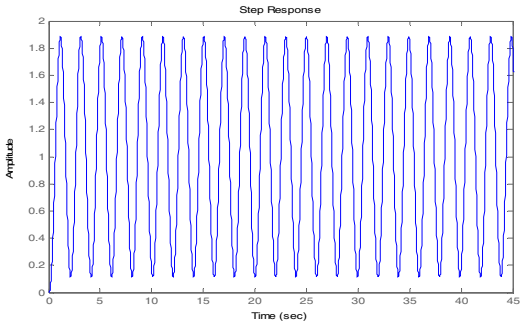

Fig.3 Step Response for $K_u = 6$

The above response in Fig. 3 clearly shows that sustained oscillations occur for $K_p = K_u = 6$. The ultimate period obtained from the time response is 2.

The value of the controller parameters obtained are-

$$K_p = 0.6 \times K_{cr} = 3.6,\ T_i = 0.5 \times T_u = 1,$$

$$T_d = 0.125 \times T_u = 0.250$$

The unit step response for the closed loop system with $K_p = 3.6$, $T_i = 1$ and $T_d = 0.250$ is observed in Fig. 4. $M_p = 57\%$, $t_s = 5.93$ sec and $e_{ss} = 0$ is observed. Both M_p and t_s are large.

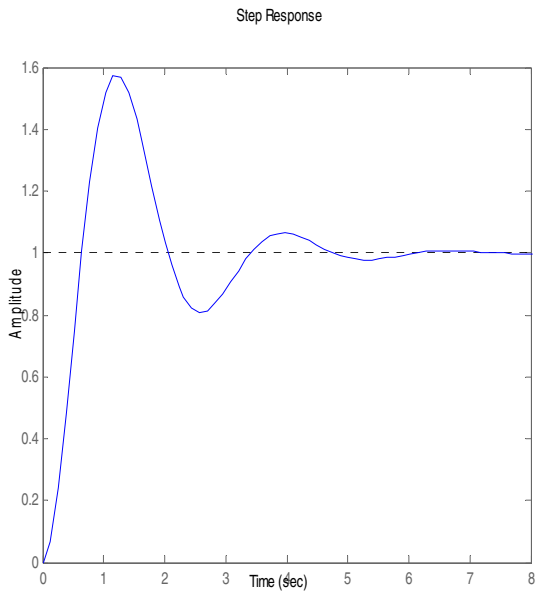

Fig. 4 Step Response of PID Controller.

With the initial values of K_p, T_i and T_d obtained from Z-N tuning method, different combinations of K_p , T_i and T_d are observed.

The unit step response with $K_p = 4.5$, $T_i = 2$ and $T_d = 0.5$ is shown in fig.5. the response gives $M_p = 23\%$, $t_s = 5.2$ sec and ess = 0. Both Mp and t_s are small as compared to the initial values obtained from Ziegler-Nichols method.

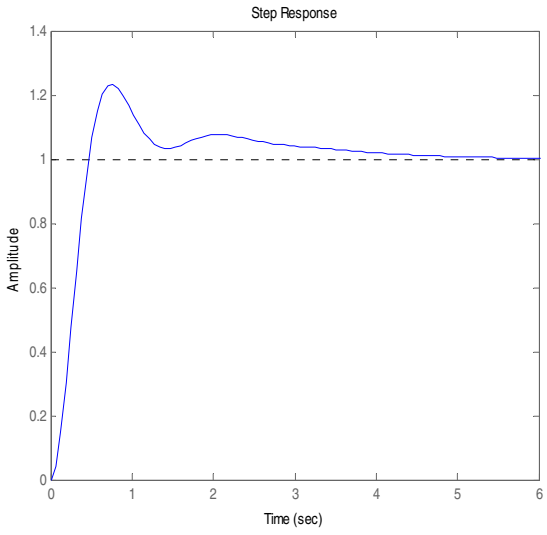

Fig. 5 Step Response of Finely Tuned PID Controller.

4. FUZZY LOGIC CONTROLLER

In an FLC, fuzzy logic is blended with the conventional PID Controller thereby, augmenting and si0mplifying its implementation. To control the process, a set of control rules called rule base is used in FLC to implement an automatic control system.

4.1 Fuzzification and Defuzzification

In the fuzzification process, the membership functions defined on the input variables are applied to their actual values as the input variables are crisp. If the sensor is fuzzy (noisy), fuzzification refers to finding the intersection of the label's membership function and the distribution for the sensed data. Fuzzification turns the measurement into a degree of membership. Suppose a temperature measurement corresponds to 80°C. Fuzzification takes this measurement and decides to what degree it is "high", "OK" and "low". This matter of degree is decided on the basis of the framework suggested by the "expert" and is usually expressed as a membership function and accordingly the control rules are set and applied to the degree implied by a measurement. Defuzzification is the process of transforming the fuzzy set assigned to a control output variable into a crisp value [4].

4.2 Designing

Simulink model of the fuzzy controller and the plant with unity feedback for the same transfer function is shown in Fig. 6.

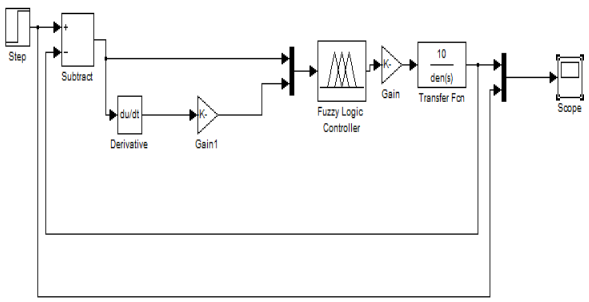

Fig. 6 Model of Fuzzy Logic Controller

4.3 Simulation

For a two input fuzzy controller, 3,5,7,9 or 11 membership functions for each input are mostly used . In this paper, five fuzzy membership functions are used for

both the two inputs, error (e) and derivative of error (diff e) and the output as shown in Fig.7, here N means Negative, Z means Zero and P means Positive. Depending upon the output 9 rules are derived for the fuzzy logic controller (Fig.8) [5][6]. These nine rules are sufficient to cover all possible situations.

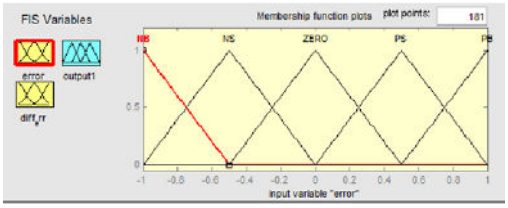

Fig.7 Membership functions

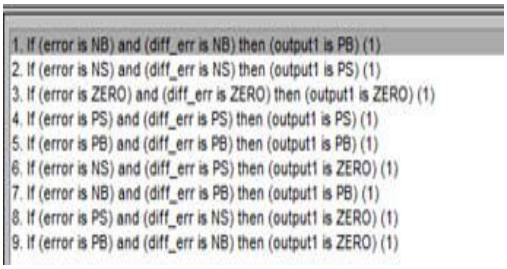

Fig. 8 Rule Base

By providing a systematic framework for computing with fuzzy rules, Fuzzy Logic Toolbox in MATLAB greatly amplifies the power of human reasoning [4].

For the same high order system the scope graph is obtained and the performance characteristics obtained are as follows:

Maximum overshoot, Mp(%) = 0
Steady state error, Es = 0
Settling Time, Ts = 2.9 s

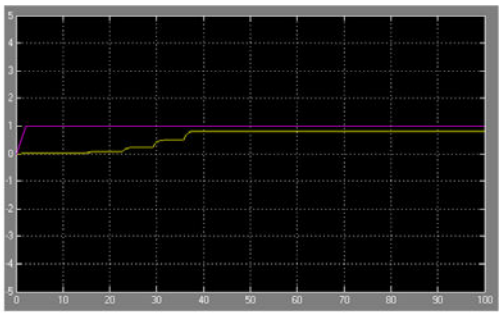

Fig. 9 Step Response of FLC

5. COMPARISON OF CONVENTIONAL PID AND FLC

The Fuzzy Logic controller gives no overshoot, zero steady state error and smaller settling time than obtained using

CONTROLLERS	Mp (%)	Ts(s)	Ess
ZNPIDC	57	5.93	0
FTPIDC	23	5.2	0
FLC	0	2.9	0

Table I: Performance Characteristics of PID controller and FLC

Ziegler Nichols tuned PID controller and fine-tuned PID controller [2] [3].

Ziegler Nichols technique gives high overshoot and settling time with zero steady state error. Initial controller parameters obtained using Z-N formula need to be adjusted repeatedly through computer simulation to get satisfactory performance [2].

Fine tuned PID controller gives zero steady state error and smaller overshoot and settling time than Ziegler Nichols tuned PID controller [1] [3].

6. CONCLUSION

The simulation results confirm that the Fuzzy logic controller with simple design and smaller rule base can provide better performance compared to the Conventional PID controller.

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A MATLAB Simulink Model for Segmentation of Coronary Arteries Using 64-Slice Computed Tomography Image

[1]Pankaj Goyal, [2]Ashwani Kumar, Ajay [3]Kumar Singh

[1]Student Member, UACEE, Member IAENG, Electrical Engineering Department,
Deenbandhu Chhotu Ram University of Science & TechnologyMurthal (Sonepat), India;
[2]Scientist, Aeronautical Development Agency, Bangalore, India;
[3]Assistant Professor, Electrical Engineering Department,
Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat), India.
[1]pankajgoyal.crsce@gmail.com; [2] ashu.ymca@gmail.com; [3]aksingheed@gmail.com

Abstract: In this paper, a method for segmentation of coronary arteries of heart has been developed on 2-D CT(Computed Tomography) data in MATLAB using Simulink Library. 64- Slice CT Scan technology provides a noninvasive method to directly visualize the coronary arteries. Using a small dose of contrast, 64-slice CT angiography provides previously unobtainable visualization of the coronary arteries. A simulink model has been developed using different image processing block sets from MATLAB. Visualization of coronary arteries is helpful in non invasive detection of heart diseases prior to their occurrence via determining different properties of coronary arteries like diameter etc. Also, the new 64-slice multi-detector CT scanner allows physicians to analyze coronary artery lesions and blockages that were previously impossible to visualize adequately [7].

Keywords: *MATLAB; Segmentation; Morphological; Calcification; Median Filter; CAD(Coronary artery disease); Simulink; Morphological operation.*

1. INTRODUCTION

Coronary artery disease (CAD) is the leading cause of death in western countries. The standard of reference for diagnosis of CAD is still invasive coronary angiography, with the advantage of high spatial resolution and temporal resolution. Despite its cost, inconvenience to patients, and a small but distinct procedure-related morbidity (1.5%) and mortality (0.2%) rate, more than 1 million invasive diagnostic coronary angiography procedures are performed annually in the United States alone. Similarly, CAD is the single most important cause of death in India, Australia, New Zealand & other countries. Every year, billions of dollars have been spent in the treatment of coronary artery disease. Given the invasiveness of coronary angiography and potential danger of having a small risk of serious complications (arrhythmia, stroke, coronary-artery dissection and death), a non-invasive technique for imaging of the coronary artery disease is highly desirable. Imaging of the heart and coronary artery branches has always been technically challenging due to the heart's continuous movement. Over the last decade, great strides have been made in the field of cardiac imaging as non-invasive coronary imaging modalities have undergone rapid developments [1-4].

Coronary computed tomography angiography with 64-slice multi-detector CT scanners allows reproducible and accurate non-invasive evaluation of coronary atherosclerotic disease in most patients. These coronary CT angiography studies are very promising and exciting. Non-invasive imaging of the heart and the coronaries using computed tomography (CT) or magnetic resonance imaging (MRI) has become widely accepted [5-10]. The continuous motion of the heart, the small caliber and the tortuous nature of the coronary vessels make these examinations challenging. Since 1993 coronary MR angiography has been performed with temporal resolution of 40-100 ms [6]. Older generations of CT scanners have had inadequate temporal resolution for coronary angiography. Because the 64-slice CT scanner

offers faster gantry rotation, as low as 330 ms, and smaller detector arrays, it allows higher temporal and spatial resolution. The 64-slice CT scanner can visualize the entire heart in less than 10 seconds, revealing blockages in blood vessels and other heart problems that are sometimes not easily detectable with other tests [12].

Image segmentation facilitates delineation of anatomical structures and other regions of interest. Segmentation is one of the most difficult tasks in image processing and determines the outcome of analysis and evaluation of pathological regions.

The aim of the proposed system is to detect Coronary Arteries in Heart through efficient segmentation. The rest of the paper is organized as follows: Simulink Model is presented in Section II. System architecture is discussed in Section III. Experimental results are presented in Section IV and analyzed. Conclusion and future work is briefed in Section V.

2. SIMULINK MODEL

The Simulink model for the system is shown in Fig. 1. It uses different simulink blocks and also video and image processing blocksets, The main blocks are shown in fig. 1.

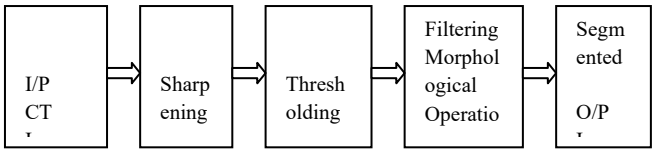

Fig. 1 Simulink Model of Coronary Artery Segmentation System

The different steps in simulation of Coronary Artery Segmentation System of Heart are shown. These are Input CT image of Heart, sharpening the image through the color space conversion of image. After sharpening the image, we apply thresholding, edge detection & morphological operations.

3. SYSTEM ARCHITECTURE

The system architecture for the segmentation of coronary arteries of heart using 64- Slice CT Scan image is shown in Fig. 2.The proposed system uses image processing techniques and work is done in the Simulink. The main components of coronary arteries segmentation system are 2-Dimensional FIR (Finite Impulse Response) filter, thresholding based segmentation of heart image, edge detection technique and morphological operations.

3.1 Selecting a CT Image

First, step in work done is to choose the desired 64-Slice CT Scan image. The selection of a suitable image is done in such a way that you can properly segment the coronary artery to detect its desirable parameters to diagnose the diseases of heart.

3.2 Image Sharpening

CT images are found to have random noise. The random distortion makes it difficult to perform perfect image processing. To sharpen a color image, you need to make the luma intensity transitions more acute, while preserving the color information of the image. To do this, you convert an R'G'B' image into the Y'CbCr color space and apply a highpass filter to the luma portion of the image only. Then, you transform the image back to the R'G'B' color space to view the results. Fig. 3(a) and Fig. 3(b) show the Binary Image before sharpening and Binary Image after sharpening respectively [17].

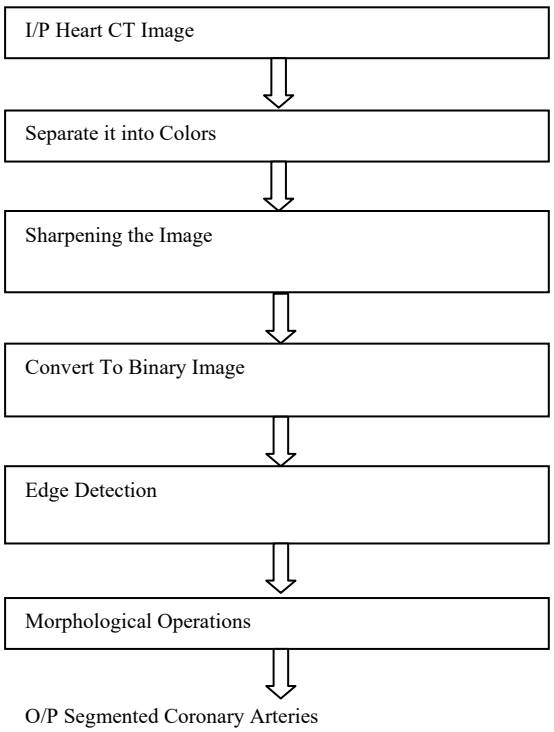

Fig. 2. Coronary Arteries Segmentation System Flowchart

Fig. 3(a) Binary Image before sharpening

Fig. 3(b) Binary Image after sharpening

3.3 Image Segmentation & Pre-Processing

After the Image sharpening, the image was segmented using a threshold value of 0.3922. The thresholding provides the binary image. The binary image data type was converted to make it suitable for edge detection. Before the edge detection, we applied a filter again, the median filter. The Median Filter block replaces the central value of an M-by-N neighborhood with its median value. If the neighborhood has a center element, the block places the median value there [14]. The median filter is a nonlinear digital filtering technique, often used to remove noise. Such noise reduction is a typical pre-processing step to improve the results of later processing. Under certain conditions, it preserves edges while removing noise [15]. After the filtering again with the Median filter, the Perwitt edge detection operator was applied, that output the horizontal & vertical gradient components of the image separately.

3.4 Morphological operations

Morphology is the study of the shape and form of objects. Morphological image analysis can be used to perform object extraction, Image filtering operations, such as removal of small objects or noise from an image, Image segmentation operations, such as separating connected objects, Measurement operations, such as texture analysis and shape description[16]. After the edge detection operation, different morphological operations were applied which dilation, erosion and opening etc on the vertical gradient component of image because it provides better segmentation of coronary arteries in heart. After the morphological operations, we got the image showing the segmented coronary arteries as output.

3.5 Inference

The 64- Slice Computed Tomography 2-D image of Heart is given to the simulink model. The image is pre-processed and coronary arteries of heart are segmented. The segmented coronary arteries can be analyzed in MATLAB for further processing to diagnose the diseases at early stage through determination of different characteristics of coronary arteries.

4. SIMULATION RESULTS

The system was tested on different 2-D CT images of heart and every time system performed well to extract the coronary arteries. Fig. 4(a) shows the input image, and Fig. 4(b) shows the image with segmented coronary arteries in Heart.

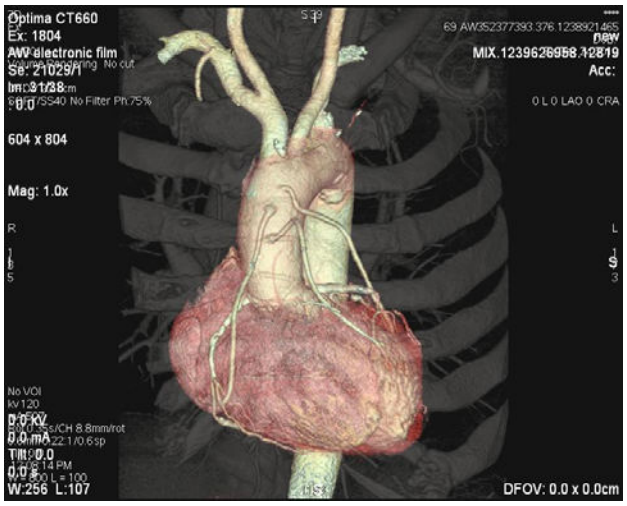

Fig. 4(a) Original Input Image

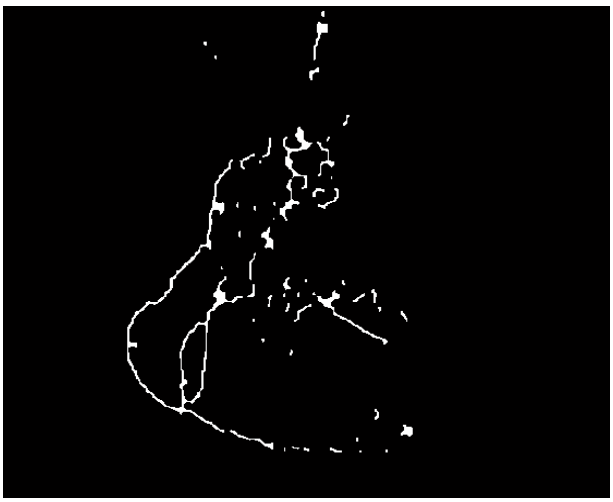

Fig. 4(b) Output Image with main Coronary Arteries Segmented

5. CONCLUSION & FUTURE WORK

The Coronary Arteries from a set of 64-Slice CT Scan Images of Heart is successfully segmented by the Coronary Artery Segmentation Simulink model developed. This system would be effective in assisting the physician to visualize coronary arteries of heart.

This Simulink model can be used for further image processing to find the diameter of segmented coronary arteries so as to diagnose blockage due to narrowing of diameter of artery because of calcium deposition such that early detection of Heart diseases can be diagnosed.

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Document Summarization Using Non-Negative Matrix Factorization and Hierarchical Agglomerative Clustering

Mubin Chandsab Bagwan, S.S.Apte

Computer Science and Engineering, Walchand Institute of Technology, Solapur, India
mbagwan@gmail.com; headcsewit@gmail.com

Abstract: In this, a summarization method that uses NMF (nonnegative matrix factorization) and the clustering method is introduced to extract meaningful sentences. The proposed method decomposes a sentence into the linear combination of sparse nonnegative semantic features so that it can represent a sentence as the sum of a few semantic features that are comprehensible intuitively. It can improve the quality of document summaries because it can avoid extracting those sentences whose similarities with the document are high but that are meaningless by using the similarity between the document and the semantic features. In addition, the proposed approach uses the clustering method to remove noise and avoid the biased inherent semantics of the documents being reflected in summaries. The method can ensure the coherence of summaries by using the rank score of sentences with respect to semantic features.

Keyword: *NMF, summarization, clustering, semantic feature.*

1. I. INTRODUCTION

Text summarization has drawn a lot of interest in the natural language processing and information retrieval communities in the recent years. The task of a text summarizer is to produce a summary of any document submitted to it. The level of sophistication of or a can vary from a simple list of isolated keywords that indicate the major content of the document, through a list of independent single sentences that together express the major content, to a coherent, fully planned and generated text that compresses the document. The more sophisticated a summary, the more effort it generally takes to produce. Several existing systems, including some Web browsers, claim to perform summarization. However, a cursory analysis of their output shows that their summaries are simply portions of the text, produced verbatim. While there is nothing wrong with such extracts, per se, the word 'summary' usually connotes something more, involving the fusion of various concepts of the text into a smaller number of concepts, to form an abstract.

Document summarization is the process of reducing the sizes of documents while maintaining their basic outlines. That is, the process should distill the most important information from the document. Document summarization can involve either generic summaries or query-based summaries. A generic summary distills an overall sense of a document's contents, whereas a query-based summary distills only the contents of a document that are relevant to a user's query [1] . Document summarization is further divided into single-document summarization or multidocument summarization according to the scope of the summary target. The purpose of multidocument summarization is to produce a single summary from a set of related documents, whereas single-document summarization is intended to summarize only one document[1].

In this paper, we propose a new multi-document summarization method using nonnegative semantic features and the clustering method. Nonnegative matrix factorization (NMF) can represent individual objects as the nonnegative linear combination of partial information extracted from a large volume of objects. It has been observed that humans use only the addition of nonnegative data when they recognize an object as the combination of partial information. This method can deal with a large volume of information efficiently since the original nonnegative matrix is decomposed into a

sparsely distributed representation of two nonnegative matrices [2], [3] .

The proposed method has the following advantages. First, the semantic features are sparse with nonnegative values. Sentences can be decomposed into intuitively comprehensible semantic features having a few terms. The inherent structure of documents can be analyzed into a linear combination of semantic features. Therefore, the proposed method can select meaningful sentences that are more relevant , and the extracted sentences are well connected with major topics and subtopics in the cluster. Second, it can find important sentences by using semantic features. Third, it can remove the noise in given documents by using clustering methods.

Thus, the method can improve the quality of document summarization since the clustering of sentences helps us to remove redundant information easily and to avoid the biased inherent semantics of documents being reflected in the summarization. Finally, it can enhance the coherence of summaries by sorting extracted sentences in the order of their rank.

2. LITERATURE REVIEW

The recent studies for document summarization are as follows: Gong and Liu [4] proposed a method using the latent semantic analysis (LSA) technique to semantically identify important sentences for summary creation. Goldstein et al. [5] proposed a method using the maximal marginal relevance (MMR) approach. This method summarizes documents by calculating the cosine similarity between a given query and a document and the cosine similarity between the currently selected sentence and the previously selected sentence. This method cannot distinguish sentences including either a polysemy or a homonym even if their relevance to the query is high, because it only uses the cosine similarity.

Hachey et al. [6] proposed multidocument summarization method using the MMR and LSA. However, the shortcoming of this method is that it may summarize less meaningful sentences when the term weight of the semantic feature vector in the latent semantic space is negative . Harabagiu and Lacatusu [7] proposed various multidocument summarization methods using sentence extraction based on both themes and sentence ordering. Their methods summarize documents by using theme selection based on natural language processing. These methods have high computational costs because they require many steps for theme selection.

Sassion [8] proposed a multidocument summarization method based on topics. His method summarizes documents by removing irrelevant sentences one by one from a set of candidate sentences until a user's specified compression ratio is met. This method shares the weakness of not being able to distinguish sentences including either a polysemy or a homonym because it relies upon the cosine similarity between candidate sentences, though it also refers to the n-gram between them.

