

3.3.2 Number of research papers per teachers in the Journals notified on UGC website during the last five years.

Title of paper	Name of the author/s	Department of the teacher	Name of journal	Year of publication	ISSN number	Link to the recognition in UGC		
						Link to website of the Journal	Link to article/paper/abstract of the article	listed in UGC Care list/Scopus/Web of Science /other,
2016-17								
Object detection and recognition in images	Pradnya A. Vikhar, S. A Chavan, D Bendale, R Shimpi	computer	International Journal of Computing and Technology (IJCAT)	2016	ISSN: 2348-6090 Volume 3, Issue 3, PP: 148-151, 2016	http://ijcat.org/	http://ijcat.org/articles/3-3/Object-Detection-and-Recognition-in-Images.html	peer reviewed
MPEG-7 Edge Histogram Descriptor (EHD) for Advancement in CBIR System	Pradnya A. Vikhar, P. P. Karde	computer	European Journal of Advances in Engineering and Technology	2016	ISSN: 2394 - 658X Vol 3, Issue 10, PP: 36-29, Nov 2016	www.ejaet.com	http://www.ejaet.com/PDF/3-10/EJAET-3-10-36-39.pdf	peer reviewed
Attendance System Based on Face Recognition	Pradnya Vikhar, Hemavati Sabu, J Patil	computer	International Journal of Innovative Research in Computer and Communication Engineering	2017	ISSN (Online): 2320-9801 Vol. 5, Issue 3, March 2017	http://ijircce.com/	http://ijircce.com/get-current-issue.php?key=MjI=	Peer Reviewed

Comprehensive Analysis of Some Recent Competitive CBIR Techniques	Pradnya Vikhar, P P Karde	computer	ICTACT Journal on Image & Video Processing, Volume 7, Issue 3, February 2017.	2017	ISSN: 0976-9102 (ONLINE), Volume 7, Issue 3, February 2017	http://ictactjournals.in/	http://ictactjournals.in/paper/IJIVP_Vol_7_Iss_3_Paper6_1433-1444.pdf	peer reviewed
Grid Integration of Hybrid Generation	Rajesh R. Waghulde Leena R. Waghule	computer	7 th International Journal on Recent Trends in Engineering, Science and Management (ICRTE SM - 17)	2017	1-2April 2017	http://data.conferenceworld.in/GSMCOE/INDEX.pdf	http://ijates.com/images/short_pdf/1491270264_GS381ijates.pdf	peer reviewed
Simulation Analysis Of Low Voltage DC Micro Grid – An Investigation Of Load Sharing By Using MATLAB	Prof. Prasad D. Kulkarni	Electrical	International Journal of Emerging Technologies in Engineering Research (IJETER)	2016	2454-6410	www.ijeter.everscience.org	https://www.ijeter.everscience.org/Manuscripts/Volume-4/Issue-10/Vol-4-issue-10-M-06.pdf	NO
An Overview on Power Quality Problems by Using D-STATCOM	Ms. Snehal B. Nerkar; Prof. Kalpesh Mahajan	Electrical	International Journal of Advanced Research in Science Management and Technology	2017	ISSN(Online)-2454-4159	http://www.ijarsmt.com/nov-2017.php	snehal-b-nerkar-prof-k-m-mahajan-263.pdf (ijarsmt.com)	NO
A Review on Implementation of UPFC for improvement of active power flow capability in power system using IEEE 14 bus system	Miss. Suvarna V. Patil, Prof. Kalpesh Mahajan	Electrical	International Research Journal of Engineering and Technology (IRJET)	2017	e-ISSN: 2395-0056, p-ISSN: 2395-0072	https://www.irjet.net	https://www.irjet.net/archives/V4/i4/IRJET-V4I4109.pdf	NO