Sakurai and Utsumi [9] proposed a query-based - summarization method using a thesaurus. Their method generates the core part of the summary from the most relevant document to the query using a thesaurus, and then the additional part of the summary, which elaborates upon the query, from the other documents. Their method works well for long summaries, while its performance is not satisfactory for short summaries.

Park et al. [10] proposed a query-based document - summarization method using NMF. Park et al. [12] proposed a multidocument summarization method based on clustering using NMF. This method clusters the sentences and extracts sentences using the cosine similarity measure between a topic and semantic features. This method improves the quality of summaries and avoids the topic being deflected in the sentence structure by clustering sentences and removing noise, but it may also extract more or less similar but meaningless sentences from documents and does not consider the coherence of the extracted sentences. Park et al. proposed a multidocument summarization method using weighted NMF and clustering methods [13],[14],[15] .

On the least-complex end is summarization through text extraction, the creation of summaries using terms, phrases and sentences pulled directly from the source text using statistical analysis at a surface level. Occurrences of words or sentences are counted and analyzed according to their frequency and where they appear and reappear in the source text. This is sometimes referred to as "knowledge poor" processing and is rooted in the term-weighting algorithms of information retrieval.

3. PROPOSED METHODOLOGY

In this, we propose a multi-document summarization method using the nonnegative semantic feature and - clustering methods.

The proposed method consists

- Preprocessing of the Document
- Clustering of the Documents
- Generate the summaries from Clusters returned by second method.

3.1 Preprocessing

In the preprocessing phase, after given documents are decomposed into individual sentences, we remove stop-words and perform word stemming. Then, we construct the weighted term-frequency vector for each sentence in the documents.

3.2 Clustering Phase

The clustering phase consists of applying the clustering methods and computing the number of sentence - extractions for each cluster.

Clustering method

In this, we use the Hierarchical Agglomerative Clustering Algorithm. The agglomerative algorithm is bottom-up because it begins with the objects (documents in our case) as individual clusters and then repeatedly merges two clusters that are most similar until a single all-inclusive cluster is obtained. It requires not only the definition of a similarity measures between individual documents, but also the definition of a similarity between clusters of documents. Three common methods for defining similarity between clusters are single-link method, the complete-link method, and ward's method.

In the single-link method, the similarity between two clusters C1,C2 is the maximum of the similarity between a pair d1,d2 where d1 € C1 and d2 € C2. Thus, two clusters are similar if some pair of members are similar.

In the complete-link method, the similarity between two clusters C1,C2 is the minimum of the similarity between a pair d1,d2 where d1 € C1 and d2 € C2. Thus, two clusters are similar if every pair of members are similar.

In ward's method, the pair of clusters that are considered to be closet together among all clusters is the pair whose merger minimizes a certain sum of squares error based on distances from centroids of the cluster.

Computing the number of sentences extracted

The number of sentences extracted from cluster Cc , ec , is as follows:

$$e_c = \left[f \times \frac{S_c \times sim(q, C^c)}{N} \right] \quad (1)$$

where f is the number of summarized sentences, N is the total number of sentences, sc is the number of sentences in Cc , sim() is the cosine similarity function, and q is the query.

3.3 Summary Generation

The summary generation phase consists of sentence extraction and sentence ranking.

Sentence extraction using semantic features

The sentence extraction process is described as follows. We construct matrices Wc and Hc by applying the NMF algorithm to Cc after removing noise(1). We calculate the number of sentences extracted from the cluster label. We select the semantic feature having the largest similarity value to the query and then extract the sentence having the largest weight with respect to this semantic feature. We add the extracted sentences to the candidate sentence set:

$C^c = W^c H^c$,c=1,2,…,k' k'=k-k_{noise} (1)

Where k is the number of cluster labels, and knoise is the number of noise cluster labels.

A weighted column vector for the j'th sentence of matrix Cc is represented as a linear combination of the semantic feature vectors and the semantic variable. The weight of the l'th semantic feature vector in sentence.

$$C^c_j = \sum_{l=1}^{r} H^c_{lj} W^c_l \quad (2)$$

The powers of the two nonnegative matrices Wc and Hc are described as follows: All semantic variables, are used to describe how the j' th sentences are structured using semantic features. Wc and Hc are represented sparsely. Intuitively, it make more sense for each sentence to be associated with some small subset of a large array of

topics, , rather than with just one topic or with all the topics. In each semantic feature, semantically related terms are grouped together by NMF. In addition to grouping semantically related terms together into semantic features, it represents the multiple meanings of the same term on contexts [2] .

Sentence Ranking

Summary generation arranges the ranked sentences from the candidate sentences set by using Equation (3). We defined the rank score of a sentence as follows:

$$r_j = sim(q, C^c_j) \times Rweight(H^c_{lj}) \quad (3)$$

where r_i is the rank score of the j' th sentence, and Rweight() is the rank weight. Here,

$$Rweight(H^c_{l*}) = \frac{\sum_{j=1}^{n} H^c_{lj}}{\sum_{l=1}^{m}\sum_{j=1}^{n} H^c_{lj}} \quad (4)$$

The rank weight, Rweight(), means the relative relevance of the l'th semantic feature among all semantic features. The rank weight also indicates how much the sentence reflects the major topic, which is represented as semantic features.

4. CONCLUSIONS

For effective multi-document summarization, it is - important to remove noise, recognize and remove redundant information, ensure the coherence of summaries, and extract sentences which are common to given documents. This document presents a multi-document summarization method using nonnegative semantic features and clustering methods. The advantages of the proposed method are as follows. First, it can represent documents by means of an intuitively comprehensible form since it uses very sparse semantic features. Therefore, it can extract the sentences that are semantically closer to the query and prevent the extraction of more or less similar but meaningless sentences. In addition, the extracted sentences are well covered with the major topics and subtopics in the cluster. Second, it removes the redundancy of sentences within a cluster and identifies the important difference of sentences between clusters. Thus, it can avoid the biased inherent structure of documents to be reflected in summaries. Third, it ensures the coherence of summaries by using a rank score for sentences.

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Three Level Image Encryption Using Two Encryption Techniques

[1]Rashmi K. Gawande, [2]Kamlesh A. Ganar, [3]Pravin S. Kulkarni

[1]Stdt. M.Tech (CSE), Dept of Computer Science & Engg., Rajiv Gandhi College of Engg. ,Research &Tech., Chandrapur;
[2]Sr.Software Engineer, Omnivision Technologies(P) Ltd., Nagpur;
[3]Prof & Head of Dept.Info. Tech., R Rajiv Gandhi College of Engg. ,Research &Tech., Chandrapur
[1]rashmiganar@gmail.com, [2]KamleshGanar@Gmail.com; [3]kulkarnips1811@gmail.com

Abstract: Encryption is used to securely transmit data in open networks. Each type of data has its own features; therefore different techniques should be used to protect confidential image data from unauthorized access. The combination of chaotic theory and cryptography forms an important field of information security. In the past decade, chaos based image encryption is given much attention in the research of information security and a lot of image encryption algorithms based on chaotic maps have been proposed. Due to some inherent features of images like bulk data capacity and high data redundancy, the encryption of images is different from that of texts; therefore it is difficult to handle them by traditional encryption methods. In this paper, we introduce a Elliptic Curve Cryptography (ECC) with chaotic mapping.ECC is an efficient technique of transmitting image securely. RSA is too slow compared to ECC because ECC required smaller key size. In this method, every pixel of the original image is transformed into the elliptic curve point (Xm, Ym), these elliptic curve point convert into cipher image pixel.

Keywords: *Encryption; Elliptic Curve Cryptography (ECC); chaotic mapping;RSA.*

1. INTRODUCTION

With the extensive use of networks ,the huge amount of data is transmitted , and securing that data becomes more and more important. Not only text but also images and real time data is also transmitted. Chaotic encryption system has drawn wide attention. As the chaotic system is very sensitive to initial values and system parameters, the chaotic sequence which is generated has the characters of wide band, class noise, accurate regeneration and difficult to forecast long-term[1].

A method called Elliptic Curve Cryptography is becoming the choice for mobile communication. Elliptic curve cipher use very small key size and computationally is very efficient. N. Koblitz and Miller, independently proposed the elliptic curve cryptosystem. A cryptoalgorithm utilizes a discrete logarithm problem (DLP) over the point on an elliptic curve. ECC should be used to provide both digital signature and an encryption scheme. The main attraction of ECC is that it can provide better performance and security for small key size, in comparison of RSA cryptosystem. In ECC a 160-bit key provides the same security as compared to the traditional crypto system RSA with a 1024-bit key, thus in this way it can reduced computational cost or processing cost.ECC was proposed by Miller and Koblitz [2].The security of ECC depends on the difficulty of finding K for the given P and KP. The security level for difference key size of RSA and ECC is given table1. ECC is not easy to understand by attackers. So provides better security through insecure channels.

2. WORK ALREADY DONE

The use of elliptic curves in public key cryptography was independently proposed by Koblitz and Miller in 1985 [2] and since then, a lot of work has been done on elliptic curve cryptography. In [3] Elliptic curve cryptography scheme was Proposed and which is based on binary finite GF [2m]. This work describe the basic design principal of ECC protocol like EC, Diffie-Hellman, EC Elgamal and ECDSA protocol.

To achieve higher security of digital image RSA scheme with MRF and ECC Proposed for image

encryption [4]. This paper proposed first encrypt original image with XOR concealed image that generate with MRF using seed and generate secret image using Elliptic curve Cryptography (ECC). XORing message again encrypted by RSA scheme. An image encryption for secure internet Multimedia application was proposed in [5]. This paper presents a join image compression and encryption scheme for internet multimedia application. The Mixed image element encryption using elliptic curve cryptography has been proposed in [6]. This work proposed highly secured image element because it gives two level encryption. Kamlesh Gupta, et al. [7] has been proposed An Ethical way for Image Encryption using ECC. Kamlesh Gupta, et al. [8] has been proposed Performance Analysis for Image Encryption using ECC. Kamlesh Gupta and Sanjay Silakari [7], [8] technique was based upon a prime curve over Z_P, use a cubic equation in which the variables and coefficients all take on values in the set of integers from 0 through p-1 and in which calculations are performed modulo p.

3. IMAGE ARNOLD TRANSFORMATION

Image scrambling is common technology with encryption fast speed and good results which is to achieve image encryption. Arnold transformation is one of main methods to achieve encryption algorithm in image transformation domain [9].The cat chaotic mapping is a discrete chaotic modal proposed by Arnold and Avez. The classical Arnold cat map is a two-dimensional invertible chaotic map described by

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} \bmod 1 \qquad (1)$$

The map is area-preserving since the determinant of its linear transformation matrix is equal to 1. The Lyapunov characteristic exponents of the map are the eigen values$\sigma 1$ and $\sigma 2$ of the matrix in (1), given by

$$\sigma_1 = \frac{1}{2}(3+\sqrt{5}) > 1, \qquad \sigma_2 = \frac{1}{2}(3-\sqrt{5}) < 1. \qquad (2)$$

The map is known to be chaotic, with geometrical explanation shown in Fig. 1, from which one can see that a unit square is first stretched by the linear transform and then folded by the modulo operation, mod. The above 2D cat map is now generalized by introducing two control parameters, a and b, as follows:

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = A \begin{pmatrix} x \\ y \end{pmatrix} \bmod N$$

$$\mathrm{A} = \begin{pmatrix} 1 & a \\ b & ab+1 \end{pmatrix}, \quad a,b \; N \qquad (3)$$

(x, y) is a pixel of the original image, x, y ε (0,1,2, ..., N-1), (x ', y') as a pixel of the scrambled image. In order to apply encryption to the cat map, we need some encryption parameters. Encryption parameters can be introduced by changing the elements of the matrix A. Then, the cat map can be extended to $N \times N$, and be discredited [10,11].

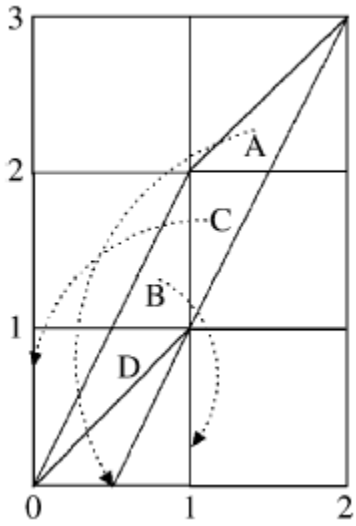

Fig:1 Geometrical explanation of 2D chaotic cat map

Through the replacement of discrete points set, while the information of image is transplanted, after all points of the original image have been traversed, then a new image will be formed Supposing that the point X of image and point Y of image have the corresponding relationships, there are gray values or RGB color value of pixel of point X and point Y, actually gray value or RGB color value is moving. This process is known as location movement. With the using digital Arnold transformation, the image has been replaced by the formula (2).When

this iterative process executing to a certain step, the image appears chaotic appearance which is based on Arnold transformation. In addition, this transformation process scan be iteratively continuous with a periodicity, that is, when reaching a certain steps, we can get the original image again. the cat map defined by formula (2) has such properties as below:

1. There is a Lyapunov exponent that is over zero;
2. A cat map is a bijective mapping;
3. Parameter a and b have the same period of N.

Lyapunov exponents play an important role in the research of character tics of bifurcation and chaotic motion of dynamics. Property 1 indicates that the mapping defined by formula (3) is a chaotic mapping in [12], and property 3 requires that 'a' and 'b' must be integers less than N.

4. ELLIPTIC CURVE CRYPTOGRAPHY

Public-key cryptography is based on the intractability of certain mathematical problems. Early public-key systems are secure assuming that it is difficult to factor a large integer composed of two or more large prime factors. For elliptic-curve-based protocols, it is assumed that finding the discrete logarithm of a random elliptic curve element with respect to a publicly-known base point is infeasible. The size of the elliptic curve determines the difficulty of the problem. It is believe that the same level of security afforded by an RSA-based system with a large modulus can be achieved with a much smaller elliptic curve group. Using a small group reduces storage and transmission requirements.

Elliptic curve cryptography (ECC) is a very efficient technology for public key infrastructures (PKI). The security of a public key system using elliptic curves is based on the difficulty of computing discrete logarithms in the group of points on an elliptic curve defined over a finite field. The mathematical operations of ECC is defined over the elliptic curve

$$y2 = x3 + ax + b,$$

where $4a3 + 27b2 \neq 0$. Each value of the 'a' and 'b' gives a different elliptic curve. All points (x, y) which satisfies the above equation plus a point at infinity lies on the elliptic curve. The public key is a point in the curve and the private key is a random number. The public key is obtained by multiplying the private key with the generator point G in the curve. The generator point G, the curve parameters 'a' and 'b', together with few more constants constitutes the domain parameter of ECC.

The domain parameters for Elliptic curve over Fp are **p**, **a**, **b**, **G**, **n** and **h**. p is the prime number defined for finite field Fp . a and b are the parameters defining the curve y2 mod p= x3 + ax + b mod p. G is the generator point (xG, yG), a point on the elliptic curve chosen for cryptographic operations. n is the order of the elliptic curve. The scalar for point multiplication is chosen as a number between 0 and n – 1. h is the cofactor where h = #E(Fp)/n. #E(Fp) is the number of points on an elliptic curve.

The domain parameters for elliptic curve over F2m are **m**, **f(x)**, **a**, **b**, **G**, **n** and **h**. m is an integer defined for finite field F2M .The elements of the finite field F2 m are integers of length at most m bits. f(x) is the irreducible polynomial of degree m used for elliptic curve operations. a and b are the parameters defining the curve y2 + xy = x3 + ax2 + b. G is the generator point (xG, yG), a point on the elliptic curve chosen for cryptographic operations. n is the order of the elliptic curve. The scalar for point multiplication is chosen as a number between 0 and n – 1. h is the cofactor where h = #E(F2 m)/n. #E(F2m) is the number of points on an elliptic curve.

ECC offers considerably greater security for a given key size. The smaller key size also makes possible much more compact implementations for a given level of security, which means faster cryptographic operations, running on smaller chips or more compact software. This means less heat production and less power consumption.

5. ENCRYPTION ARCHITECTURE

1. First we are take $M \times N$ binary image as a input X.
2. We use generalized Arnold cat map to scramble the image. This is first level encryption.
3. Then the scrambled image is divide into 8*8 block and the blocks are randomly shuffled .
4. Each pixel value of image W, that is called message m, can be converted into the coordinate (Xm, Ym) that are the point on elliptic curve.

$Xm = m \times k + J$, here $J = 0, 1, 2, 3$ ……..

$$Ym = x+ax+b$$

Where m is message K is the random positive integer. (Xm, Ym) is a square modulo P, where P is the prime no. and $P \geq K \times m$.

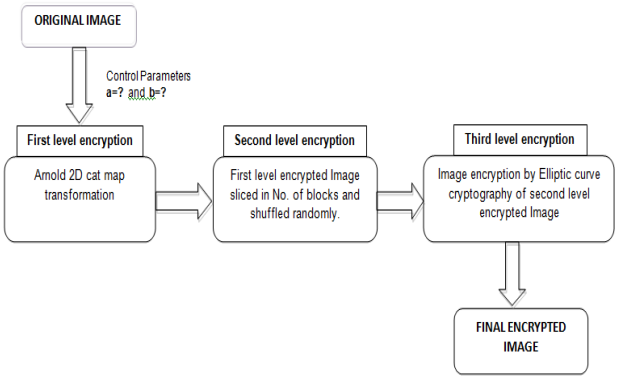

Fig:2 Encryption model

5. Encryption/decryption system require a point on G and an elliptic group $Ep(a, b)$. User A select a private key nA and generate a public *key* nA G. To encrypt and send message pm to B, A choose a random positive integer k and produce the cipher text Cm consisting of the pair of points.

$$Cm \{kG, Pm + kPB\}$$

where PB is the public key of user B.

6. Decrypt the cipher text using the method

$$\{Pm + kPB – nB(kG) = Pm + k(nBG) – nB(kG)\} = Pm$$

5.1 Experiment

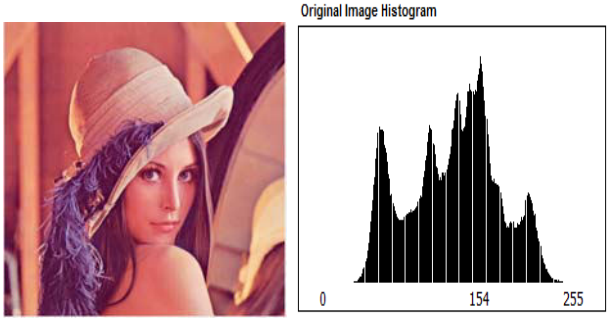

Fig: 3 Original Image and its histogram

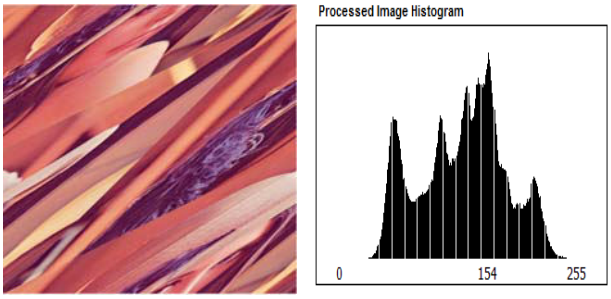

Fig: 4 Scrambled Image and its histogram

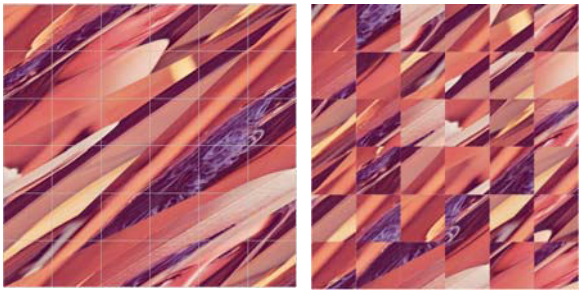

Fig: 5 Image divided into blocks and shuffled

6. CONCLUSION

In this paper the encryption method is proposed uses two different techniques, Chaotic mapping and ECC . Firstly we used a cat chaotic mapping to disorder the pixel coordinates of the digital image. The control parameters are used for distortion of the image, as we are using the Arnold map, if the process is repeated number of times after certain iteration we will get the original image. Secondly Elliptic curve cryptography is applied .

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A High Efficiency Charge Pump for Low Voltage Devices

Aamna Anil, Ravi Kumar Sharma

Department of Electronics and Communication Engineering

Lovely Professional University, Jalandhar, Punjab, India.

jaswalaamna@gmail.com, ravi.85jpr@gmail.com

Abstract: A charge pump is a kind of DC to DC converter that uses capacitors as energy storage elements to create a higher or lower voltage power source. Charge pumps make use of switching devices for controlling the connection of voltage to the capacitor. Charge pumps have been used in the nonvolatile memories, such as EEPROM and Flash memories, for the programming of the floating-gate devices. They can also be used in the low-supply-voltage switched-capacitor systems that require high voltage to drive the analog switched. This paper includes voltage analysis of different charge pumps. On the basis of voltage analysis a new charge pump is proposed.

Keyword:

1. INTRODUCTION

Power consumption is one of the most crucial considerations in VLSI designing. Generally, the most common and capable method to reduce the power consumption in a digital system is to reduce the supply voltage. However, a low supply voltage can considerably reduce the quality of the circuit function. In fact, it causes a reduction in speed and noise margins in digital circuits, a reduction dynamic range of analog circuits and some difficulties in read and write operation in some types of memories such as EEPROM and Flash types.

Charge pumps are used in applications where low or high voltage than power supply are required. Charge pumps make use of capacitors as energy storage element and pump charges towards the output stage using switches to convert lower DC voltage level at the input into higher DC level voltage at the output[1]. These circuits can find application in nonvolatile memories, such as EEPROM and Flash memories, for programming of the floating gate devices.

Many of the systems- such as EEPROMS, Flash memories, power management blocks, audio and video codes, image sensor circuits and displays- require internal voltage higher than supply voltage. This internal high voltage needs to be generated on chip or in-system. The traditional approach of switch-capacitor circuit or inductor based linear regulators consumes too much power and silicon area, to justify today's shrinkage needs. An on-chip charge pump provides an excellent solution and eliminates the need for an inductor.

The implementation of DC-DC convertor in CMOS is desirable. CMOS is currently the technology of choice in low power design. The popularity of CMOS is largely due to ease in designing circuits with minimal static power dissipation [2]. A CMOS charge pump circuit, which uses both NMOS switches and PMOS switches to eliminate the body effect, has been designed. A novel CTS control scheme which combines the backward control scheme and the forward control scheme is to obtain high voltage gain.

The charge pump solution eliminates the need of DC/DC boost convertors and expensive low profile inductors that are required to meet the size limitations of handheld devices and cell phones.

The paper is organized as follows: Basic concept of charge pump is given in section 2. Analysis of Dickson charge pump is presented in section 3. Analysis of Static charge pump is given in section 4. Analysis of Dynamic charge pump is explained in section 5. At the end the conclusion is given in section 6.

2. BASIC CONCEPTS

A charge pump circuit provides a voltage that is higher than the voltage of the power supply or a voltage of reverse polarity. In many applications such as Power IC, continuous time filters, and EEPROM, voltages higher than the power supplies are frequently required. Increased voltage levels are obtained in a charge pump as a result of transferring charges to a capacitive load and do not involve amplifiers or transformers.[2] It is for this reason that charge pump is a device of choice in semiconductor technology where normal range of operating voltages is limited. To generate a higher voltage, the first stage involves the capacitor being connected across a voltage and charged up. The second stage includes the capacitor being disconnected from the original charging voltage and reconnected with its negative terminal to the original positive charging voltage. Because the capacitor retains the voltage across it (ignoring leakage effects) the positive terminal voltage is added to the original, effectively doubling the voltage. The output capacitor smooth's the pulsing nature of the higher voltage output . Charge pumps usually operate at high frequency level in order to increase their output power within a reasonable size of total capacitance used for charge transfer. This operating frequency may be adjusted by compensating for changes in the power requirements and saving the energy delivered to the charge pump.

3. DICKSON CHARGE PUMP

John F Dickson proposed a voltage multiplier circuit. The MOST's in Dickson charge pump function as diodes, so that the charges can be pushed only in one direction. However the nodes of the diode chain are coupled to the inputs via capacitors in parallel so that the capacitors have to withstand the full voltage developed along the chain[3]. Two pumping clocks are used. The two pumping clocks Clk1 and Clk2 are out of phase and have a voltage amplitude V which is equal to input voltage . The value of input voltage is equal to VDD. Two clocks push the charge voltage upward through the transistors through the coupling capacitors C1-C4,. Cs is the parasitic capacitance assosiated with each pumping node, f is the frequency of the pumping clocks and I_0 is the output current loading.

When CLk1 goes from low to high and Clk2 goes from high to low, the voltage at node 1 is settled to $V_1 + \Delta V$ and the voltage at node 2 is settled to V_2, where V_1 and V_2 are defined as steady-state lower volatge at node 1 and node 2. Charges are being pushed from node 1 to node 2 through MD2, MD1 and MD2 are reverse biased. The final voltage difference between node 1 and node 2 is the threshold voltage MD2[1]. The necessary condition for the charge pump to function is that ΔV must be larger than the MOST's threshold voltage V_{tn}, i.e $\Delta V > V_{tn}$. The voltage pumping gain for the second pumping stage $G_{V2}$is defined as the voltage difference between V_2 and V_1.

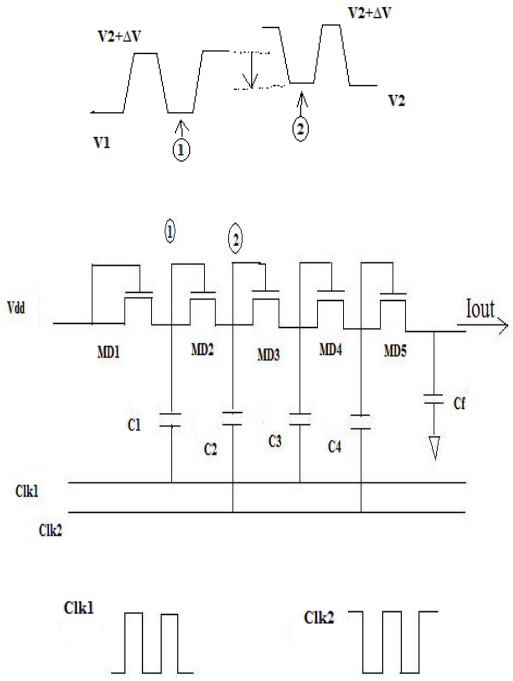

Figure 1. A four-stage dickson charge pump.[1]

The drawback of Dickson charge pump is that the boosting ratio is 3 degraded by the threshold drop across the diodes. The body effect makes this problem even worst at high voltages[4].

4. STATIC CHARGE PUMP

MOST switches with proper on/off cycles are reffered to as CTS's. They have been used in place of diodes and show better voltage pumping gain than the diodes. MD1-MD4 are diodes for setting up the initial voltage at each pumping node[1]. They are not involved in the pumping operation. MS1-MS4 are the CTS's. If the switches can be on/off at the designated clock pulses, they can allow

the charge to be pushed only in one direction. Then for each pumping stage upper voltage of each input is equal to the lower voltage of the output. In Fig.2 when Clk1 is high and Clk2 is low , the voltage at node1 is pushed to V_2 from V_1 and voltage at node 3 is pushed to $V_3 + \Delta V$. MS2 switch must be turned on by the voltage at node 3. Therefore voltage at node 3 must be higher than the threshold voltage of MS2. The gate to source volatge of MS2 is $2\Delta V$, i.e. $2\Delta V > V_{tn}(V_2)$.

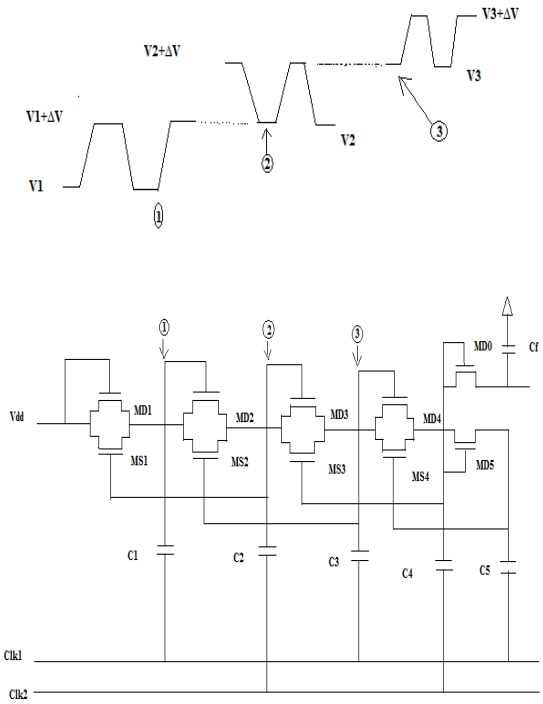

Figure 2. A four stage charge pump using static CTS's.[1]

On the other hand when the opposite condition arises the voltage at node 1 is V_1 and voltage at node 3 is V_3. For ideal operation MS2 has to be turned off. Therefore gate to source voltage of MS2 must be smaller than the threshold voltage i.e. $2\Delta V < V_{tn}\, V_1$ These two conditons have to be satisfied. Therefore MS2 can never be turned off completely and reverse charge sharing between node 1 and node 2 occurs. Thereby reducing the output of the charge pump.

The drawback of this circuit is that charge transfer switches can not be completely turned off, leading to reverse charge sharing which leads to reducing in voltage gain[4].

5. DYNAMIC CHARGE PUMP

To overcome the drawback of static charge pump dynamic charge pump is designed. In dynamic charge pump each CTS's is accompanied with p-mos and n-mos pair, so that CTS's can be turned on and off completely.

When Clk1 is high node 1 and node 2 have volatge V_2 and voltage at node 3 is V_3+ΔV. If the voltage is $2\Delta V$ above V_{tn} , then MP2 is turned on, causing Ms2 being turned on by the voltage at node 3[1]. On the other hand , when Clk1 is low and Clk2 is high, the voltage at node 1 is V_1 and both the voltages at node 2 and node 3 is $2\Delta V$. If $2\Delta V$>V_{tp} and $2\Delta V$>$V_{tn}(V_2)$, where $V_{tn}$is the threshold voltage of pMOST's , then MP2 is turned on , causing MS2 being turned off.

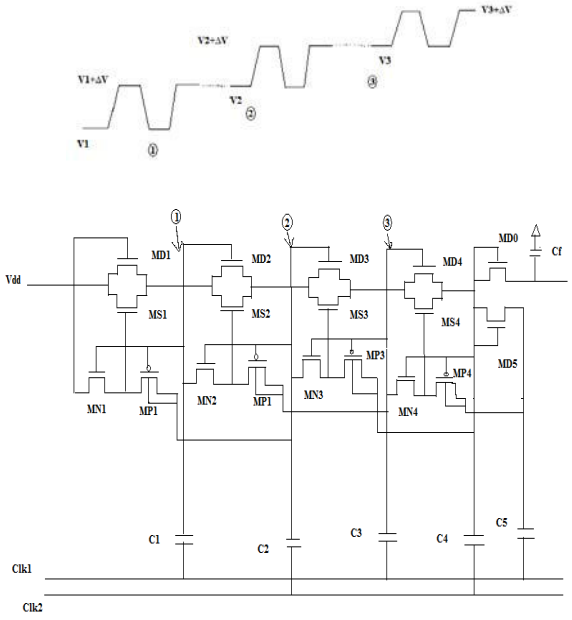

Figure 3. A four stage charge pump using dynamic CTS's[1].

6. RESULTS

In this paper volatge analysis for different charge pumps has been performed. Results have been simulated in Cadence Virtuoso and the results are shown in the form of input vs output voltage plot.

6.1 Dickson Charge Pump

Voltage analysis of the Dickson charge pump. On varying the input voltage change is observed in output voltage. Output voltage increases with increase in input

voltage.Input voltage is varied from 1V to 5V. Period of the input pulse is kept constant at 10ns.

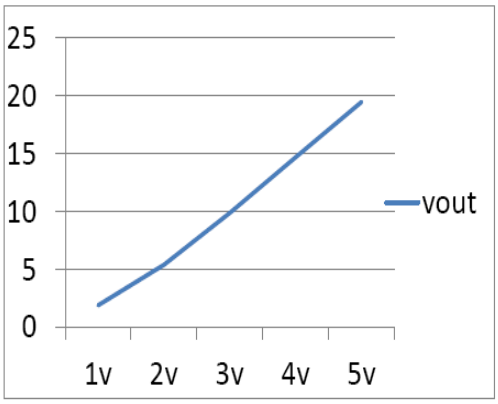

Figure 4. Voltage analysis of Dickson charge pump

6.2 Static Charge Pump

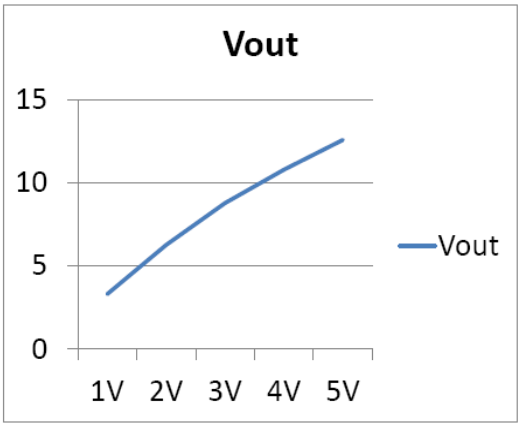

Figure 5. Voltage analysis of static charge pump

Voltage analysis of the Static charge pump. On varying the input voltage change is observed in output voltage. Output voltage increases with increase in input voltage. But the increase in output voltage is less in comparison to Dickson charge pump. The output voltage is less because of reverse charge sharing effect. To overcome this problem Dynamic charge pump was designed. Input voltage is varied from 1V to 5V. Period of the input pulse is kept constant at 10ns. Voltage of input pulse is also varied fromm 1V to 5V.

6.3 Dynamic Charge Pump

Voltage analysis of the Dynamic charge pump. On varying the input voltage change is observed in output voltage. Output voltage increases with increase in input voltage. Input voltage is varied from 1V to 5V. Period of the input pulse is kept constant at 10ns. Voltage of input pulse is also varied from 1V to 5V.

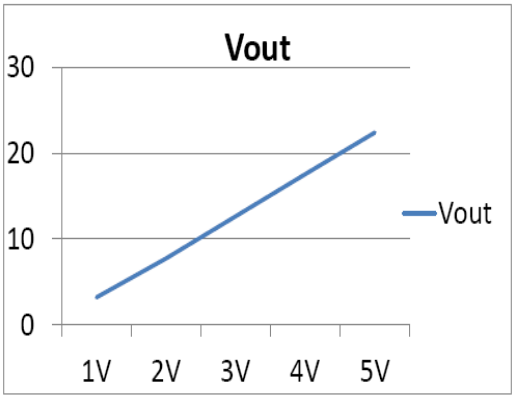

Figure 6. Voltage analysis of Dynamic charge pump

7. PROPOSED CHARGE PUMP

A MOS switch when is completely ON can pass charge from its drain to its source similar to a forward biased diode. It has the advantage that almost no voltage drop occurs between its drain and source terminal. Replace the diode connected NMOS transistors of a classical Dickson charge pump with PMOS switches. If these switches are turned ON and OFF at proper clock phases, they can allow the charge to be pushed in only one direction. In order to control the ON/OFF operation of each switch, a dynamic inverter is inserted in each stage.

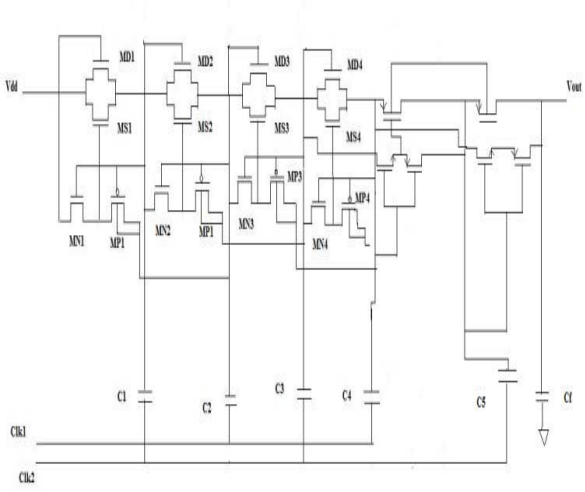

Figure 7. Proposed charge pump

As a result, the output voltage obtained is 25.07V.

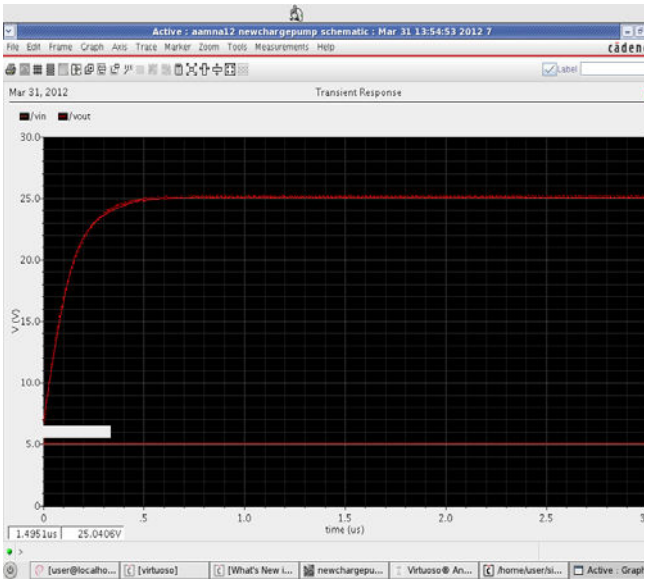

Figure 8. Output waveform of proposed charge pump

8. COMPARISON BETWEEN DICKSON, STATIC AND DYNAMIC CHARGE PUMPS

Comparison between Proposed, Dickson ,Static and Dynamic Charge Pump on the basis of variation of input voltage and output voltage obtained.

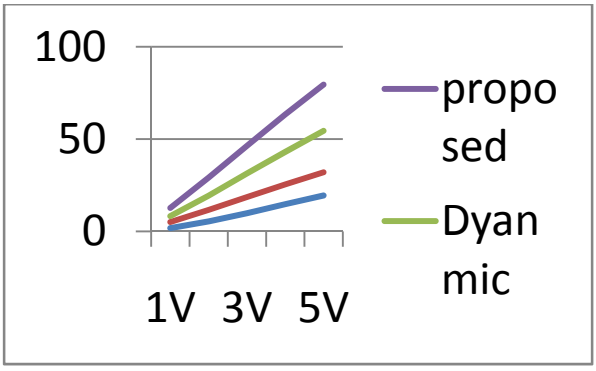

Figure 9. Comparison on the basis of voltage variation

9. CONCLUSION

As we can see that based on voltrage analysis of the charge pumps , the output gain of Proposed charge pump is the highest. On the basis of voltage analysis of three different charge pumps-Dickson, Static and Dynamic, a new charge pump is proposed for improving the output voltage gain by making changes at the output stages of the charge pump.

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Video Watermarking Using Discrete Wavelet Transform and Principal Component Analysis

[1]Amita Anant Waghmare, [2]V.B.Gaikwad

[1]Electronics and Telecommunication, Terna College of Engineering, Nerul, Navi Mumbai , India
[2] Department of Computer, Terna College of Engineering, Nerul, Navi Mumbai, India.
amita_waghmare@rediffmail.com; vb2k@rediffmail.com

***Abstract**:* It is widely accepted that transform domain watermarking make full use of Human visual characters to achieve robustness. In this paper we attempt to develop a simple and effective way of watermarking the video, using discrete wavelet transform (DWT) and principal component analysis (PCA) scheme. The proposed technique is non-blind luminance based. The original 512□512 RGB color space is converted into YUV color space. DWT transform is applied to Y component of each frame to get four subband LL, HL, LH, HH. Decomposition is done with 'Haar' which is simple, symmetric and orthogonal wavelet and direct weighting factor is used in watermark embedding and watermark extraction process. PCA analysis is done on LL and HH of DWT transformed Y component to get PCA component. A 32□32 binary image is used as watermark. Watermark is embedded in this PCA component. The watermark is extracted from watermarked video. The approach wiil be tested against variety of attacks and filters: such as, highpass, lowpass, Gaussian, median, salt and peppers. The proposed approach shows great ability to preserve watermark against these attacks.

Keywords: *Discrete Wavelet Transform, Principal Component Analysis.*

1. INTRODUCTION

With rapid development of computers and information network, storage of information and access to it has become easier and efficient. Also the digital media has ease to copy and change. Thus it is an obstacle for digital media distribution and related business concerned to security and copyright protection. Digital Watermarking is defined as the process of hiding a piece of digital data in cover data which is to be protected and extracted later for ownership verification [2]. Thus Digital watermarking provides copyright protection to image by hiding appropriate information in original image to declare rightful ownership. Robustness, Perceptual transparency, capacity and non-blind watermarking are four essential factors to determine quality of watermarking scheme.[4][5]. In spatial domain, watermark is embedded by directly modifying pixel values of cover image. Least Significant Bit insertion is example of spatial domain watermarking. This algorithm is simple in implementation. But the problems with such algorithm are: Low watermark information hiding capacity, less security, low peak signal to noise ratio (PSNR), Less Correlation between original and extracted such algorithm. In Frequency domain the watermark is inserted into transformed coefficients by any one transformation techniques such as Discrete Fourier Transform (DFT), Discrete short Fourier Transformation (DSFT), Discrete Cosine Transformation (DCT) [3] [6],Walsh Hadamard transformation (DHT) [7] and Discrete Wavelet Transformation (DWT)[8][9]. It gives more information hiding capacity and robustness against watermarking attacks because information can be spread out to entire frame [1]. Section 2 describes watermarking techniques .Section 3 focuses on survey of existing video watermarking algorithms. In Section 4 importance of Discrete Wavelet Transform is explored. Section 5 focuses on Principal Component Analysis. In section 6, watermarking methodology is given. Section 7 shows experimental results after implementation and Testing and conclusion is drawn.

2. VIDEO WATERMARKING TECHNIQUES

Any image watermarking technique can be extended to watermark videos, but in reality video watermarking

techniques need to meet other challenges than that in image watermarking schemes such as large volume of inherently redundant data between frames, the unbalance between the motion and motionless regions, real-time requirements in the video broadcasting etc. Watermarked video sequences are much susceptible to pirate attacks such as frame averaging, frame swapping, statistical analysis, digital-analog (AD/DA) conversion, and lossy compressions. Video watermarking applications can be grouped as security related like Copy control [11], fingerprinting, ownership identification, authentication, taper resistance etc. or value added applications like legacy system enhancement, database linking [12], video tagging, digital video broadcast monitoring [13], Media Bridge [14] etc. Apart from robustness, reliability, imperceptibility and practicality video watermarking algorithms should also address issues such as localized detection, real time algorithm complexity, synchronization recovery, effects of floating point representation, power dissipation etc [15]. According to the working domain, video watermarking techniques are classified in pixel domain and transform domain techniques. In pixel domain the watermark is embedded in the source video by simple addition or bit replacement of selected pixel positions. The main advantages of using pixel domain techniques are that they are conceptually simple to understand and the time complexity of these techniques are low which favours real time implementations. But these techniques generally lacks in providing adequate robustness and imperceptibility requirements. In transform domain methods, the host signal is transformed into a different domain and watermark is embedded in selective coefficients. Commonly used transform methodologies are discrete cosine transformation (DCT) and discrete wavelet transformation (DWT). Detection is generally performed by transforming the received signal into appropriate domain and searching for the watermarking patterns or attributes. The main advantage of the transformed domain watermarking is the easy applicability of special transformed domain properties. For example, working in the frequency domain enables us to apply more advanced properties of the human visual system (HVS) to ensure better robustness and imperceptibility criteria.

3. SURVEY ON VIDEO WATERMARKING

Watermark can be embedded in different ways .The raw video is directly inserted in raw video data or integrated during encoding process or implemented after compressing the video data. Common video watermarking techniques will be discussed further. Spread spectrum (SS) based watermarking technique was proposed in [16]. In this algorithm each bit of watermark a_j, $a_j \in \{-1,1\}$ is spread over a large number of chips (cr) and it is modulated by a binary pseudo-noise sequence pi , $pi \in \{-1,1\}$. Both video and watermark are represented as vectors and scaled addition is carried out for watermark insertion. The retrieval of the watermark is carried out by high-pass filtering followed by correlation based method. Robustness of the algorithm can be increased by increasing cr , σ^2 (variance of pseudo random sequence) or μ_α (mean of locally adjustable amplitude factor). Increase in cr reduces the data rate of the scheme, where as increases in μ_α results in perceptibility of the watermark. A 2D spread spectrum method for video watermarking (just another watermarking system, JAWS) was proposed in [17]. It is used for monitoring video data transmitted over different broadcast links. This pixel domain watermarking scheme is distinctive for its enhanced payload capabilities and shift invariance. A novel collusion resistant (CR) video watermarking approach is proposed in [18]. This is a practical frame by frame video watermarking technique. Here a basic $s \times s$ watermark pattern is first created and this pattern is repeatedly embedded so that it is centered around a fixed number of selected points known as anchors in every video frame. The part of the video frame where the basic watermark is embedded is called the footprint. Anchor points are calculated using feature extraction algorithm. As the content of the video frames changes, the selected feature points do change. As a result of that watermark footprints evolves with the video. After generating these watermark frames within a given host frame, spatial masking is applied on it to ensue robustness and imperceptibility criteria. Then the scaled watermark is embedded in the host data using addition.

Watermarking using CDMA modulation was proposed in [19]. In this proposed methodology one of the four least significant bitplanes are replaced by watermark planes. The bitplanes to be replaced are selected according to a random periodic quaternary sequence. The watermark plane is generated using 1D spread spectrum methodology. For detection of the watermark, the author proposed a two-level hierarchical

correlation methodology. One of the prime motivations for integrating watermarking into video coding structures such as MPEG2, H.264 etc is to reduce the overall real-time video. In [20], Darmstaedter et al. proposed a data hiding method (region based energy modification, RBEM), where data were embedded by manipulating the average energy or luminance intensities in sub-regions of each frame. This method achieves a high data capacity by embedding one bit into every 8×8 block, and error control coding is used to ensure robustness. Here the data sequence is directly embedded in the cover data. The concept of block classification was introduced here. With the classification of blocks, this scheme can take the advantage of local spatial characteristics and adjust its embedding strategy to improve imperceptibility and robustness criteria. One of the first transformed domain video watermarking methods (TDC) was proposed by Cox et al. in [21]. The authors proposed and stressed on the importance of embedding the watermark into perceptually significant components to increase robustness against signal processing and lossy compression techniques. The watermark of length *n* was populated from a standard normal distribution apart from a binary PN sequence in order to enhance robustness. This method uses a non-blind approach for watermark detention. Detection is performed by transforming the original and test frame in the DCT domain and correlating the difference vector with the expected watermark pattern. A perceptual watermarking (PW) method explicitly model masking properties of the HVS and utilizes these models to analyze video sequence or frames to embed watermark in the optimal way. In [22] a 3D DFT based robust watermarking scheme was proposed. Watermarking algorithm based on group of frames (GOF) has few important benefits as they utilize temporal properties of the video. This consideration helps to maintain temporal imperceptibility.

4. DWT TRANSFORM

Wavelets are special functions. It is in a form analogous to sines and cosines in Fourier analysis are used as basal functions for representing signals. For 2-D images, applying DWT corresponds to processing the image by 2-D filters in each dimension. The filters divide the input image into four non-overlapping multi-resolution sub-bands LL1, LH1, HL1 and HH1. The sub-band LL1 represents the coarse-scale DWT coefficients while the sub –bands LH1, HL1 and HH1 represent the fine scale of DWT coefficients. To obtain the next coarser scale of wavelet coefficients, the sub-band LL1 is further processed until some final scale N is reached. When N is reached we will have 3N+1 sub-bands consisting of the multi-resolution sub-bands LLN and LHx, HLx and HHx where x ranges from 1 until N. Due to its excellent spatio-frequency localization properties, the DWT is very suitable to identify the areas in the host image where a watermark can be embedded effectively. In particular, this property allows the exploitation of the masking effect of the human visual system such that if a DWT coefficient is modified, only the region corresponding to that coefficient will be modified. In general most of the image energy is concentrated at the lower frequency sub-bands LLx and therefore embedding watermarks in these subbands may degrade the image significantly. Embedding in the low frequency sub-bands, however, could increase robustness significantly. On the other hand, the high frequency sub-bands HHx include the edges and textures of the image and the human eye is not generally sensitive to changes in such sub-bands. This allows the watermark to be embedded without being perceived by the human eye. The compromise adopted by many DWT-based watermarking algorithm, is to embed the watermark in the middle frequency sub bands LHx and HLx where acceptable performance of imperceptibility and robustness could be achieved.

5. PRINCIPAL COMPONENT ANALYSIS

Principal component analysis (PCA) involves a mathematical procedure that transforms a number of possibly correlated variables into a smaller number of uncorrelated variables called principal components.PCA is called as eigen analysis. The first component has maximum variance. The second component has less variance and is orthogonal to the first component.

6. METHODOLOGY

Algorithm for embedding watermark in video is given by

Watermark Embedding**:**

Step1: Wavelet suband is divided into N*N nonoverlapping blocks.

Step2: Each block in LL is processed by method 1 and each HH is processed by method 2.