Implementation Of Power Electronic Transformer Based Dynamic Voltage Restorer (DVR) To Improve Power Quality At Distribution Side (Load)	Prof.Prasad D. Kulkarni	Electrical	International Journal of Modern Trends in Engineering and Research (IJMTER)	2017	(online)-2349-9745 (print)-2393-8161	https://www.ijmter.com/	https://www.ijmter.com/papers/volume-4/issue-6/implementation-of-power-electronic-transformer-based-dynamic-voltage-restorer-dvr-to-improve-power-quality-at-distribution-side-load.pdf	NO
Shifting of Loyalties: Perception of Telecom Customers after launching of “Jio” in Jalgaon cit	Dr. Veena Bhosale	MBA	IJSDR (International Journal of Science & Engineering Development Research)	2016-2017	ISSN: 2455-2631, November 2016 IJSDR Volume 1, Issue 11.	https://www.ijedr.org	https://www.ijedr.org/papers/IJSDR1611020.pdf	Yes
Microgrid Power Quality Improvement by using Dual Output Four-Leg Inverter	Prashant Gorakhnath Patil; Kalpesh Mahajan; Mohan T Patel	Electrical	International Journal Of Scientific Research And Education, (20160812)	2016	ISSN(e)2321-7545, May 2016 IJSRE Volume 4	www.worldcat.org	https://www.worldcat.org/title/microgrid-power-quality-improvement-by-using-dual-output-four-leg-inverter/oclc/6826461566&referer=brief_results	NO

Object Detection and Recognition in Images

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Abstract - Object Detection and recognition is an important task in image processing and computer vision. It is concerned with determining the identity of an object being observed in an image. Humans can recognize any object in the real world easily without any efforts. But computerize recognition of object in image is not easy task. In such system some problems are occurred such as lightning, mirroring, rotating. It also used Sketch based system for object detection in which user can draw the images by hand and then matches the images from the database. The system developed has many types of applications in the field of Medical Diagnose, Cartography, and Robotics.

Keywords - Multi-object Detection, Object Recognition, Object Recognition Applications.

1. Introduction

The Object Detection and Recognition system In Images is web based application which mainly aims to detect the multiple objects from various types of images. It also recognizes the images after performing the detection. In this chapter, The Background and applications of project discussed. Object detection is a computer technology related to computer vision and image processing that deals with detecting instances of semantic objects of a certain class (such as humans, buildings, or cars) in digital images and videos. Well-researched domains of object detection include face detection and pedestrian detection. Object detection has applications in many areas of computer vision, including image retrieval and video surveillance. Object recognition is an important task in image processing and computer vision. It is concerned with determining the identity of an object being observed in an image from a set of known tags. Humans can recognize any object in the real world easily without any efforts; on contrary machines by itself cannot recognize objects.

The propose is to develop sketch-based method for image retrieval in which users draw sketches via a Web browser that enables the automatic retrieval of similar images from a database of images. The characteristics of these images are different from those of naturalistic images. There are unique challenges associated with such content based retrieval. The propose is to develop sketch-based method for image retrieval in which users

draw sketches via a Web browser that enables the automatic retrieval of similar images from a database of images. The characteristics of these images are different from those of naturalistic images. There are unique challenges associated with such content based retrieval. In this, fig 1 shows object detection and fig 2 shows sketch detection.



Fig. 1 Object Detection

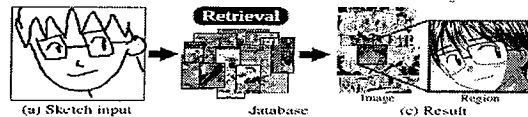


Fig. 2 Sketch Detection

2. Background

The goal of object detection is to detect all instances of objects from a known class, such as people, cars or faces in an image. Typically only a small number of instances of the object are present in the image, but there is a very large number of possible locations and scales at which they can occur and that need to somehow be explored. Each detection is reported with some form of pose information. This could be as simple as the location of the object, a location and scale, or the extent of the object defined in terms of a bounding box. In other situations the pose information is more detailed and contains the parameters of a linear or non-linear transformation. For example a face detector may compute the locations of the eyes, nose and mouth, in addition to the bounding box of the face. Object detection systems construct a model for an object class from a set of training examples. In the case of axed rigid object only one example may be needed, but more generally multiple training examples are necessary to capture certain aspects of class variability.

2.1 Limitations

Lightning: The lightning conditions may differ during the course of the day. Also the weather conditions may affect the lighting in an image. In-door and outdoor images for same object can have varying lightning condition. Shadows in the image can affect the image light. Whatever the lightning may be the system must be able to recognize the object in any of the image.