Method1: Consider each block like vector

Method2: Consider each block as 2D array

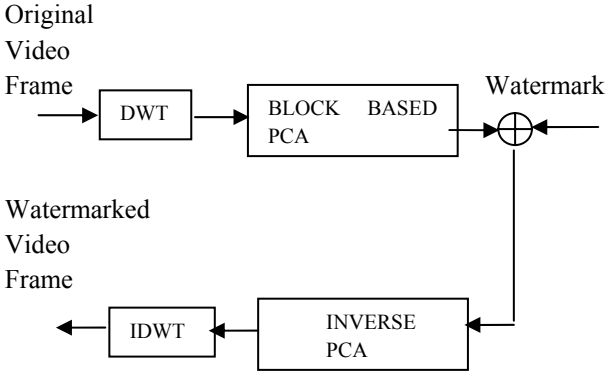

Figure1: Watermark embedding algorithm

Step3: For each block covariance matrix of zero mean blocks A is calculated as:

$$C_i = A_i * A_i' \quad (1)$$

where Ai is known as zero mean block and is given as

$$A_i = E(I - m_i) \quad (2)$$

m_i is mean of block and E denotes expectation

Step 4: PCA analysis is done on A_i first by taking eigen vector (phi) and sorting it in decrementing order of eigen value.

$$Y = phi' * A_i \quad (3)$$

Step 5: Watermark is first scaled and then embedded in each PCA component. as follows:

1. For LL the first principal component and the wm is embedded and can be expressed as

$$Y_1' = Y_1 + \alpha 1 Wm \quad (4)$$

2. For HH band two PN sequences generated using key and is used in embedding depending on the value of logical bit in watermarked.

$$Y_1' = Y_1 + \alpha 2 Wm \quad (5)$$

Wm=p0 /p1 if wm=0/1

Y1' is watermarked bit, Wm is original watermark.

α1,α2 are known as scaling parameters.

Apply inverse PCA and IDWT to watermarked block to form luminance component. Then reconstruct the watermarked frame.

Watermark Extraction:

Step1: Convert watermarked video into frame and convert RGB frame into YUV components.

Step2: For each frame select luminance component and apply DWT to decompose into multi resolution subband.

Step 3: Divide subband into non overlapping blocks.

Step4: Apply PCA to each block in LL and HH subband.

Step5: For LL band watermark is extracted from first component of each block

$$W' = (Y1' - Y1)/\alpha. \quad (6)$$

Step 7: For HH band regenerate two PN sequences with same keys k1 and k2 used in embedding. The PN sequence is extracted from PCA block by

$$W_B' = (Y_B' - Y_B') \quad (7)$$

The embedded bits are estimated depending on correlation value Cor between p0 and p1 and extracted sequences Wm' and predefined threshold

Wm=0 if Cor(p0,Wm')>Cor(p0,Wm') and Cor(p0,Wm')>th

Wm=1 if Cor(p1,Wm')>Cor(p1,Wm') and Cor(p1,Wm')>th

where th is the threshhold value and is taken as 0.5. The scale factor is take as 12 and 6 for LL and HH watermarking.

Step 8: After extracting watermark from LL and HH similarity measurements of extracted watermark and reference watermark is used for watermark fidelity.

$$NC = \frac{\sum\sum w(i,j) * w'(i,j)}{\sum w(i,j)\text{^}2 \sum w'(i,j)\text{^}2}$$

6.1 Experimental result:

The performance of proposed approach is tested on Akiyo video sequences. Performance is evaluated in terms of imperceptibility and Robustness.

Figure2:Original Frame *Figure 3:Watermarked frame*

Figure 4:Watermark

Figure 5:Extracted watermark NC=1 PSNR=52.5 decibel

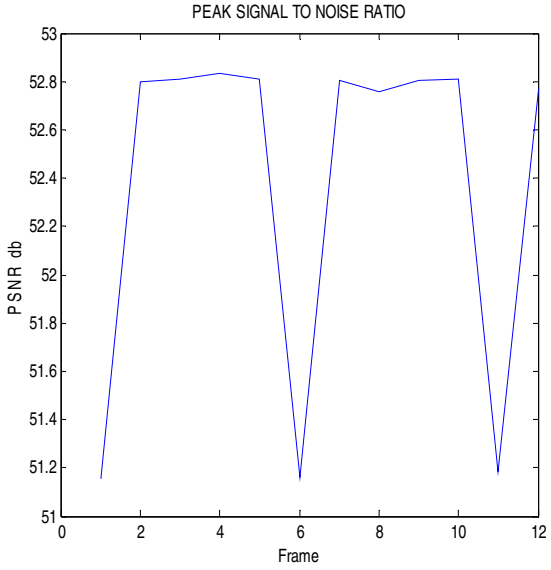

Figure 6: Frame vs PSNR

Figure 6 is graph showing PSNR for first 12 frames.

Watermark produced by proposed algorithm has produced NC value higher than that produced using conventional method

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Text Summarization Using MMI based on Bigram, Trigram & Quad-Gram Selection

Saba Anjum Jahangir Patel, Sulbha S. Apte

Computer Science & Engineering, Walchand Institute of Technology, Solapur, India.
saba.anjum12@gmail.com; headcse@gmail.com

***Abstract*:** Seekers of the information get frustrated while searching for interesting information in a huge data collection. The automatic text summarization has come to facilitate such searching process. Automatic text summarization is to compress an original document into an abridged version by extracting almost all of the essential concepts with text mining techniques. This paper applies three evidences which are employed as clustering using k-means algorithm, binary tree building and diversity based method to help in finding the documents distinct ideas using Maximal Marginal Importance approach. The role of clustering is very important, therefore used K-means clustering algorithm. Document-Sentence Tree is build on which the MMI approach is applied to get the quality text summary, reducing redundancy. Selecting Bigram, Trigram & Quadgram will help to get more appropriate summary

Keywords: *summarization, k-means, MMI, Document, Sentence Tree, Bigrams, Trigram , Quadgrams*

1. INTRODUCTION

Due to the rapid growth of the World Wide Web, information is much easier to disseminate and acquire than before. Finding useful and favored documents from the huge text repository creates significant challenges for users. Typical approaches to resolve such a problem are to employ information retrieval techniques. Information retrieval relies on the use of keywords to search for the desired information. Nevertheless, the amount of information obtained via information retrieval is still far greater than that a user can handle and manage. This in turn requires the user to analyze the searched results one by one until satisfied information is acquired, which is time-consuming and inefficient. It is therefore essential to develop tools to efficiently assist users in identifying desired documents.

One possible means is to utilize automatic text summarization. Automatic text summarization is a text-mining task that extracts essential sentences to cover almost all the concepts of a document. It is to reduce users' consuming time in document reading without losing the general issues for users' comprehension. With document summary available, users can easily decide its relevancy to their interests and acquire desired documents with much less mental loads involved.

In automatic text summarization, the selection process of the distinct ideas included in the document is called diversity. The diversity is very important evidence serving to control the redundancy in the summarized text and produce more appropriate summary. Many approaches have been proposed for text summarization based on the diversity. The pioneer work for diversity based text summarization is MMR (maximal marginal relevance), it was introduced by Carbonell and Goldstein [2], MMR maximizes marginal relevance in retrieval and summarization. The sentence with high maximal relevance means it is highly relevant to the query and less similar to the already selected sentences. Our modified version of MMR maximizes the marginal importance and minimizes the relevance. This approach treats sentence with high maximal importance as one that has high importance in the document. This approach employs two evidences (clustering algorithm and a binary tree) to exploit the diversity among the document sentences. A procedure for creating approximate structure for document sentences in the form of a binary tree, we build a binary tree for each cluster of document sentences,

where the document sentences are clustered using a clustering algorithm into a number of clusters. An objective of using the binary tree for diversity analysis is to optimize and minimize the text representation; this is achieved by selecting the most representative sentence of each sentences cluster. The redundant sentences are prevented from getting the chance to be candidate sentences for inclusion in the summary, serving as penalty for the most similar sentences. MMI is used to select one sentence from the binary tree of each sentence cluster to be included in the final summary. The sentences will be partitioned in to bigrams, trigram or Quadgrams. Summaries generated on taking bigram, trigram & Quadgram will be compared to find out most appropriate summary among all.

2. LITERATURE REVIEW

Summarization based on the diversity. The pioneer work for diversity based text summarization is MMR (maximal marginal relevance), it was introduced by Carbonell and Goldstein [2], MMR maximizes marginal the query and less similar to the already selected sentences.

MMR has been modified by many researchers [4; 10; 12; 13; 16; 21; 23]. Our modification for MMR formula is similar to Mori et al.'s modification [16] and Liu et al.'s modification [13] where the importance of the sentence and the sentence relevance are added to the MMR formulation. Ribeiro and Matos [19] proved that the summary generated by MMR method is closed to the human summary, motivating us to choose MMR and modify it by including some documents features. Here it employs two evidences (clustering algorithm and a binary tree) to exploit the diversity among the document sentences. Neto et al. [17] presented a procedure for creating approximate structure for document sentences in the form of a binary tree, build a binary tree for each cluster of document sentences, where the document sentences are clustered using a clustering algorithm into a number of clusters equal to the summary length. An objective of using the binary tree for diversity analysis is to optimize and minimize the text representation; this is achieved by selecting the most representative sentence of each sentences cluster. The redundant sentences are prevented from getting the chance to be candidate sentences for inclusion in the summary, serving as penalty for the most similar sentences. Employed idea is similar to Zhu et al.'s idea [25] in terms of improving the diversity where they used absorbing Markov chain walks.

3. METHODOLOGY

3.1 Sentence Features

The method makes use of eight different surface level features, these features are identified after the preprocessing of the original document is done, like removing stop words. The features are as follows.

Word sentence score (WSS)

It is calculated using the summation of terms weights (TF-ISF, calculated using eq. 1, [18]) of those terms synthesizing the sentence and occur in at least in a number of sentences equal to half of the summary length (LS) divided by highest term weights (TF-ISF) summation of a sentence in the document (HTFS) as shown in eq. 2, the idea of making the calculation of word sentence score under the condition of occurrence of its term in specific number of sentences is supported by excluding the unimportant terms.Term frequency-inverse sentence frequency (TF-ISF) [18]: Term frequency is very important feature; its first use dates back to fifties [14] and still used.

$$W_{ij}=tf_{ij} \times isf \qquad (1)$$

Where Wij is the term weight (TF-ISF) of the term tij in the sentence Si

$$WSS(S_i)= 0.1+\frac{\sum_{t_j \in S_i} W_{ij}}{HTFS} \quad | no.of\ sentences\ containing\ t_j >= \frac{1}{2}LS \qquad (2)$$

Where 0.1 is minimum score the sentence gets in the case its terms are not important

Key Word Feature

The top 10 words whose high TF-ISF (eq. 1) score are chosen as key words [8; 9]. Based on this feature, any sentence in the document is scored by the number of key words it contains, where the sentence receives 0.1 score for each key word.

Nfriend Feature

The nfriends feature measures the relevance degree between each pair of sentences by the number of sentences both are similar to that sentence. The friends of any sentence are selected based on the similarity degree and similarity threshold [3].

$$Nfriends(s_i, s_j) = \frac{s_i(friends) \cap s_j(friends)}{|s_i(friends) \cup s_j(friends)|} | i \neq j \quad (3)$$

Ngrams Feature

This feature determines the relevance degree between each pair of sentences based on the number of n-grams they share. The skipped bigrams [11] used for this feature.

$$Ngrams(s_i, s_j) = \frac{s_i(ngrams) \cap s_j(ngrams)}{|s_i(ngrams) \cup s_j(ngrams)|} | i \neq j \quad (4)$$

Similarity to the First Sentence(sim_fsd)

This feature is to score the sentence based on its similarity to the first sentence in the document, where in news article, the first sentence in the article is very important sentence [5]. The similarity is calculated using eq. 11.

Sentence Centrality(SC)

The sentence has broad coverage of the sentence set (document) will get high score. Sentence centrality widely used as a feature [3; 22]. We calculate the sentence centrality based on three factors: the similarity, the shared friends and the shared Ngrams between the sentence in hand and all other the document sentences, normalized by n-1, n is the number of sentences in the document.

$$SC(S_i) = \frac{\sum_{j=1}^{n-1} sim(S_i, S_j) + \sum_{j=1}^{n-1} nfriends(S_i, S_j) + \sum_{j=1}^{n-1} ngrams(S_i, S_j)}{n-1} | i \neq j \text{ and } sim(S_i, S_j) >= \theta \quad (5)$$

Where Sj is a document sentence except S i , n is the number of sentences in the document. θ is the similarity threshold which is determined empirically

The following features are for those sentences containing Ngrams [20] (consecutive terms) of title where n=1 in the case of the title contains only one term, n=2 otherwise:

Title-help sentence(THS)

The sentence containing n-gram terms of title.

$$TIIS(s_i) = \frac{s_i(ngrams) \cap T(ngrams)}{|s_i(ngrams) \cup T(ngrams)|} \quad (6)$$

Title-elp sentence relevance sentense(THSRS)

The sentence containing Ngram terms of any title-help sentence.

$$THSRS(s_j) = \frac{s_j(ngrams) \cap THS(s_i(ngrams))}{|s_j(ngrams) \cup THS(s_i(ngrams))|} \quad (7)$$

The sentence score based on THS and THSRS is calculated as average of those two features:

$$SS\_NG = \frac{THS(s_i) + THSRS(s_i)}{2} \quad (8)$$

The Sentence Importance (Impr) And Sentence Relevance(Rel)

The sentence importance is the main score in our methodology; it is calculated as linear combination of the document features.

$$IMPR(S_i) = avg(WSS(S_i) + SC(S_i) + SS\_NG(S_i) + sim\_fsd(S_i) + hwrd(S_i)) \quad (9)$$

Where WSS: word sentence score, SC: sentence centrality, SS_NG: average of THS and

THSRS features, Sim_fsd: the similarity of the sentence si with the first document sentence and kwrd (Si) is the key word feature.

The sentence relevance between two sentences is calculated in [13] based on degree of the semantic relevance between their concepts, but in our method the sentence relevance between two sentences is calculated based on the shared friends, the shared Ngrams and the similarity between those two sentences

$$Rel(s_i, s_j) = avg(nfriends(s_i, s_j) + ngrams(s_i, s_j) + sim(s_i, s_j)) \quad (10)$$

Sentences Clustering

The clustering process plays an important role; it is used for grouping the similar sentences each in one group. The clustering is employed as an evidence for finding the diversity among the sentences. The selection of clustering algorithm is more sensitive needing to experiment with more than one clustering algorithm. There are two famous categories of the clustering methods: partitioned clustering and hierarchical clustering. The difference between those two categories is that hierarchical clustering tries to build a tree-like nested structure partition of clustered data while partitional clustering requires receiving the number of clusters then separating the data into isolated groups [7]. In this method k-means clustering is used to generate the cluster.

Document-Sentence Tree Building(DST) Using K-Means Clustering AlgorithmUnits

The first stage for building the document-sentence tree is to cluster the document sentences into a number of clusters. The clustering is done using k-means clustering algorithm.

The initial centroids are selected as the following:

- Pick up one sentence which has higher number of similar sentences (sentence friends).
- Form a group for the picked up sentence and its friends, the maximum number of sentences in that group is equal to the total number of document sentences divided by the number of clusters.
- From the created group of sentences, the highest important sentence is selected as initial centroid.
- Remove the appearance of each sentence in the created group from the main group of document sentences.
- Repeat the same procedure until the number of initial centroids selected is equal to the number of clusters.

To calculate the sentence similarity between two sentences sij and s , we use TF-ISF and cosine similarity measure as in eq. 11 [3]

$$sim(s_i, s_j) = \frac{\sum_{w_i \in s_i, s_j} tf(w_i, s_i) tf(w_i, s_j) \left[1 - \frac{\log(sf(w_i)+1)}{\log(n+1)}\right]^2}{\sqrt{\sum_{w_i \in s_i} \left(tf(w_i, s_i)\left[1 - \frac{\log(sf(w_i)+1)}{\log(n+1)}\right]\right)^2} \times \sqrt{\sum_{w_i \in s_j} \left(tf(w_i, s_j)\left[1 - \frac{\log(sf(w_i)+1)}{\log(n+1)}\right]\right)^2}} \quad (11)$$

Where tf is term frequency of term wi in the sentence sij or s , sf is number of sentences containing the term wi in the document, n is number of sentences in the document.

Each sentences cluster is represented as one binary tree or more. The first sentence which is presented in the binary tree is that sentence with higher number of friends (higher number of similar sentences), then the sentences which are most similar to already presented sentence are selected and presented in the same binary tree. The sentences in the binary tree are ordered based on their scores. The score of the sentence in the binary tree building process is calculated based on the importance of the sentence and the number of its friends using eq. 12.

The goal of incorporating the importance of sentence and number of its friends together to calculate its score is to balance between the importance and the centrality (a number of high important friends).

$$Score_{BT}(s_i) = impr(s_i) + (1 - (1 - impr(s_i) \times friendsNo(s_i))) \quad (12)$$

Where ScoreBT (si)is the score of the i s sentence in the binary tree building process, impr (si) is importance of the sentence i s and friendsNo (si) is the number of sentence friends. Each level in the binary tree contains 2ln of the higher score sentences, where ln is the level number, ln=0, 1, 2, ….., n, the top level contains one sentence which is a sentence with highest score. In case, there are sentences remaining in the same cluster, a new binary tree is built for them by the same procedure.

Maximal Marginal Importance Calculation

Summary generation for this method depends on the extraction of the highest important sentences from the original text, we introduce a modified version of MMR, and we called it MMI (maximal marginal importance). MMR approach depends on the relevance of the document to the query, and it is for query based summary. In our modification we have tried to release this restriction by replacing the query relevance with sentence importance for presenting the MMI as generic summarization approach.

Most features used in this method are accumulated together to show the importance of the sentence, the reason for including the importance of the sentence in the method is to emphasize on the high information richness in the sentence as well as high information novelty. We use the tree for grouping the most similar sentences together in easy way, and we assume that the tree structure can take part in finding the diversity.

MMI is used to select one sentence from the binary tree of each sentence cluster to be included in the final summary. In the binary tree, a level penalty is imposed on each level of sentences which is 0.01 times the level number. The purpose of the level penalty is to reduce the noisy sentences score. The sentences which are in the lower levels are considered as noisy sentences because they are carrying low scores. Therefore the level penalty in the low levels is higher while it is low in the high levels. We assume that this kind of scoring will allow to the sentence with high importance and high centrality to get the chance to be a summary sentence, this idea is supported by the idea of PageRank used in Google [1] where the citation (link) graph of the web page or backlinks to that page is used to determine the rank of that page. The summary sentence is selected from the binary tree by traversing all levels and applying MMI on each level sentences.

$$MMI(S_i) = Arg \max_{S_i \in CS \setminus SS} \left[(Score_{BT}(S_i) - \beta(S_i)) - \max_{S_j \in SS} (Rel(S_i, S_j)) \right] \quad (13)$$

Where Re (Si ,Sj) is the relevance between the two competitive sentences, Si is the unselected sentence in the current binary tree, Sj is the already selected sentence, SS is the list of already selected sentences, CS is the competitive sentences of the current binary tree and β is the penalty level.

In MMR, the parameter λ is very important, it controls the similarity between already selected sentences and unselected sentences, and where setting it to incorrect value may cause creation of low quality summary. This method pays more attention for the redundancy removing by applying MMI in the binary tree structure. The binary tree is used for grouping the most similar sentences in one cluster, so we didn't use the parameter λ because we just select one sentence from each binary tree and leave the other sentences.

Implamentation steps

1. Select document to summarize
2. Preprocess the document (Remove stop words, blank spaces, diagrams, etc)
3. Partition the document into words(select bigram or trigram or Quadgram)
4. Calculate Term frequency, Inverse term frequency
5. Find top 10 keywords
6. Calculate all the features specified by the formulas
7. Apply K-means algorithm
8. Generate Document sentence tree
9. Generate Summary by taking Bigram, Trigram & Quadgram differently
10. Compare generated summaries with the summary generated by MS-Word Summarizer.
11. Find Maximum similarities between the summaries with reference summary (generated by online Summarizers)
12. Conclude most appropriate summary generated by taking bigram or trigram or Quadgram

4. RESLUTS AND DISCUSSION

The first consideration is how to evaluate the summary results. The common approach is to invite human experts for result justification. This approach, however, may suffer from the intrinsic expert bias and the limited manual processing ability of experts.

In contrast, we can employ summary similarity with original documents or with summary results from other summarization tools and judge summarization performance. If a summary is of good quality with the essence remaining and noises removed, it then represents a high-level data- cleansing result. In addition, this kind

of evaluation can be performed automatically in a large scale.

We therefore adopt the use of online summarizer tools to evaluate our method for creating a generic summary. We used different types of online summarizers listed below

- GREATSUMMARY
- SMMRY
- Free Summarizer
- Topic Marks
- AutoSummary Tool(Ms-Word summarizer)
- Text Compactor

to generate approximate 10 sentences summary of the given input text.

Generate summary by our method which will yield 3 different summaries by selecting Bi-Gram, Tri-Gram and Quad-Gram for partitioning. All these three generated summaries will be compared on the basis of similar sentences and keywords in the summaries generated by the online summarization tools. For every online summarization tool we generated one graph showing maximum similarity to the summary generated by our method.

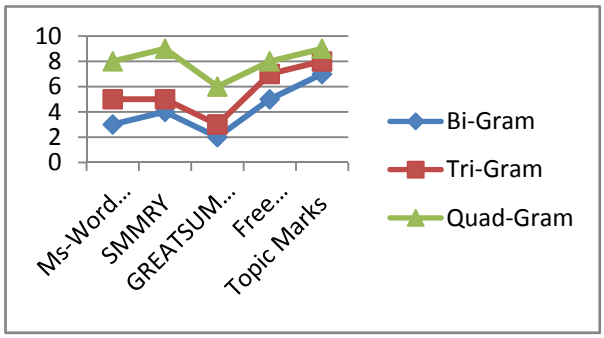

Fig. 1Result

Fig.1 shows result analysis, on Y-axis we have taken number of sentences and keywords matched with the summary generated by the respective summarizer tool and on X-axis we have taken different types of summarizer tools. The mapping shows that in every tool summary generated by partitioning on Quad-Gram gives good performance as compared to the other partitioning techniques.

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Towards Expert systems for Enhancing Quality of Service in Cloud Computing

Aadarsh Malviya, Vivek Kumar

Jagan Nath University , Jaipur

Abstract: Cloud Computing is a technology that has accelerated the use of resources, internet, storage, server, services and their accessing mechanisms. It has provided globalization of these resources which can be accessed without personally acquiring them. It has presented a flexible technology which has reduces the cost, time and provided scopes for future technologies. It is a superset of all the technology that encircles the application and makes it available for other users.

Keyword:

1. INTRODUCTION

Today we are standing in the ocean of Technologies where every latest technology becomes outdated just the next day. Cloud computing is a term which has globalized these technologies in an effort to reduce the cost per user. Cloud computing aims to tie all the applications and put it on the roof of the world which can be accessed as per demand. It is just as the buffet system of serving meals. One can serve himself according to his taste and satisfaction. One problem that arises in this system is congestion due to high load. We can arrange every single technology that we need. All we need is an application that can make appropriate use of these resources and develop an application which provides us the desired technology. Cloud Computing is a term that make use of all the technical resources such as internet, computers, servers, database and create a centralized ware house such that every user can utilize it without investing extra time and cost. It finds application mostly in business and allows an entrepreneur to extend his business.

When we hear of the term cloud we imagine a large mass above us in the sky ready to shower water on us. The point in this is that we can neither own a cloud nor the rain. Cloud consists of all the technologies and we keep this technology in a centralized architecture so that anyone can use it. Everyone can access it and take use of the resources. It is hard to create a cloud for an individual. It finds its vast application in a large business where you have hundreds of employees and a large application. It is just like buying a large umbrella which is covering the entire family.

Figure 1.1

2. NEED FOR CLOUD[1]:

Cloud computing is built for the world of tomorrow, where we each use many different kinds of computing devices: desktop, laptop, cell phone, or tablet. The intention is to make the functionality and data we need always accessible no matter where we are in the world, and no matter what we're using to access the Internet.

In addition, cloud computing is cheaper for businesses. If an online storage service is used, there's no

need to buy server hardware, for example, or to pay for staff to maintain hardware.

Of course, there are some downsides. Putting data into the cloud involves a lot of trust that the cloud provider will not let it leak out. Cloud providers are a little coy when discussing issues such as this. Additionally, cloud services tend still at a primitive stage compared to equivalents on a desktop computer--Google Docs is only a fraction as powerful as Microsoft Office, for example.

Cloud Computing is an abstraction of technology, resources and their location. The key issues in Cloud Computing is networking , servers , Large storage space , Uninterrupted Connections , hardware to implement the applications and software which can act as an interface between the user and the application. The well known technology "INTERNET" provides a large network which covers the entire system in this world. The most sensitive part in Cloud Computing is Security and Handling of high congestion.

Security comes into consideration in a space where we share data and application. Security of data can be tightened when we hide the location of the data that has to be shared and we can keep changing the location of this shared data. This even covers security issues as well. It is based on PAY as YOU use technique. As everyone knows using a technology should not move out of the pocket. Clouds Computing has brought this technique as live and still more areas are there which are yet to be covered.

Cloud Computing starts with the application running under the system architecture. Applications are designed for a particular task. In Cloud Computing we make cloud full of application of similar functions performing their own functions. Each application in the cloud serves a different functions and offer different products for business and individuals. Under this roof we have a large space to collect the data required. We can have several users and each user have their own data. We need to have a large space which is in connection with each application so that user can access any application and store the required information. The storage space is provided to store data which cannot be accessed publically. It needs an authentication and only the particular user or the owner of the data has the access to the data. The complete data base has a unique key which identifies the particular user. User when ever gets in connection with the application he tries to retrieve his previous accessed data. Database keeps the track of all such details. Every user has his data saved in the database. Then is the need of sharing his data with other users in the cloud .Cloud computing vigorously uses INTERNET as the connecting media. All the applications running under this roof are connected to Internet. Users make full use of this technology in sharing data among each other. Cloud computing make use of INTERNET to maintain database and connect users.

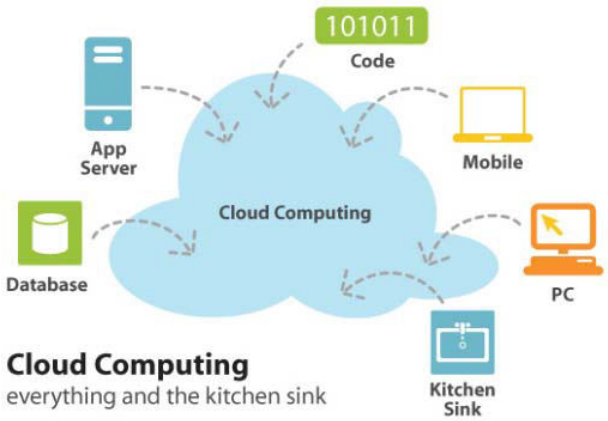

Figure 2.1

3. FEATURES OF THE CURRENT TECHNOLOGY RUNNING AS CLOUD COMPUTING [9] :

- It provides flexible, elastic and fast growing infrastructure.
- User need not to understand the complete technical details that is running under the application.
- It has high capability and can provide services to several users at the same instance.
- Provides space for each person which can be accessed personally.
- Provides security to the personal data.
- Gives an abstraction to the user of owning the complete structure.
- Highly scalable and self healing capacity.
- It allows the user to share personal data without worrying and compromising his security and privacy.
- It is independent of hardware.
- User has to pay only for the services he uses.
- Reduces accessing cost.

4. CHALLENGES IN QUALITY OF SERVICE [12]

Is cloud computing the savior of business? Is it a threat to data security? Does it signal the demise of the corporate IT function entirely? These are some of the questions executives are asking about the use of remote servers in the cloud, which enables organizations to access on-demand computing capacity, software and business functionality.

Cloud computing is a young phenomenon, and it is suffering through the growing pains typical of its age. It's also subject to many overblown claims in the marketplace, from ardent supporters and detractors alike. Although the upside of cloud computing is considerable, numerous challenges lie ahead—among them, safe-guarding data security and privacy, defining the contra-ctual relationship with providers, dealing with lock-in and exit strategies, and managing the cloud services.

New research from the London School of Economics and Accenture—based on surveys of more than 1,000 business and IT executives, as well as in-depth interviews with more than 35 service providers and other stakeholders—takes a rigorous, data-driven look at cloud computing trends and usage. It is telling that the IT executives interviewed were almost uniformly more cautious about realistic timeframes for cloud implementation than were the business executives, who are especially interested in agile and cost-effective IT solutions in the near term. This caution is rooted in several implementation challenges.

4.1 Challenge #1: Safeguarding data security

Our survey asked IT executives to identify the biggest risks in cloud computing. The top answer, named by two-thirds of respondents, was "data security and privacy." Potential adopters are concerned about the security of data outside the corporate firewall. A related issue has to do with offshore data housing, which can pose problems of legislative compliance when data crosses borders. In the short term, most companies can avoid these issues by using domestic cloud facilities.

The cloud carries some new risks, however—notably, as one of our interviewees put it, "People hack brands or hack applications regardless of what the infrastructure is underneath." Because a cloud provider hosts multiple clients, each can be affected by actions taken against any one of them, as in distributed denial-of-service attacks—server requests that inundate a provider from widely distributed computers. This is what happened, for example, in the wake of the WikiLeaks activities: when attacks came into the provider hosting WikiLeaks, all other clients were affected as well.

However, some of these risks are mitigated to a degree by new security applications such as encrypted file systems and data-loss prevention software. Cloud providers also have the ability to invest in more sophisticated security hardware and software, such as using analytics to examine unusual behavior across vast numbers of virtual servers. Beyond this, a provider's scale enables effective responses to large-scale server attacks through high levels of redundancy.

Concerned enterprises can also mitigate risk by employing hybrid clouds—a situation in which most servers are in the cloud, but key data is hosted internally—and by improving data governance.

4.3 Challenge #2: Managing the contractual relationship

Cloud computing contracts are a mix of outsourcing, software and leasing. Some observers have argued that contracting for cloud is simpler than traditional approaches to IT sourcing because only one contract is required instead of multiple agreements for software, hardware and systems integration. In reality, however, few software, platform or infrastructure providers meet all of a client's functional requirements, so contracting for cloud services typically involves ecosystems of providers that must be integrated to provide complete solutions.

Cloud contracts generally focus on service-level agreement (SLA) guarantees, but the network of interactions within the overall ecosystem increases the complexity of SLAs. Software-as-a-service providers, for example, often share a single platform for all users, and so they cannot provide each client with a differentiated SLA. At present, relatively low compensation is offered by providers for breaches of SLAs, but competition should improve this situation, as should the development of cloud standards.

Our research also found that cloud providers are currently not adequately focused on providing enterprise

contracting requirements. As one respondent told us, "The problem with cloud services today is that many of the service providers have not evolved to the point that they are comfortable being custodians of data." That is, many providers have historical roots in product development, not service provision, so they often do not adequately understand what it means to have service liability.

In response, companies should evaluate cloud SLAs in relation to their company's risk management profile and the ecosystem of cloud providers. When the offered SLAs are insufficient, companies can seek to exploit multiple cloud providers for the same service. In this way they can fashion their own guaranteed uptime by creating virtual points of presence at extremely low cost. Also, companies can engage a service integrator to perform management and contractual functions.

4.4 Challenge #3: Dealing with lock-in

Exit strategies and lock-in risks are key concerns for companies looking to exploit cloud computing. There is always a switching cost for any company receiving external services. However, cloud providers have a significant additional incentive to attempt to exploit lock-in. If computing were to become a very liquid commodity, and if switching to a lower-cost provider were too easy, margins would rapidly become razor thin.

When contracting for a cloud service, executives should be aware of two forms of lock-in. The first form, technology lock-in, concerns the cost of moving a business service from one cloud platform to another. Once a company is on a particular platform, it is often more cost-effective to purchase additional services compatible with existing ones—thus increasing lock-in. A second form, institutional lock-in, occurs when technologies become embedded within organizational routines and users' work practices. Particularly for users of software-as-a-service, such institutionalism can have a serious impact on the ability to switch cloud providers--which increases the severity of lock-in.

Providers are likely to focus on increasing lock-in as competition reduces margins. Competitors, however, will focus on reducing switching costs for dominant players. Specialist services and service integrators can help meet these challenges.

4.5 Challenge #4: Managing the cloud

Although many dramatic predictions are being made about the impact of cloud computing—among them, the claim that traditional IT departments will become obsolete—our research supports the conclusion that cloud impacts are likely to be more gradual and less linear. Nevertheless, the cloud does carry with it significant disruption to business as usual, leading to two particular management challenges.

First, once introduced into the enterprise, cloud services can be easily updated or changed by business users without the direct involvement of the IT department. And it is in the provider's interests to develop functionality that expands usage and spreads it across the organization. So maintaining overall, strategic control of services can be difficult. This independence of the business when it comes to IT services also means that IT must work harder to gain the ongoing attention of the C-suite and to extend its strategic role.

Second, organizations are still slow in developing management capabilities and principles for operating with cloud services. Such strategies should focus on the multiple contracts needed for a cloud ecosystem. Effective supervision of usage, SLAs, performance, robustness and business dependency is vital. Monitoring the external provider's services must be done, but internal cloud monitoring should also be introduced. Support provided by cloud providers can be variable, and organizations should develop their own support services, either internally or with third parties.

5. TOWARDS EXPERT SYSTEM [13]

Expert Systems are computer programs that are derived from a branch of computer science research called *Artificial Intelligence* (AI). AI's scientific goal is to understand intelligence by building computer programs that exhibit intelligent behavior. It is concerned with the concepts and methods of symbolic inference, or reasoning, by a computer, and how the knowledge used to make those inferences will be represented inside the machine.

Of course, the term *intelligence* covers many cognitive skills, including the ability to solve problems, learn, and understand language; AI addresses all of those. But most progress to date in AI has been made in the area

of problem solving -- concepts and methods for building programs that *reason* about problems rather than calculate a solution.

AI programs that achieve expert-level competence in solving problems in task areas by bringing to bear a body of knowledge about specific tasks are called *knowledge-based* or *expert systems*. Often, the term expert systems is reserved for programs whose knowledge base contains the knowledge used by human experts, in contrast to knowledge gathered from textbooks or non-experts. More often than not, the two terms, expert systems (ES) and knowledge-based systems (KBS), are used synonymously. Taken together, they represent the most widespread type of AI application. The area of human intellectual endeavor to be captured in an expert system is called the *task domain*. *Task* refers to some goal-oriented, problem-solving activity. *Domain* refers to the area within which the task is being performed. Typical tasks are diagnosis, planning, scheduling, configuration and design.

Building an expert system is known as *knowledge engineering* and its practitioners are called *knowledge engineers*. The knowledge engineer must make sure that the computer has all the knowledge needed to solve a problem. The knowledge engineer must choose one or more forms in which to represent the required knowledge as symbol patterns in the memory of the computer -- that is, he (or she) must choose a *knowledge representation*. He must also ensure that the computer can use the knowledge efficiently by selecting from a handful of *reasoning methods*. The practice of knowledge engineering is described later.

6. THE BUILDING BLOCKS OF EXPERT SYSTEMS

Every expert system consists of two principal parts: the knowledge base; and the reasoning, or inference, engine.

The *knowledge base* of expert systems contains both factual and heuristic knowledge. *Factual knowledge* is that knowledge of the task domain that is widely shared, typically found in textbooks or journals, and commonly agreed upon by those knowledgeable in the particular field.

Heuristic knowledge is the less rigorous, more experiential, more judgmental knowledge of performance. In contrast to factual knowledge, heuristic knowledge is rarely discussed, and is largely individualistic. It is the knowledge of good practice, good judgment, and plausible reasoning in the field. It is the knowledge that underlies the "art of good guessing."

Knowledge representation formalizes and organizes the knowledge. One widely used representation is the *production rule*, or simply *rule*. A rule consists of an IF part and a THEN part (also called a *condition* and an *action*). The IF part lists a set of conditions in some logical combination. The piece of knowledge represented by the production rule is relevant to the line of reasoning being developed if the IF part of the rule is satisfied; consequently, the THEN part can be concluded, or its problem-solving action taken. Expert systems whose knowledge is represented in rule form are called *rule-based systems*.

Another widely used representation, called the *unit* (also known as *frame*, *schema*, or *list structure*) is based upon a more passive view of knowledge. The unit is an assemblage of associated symbolic knowledge about an entity to be represented. Typically, a unit consists of a list of properties of the entity and associated values for those properties.

Since every task domain consists of many entities that stand in various relations, the properties can also be used to specify relations, and the values of these properties are the names of other units that are linked according to the relations. One unit can also represent knowledge that is a "special case" of another unit, or some units can be "parts of" another unit.

The *problem-solving model,* or *paradigm*, organizes and controls the steps taken to solve the problem. One common but powerful paradigm involves chaining of IF-THEN rules to form a line of reasoning. If the chaining starts from a set of conditions and moves toward some conclusion, the method is called *forward chaining*. If the conclusion is known (for example, a goal to be achieved) but the path to that conclusion is not known, then reasoning backwards is called for, and the method is *backward chaining*. These problem-solving methods are built into program modules called *inference engines* or *inference procedures* that manipulate and use knowledge in the knowledge base to form a line of reasoning.

The *knowledge base* an expert uses is what he learned at school, from colleagues, and from years of experience. Presumably the more experience he has, the larger his store of knowledge. Knowledge allows him to interpret the information in his databases to advantage in diagnosis, design, and analysis.

Though an expert system consists primarily of a knowledge base and an inference engine, a couple of other features are worth mentioning: reasoning with uncertainty, and explanation of the line of reasoning.

Knowledge is almost always incomplete and uncertain. To deal with uncertain knowledge, a rule may have associated with it a *confidence factor* or a weight. The set of methods for using uncertain knowledge in combination with uncertain data in the reasoning process is called *reasoning with uncertainty*. An important subclass of methods for reasoning with uncertainty is called "fuzzy logic," and the systems that use them are known as "fuzzy systems."

Because an expert system uses uncertain or heuristic knowledge (as we humans do) its credibility is often in question (as is the case with humans). When an answer to a problem is questionable, we tend to want to know the rationale. If the rationale seems plausible, we tend to believe the answer. So it is with expert systems. Most expert systems have the ability to answer questions of the form: "Why is the answer X?" Explanations can be generated by tracing the line of reasoning used by the inference engine (Feigenbaum, McCorduck et al. 1988).

The most important ingredient in any expert system is knowledge. The power of expert systems resides in the specific, high-quality knowledge they contain about task domains. AI researchers will continue to explore and add to the current repertoire of knowledge representation and reasoning methods. But in knowledge resides the power. Because of the importance of knowledge in expert systems and because the current knowledge acquisition method is slow and tedious, much of the future of expert systems depends on breaking the knowledge acquisition bottleneck and in codifying and representing a large knowledge infrastructure.

7. IMPLEMENTATION

As we have already seen the challenges in cloud computing .The only way to overcome all the challenges is to implement expert system in Cloud computing or in other words we can say that we need to develop an expert cloud .We aim to improve the quality of Service. . Here are the four techniques that we have implemented .

1. Fuzzy Computing.
2. Evolutionary computing
3. Neural Computing
4. Probalistic computing.

1. **Fuzzy Computing** : In the real world there exists much fuzzy knowledge , i.e., that is knowledge which is vague , imprecise, uncertain , ambiguous , inexact or probalistic in nature .Human can use such information because the human thinking and reasoning frequently involve fuzzy information, possible originating from inherently inexact human concepts and matching of similar rather than identical experiences .We need a technology which not only answers like humans but also describe their reality levels. These levels needs to be calculated using imprecision and the uncertainty of facts and rules that were applied.
2. **Evolutionary Computing** [4]: Evolutionary Computing refers to a group of problem solving techniques which are based on biological evolution such as natural section and genetic inheritance . These techniques are randomly applied to a variety of problems, ranging from practical applications in the industry and commerce to leading edge scientific research.
3. **Neural Computing** [5]: aims to design and artificial brain which can manipulate the problems as a human brain do. It is a term which is used to investigate how biological nervous systems accomplish the goals of machine intelligence but while using radically different strategies, architectures and hardware and to investigate how artificial neural systems are designed that try to emulate some of those biological principles in the hope of capturing some of their performance.
4. **Probalistic Computing** [6] : is Based on or adapted to a theory of probability. It refers to a model where there are multiple possible outcomes, each having varying degrees or certainty or uncertainty of it's occurrence. It is directly associated with randomness.

8. METHODOLOGY

The technique which we would like to implement is to **encapsulate techniques of Expert Systems**. When we have a look to the basic structure of Cloud Computing it looks like:

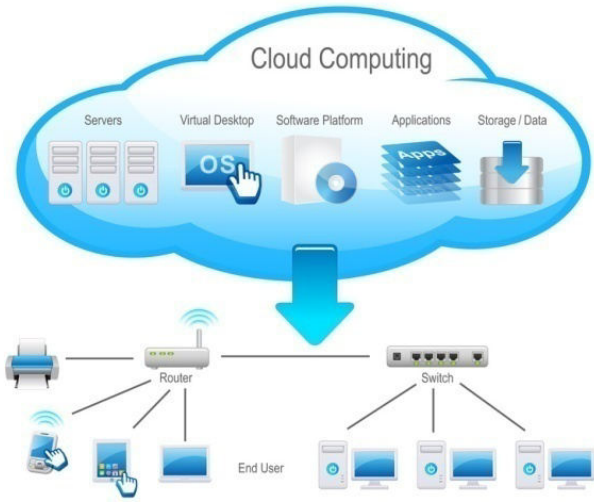

Figure 4.1

In this we find that we have all the applications in a single cloud which provides all sorts of services to the user.A user connects to the cloud using http (Hyper Text Transfer Protocol)[7][8].http is used to build the network using logical links between the nodes. The request of the user is sent as a http command and reaches the server in the cloud. It follows client server protocol. The user sends the request in the form of http , and the server response to the request. As the cloud receives the request it maps the request from the data base and gives access to the user. It is a predefined technique. For a standalone cloud, an entrepreneur needs to have a large database where he needs to have all the data accordingly.

4.2 Importance and Relevancy[10]

The technology now so called as latest is going to be outdated just the moment it's released. Before moving forward I would like to give a small introduction to what is technology. When we move around the technology, it is nothing without INTERNET. It is a string which ties the whole world. Computing is nothing without this network so called "Internet". Cloud Computing is often referred as as Internet Computing. There are various applications running in this world and no one would know it if there was no NETWORK. The technology that I am going to introduce to the world is surely is based on INTERNET. My small step is to implement the use of Expert Systems in Cloud computing. I would like to introduce a technology that can think of it"s own, can manage of it's own. If I request for something I would like the technology would work as if it were a human .I don't need any application I need a human .The research is still going on and will be moving further to get a technology which can work as a human. We can never have a human but can develop a brain which works as fast as the brain of human. My effort would be creating a brain which can work to think and manipulate the problems like a Friend which can fulfill all the demands of the consumer. I am here to implement the all four techniques of soft computing which can sort the problems of the whole world.

The first technology which is fuzzy computing. There are millions of brains and each brain thinks in a billion of ways .It's confused enough to make a choice. In human technology if a person thinks we call it "Sharpening of 'brain". But how can we sharpen the brain of a computer since we are the one whom have filled its database and also ordered the way to react. It can only work according to the command which has already been fed. Fuzzy technology is introduced to remove all the confusions and create a decision making technique .Research are still moving on and its vast area.

If we develop a brain, we would surely talk about neural network that can be used for connections between all the cells and communicate with each other and create a common thinking. Neural Computing deals with a technology in which brain cells and can communicate with each other. Neural computing is the technology that can think and implement and can even handle harsh situations .In an human being brain is the most important part that generates all sorts of feelings as happiness, harshness, lovable and so on and so forth, I have a question "Can there be a technology which can deliver feelings with expression. There is no limit to technology and my effort is to generate such a feeling full technology which works according to the situation.

We have seen many generations in this world and day by day every generation seems to be outdated to the next generations and the same follows with the current technology. But the generation only moves forward if we inherited the technology that has already been generated.

Yes, I am talking about the technology "Evolutionary Computing" which can inherit the computing which has already been introduce to the world and this can only happen if we teach the new generation about the technology that has been generated. Even if we don't tech here are many things which can be implemented that is so called born talent in Human beings. Evolutionary techniques cover all the parts which have already been introduced and give the world knowledge or a summary of the thing that has already been done.

When we talk about brains in computer we have to talk about chance as we know there is nothing fixed in this world .The brain of the user can request for anything and if there is a limitless demand we have to use the probability .The world of probabilistic computing is just to take a chance what would be the result. We have to take the consequences of all the outputs and define the technology accordingly.

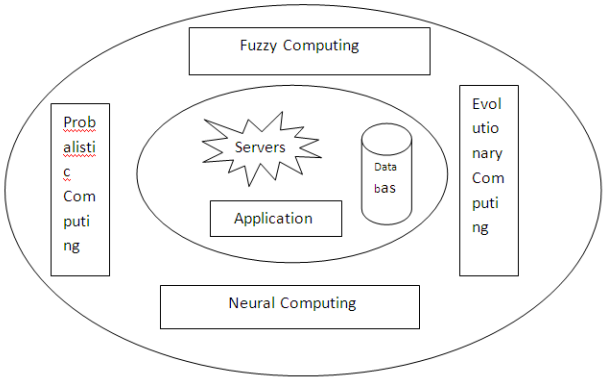

Figure 4.2

Our aim is to develop an intelligent Cloud which can work and can chose the services at its own without wasting time and extra cost. Often we have seen the user is not satisfied with the service and tries to switch from one server to the other and in every server he faces one or the other problems. There is no overall solution to the problem and user has to face the problem. This results in the loss of an Entrepreneur. We would work in sorting out this types of problems where are user need not to switch from one server to the other and can be given a proper choice .The other step which will be involved in this will be that there will be interconnections between the clouds so that the user of one server can access the application of other servers and would just pay for the thing that he used.We have limitless application running currently .The current demand is to develop a computing or intelligent cloud which is as equal as a human being. Implementation of soft computing in a cloud computing seems to be an easier task to think on but has a vast problems to work on. This opens new arms for research. I would be presenting an architecture which would implement in our work.

9. CONCLUSION: RESOLVING THE TENSIONS

Our interviews have exposed potential tensions between enterprise executives, who express the desire for command and control over business services, and IT executives, who must adopt new modes of operation when it comes to leveraging the power of the cloud. Other tensions exist as well: for example, if cloud suppliers are looking to commoditize their services, how will clients achieve the customized services they desire to support business agility and differentiation?

These tensions are not insoluble, but they do suggest that providers and clients alike must consciously address a suite of cloud challenges in the planning, contracting and management of services.

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Modelling and Simulation of 6-pulse Static Synchronous Compensator for Voltage Stabilty in Power System.

Anju Gupta[1], Rajesh Ahuja[2], Muddassir Nabi[3]

Department of Electrical Engineering, YMCA University of Science and Technology Faridabad, India.
anjugupta112@gmail.com[1], rajeshkrahuja@gmail.com[2],eng40805@gmail.com[3]

***Abstract*:** This paper presents the use of a 6-pulse Gate Turn Off (GTO) model of voltage source converter Static Synchronous Compensator (STATCOM) for reactive power compensation and voltage stabilization on electric network. The device is connected in shunt with the power system bus and is controlled by a controller. The complete simulation of the STATCOM within a power system is performed in the MATLAB/Simulink environment using the Power System Blockset (PSB). The STATCOM Scheme and the electric grid network are modeled by specific electric blocks from the power system blockset The control system is based on Synchronous Reference Frame theory The performance of the selected ±100 Mvar STATCOM scheme connected to the 500-kV grid is evaluated. The operation of the STATCOM is validated in both the capacitive and inductive modes of operation. Reactive power compensation and voltage regulation is validated for load and system excursions.

Keywords: *6-pulse STATCOM, voltage stabilization,reactive compensation, Synchronous Referece Frame (SRF).*

1. INTRODUCTION

The advent of FACT [1] devices e.g. STATCOM[2] ,SSSC, UPFC etc is giving rise to a new family of power electronic equipment for controlling and optimizing the dynamic performance of power system. In the last two decades the commercial availability of GTO [3] devices with higher power handling capability, have led to development of new controllable reactive power sources utilizing electronic switching of voltage source converter(VSC)[4]. The GTO switching devices enable the design of power electronic converters that can either be connected in parallel e.g. STATCOM (Static Synchronous Compensator) or in series e.g. SSSC with the power grids. STATCOM is one such power electronic converter which has characteristics similar to synchronous machine but without sluggish mechanical inertia and is used for compensation in both distribution and transmission lines.

2. STATCOM PRINCIPLE

STATCOM is a controlled reactive power source. It provides the desired reactive power generation and absorption entirely by means of electronic processing of voltage and current waveforms in a voltage source converter. A single line STATCOM is shown in Fig 1, where a voltage source converter is connected to bus through a reactance. Here STATCOM is seen as an adjustable voltage source behind a reactance. The exchange of reactive power between the converter and AC system can be controlled by varying amplitude of 3-phase output voltage 'Es' of the converter Fig 2.

If the amplitude of the output voltage of converter is increased above utility bus voltage 'Et', then a current flow through reactance from converter to AC system and voltage source converter generates capacitive reactive power for the AC system. If output voltage of converter is decreased below the utility bus voltage then current flows from AC system to the converter and converter absorbs inductive reactive power from AC system. If the converter output voltage equals the AC system voltage the reactive power exchange becomes zero, in that case STATCOM is said to be in floating state. In steady state operation and due to converter voltage losses the bus voltage always leads the converter voltage by a very small angle to supply the small active power losses.