Fig. 3 Difficulties in Lightning

Positioning: Position in the image of the object can be changed. If template matching is used, the system must handle such images uniformly.

Rotation: The image can be in rotated form. The system must be capable to handle such difficulty. The character „A“ can appear in any of the form. But the orientation of the letter or image must not affect the recognition of character „A“ or any image of object

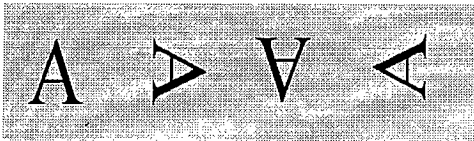


Fig. 4 Different Rotation

Mirroring: The mirrored image of any object must be recognized by the object recognition system.

Occlusion: The condition when object in an image is not completely visible is referred as occlusion. The image of car shown in a box in fig.3.3 is not completely visible. The system of object recognition must handle such type of condition and in the output result it must be recognized as a car. [1]

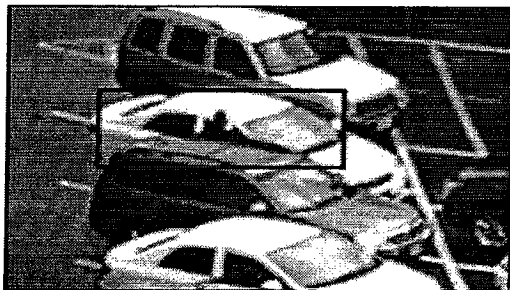


Fig. 5 Occultation

2.2 Scope of Object Detection and Recognition

The project has wide scope in multiple areas and can easily increase its utilization by adding more efficient algorithms. Some of the areas are as follows-

Medical Diagnose: Use of object detection and recognition in medical diagnose to detect the X-Ray report, brain tumors.

Shapes recognition: Recognize the shape from whole region in images.

Cartography: The cartography as the discipline dealing with the conception, production dissemination and study of maps.

Robotics: In robotics use of object detection is movement of body parts and motion sensing.

3. Methodology

3.1 Architecture Of Object Detection

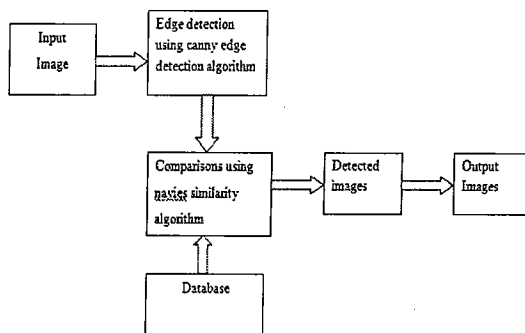


Fig. 6 Architecture Of Object Detection

Input Image:-User takes the input as image.

Edge Detection: - Edge detection is a process of finding the number of edges from the given input image. Canny edge detection algorithm is used to find edge of image.

Navies Similarity Algorithm:- This algorithm is used for matching the images from database/.

Database: - Database helps to detecting the images.

Detected Images:-The system gives the number of similar images as a output after comparison.

Output Image :User Get the Detected images.

4. Implementation

We are develop our proposed system by using java technology and also used the imagevary database to

show the result of our system. It is a standard database. This Database helps to detect the multiple images. This system supports all versions of windows operating system. We implement our system by using two algorithm.1) Canny Edge Algorithm 2) Navies Similarity Algorithm. Canny edge algorithm is used to find the edges of object. Navies' similarity algorithm is used for comparison between database images and user input image.

4.1 Canny Edge Detection

The purpose of edge detection in general is to significantly reduce the amount of data in an Image, while preserving the structural properties to be used for further image processing. Several algorithms exists, and this worksheet focuses on a particular one developed by John F. Canny(JFC) in 1986 .Even though it is quite old, it has become one of the standard edge detection methods and it is still used in research.

The aim of JFC was to develop an algorithm that is optimal with regards to the following criteria:

Detection: The probability of detecting real edge points should be maximized while the probability of falsely detecting non-edge points should be minimized. This corresponds to maximizing the signal-to-noise ratio.

Localization: The detected edges should be as close as possible to the real edges.

Number of responses: One real edge should not result in more than one detected edge one can argue that this is implicitly included in the first requirement.

The algorithm runs in 5 separate steps:

1. **Smoothing:** Blurring of the image to remove noise.
2. **Finding gradients:** The edges should be marked where the gradients of the image has large magnitudes.
3. **Non-maximum suppression:** Only local maxima should be marked as edges.[3]
4. **Double thresholding:** Potential edges are determined by thresholding.
5. **Edge tracking by hysteresis:** Final edges are determined by suppressing all edges that are not connected to a very certain (strong) edge.[3]

4.2 Navies Similarity Algorithm

The features for our test will be 25 RGB triples, corresponding to the average of the RGB values on the 25 regions marked in the figure on the left. The image will be normalized to 300x300 pixels. No texture or variance feature will be stored, only the colour averages. Each region has 30x30 pixels. Each image will be

represented, then, a 25x3 feature vector. To calculate the similarity measure between two images A and B we will take each of the 25 regions, calculate the Euclidean distance between the regions and accumulate. The distance from A to A will be, by definition, zero. The upper bound (maximum possible distance between two images, using this similarity measure method) is calculated as $25 * (\text{Math.sqrt}((255-0)*(255-0) + (255-0)*(255-0) + (255-0)*(255-0)))$ or a little bit over 11041. This method was chosen because it is simple to understand and implement and can be easily modified by the reader. It combines color (spectral) information with spatial (position/distribution) information, and is expected to be more robust (i.e. tolerant to differences) than comparing pixel by pixel or the average of the whole image, but, again, it is very simple and cannot be expected for perform well in any circumstances, being shown only as an example. To test the feature extraction and similarity measure we will use a set of 24 test images, shown below. Some of those images have similar objects on them (wall, trees, sky) but we are not considering meaning on the images, just patches of similar colors. Images are in different sizes, click on the icons to get the full images. The 16 images on the first two rows are photos of objects, while the last row is of images from the first two rows distorted in scale, color, position, etc[4]

5. Results

Object detection and recognition in images is a web application. There are three options first is the image search by image, second is the image search by sketch and third is the image is detected by edges. In fig 6, we find the edges using canny algorithm of input image. Fig 7 shows the detected images as output using navies' similarity algorithm. In fig 8and Fig 9 shows the sketch detection.

5.1 Screen Shot

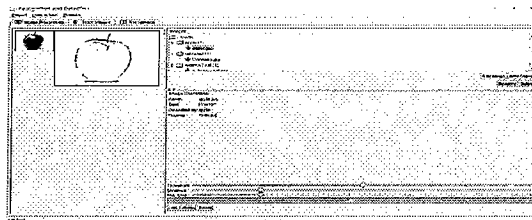


Fig 6 Edge Detected Image

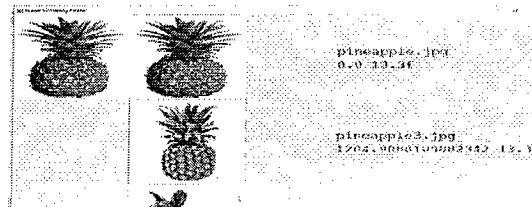


Fig 7 Detected Images

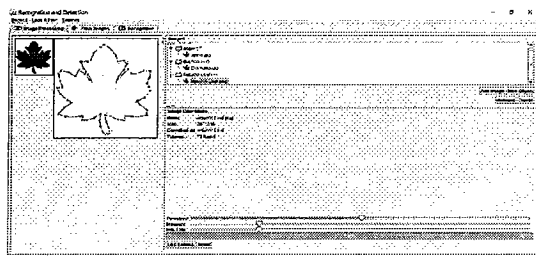


Fig 8 Sketch Edge Detected

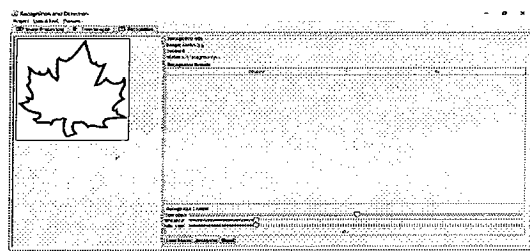


Fig 9 Sketch Detected Images

6. Conclusion

The Object Detection and Recognition system in Images is web based application which mainly aims to detect the multiple objects from various types of images. To achieve this goal shape and edge feature from image is extracted. It uses large image database for correct object detection and recognition. This system will provide easy user interface to retrieve the desired images. The system have additional feature such as Sketch based detection. In Sketch detection user can draw the sketch by hand as an input. Finally the system results output images by searching those images that user want.