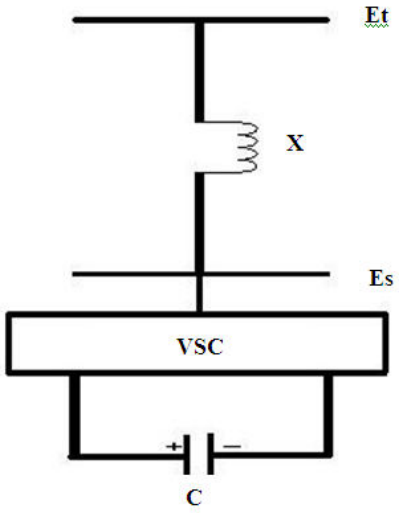

Fig 1: STATCOM Power Circuit

The reactive power supplied by STATCOM is given by

$$Q = \frac{(Es - Et)}{X}.Et$$

where,

Q is the reactive power in VAR's.

Es is the magnitude of STATCOM side voltage.

Et is magnitude of utility side voltage.

X is equivalent impedance between STATCOM and AC system.

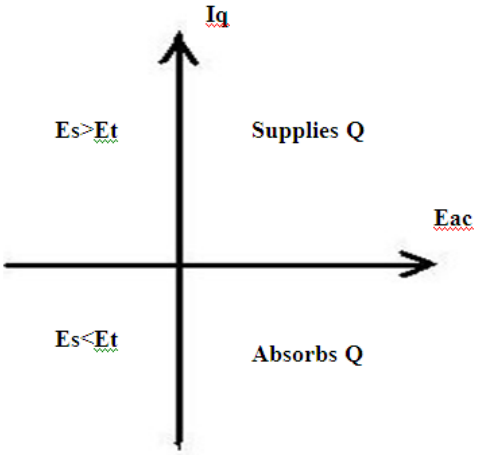

Fig 2: Power Exchange Between STATCOM and AC System

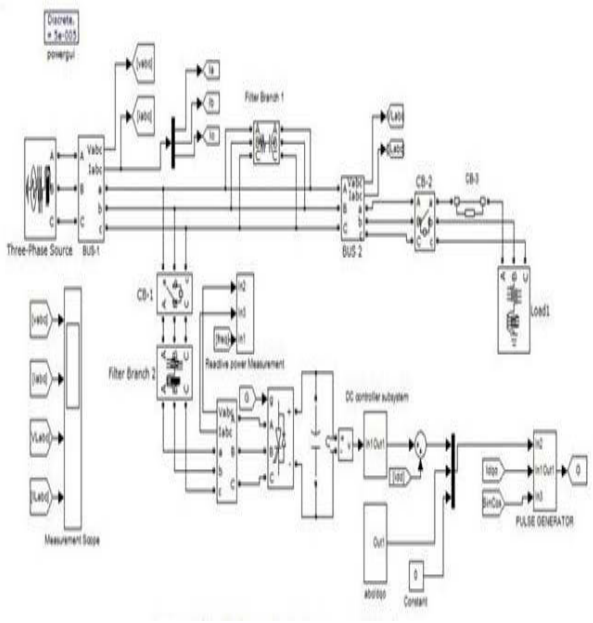

Fig 3: Simulink Model Of Proposed System

3. SIMULINK MODEL

A 6-pulse digital simulation full model of the STATCOM within a power system is presented in this paper. The digital simulation is performed using the MATLAB/Simulink software environment and the Power System Blockset (PSB). The basic building block of the STATCOM is the 6-pulse converter cascade implemented by using Matlab/Simulink. The control process is based on Split Synchronous Rotating Frame strategy. The operation of the STATCOM model is studied in both capacitive and inductive modes in a power transmission system and with one line open circuited.

3.1 Model Description

Modeling the STATCOM including the power network and its controller is done using Matlab/Simulink. It requires electric blocks from the power system and control blocks from the Simulink power blockset library. A ±100 Mvar STATCOM [5] device is connected to the 500-kV (L-L) transmission network. Figure 3 shows the MATLAB model of the studied system. The voltage source is represented by a 500 kV with 10000 MVA short circuit capacity and X/R = 11 followed by a bus B1 connected to bus b2 through transmission line.STATCOM is connected at the midpoint between bus B1 and B2 The system parameters used are given in

Appendix. The STATCOM device consists mainly of the 6-pulse voltage source converter connected to the host grid network through a reactance. The dc link voltage is provided by the capacitor C which is charged from the AC host network. The proposed control scheme ensures the dynamic regulation of the bus voltage and the dc link voltage.

A control scheme based on SRF[6] is implemented using the DC capacitor voltage. The dc side capacitor voltage is chosen based on the change in the capacitor voltage. A PI controller with gains Kp= 0.001 and Ki = 0.0001 is used for generating reference current Id_{ref} which along with Iq_{ref} from PLL is used to generate the gating pulses for the VSC bridge as shown in figure 4.

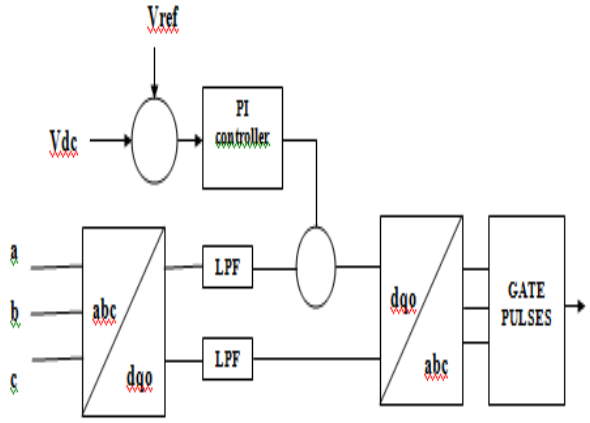

Fig 4: Proposed Current Control System

4. SIMULATION RESULTS

The sample study radial power system is subjected to load switching at bus B2. At starting, the source voltage is such that the STATCOM is inactive. It doesn't absorb nor provide reactive power to the network. The network voltage, Et, is 1 pu and only inductive load with P=1 pu and Q=0.8 pu at rated voltage is connected at load bus B2 and the transmitted real and reactive power are PL=1.25 pu and QL=1 pu. The simulation is carried out by using the MATLAB/Simulink and power system blockset and the digital simulation results is given as shown in Figure 5. The following excursion sequence is tested:

STEP 1: Due to load switching at bus B2 at 0.1 the bus B2 voltage falls from 1 pu to 0.92 pu.At t = 0.1 sec, the static synchronous compensator STATCOM is switched and connected to the power system network by switching on the circuit breaker CB1. as shown in Figure (6). The STATCOM voltage Es lags the transmission line voltage Et by a small angle and therefore the dc capacitor voltage increases. The STATCOM is now operating in the capacitive mode and injects about 0.012 pu of reactive power into the AC power system, as shown in Figure (5). The B2 bus voltage is increased to 0.98 pu as shown in Figure (7).

STEP 2: Now at time t = 0.1 Sec, a capacitive load 2 with P=1 pu , Qc=0.8 pu at rated voltage is now added to the power system.At bus B2.due to addition of a capacitive load the voltage at bus B2 increases to 1.07 pu and also it causes unbalance is the source voltage and current waveforms due to increased harmonics as shown in figure (8). At time t=0.1 sec STATCOM is switched ON. Since the capacitive load has a compensative effect so the STATCOM absorbs reactive power of 0.02 pu from the AC system and also balances the three phase voltages and currents as shown in figure (10).The regulated bus voltage is 1.05 pu as shown in figure (9).

STEP 3: At time t=0.05 sec system is subjected to an unbalanced inductive load with P=1 pu and Q= 0.8 pu by switching off one of the lines on the load side using circuit breaker CB3. Without STATCOM the source is not able to deliver balanced currents as shown in figure (11). After switching STATCOM at t=0.05 sec the STATCOM is able to force the source to deliver the balanced currents by compensating reactive power as shown in figure (12) and reducing the harmonics by a large margin.

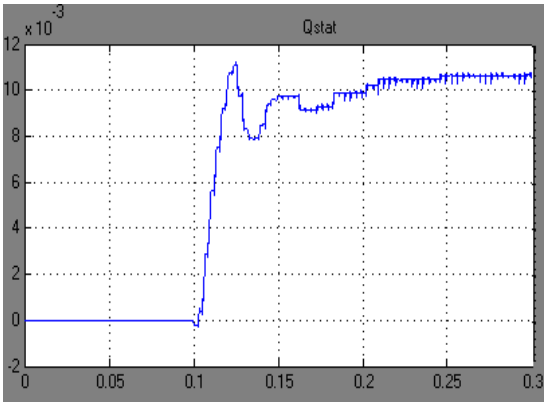

Fig 5: Reactive power supply from STATCOM for inductive load.

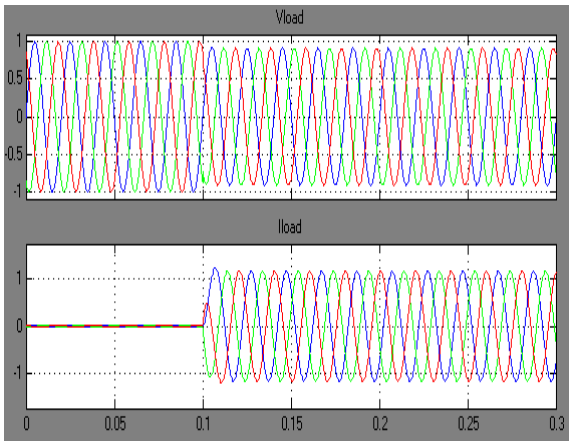

Fig 6: Load voltage and current for inductive without STATCOM

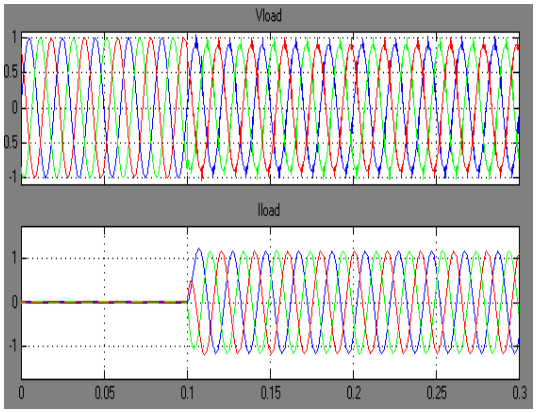

Fig 7: Load voltage and current for inductive load with STATCOM

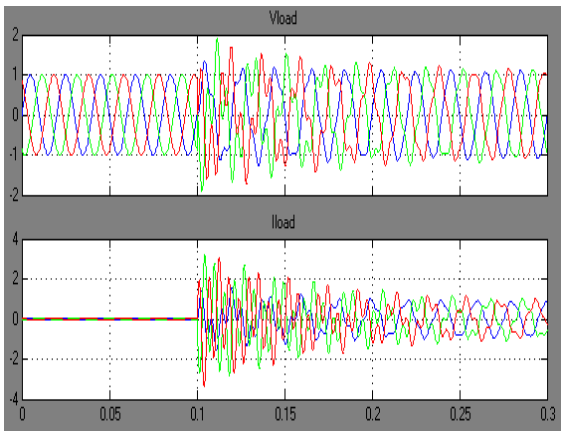

Fig 8: Load voltage and current without STATCOM for capacitive load

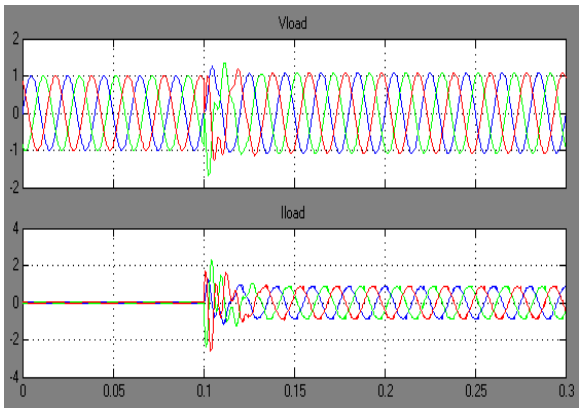

Fig 9: Load voltage and current with STATCOM for capacitive load.

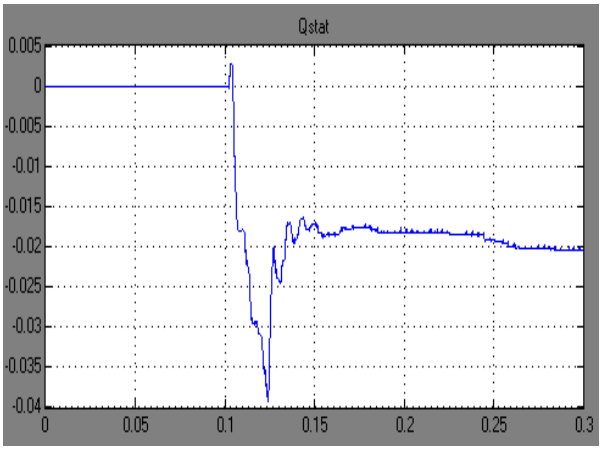

Fig 10: Reactive power Absorbed by STATCOM for Capacitive load.

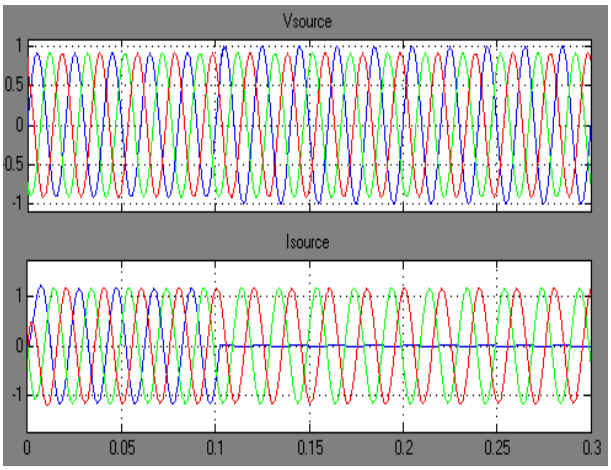

Fig 11: Source voltage and current with unbalanced load.

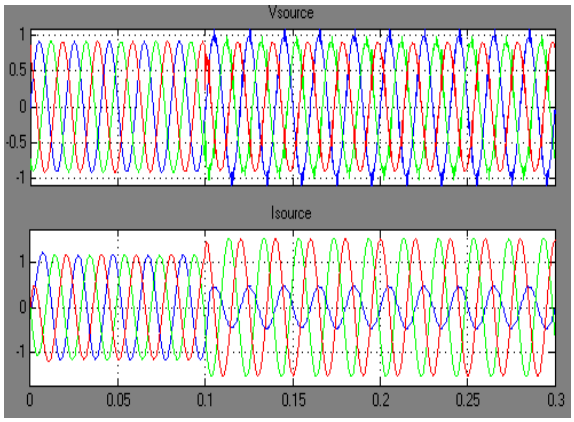

Fig 12: Source voltage and current with unbalanced load with STATCOM

5. CONCLUSION

This paper presented 6-pulse STATCOM and its use for reactive power compensation and voltage regulation. A MATLAB/Simulink based ±100 MVAR STATCOM has been developed and connected to the 500 kV AC grid network in order to provide the required reactive power compensation. The control process has been developed based on Synchronous Rotating Frame Theory. The operation of STATCOM is simulated for both inductive and capacitive loads in the sample power transmission system. The simulation results have demonstrated the effective reactive power compensation of 6-pulse STATCOM when subjected to different loads.

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APPENDIX

TABLE-1	
Three Phase AC Source	
Rated voltage	500 [KV]
Frequerncy	50 [Hz]
SC Level	10000 [MVA]
Base Voltage	500 [KV]
X/R	11
Three Phase Loads	
Load 1	
Active Power (P)	1000 [MW]
Reactive Power (QL)	800 [MVAR]
Load 2	
Active Power (P)	1000 [MW]
Reactive Power (Qc)	800 [MVAR]
STATCOM	
Nominal power	100 [MVAR]
Frequency	50 [Hz]
Equivalent Capacitance	7500 [μF]
GTO Switches	
Snubber resistance	1e5 [ohms]
Snubber Capacitance	inf
No. of bridge arms	3

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Optimum Design & Analysis of Arc Welding Machine with Hardware Implementation.

[1]Mohd. Bashir, [2]HS Dalvi

[1]IV sem M.Tech student, G.H.Raisoni College of Engg., Nagpur,Maharashtra,India;
[2]Assistant Professor, G.H.Raisoni College of Engg., Nagpur,Maharashtra,India.
bashir.sheaikh@gmail.com; hsdalvi123@yahoo.com

***Abstract*:** Design of Multi-functioning welding transformer, this concept is completely different from the ordinary conventional machine which is available in the local market. In this concept the welding transformer has two welding holders so that more than one person can work at a same time. The optimum design and material used in this machine makes it highly efficient. This transformer has better efficiency compared with conventional machine that is for double holder welding machine efficiency is 94.57 percent and single holder welding machine efficiency is 93.77 percent. The unique function of this welding machine is charge the battery bank same time of welding. A power supply used for welding that provides an electric current to perform arc welding. Arc Welding usually requires high current more than 80 ampere, Low current can also be used.

Keyword:

1. INTRODUCTION

Arc Welding Machine is ideal slightly different from the ordinary conventional machine that available in the local market. It has two welding holders so that more than one person can work at a same time , optimum design and combination of winding material used in this arc welding machine make it highly efficient. The joining of metal parts by fusion, in which the necessary heat is produced by means of an electric arc with the help of filler material sometimes accompanied by the use of a filler metal and without filler material called spot welding. [1] A CRGO (cold rolled grain oriented) core with proper or standard design are used to get a better efficient machine. There are different types of metal are present with different thickness, to joint thinner metal sheet, arc welding requires less current so, choke coil are used here for the current variation, from the choke coil tapping are provided and wide range of current i.e. 150 to 350 Amp are kept in provision. As well as, making this arc welding machine completely naturally air cooled, so this machine can use for continuous operation. This arc welding machine is designed in such a manner that it gives low no load current to save the electricity. After this, design such a way to make this machine more flexible, compact and advance. By new concept used in this machine is a rectifier and back-up charger, by installing the new designed charging winding on same core and making the tapings for different output connection to make more flexible, air cooled and compact. The main objectives of the this paper is to improve efficiency margin, designing of machine which performed multi-tasks for multi user.

2. ARC WELDING PROCESS

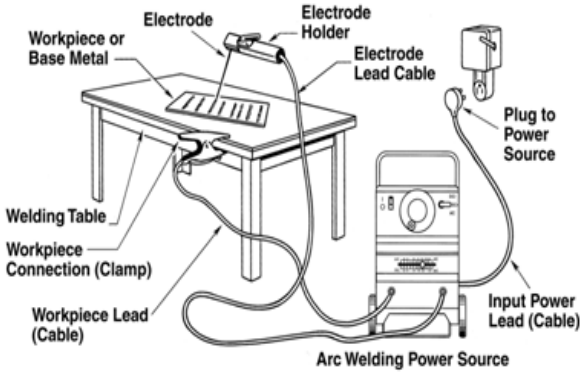

Fig. 1. Working of Arc welding machine

Welding is a fabrication or sculptural process which joins metals, by causing coalescence. This is often done by melting the work metal pieces and adding a filler material to form a layer of molten material that cools to become a strong joint, for this function. Conventional welding machine uses materials for joining process which produces coalescence of the materials by heating them from the welding arc temperature.[2] It may be with or without application of pressure and with or without metal fillers. All metal may be joint by one welding process or another some metals are weld easily some are difficult to weld. Easily weld able metal can be welded in thicknesses from the very thinnest or heaviest and the metal which is difficult to weld requires special techniques, and procedure which is used for specific application. Some metals never are joint or welded like mercury. To developed arc requires high current low voltage. Arc welding transformer takes the power from line and converts into the high current and low voltage. The high current flows through the electrode holder with the help of cable the power then flows through the electrode and the through the metal work piece get back to the machine by ground cable as shown in Fig.1

3. POWER SUPPLY FOR ARC WELDING

To supply the electrical energy to the arc welding machine processes, there are number of different power supplies are available which can be used. Generally most common arc welding power supplies are constant *voltage* power supplies and constant *current* power supplies. In metal arc welding, the voltage is directly related to the length of the arc, and the amount of heat input is related to the output current. In this design we are taking the const voltage power supplies because of some advantages. There are five common power supplier generally used. [3]

- Transformer work on AC only.
- Rectifier work on DC only.
- Transformer or rectifier works on AC or DC.
- Generator work on DC and or AC.
- Inverter works on AC and DC.

Out of above five common power supplier, design of this machine based on transformer which works on ac only [4].

4. DESIGNING OF ARC WELDING TRANSFORMER

4.1 Fixed parameter before designing for selecting an Arc Welding Power Supply.[5]-[6]

- Maximum Amperage: Thickness of metal which requires the different current rating which determines the output power generally 190-300 ampere is required. Metal can be welded in thicknesses from the very thinnest or heaviest.
- Duty cycle: Definition of duty cycle is the amount of continuous arc welding time a power supply can be used is determined by the duty cycle of the arc welding power supply. Duty cycle may be up to 100%, but generally is less. Duty cycle is based on a 10 minute interval. Many power supplies have a sloping duty cycle.
- Amperage range: There should be a wide current range for flexibility
- Amperage adjustment mechanism: There are two mechanisms electric and mechanical.
- Input power requirements: There are different power machine are available 1, 2 & 3 phases.
- Initial cost and operating cost: As arc welding machine is required the filler material and initial cost includes core and cupper.
- Size and portability: It should be compact and portable.
- Safety: Safety required because it is dangerous, it covers the human risk.
- Future needs for a power supply
- Available skills
- Manufacturer's support
- Open circuit voltage: open circuit voltage should be moderate because length of arc is depending on voltage level.

By considering all the parameter, first decide output so we select different current output from both winding. Then design charging winding after the completion of the arc welding winding. We designed for three phase so the voltage and current will be [4].

Table I: Fixed value of voltage and current for design

Symbol	Quantity	Description
V_1	440v	Primary voltage
V_2	60v	Secondary voltage for first holder
V_3	50v	Secondary voltage for second holder.
I_1	5A	Primary current
I_2	350A	Secondary current for first holder.
I_3	250A	Secondary current for second holder

V= voltage, A= ampere

4.2 Calculated KVA rating

For first holder

$Q = \frac{secondary\ voltage * seceondary\ current}{1000}$ (1) $Q = \frac{55*350}{1000} = 19.25\ KVA$

For second holder

$$Q = \frac{55*250}{1000} = 13.75\ KVA$$ (2)

Output equation

$V_t = 3*4.44*\Phi_m f AT*10^{-3}$ (3)

$\Phi_m = B_m A$

Where, Φ_m to be assumed 1.1 to 1.35 and A_i is 0.1538

B_m is 1.1.

Therefore

$\Phi_m = 1.1*0.1538 = 0.1692$ (4)

Now, $A_t = \frac{K_w * A_w}{4}$ (5)

Window space factor is $K_w = \frac{8}{30+KV}$ (6)

Where, $A_W = 0.025\ m^2$

For first holder K_w is 0.1624 and for second holder K_w is 0.1624 therefore, total K_w is 0.1828

So output equation gives volt per turn [7].

$V_t = 3*4.44*\Phi_m f AT*10^{-3} = 0.260$ V (7)

$primary\ turn = \frac{V_p}{Et}$ (8)

Therefore primary turn 420 for first holder,

$secondary\ turn = \frac{V_s}{Et}$ (9)

Where, secondary turns 42 for second holder

Standard wire of gauge used is 10 SWG so in mm conversion is made by the standard conversion table 10 SWG in 3.25 mm is used. For secondary winding 3.25*7 no of conductor 22.75 mm is used. For primary winding 420 turns of 10 SWG in 3.25 mm is taken.

Net core area is $3.629*10^{-3}$

Window area A_w is $0.025 m^2$

Current density of cupper conductor $\Delta_c = \frac{I}{A}$ given by this equation is $6*10^6 A/m^2$. [8]

Table II. Standard wire gauge to metric conversion chart

Gauge	*Mm*	*Standardized metric material*
4 SWG	5.89	6.00
6 SWG	4.88	5.00
8 SWG	4.06	4.00
10 SWG	3.25	3.00
12 SWG	2.64	2.50
14 SWG	2.03	2.00
16 SWG	1.63	1.5
18 SWG	1.22	1.20
20 SWG	0.914	0.80
22 SWG	0.711	0.60

4.3 Designed of core and chock

Following are the designed parameter,

- Overall height 45.72 cm.
- Overall width 40.38 cm.
- Left and right limb 7.62*8.89 cm each
- Central limb 8.89*9.90 cm.
- Gap between two limbs 8.12 cm.
- Limb height 30.98 cm.