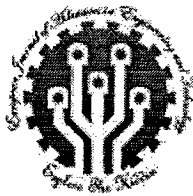
7. Future Scope

Object is detected but also tries to find out its location. In Future we will achieve accuracy in motion analysis the segmented moving object from tracking can be further analyzed with the statistics of each motion to verify whether a car is speeding or not, or whether a person is running, walking, or jumping. Processing time need to produce searching time by searching only in some parts of the image. Here use motion trigger and search only in the moving region. Searching algorithm such as hierarchical search or block matching algorithm might be able to make this program faster because it reduces number of pixels to be searched.

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MPEG-7 Edge Histogram Descriptor (EHD) for Advancement in CBIR System

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ABSTRACT

In design and development of any Content Based Image Retrieval (CBIR) system, feature extraction from image plays a vital role. Color, texture and shape are three important features that can be used to represent an image. Efficiency of CBIR system depends on feature extraction which effectively represents image contents. Instead of focusing on single feature, most of the recent CBIR system uses combinations of these features to represent an image. This paper introduces the concept and area of content based image retrieval system. It also includes the overview of basic MPEG-7 visual feature descriptor; edge histogram descriptor (EDH) to extract the contents from images. To enhance the result of CBIR system, the methodology combines color moments, color-correlogram and Gabor texture features along with edge orientation histogram.

Key words: CBIR, Feature Extraction, MPEG-7, Edge Histogram Descriptor (EDH)

INTRODUCTION

Due to rapid enhancement in digital technology, huge amount of digital information in the form of images and videos is available in recent years. Also gigabytes of new digital information are generated and transmitted every day [1-2]. Today's technology demands the use of this digital information in form of images in various domains including bioinformatics, medicine, entertainment, designing, advertisement and engineering sciences. All this visual information is useless, if there is no proper mechanism to effectively store and retrieve these images. In early days, images were represented by text and then text-based concept of traditional database management system was used to search and retrieve images. As the approach is based on text-based search, it is commonly known as Text-based Image Retrieval (TBIR) [3]. The problems in front of Text-Based image retrieval (TBIR) system became more severe, as volume of digital images produced increased dramatically in various fields of science and engineering. The other and main difficulty faced by this approach is to describe rich content in image manually. It is very expensive and obviously subjective task. This is driving force behind the emergence of Content Based Image Retrieval (CBIR) system [1&3]. In CBIR system manual representation of images by text-based key words is replaced by their own visual content, such as color, texture and shape. Since 1990s, it is an active area of research and development. Exhaustive efforts have been undertaken by many researchers to build efficient and effective CBIR system. Most of the work in this area is focused on feature extraction, similarity matching, indexing (to sort output images based on certain attributes), relevance feedback (take users view to display the result) [1-2].

The aim of this paper is to focus on feature extraction using Edge Histogram Descriptor (EHD) [4]. EHD belongs to family of MPEG-7 descriptor standard which includes standardized tools to enable detail description of visual information. To develop more effective CBIR system, these techniques are combined with color moment, color auto-correlogram and Gabor texture features.

CONTENT BASED IMAGE RETRIEVAL SYSTEM

Application involving automatic indexing, searching, retrieving and browsing of image databases uses concept of Content based image retrieval (CBIR) systems. It is technique which uses visual content (color, shape and texture) of image to search large image database as per users' interest [1-2]. A typical CBIR system is as follows -



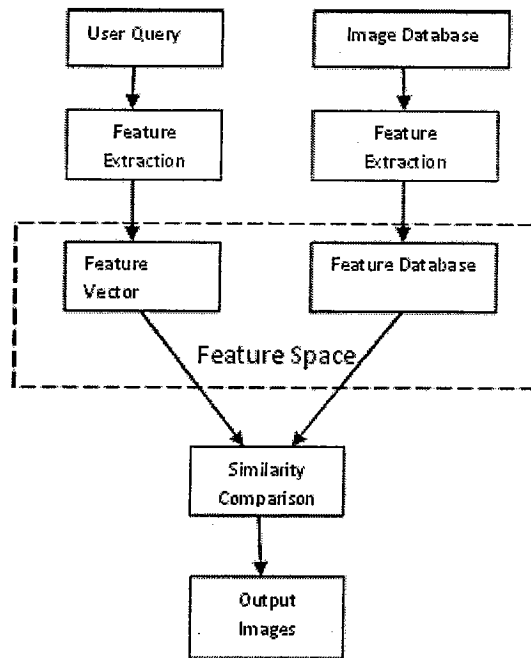


Fig. 1 A typical view of CBIR System

In CBIR system, the input query given by user is in the form of image. It has to search the relevant images similar to input image from image database. For this feature extraction of query image and images present in database is done based on certain visual features. It forms feature space (digital representation of image using visual feature). Then feature vector of query image is matched with feature vectors of images present in feature database. After similarity matching, most similar images result as an output. Thus in the CBIR system, the input given and output produced are both in form images [5].

EDGE ORIENTATION HISTOGRAM

In order to describe and interpret visual contents from images, MPEG-7 standard provides different Multimedia Descriptors. These MPEG-7 visual standard descriptors offer interoperability across different multimedia database systems [6]. MPEG-7 provides standardized descriptors for visual, audio and video retrieval. Main visual features descriptors are color descriptors, shape descriptors and texture descriptors. In the methodology widely used texture descriptor: Edge Histogram Descriptor (EHD) is applied to develop CBIR system.

The EHD [4][6] is used to characterizes edges in form of spatial distribution in an image. The process of feature extraction using EHD consists of following steps:

1. First digital image array is subdivided into equal 4X4 subparts/ sub image.
2. In next step, every subpart is further divided into square blocks which are not overlap on each other. The size of blocks is depending on the resolution of input image.
3. From every block the edge is calculated and its type is identified. There are six types of edges. The type of edge may be vertical, horizontal, 45° diagonal, 135° diagonal, no-direction edge and no-edge.

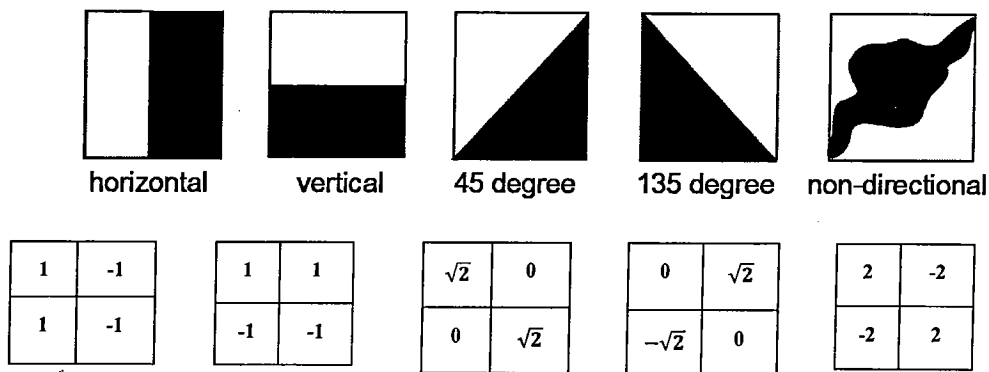


Fig. 2 Five types of edges and corresponding filters [7]



The first five edge types are detected using the filter coefficients illustrated in figure. 2. Information about no-edge blocks can be automatically obtained after the process of normalization.

4. By applying above steps, from every sub image 5-bin (vertical, horizontal, 45° diagonal, 135° diagonal, and no-direction) edge histogram is obtained.
5. Then normalization is used to calculate the value of each bin in the sub image. It is computed by normalizing total number of image blocks in the sub image.
6. Then nonlinear quantization of these normalized bin values is done. It helps to limit the number of bits sufficient for the descriptor.