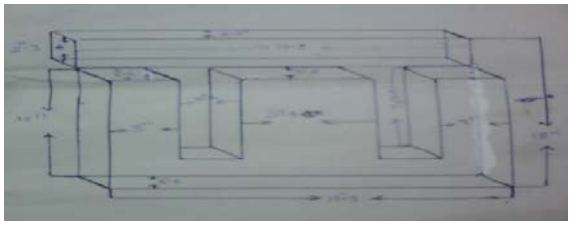

Fig.2.Design of Core.

Designed of choke core

- Overall height of core 3.9 inch choke designing
- Overall width of core 13.2 inch

- Choke winding turns is 42 (SWG 10*7 aluminum conductor)

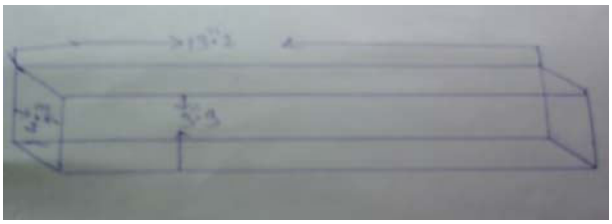

Fig. 3. Dimension of choke core

4.4 Arc welding winding and charging winding design

- Primary turns 210 plus 210 total 420 turns SWG 10 no DCC Aluminum.
- Copper Secondary turns 21 and 21 total 42 SWG 10*7 copper conductor.
- Aluminum secondary turns 18 &18 so total 36 turns SWG 10*7 Aluminum conductor.
- Charging winding 5, 5 and 5*10 SWG for 12 volt and 15 ampere with rectifier diode.
- Diode full wave Bridge rectifier is used to convert the AC power to DC.

5. RESULT AND HARDWARE IMPLEMENTION

- After designing the core by considering all above value Fig. 4 shows actual fabricated core,

Fig.4. Assembled Core

- Fig. 5 shows fabricated core coil after design by considering calculated value,

Fig .5. Assembled core coil

- Chock core is fabricated using calculated value which is shown in Fig.6.

Fig.6. Fabricated choke core

By using calculated parameter for design of arc wielding machine , it is fabricated and it was tested for different condition then tested result is compare with conventional machine so it found that this arc wielding machine is better which has number of advantages these are Double holder machine, a better and quicker job with less spatter, Simple operation, good arc striking proportion with higher efficiency, no breakdown, high efficiency, Power saving , Minimum maintenance , low running cost, heavy duty, light and most flexible in operation.[9]

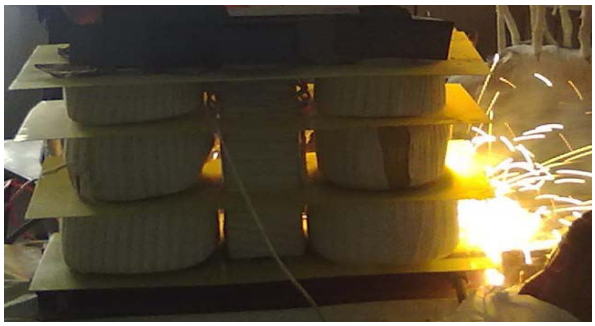

Fig.7. Fabricated model of arc welding machine

After comparing this arc wielding machine with conventional machine following result found,

- Use of CRGO core makes it highly efficient than ordinary machine. Ordinary machine generally used HRO core.
- “No load” current is less compare to ordinary machine. 4.55 A whereas same rating conventional machine takes 6 to 7 A
- It is a natural air cooled machine where as ordinary machine have either oil cooled or force cooled.
- Mixed winding of copper and aluminum is used where as in ordinary machine either purely copper or aluminum is used.

- It is a heavy duty machine, in which it can be used for 24 hours.
- It is compact and portable, with less loss.

6. CONCLUSION

This paper represents a detailed study of arc welding machine with backup/ automobile battery charger. Parameter is calculated and arc welding machine designed. After designed it is fabricated for higher efficiency and better performance. The result of such design proved that this machine has higher performance and better cooling, low maintained and higher efficiency than conventional machine. It is expected that modern arc welding machine will replace the conventional machine in many industrial application.

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Mr.Mohd.. Bashir was born in 1995 in india. He received BE (Electronics and Power) from G.H Raisoni college of engineering, Nagpur, Maharashtra, India after graduation he worked as a lecturer in PIET engg collage,Nagpur in 2011, Md Mohd Bashir has presented / published paper in international conference and international journal, his area of interest including machine and transformer.

Mr H.S Dalvi was born in 1974 in India. He received BE (Electronics & Power) from Y.C.C.E college , Amravati, Maharashtra, India after graduation he received M Tech from Govt. College of Engineering , Amravati, Maharashtra, India, Presently he is working as Assistant Professor in G.H. Raisoni College of Engineering, Nagpur, Maharashtra, India., His area of interest includes Non –Conventional Energy system particularly wind energy.

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Performance Improvement of LDA and PCA Algorithms for Image Recognition

Avneet Kaur[1], Lakhwinder Kaur[2] Savita Gupta[3]

[1,2]Department of Computer Engineering, University College of Engineering (UCOE), Punjabi University, Patiala, Punjab (India), [3]Department of Computer Engineering, University Institute of Technology (UIET), Panjab University, Chandigarh (India)
[2]mahal2k8@yahoo.com[1]avneet_lehal@yahoo.co.in, [3]savita2k8@yahoo.com

Abstract: The goal of this paper is to analyse as well as to improve the performance of two leading image recognition methods; Principal Component Analysis (PCA) and Subspace Linear Discriminant Analysis (LDA) including an assessment of their suitability for applications in real-time environment. Discrete Wavelet Transform is used for pre-processing to reduce the image dimensionality and to handle bad illumination. The main novelty of the method is no need to store multiple copies of same image at different orientations. To increase the recognition accuracy, the proposed algorithm compares the input test image against stored images with and without rotations in the horizontal, vertical, diagonal, reverse diagonal and flipped directions. Experiments indicate that recognition performance of subspace LDA and PCA is improved with rotations and discrete wavelet transform. It was also concluded that subspace LDA with DWT yields better performance as compared to LDA, PCA and PCA with DWT.

Keywords: *Image Recognition, Principal Component Analysis, Subspace Linear Discriminant Analysis, Discrete Wavelet Transforms*

1. INTRODUCTION

The success of any image recognition method depends heavily on the particular choice of features used by the classifier. A good feature extractor is claimed to select features which are not sensitive to arbitrary environmental variations such as orientation and illumination [1]. Image recognition systems can operate in well-controlled or uncontrolled environments. Image Recognition in well-controlled environments, where the imaging conditions of the trainee as well as the probe images are fixed, is relatively mature field of research [2]. Research in uncontrolled environments is much less mature and the results from well-controlled environments cannot be assumed to hold in uncontrolled environments. Recognition in controlled environments can be time and cost intensive and can be impractical to use in real world use [2]. As part of this research, main emphasis is on the assessment of suitability of image recognition systems in uncontrolled environment and their ability to use in real-world. A wide variety of recognition methods for image recognition (fig. 1), especially for face image recognition are reported in the literature [3]. In this survey various methods for image recognition are categorized as Holistic methods [4-6], Feature-based methods [7-9], Hybrid methods [10]. Holistic methods use the whole face region as the raw input to a recognition system [3]. One of the most widely used representations of the face region is eigenfaces, which are based on principal component analysis and use a nearest neighbour classifier [4]. Fisherfaces which use linear/Fisher discriminant analysis (FLD/LDA) for best discriminating the face images of same class [5-6]. In Feature-based (structural) matching methods, local features such as the eyes, nose and mouth are first extracted and their locations and local statistics (geometric and/or appearance) are fed into a structural classifier [3]. Earlier methods belong to the category of structural matching methods, use the distances and angles between eye corners, mouth extreme, nostrils, and chin top [7]. Hidden Markov Model (HMM) based methods use strips of pixels that cover the forehead, eye, nose, mouth, and

chin [8]. The Elastic Bunch Graph Matching (EBGM) algorithm stores spectral information about the neighbourhoods of facial features by convolving these areas with Gabor wavelets (masks) [9]. The Hybrid methods, just as the human perception system uses both local features and the whole face region to recognize a face. One can argue that these methods could potentially offer the better of the two types of methods [3].

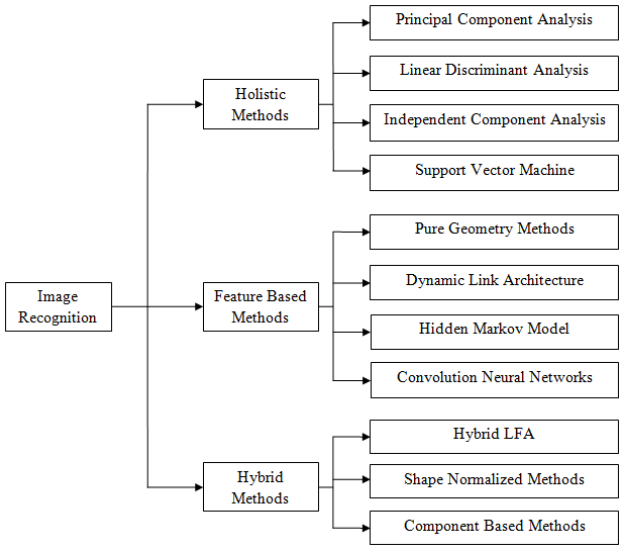

Fig. 1: Different techniques of Image Recognition [3]

One of the methods of this category is based on recent advances in component-based detection/recognition and 3D morphable models. The basic idea of component-based methods is to decompose a face into a set of facial components such as mouth and eyes that are interconnected by a flexible geometrical model. The 3D morphable face model is applied to generate arbitrary synthetic images under varying pose and illumination. Only three face images (frontal, semi-profile, profile) of a person are needed to compute the 3D face model [10]. The techniques used in this paper are based on holistic approaches.

The paper is organized as follows. In next Section, we have discussed the DWT which is used as pre-processing step for the Feature Extraction algorithms. Section 3 includes the discussions about Feature Extraction algorithms and classifier used for recognition. In Section 4, we have discussed the database used for the experimental purposes and experimental results. Finally, Section 5 contains conclusions drawn from the experimental results.

2. DISCRETE WAVELET TRANSFORM (DWT)

The wavelet transform concentrates the energy of the image signals into a small number of wavelet coefficients. It has good time-frequency localization property [11]. The fundamental idea behind wavelets is to analyse signal according to scale. It was developed as an alternative to the short time Fourier to overcome problems related to its frequency and time resolution properties [12] [27]. Wavelet transform decomposes a signal into a set of basic functions. These basic functions are obtained from a mother wavelet by translation and dilation [26].

$$\Psi_{a,b}(t) = \frac{1}{\sqrt{a}} \Psi\left(\frac{t-b}{a}\right) \qquad (1)$$

where a and b are both real numbers which quantify the scaling and translation operations respectively[13]. The advantage of DWT over DFT and DCT is that DWT performs a multi-resolution analysis of signal with localization in both time and frequency. Also, functions with discontinuities and with sharp spikes require fewer wavelet basis vectors in the wavelet domain than sine-cosine basis vectors to achieve a comparable approximation [14].

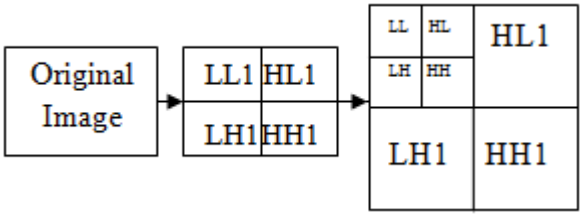

Fig. 2: Process of decomposing an image [13][26]

Fig. 3 Original Image

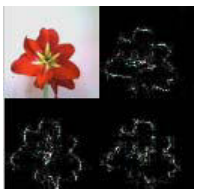

Fig.4 After 1-level wavelet transform

The symbols L and H refer to low-pass and high-pass filter respectively. LL represents the approximation sub-band & LH, HL and HH are the detail sub-bands. LL is the low frequency sub-band gives global description of an image [15] [27]. Horizontal coefficients (LH) correspond to the low-frequency component in the horizontal direction and high-frequency component in the vertical direction [16].

3. FEATURE EXTRACTION ALGORITHMS

An image can be viewed as a vector of pixel values. This image vector can be examined not only in its original space but also in many other subspaces into which the image vector can be transformed by various mathematical / statistical manipulations. PCA and LDA algorithms are examples of such transforms of an image. They transform image vectors into their subspaces called feature spaces and serve as a feature extraction stage [17]. One characteristic of both PCA and LDA is that they produce spatially global feature vectors. In other words, the basis vectors produced by PCA and LDA are non-zero for almost all dimensions, implying that a change to a single input pixel will alter every dimension of its subspace projection. At one level, PCA and LDA are very different: LDA is a supervised learning technique that relies on class labels, whereas PCA is an unsupervised technique [18].

3.1 Principal Component Analysis (PCA)

Principal Component Analysis is proposed by Turk and Pentland in 1991, which is often used for extracting features and dimension reduction. PCA aims to maximize between-class data separation [17]. It works by finding a new coordinate system for a set of data, where the axes (or *principal components*) are ordered by the variance contained within the training data [14]. A brief view of PCA is given below [4].

Step1: A set of M images (I_1, I_2, I_3…I_M) with size N*N can be represented by column or row vector of size N^2

Step2: The average (μ) of the training set image is defined by

$$\mu = \frac{1}{M}\sum_{n=1}^{M} I_n \qquad (2)$$

Step3: Each trainee image differs from the average image by vector (Φ)

$$\Phi_i = I_i - \mu \qquad (3)$$

Step4: Total Scatter Matrix or Covariance Matrix is calculated from Φ as follows:

$$C = \frac{1}{M}\sum_{n=1}^{M} \Phi_n \Phi_n^T \qquad (4)$$

$$= AA^T \quad , \text{ where } A = [\Phi_1 \Phi_2 \Phi_3 ... \Phi_n]$$

Step5: Calculate the eigenvalues λ_k and eigenvectors u_k of the covariance matrix C.

Step6: To classify an image, it can be projected into this feature space. Calculate the vectors of weights

$$\Omega^T = [\omega_1, \omega_2 ... \omega_{M'}], \qquad (5)$$

Where,

$$\omega_k = u_k^T (I - \mu), \qquad k = 1,2.....,M' \qquad (6)$$

where M' represents not the total eigenfaces, but the ones with greater values.

Benefits of PCA

- There is no data redundancy as components are Orthogonal [19].
- With the help of PCA, complexity of grouping the images can be reduced [19].
- Smaller representation of database because we only store the trainee images in the form of their projections on the reduced basis [20].
- Noise is reduced because we choose the maximum variation basis and hence features like background with small variation are automatically ignored [20].

Limitation of PCA

PCA treats inner-class and out-class equally and therefore it is sensitive to illumination changes [1].

3.2 Subspace Linear Discriminant Analysis (LDA)

LDA tries to maximize inter-class variations and minimize intra-class variations [17]. The Subspace LDA method consists of two steps: firstly project the images from the original vector space to a subspace via PCA,

then use LDA to obtain a best linear classifier. The basic idea of combining PCA and LDA is to improve the generalization capability of LDA when only few samples per class are available [5].

The primary reasons that PCA is used in conjunction with LDA are as follows [21]:

• Pure LDA algorithms have documented problems with detecting images that were not in the training set.

• The $S = S_w^{-1}S_b$ operation can be very expensive in terms of processing time if the scatter matrices are too large due to the matrix inversion in the calculation.

The between-class scatter matrix S_B, is defined as [6]:

$$S_B = \sum_{i=1}^{C} N_i (\mu_i-\mu)(\mu_i-\mu)^T \quad (7)$$

and the within-class scatter matrix S_W, is defined as:

$$S_W = \sum_{i=1}^{C} \sum_{x_k \in X_i} (x_k - \mu_i)(x_k - \mu_i)^T \quad (8)$$

where, μ_i is the mean image belonging to class X_i, N_i is the number of samples in class X_i, and μ is the mean image of all samples. If S_W is non-singular, the optimal projection *Wopt* is chosen as the matrix with orthonormal columns which maximizes the ratio of the determinant of the between-class scatter matrix of the projected samples to the determinant of the within-class scatter matrix of the projected samples, i.e.,

$$W_{opt} = \arg\max_W \frac{\left|W^T S_B W\right|}{\left|W^T S_W W\right|} \quad (9)$$

$$= [w_1\ w_2\ ...\ w_m] \quad (10)$$

where $\{w_i | i = 1, 2,...,m\}$ is the set of generalized eigenvectors of S_B and S_W corresponding to the m largest generalized eigenvalues $\{\lambda_i | i=1,2,...m\}$,i.e.

$$S_B w_i = \lambda_i S_W w_i \qquad i = 1, 2...m \quad (11)$$

More formally, *Wopt* for Subspace LDA is given by

$$W_{opt}^T = W_{fld}^T W_{pca}^T \quad 12)$$

Where,

$$W_{pca} = \arg\max_W \left|W^T S_T W\right| \quad (13)$$

$$W_{fld} = \arg\max_W \frac{\left|W^T W_{pca}^T S_B W_{pca} W\right|}{\left|W^T W_{pca}^T S_W W_{pca} W\right|} \quad (14)$$

Limitation of LDA

- LDA is guaranteed to find the optimal discriminant directions when the class densities are Gaussian with the same covariance matrix for all the classes. But when the class densities become more flexible, LDA can fail [22].
- LDA often suffers from the Small-Sample-Size (SSS) problem when the number of samples is much small than the dimensionality of the samples. In this case, the within-class scatter matrix may become singular, which makes LDA difficult to be performed [23].

3.3 Classifier

Euclidean distance is used as similarity measure to compare the feature vector of test image with that of trainee images. Euclidean distance is one of the simplest and faster classifier as compared to other classifiers. Euclidean distance is defined as the straight-line distance between two points. Minimum Euclidean distance classifier is optimum for normally distributed classes. All the trainees as well as the test image are projected to the feature space of training dataset. Euclidean distances between the projected test image and the projection of all centred trainee images are calculated. Test image is supposed to have minimum distance with its corresponding equivalent image in the training dataset.

For N-dimensional space, Euclidean distance between any two point's x_i and y_i can be described as follows [24]:

$$D = \sqrt{\sum_{i=1}^{N} (x_i - y_i)^2} \quad (15)$$

Where x_i (or y_i) is the coordinate of x (or y) image in dimension *i*.

Basic steps of the proposed procedure are shown in figure 5.

4. EXPERIMENTAL RESULTS AND CONCLUSIONS

4.1 Image Database Used

The training dataset used in the experiments consists of the images of three different subjects, which are human faces, plant leaf images and flower images (figure 6). The entire trainees as well as the test images are captured in the real-time environment with the help of MATLAB software's Image Acquisition Toolbox. Using it, we captured images through CyberLink Web Camera Filter having resolution 160x120 in RGB color space. Pre-processing (figure 5) of images includes following steps:

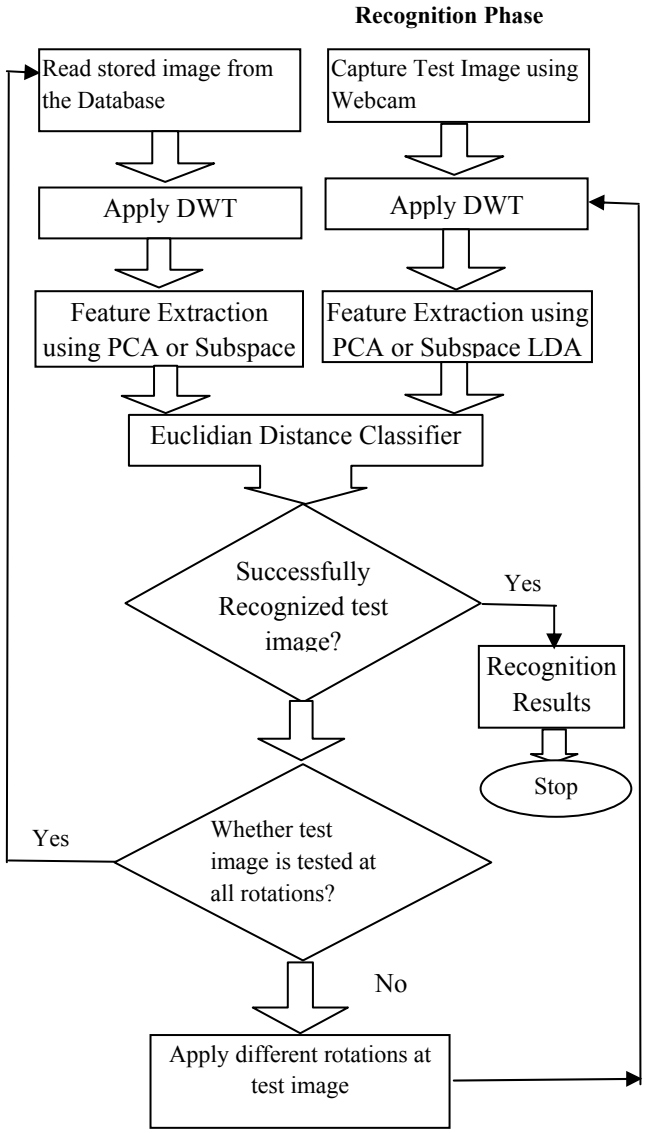

Figure 5: Execution Steps of proposed algorithm.

- Resize images to size of 120x120.
- Conversion of images from RGB color space to gray scale.
- Integer to double precision conversion.

Figure 6: Examples of \stored images in the database

4.2 Experimental Results and discussions

The performance of all the image recognition methods is compared quantitatively in terms of metrics Recognition Rate and Rejection Rate given below [25]:

$$(\%)\ Rejection\ Rate = \frac{Number\ of\ rejected\ samples\ X\ 100}{Total\ number\ of\ test\ samples}$$

From the Table I , Figure 7 and Figure 8, it is concluded that subspace LDA with DWT has high recognition rate and low rejection rate as compared to simple LDA, PCA and PCA with DWT.

Further, to show the impact of rotations, images are captured at different orientations and different recognition algorithms with and without rotations are applied. The figure 9, shows that LDA and PCA fail to recognize without rotations, but with the application of rotations on captured image they recognize. Figure 10, reveals that due to illumination effect PCA yields wrong result, but application of PCA+DWT recognizes correct image.

5. CONCLUSION

From the results given above, it is clear that all the image recognition methods give satisfactory results in the uncontrolled environments also. The recognition accuracy of Subspace LDA when used in conjunction with the DWT gives the best results as compared to other methods used. From this we can conclude that DWT extract features and these features helps to improve the performance of Subspace LDA and PCA. So, these methods can be used for real-world applications with a little attention.

Table I: Recognition accuracy of image recognitiondifferent methods

Method Used for Image Recognition	Total Images	Images correctly recognized	Recognition Rate (%)
PCA	9	6	66.66
DWT+ PCA	9	6	66.66
Subspace LDA	9	7	77.77
DWT+ Subspace LDA	9	8	88.88

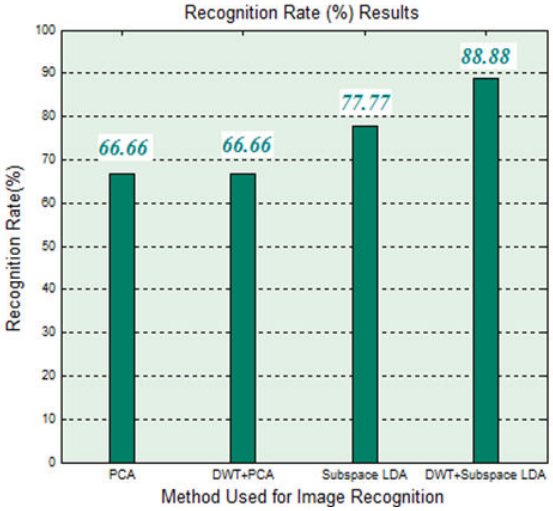

Figure 7: Recognition rate of different methods

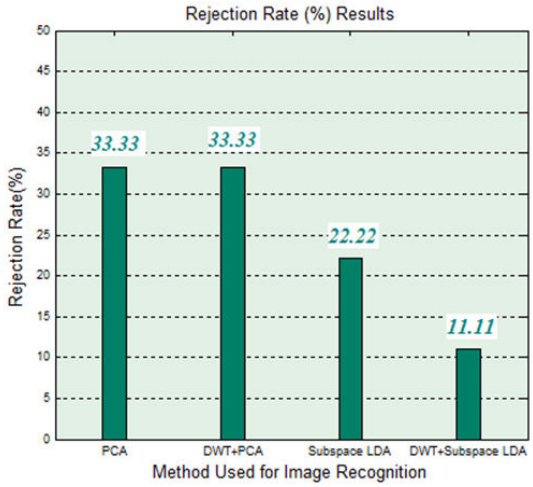

Figure 8: Rejection rate of different methods

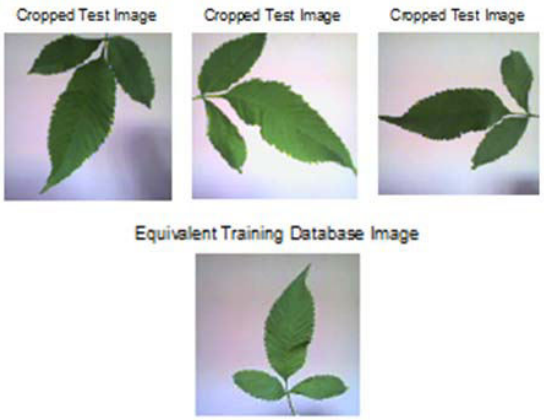

Figure 9: First row shows captured images at different orientations and second row shows the recognized image from the database by proposed modifications.

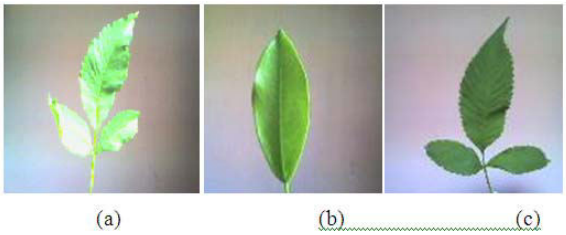

Figure 10: (a) shows captured image, (b) shows output of PCA this is due to illumination problem during capturing image and (c) output of PCA+DWT

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Enhanced Thresholding Algorithm to Extract Tumorregion from MR Brain Images

Neelofar Sohi[1], Lakhwinder Kaur[2,] Savita Gupta[3]

[1-2]Department University College of Engineering, Punjabi University, Patiala, Punjab, India.
[3]University Institute of Engg. and Technology, Panjab University, Chandigarh, India.
[1]sohi_ce@yahoo.co.in; [2]mahal2k8@yahoo.com; [3]savita2k8@yahoo.com

Abstract: Medical image segmentation is an active research area owing to its great importance in medical image analysis. Magnetic resonance (MR) images are most widely used in medical image segmentation since magnetic resonance imaging is rated the best among all diagnostic techniques especially for brain imaging. Aim of this study is to develop an efficient thresholding based segmentation method to extract tumor region from MR brain images. Novelty of this paper is two-fold. First, instead of considering each gray value as threshold initially, threshold vector is limited to intensity values in the region of interest marked by user. Second, to enhance the performance of thresholding for tumor area extraction, thresholding is followed by opening by reconstruction. The results show that simple thresholding could not segment the region of interest properly, whereas proposed algorithm effectively extract tumor region.

Keywords: *Segmentation, brain tumor extraction, thresholding, morphology.*

1. INTRODUCTION

The image segmentation process can be considered as one of the basic, yet very important, steps in digital image processing and computer vision applications. This is being used extensively in multidisciplinary areas of medical imaging, computer vision, remote sensing, agricultural imaging, object recognition to name a few. Segmentation of medical images is a challenging task and is of great importance for medical image analysis, interpretation and understanding of images for subsequent computer aided diagnosis and surgical planning. A large number of segmentation algorithms have been developed over past few decades [1]. Medical image segmentation still continues to be a challenging problem owing to poor contrast, complex nature and dependency of segmentation method on imaging modality, image features and dimensions [2], [3]. Segmentation algorithms are based on different parameters of an image like gray-level, color, texture, depth or motion. In medical images, segmentation is mainly done based on the gray-level value of pixels, because the majority of medical images are gray-scale representations. Image segmentation using the gray-level value of images is performed mainly using thresholding, clustering and region growing methods [1]. Medical imaging is performed using various diagnostic techniques like magnetic resonance imaging (MRI), computed tomography (CT), ultrasound, etc. Magnetic Resonance Imaging (MRI) is the most widely-used method especially in brain imaging where MRI's soft tissue contrast and non-invasiveness are clear advantages [3]. Segmenting MR brain image for extracting tumor or any other lesion requires knowledge of brain anatomy. Developing brain tumor extraction software relieves radiologists from the task of identifying region of interest but for reliable segmentation results it should incorporate some intervention by an expert. Thresholding is one of the simplest and most widely used approaches in image segmentation. Most of the existing thresholding methods are bi-level [4]. Multi-level thresholding algorithms have been developed for computing the optimum thresholds. Various thresholding based algorithms for MR segmentation have been proposed in [5]-[9]. Morphology is used to transform an image into another image by eliminating undesirable features. This is done by probing the input image with other image of certain shape and size known as structuring element [10]. Various

morphology based algorithms for MRI segmentation have been presented in [10]-[18].

The paper is organised as follows: A brief introduction to medical image segmentation is presented in section 1. Section 2 explains existing thresholding based segmentation algorithm. The enhanced thresholding algorithm is presented in section 3. Results and discussion are provided in section 4 and finally conclusion remarks are given in section 5.

2. EXISTING THRESHOLDING BASED SEGMENTATION ALGORITHM

Thresholding is one of the simplest and most widely used approaches in image segmentation. Most of the existing thresholding methods are bi-level [4], which use two levels to categorize the image into background and object segments. However, MR images have many different parts which make these methods non-applicable. Thus, the loss of information from the image may occur and diagnosis system may mislead physicians in their clinical task. Therefore, multi-level thresholding algorithms have been developed to ensure that all important information from MR images are retained, but they become computationally expensive, because a large number of iterations would be required for computing the optimum threshold [5]. Otsu's global thresholding method is the most suitable image segmentation method to segment a brain tumor from a MR image [1]. It selects that gray level value as threshold for which between-class variance is maximised. In general, thresholding algorithms do not use spatial information of an image and they usually fail to segment objects with low contrast or noisy images with varying background [19]. Thresholding alone is rarely used for medical image segmentation. Instead, it usually functions as a pre-processing step. The pseudocode for the thresholding

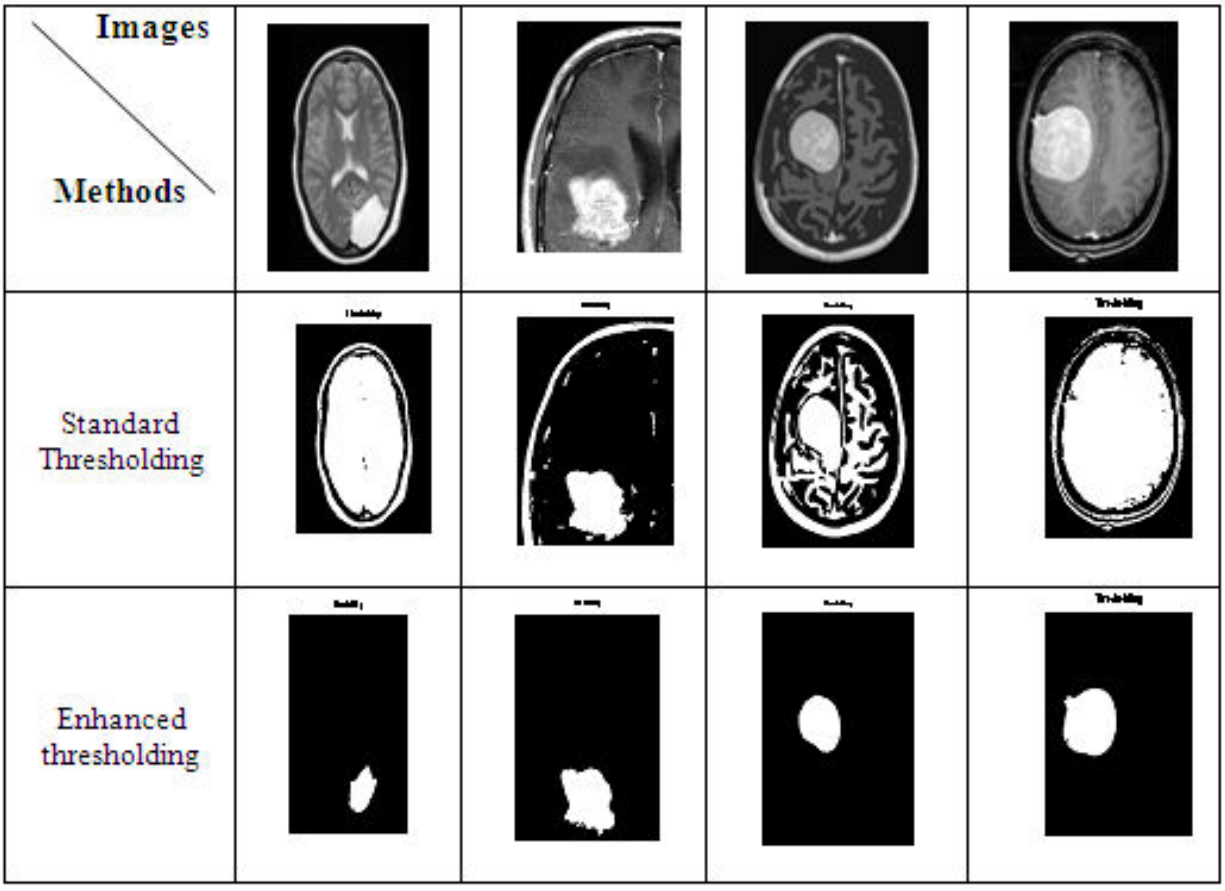

Figure 1. First row shows four MR images (image 1-4) to extract tumor region. Second and third row shows the outputs standard and Enhanced thresholding method

based segmentation algorithm [20] is given below:

1. Initially, every gray level value in the image (I) is tested as a potential threshold to segment the image into two levels (binary image)
2. For each threshold, segment image using following Matlab command.

   BW=im2bw (I, double (T)/255); and compute the following terms:

   - Probability of Foreground pixels, w0 is
     w0= No. of Foreground Pixels/ Size of image
   - Probability of Background pixels, w1 is
     w1= No. of Background Pixels/ Size of image
   - Mean of Foreground pixels, u0 is
     u0= Foreground Sum/ No. of Foreground Pixels
   - Mean of Background pixels, u1 is defined as
     u1=Background Sum/ No. of Background Pixels

3. Gray level value for which between-class variance [21] maximizes is chosen as threshold, T to segment image:
   $T=\text{Max } \{wo*w1*(u0-u1)^2\}$

3. PROPOSED THRESHOLDING ALGORITHM

Thresholding algorithm presented in section II is modified to select gray level values from tumor region to enhance its effectiveness for brain tumor extraction (step a). Morphology is applied next for extracting desired region.

1. Gray level values are selected using impixel command of Matlab as:

```
Figure, imshow(Img)

Vals=impixel

a=min(min(vals));

b=max(max(vals));
```

A row vector for threshold with minimum to maximum gray level value is formed:

```
T=double(a:b);
```

2. Every element in T has the potential to become threshold. Steps (b) to (c) from section 2 are performed for this vector T.
3. Morphology is applied to the image (Ithres) obtained from step (c) to eliminate the undesirable features [10]. Reconstruction based morphology [11] is applied which is more effective and powerful tool than standard morphology in eliminating the undesirable features without affecting desirable ones [22], [23].

Table I. Values of performance metrics viz. PSNR, Correlation coefficient, Structural Similarity Index produced by standard thresholding and enhanced thresholding algorithms for given MR brain image

Images	Methods	Correlation Coefficient	Structural Similarity Index
Image 1	Standard Thresholding	0.4129	0.5395
	Enhanced thresholding	0.9755	0.9924
Image 2	Standard Thresholding	0.7326	0.8398
	Enhanced thresholding	0.9708	0.9734
Image 3	Standard Thresholding	0.4801	0.6140
	Enhanced thresholding	0.9875	0.9942
Image 4	Standard Thresholding	0.6064	0.4500
	Enhanced thresholding	0.9718	0.9793

4. RESULTS AND DISCUSSION

The proposed algorithm is applied to 2-D T1 and T2 post-contrast MR images of human brain containing tumor and their performance is analyzed for tumor extraction. MR brain images are collected from websites: www. radquiz.com, mri.co.nz/ medimgs, newsroom. ucla.edu, www.ajnr.org. Implementation is done in matlab 7.5 (R2007b). The performance metrics [24-26]: correlation coefficient and structural similarity index (SSIM) are computed for quantitative comparison. The quantitative results are presented in table I. The numerical values of the metrics, reveal that the proposed algorithm have higher correlation coefficient and SSIM as compared to standard thresholding method. This implies that proposed

algorithm extract tumor region effectively. For visual comparison segmentation results are shown in figure 1. The segmented images reveal that standard thresholding algorithm doesn't extract the tumor region whereas the enhanced thresholding algorithm is efficient enough to extract the tumor properly.

5. CONCLUSIONS

From the numerical results and visual inspection, it was concluded that enhanced thresholding algorithm is more effective and efficient in extracting the tumor regions from MR brain images. This algorithm can be applied in other applications also to segment region of interest. The advantage of the method is that it leads to high compression by saving only region of interest.

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Measuring Success of E-learning Applications: A Review

Debayan Dhar[1*], Yogesh Deshpande[2] and Pradeep Yammiyavar[3]

[1,2,3]Department of Design, [1,2,3]Indian Institute of Technology Guwahati Assam, India.

[1]debayan@iitg.ernet.in, [2]d.deshpande@iitg.ernet.in, [3]pradeep@iitg.ernet.in

Abstract: The use of electronic media in educational programs are increasing. E-learning applications itself has undergone tremendous changes from being a simple web 1.0 platform to imbibing features of web 2.0, but still the intention to continue to use such systems are still very low[1]. The success of these e-learning applications depends on the extent to which users accept them and continue using it. This paper reviews seven recent journal papers from 2007 to 2012 and highlights the critical factors that determine the success of e-learning applications and various strategies to measure them.

Keywords: *e-learning, measuring success, Information success models.*

1. INTRODUCTION

E-learning is widely incorporated in many educational programs. Students are encouraged to use such systems in many university and professional courses nowadays. Although e-learning applications and softwares are initially accepted which is crucial in achieving e-learning success (Ming-Chi Lee, 2009)[2] but Chiu et al., (2007)[1] highlights that users intention to continue using e-learning system is very low, moreover Roca et al., (2006)[3] further states that it is often observed, users discontinue using e-learning after initially accepting it, which is generally known as the acceptance – discontinuance anomaly phenomenon. A Successful e-learning system does not only signify successful acceptance of the e-learning systems initially by its users but also means successful loyal users, who continue using the system for achieving their goals. In India initiatives by the government in collaboration with its premiere institutes have resulted in the creation of online courses, labs and tutorials through NPTEL, Virtual Labs etc to extend educational opportunities to one and all. For these e-learning systems to be successful, factors that influence the acceptance and continuance of the e-learning systems by its users should be taken into consideration while designing these systems.

In this paper we have considered seven latest journal papers from 2007 to 2012, to understand the recent trends in identification of the factors responsible for acceptance and continuation of e-learning systems. These papers were selected based on the critical factors highlighted which take into consideration the recent changes in the current web scenario influencing the success of e-learning systems.

2. INFORMATION SUCCESS MODELS

The critical factors highlighted by the authors of the literatures reviewed in this paper has been derived from classical models of Information success, most prominent among them is the Delone and McLean's (1992, 2003) (D&M)[4][5] model. Although current research in the area of successful e-learning system also tends to focus on models such as Technology Acceptance Model (TAM) – the second most widely used after D&M model, Theory of planned behavior (TPB), Flow theory (FT), Expectation-Confirmation model (ECM), Social Cognitive Theory (SCT), Seddon Model (SM) and Motivation Theory (MT) but D&M model is the most widely used one.

Yi-Shun Wang, et al., (2007)[6], Tella A., et al., (2010)[7], Alireza H., et al., (2012)[8], T.Ramayaha, et al., (2010)[9] have referred to the D&M model (2003) to identify the critical success factors of e-learning systems. Hei Chia Wang, et al., (2011)[10] used the Wang model (2008)[11] which is based on the D&M model (2003), the TAM model and the Seddon model.Wannasiri B., et al., (2012) [12], referred to the social cognition theory

and the motivation theory in addition to the D&M model to identify the critical success factors.Ming-Chi Lee (2010)[13] on the other hand has only referred to the TAM model, ECM model, TPB and the Flow theory to derive the success factors. Table 1 enlists the basic Information success models referred by these authors to establish the critical success factors of e-learning systems. It is important to highlight that the information success models such as the D&M model and the Wang model was originally based out of e-commerce systems which the authors Yi-Shun Wang, et al., (2007)[6], Tella A., et al., (2010)[7], Alireza H., et al., (2012)[8], T.Ramayaha, et al., (2010)[9] and Hei Chia Wang, et al., (2011)[10] used in the context of identification of e-learning systems success factors.But these studies considered very few factors pertaining to end user characteristics that can influence the acceptance and continuance of e-learning systems. Wannasiri B., et al., (2012)[12] to some extent has tried to incorporate models such as the social cognitive theory and TAM model in order to predict human behavior.Ming-Chi Lee (2010)[13] has incorporated models to predict human behavior, their attitude, expectations in order to understand the acceptance and continuance anomaly from the behavioral perspective.

3. CRITICAL SUCCESS FACTORS

The critical success factors highlighted by the literatures reviewed in this paper can be classified mainly into six broad groups, namely System Quality, Service Quality, Information Quality, Communication Quality, Instructor Characteristics and Learner Characteristics. Table 2 enlists the success factors highlighted by the authors in these papers. Table 2 does not elicit the contribution of Yi-Shun Wang[6], et al., (2007) because the author develops a scale (ELSS scale) based on the D&M model to capture user data, whereas the other papers modified existing information success models to accommodate the critical success factors in the context of e-learning systems. Alireza H., et al., (2012)[8]has highlighted few learner characteristics such as Intention to use, user satisfaction, Loyalty to system and goals achievement; bifurcated System Quality as Technical system quality and Educational quality; and Information quality as Content and information quality and Service quality as critical success factors. Tella A., et al., (2010) highlighted System quality, Service quality, Information Quality as Course content quality, Learner's self-regulated learning, Learning Quality and Teaching quality as critical success factors. Wannasiri B., et al., (2012)[12] highlighted System Quality, Service Quality,

	T.Ramayaha, et al., (2010)	Alireza H., et al., (2012)	Tella A., et al., (2010)	Yi-Shun Wang, et al., (2007)	Hei Chia Wang, et al., (2011)	Ming-Chi Lee (2010)	Wannasiri B., et al., (2012)
D&M Model (2003)	■	■	■	■	■		■
TAM					■	■	
ECM						■	
TPB						■	
FT						■	
SCT							■
MT							■
SM					■		

Table1: Different types of Models referred by the authors of the papers for identifying e-learning system success factors.

Computer Self efficacy, internet self-efficacy, Perceived Usefulness, Clear direction, Timely response, Self-efficacy (Instructors), Technology Control, Focus on Interaction, Attitude towards students and interaction fairness as success factors. Ming-Chi Lee (2010)[13] highlighted Perceived Usefulness, Attitude towards e-learning, Concentration, User Satisfaction, subjective Norms, Goals Achievement as success factors. Similarly T.Ramayaha, et al., (2010)[9], Tella A., et al., (2010)[7], Hei Chia Wang, et al., (2011)[10] all of them highlighted System Quality, Service Quality And Information Quality except Hei Chia Wang, et al., (2011)[10] who also highlighted Communication Quality as Critical success factors.

It can be observed that the critical success factors highlighted by T.Ramayaha, et al., (2010)[9], Hei Chia Wang, et al., (2011)[10] which are based on the D&M Model (2003) does not add any significant factors in the e-learning context apart from factors proposed in the D&M model. Although Hei Chia Wang, et al., (2011)[10] highlights Communication Quality apart from these quality factors, this can be attributed to Wang's Model (2008)[11] referred by the author, which is a modified D&M model proposed by Wang (2008) by integrating the D&M model (DeLone& McLean, 2003), the Seddon model (Seddon, 1997) with the Technology Acceptance Model (TAM)(Davis, 1989) in the context of e-commerce. Whereas Ming-Chi Lee (2010)[13] and Wannasiri B., et al., (2012)[12] identified more Learner and User Characteristics than T.Ramayaha, et al., (2010)[9], Tella A., et al., (2010)[7], Hei Chia Wang, et al., (2011)[10].This can be attributed to the models referred by this authors for identifying critical success factors. Ming-Chi Lee (2010)[13] did not present System Quality (SQ), Service Quality (SEQ) and Information Quality (IQ) as

Success factors because D&M model was not referred by the author to identify e-learning success factors, nor it has identified any instructor characteristics. Although Tella A., et al., (2010)[7]&Alireza H., et al., (2012)[8] referred to the D&M model but identified few Learner characteristics and Instructor characteristics apart from SQ, SEQ, IQ. The authors feel that this is because of the fact that they considered the specific nature of IS context- learning, which helped them to modify factors represented by the popular D&M model.

Critical success factors identified for Information Systems in general cannot suit an e-learning system because of the nature of end users who are unique and behave differently than those of other Information systems. Users of e-learning systems are learners and instructors who have unique needs.Learners lack motivation and domain knowledge. The success of eLearning system does not only rely on a usable and accessible system but also depends on how efficiently the system aids the learning process of the users to achieve their desired learning goals. As mentioned by S. Hsi, and E. Soloway(1998)[14] the goal of e-learning systems is to "make people more effective learners", so the critical factors the e-learning system imbibes is based on the knowledge of the users and their different characteristics: how learners prefer to learn, how they are learning the information, under what pressures the learners operate in their day-to day life, their motivation or incentive to engage in online learning, what constraints they face, what special accommodations they need, how they feel comfortable while using the online applications, what experience they have with e-learning applications. It can be stated that the success of e-learning system depends on how effectively the system has employed critical factors to address unique needs of the learners. So critical factors of e-learning systems should highlight factors from both qualities of pedagogical contents as well as from the effectiveness of the delivery media. Factors such as instructional goal, instructional content, learning tasks, learning aids, and assessment and acceptance factors namely, level of motivation to use the product, level of active participation entailed, quality of learning support, and level of user satisfaction should be taken into account as proposed by Quinn et al. [15] foridentification of critical success factors of e-learning systems. Moreover according to Arditoet. al., (2006) [16] ethnographic issues should also be considered as culture plays an important role in technology acceptance of the masses and influencing personal attitudes.In this aspect the work of Trinchero [17] is significant because he proposes an organized set of indicators for evaluating the quality of formative systems based on ICT (Information and Communication Technology).Table 3 shows the evaluation indicators identified by Trinchero whose primary dimensions are quality of learning, quality of

		T.Ramayaha, et al.,(2010)	Alireza H., et al., (2012)	Tella A., et al., (2010)	Hei Chia Wang, et al., (2011)	Ming-Chi Lee(2010)	Wannasiri B., et al., (2012)
			Technical Sys. Quality +Educational Sys. Quality				
Service Quality							
Information Quality			Content & Information Quality	Course Content Quality			
Communication Quality							
Learner Characteristics	**Computer Self efficacy**						
	Internet Self efficacy						
	Intention to use						
	Perceived Usefulness						
	Attitude towards e-learning						
	Concentration						
	Clear direction						
	User Satisfaction						
	Learner's self-regulated learning						
	Learning Quality						
	Subjective Norms						
	Loyalty to system						
	Goals Achievement						
	Perceived Behavior Control						
Instructor Characteristics	**Timely Response**						
	Self-Efficacy						
	Technology Control						
	Focus on Interaction						
	Attitude towards students						
	Interaction Fairness						
	Teaching Quality						

Table 2: E-learning system success factors identified by the authors of the papers

teaching, quality of learning environment and quality of interaction.So, in order to achieve a comprehensive evaluation methodology by identifying critical success factors of e-learning systems, all the parameters that influences the goal of learning systems, i.e., the "learning" itself should be considered. Although various research studies stated above have tried to classify the dimensions of e-learning systems in terms of pedagogical content and learner characteristics but the evaluating indicators proposed by Trinchero covers comprehensively the various aspects of e-learning systems both from the perspective of the instructional media and the instruction itself. In accordance with these dimensions it can be argued that the seven papers reviewed falls short in establishing the critical success factors of e-learning systems.

Analysis dimensions	Indicators
Quality of learning	Learning in instructive systems based on ICT
	Quality of monitoring of student's basic competencies and motivations
	Quality of lessons content
	Quality of structuring of the instructive path
	Quality of participation
	Quality of students' results
Quality of teaching	Quality of teachers'/tutors' competencies
	Quality of course preparation
	Quality of course organization
	Quality of didactic process
	Quality of applicative activities
Quality of learning environment	Quality of technological equipment
	Quality of interface
	Quality of infrastructures
	Quality of logistic services
	Quality of feedback
Quality of interaction	Quality of tutor—student's interaction
	Quality of students' interaction
	Propitious class atmosphere

Table III: Evaluation indicators identified by Trinchero

4. CONCLUSION

Critical Success factors of e-learning systems should include factors to assess the effectiveness of the system in addressing unique learner needs. Although the quality of the learning environment or the instructional media cannot be ignored but it cannot be the sole factors responsible for the success of e-learning systems whose primary focus is to support the learner in acquiring knowledge. So a mix of factors that comprises of technical qualities and instructional qualities that address learners' issue be used to assess the success of e-learning systems.

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