By applying above steps, the texture features are extracted from the input image.

METHODOLOGY

In this paper, Edge Histogram Descriptor (EHD) of MPEG-7 is used to develop the Content Based Image Retrieval system. By using EHD the texture features of image are extracted [7][8]. Further to provide more effective system the approach combines color auto-correlogram, color moments and Gabor wavelet transforms along with EHD. The methodology to develop complete CBIR system contains following steps:

Step 1: All the images initially are stored in a directory, called image database. Directory of image database is selected first.

Step 2: With the process of normalization, all images in database are resized (set size of all images to 384 x 256).

Step 3: Compute the Edge Histogram Descriptor (EDH) by steps involved in extraction process mentioned above

Step 4: In this step Color Auto Correlogram is computed.

The color correlogram [2] is defined as: consider an image (I), with size $n \times m$. let distance (d) is $\in \{1, 2, \dots, n\}$, image I correlogram for $i, j \in \{1, 2, \dots, m\}$ and $k \in \{1, 2, \dots, d\}$ is defined as

$$Y_{ci,cj}^{(k)} = Pr_{p1 \in I_{ci}, p2 \in I_{cj}} [P_2 \in I_{cj} | [P_1 - P_2] = K]$$

The color correlogram is represented by a tabled index with pair of colors; where probability of finding a pixel with color j at a distance k from a pixel with color i in the image, is determined by the kth entry for (i, j). It is important step in building image retrieval systems as this feature makes it more robust against large alteration in appearance of the same picture.

Step 5: In this step Color Moments [2] (here up to 3rd order) is calculated. Three orders are; first order (mean μ_i), the second order (variance σ_i) and the third order (skewness S_i). Generally, image is recognized by distribution using color moments, when there is a certain probability distribution in color of image. Color distributions of images is efficiently and effectively represented by using color moments.

$$\mu_i = \frac{1}{N} \sum_{j=1}^n P_{ij}, \quad \sigma_i = \left(\frac{1}{N} \sum_{j=1}^n ((P_{ij} - \mu_i)^2) \right)^{\frac{1}{2}}, \quad S_i = \left(\frac{1}{N} \sum_{j=1}^n ((P_{ij} - \mu_i)^3) \right)^{\frac{1}{3}}$$

Step 6: In this step, widely implemented tool to extract image texture feature, Gabor wavelet [2] is used to compute mean amplitude and Mean squared energy. Based on this wavelet moment are calculated. There are many approaches suggested to interpret texture of images by using Gabor filters. Mostly CBIR systems develop using Gabor wavelet, feature vector is constructed by calculating mean and standard deviation of distribution of wavelet transform coefficients. A two dimensional Gabor function $g(x, y)$ to represent texture features of image is defined

$$g(x, y) = \frac{1}{2\pi\sigma_x\sigma_y} \exp \left[-\left(\frac{1}{2} \left(\frac{x^2}{\sigma_x^2} + \frac{y^2}{\sigma_y^2} + 2\pi jw_x \right) \right) \right]$$

Where σ_x and σ_y are the standard deviations along the x and y direction.

Step 7: All feature vectors constructed using EHD, Color Auto Correlogram, Color Moments, Mean amplitude, Mean Squared Energy, and wavelet moments of an image are combined. It generates the feature vector of that image.

Step 8: Steps 2 to 7 are applied to each image in database to calculate feature vector. Thus feature vectors of all images in database form the feature database.

Step 9: Through interface, user select Query image as an input.

Step 10: Using steps from 2 to 6 now generate feature vector for input query image (again using EHD, Color Auto Correlogram, Color Moments, Mean amplitude, Mean Squared Energy, and wavelet moments).

Step 10: Next step is to match feature vector of query image to feature vectors computed and stored in feature database (step 8). There are various measures are used to compute the similarity between the images. Here Euclidean distance [2] is used as similarity measure. After matching similar images are retrieved. Consider two feature vectors a and b. suppose $a = (a_1, a_2, \dots, a_n)^T$ and $b = (b_1, b_2, \dots, b_n)^T$, the distance using Euclidean method is calculated as follows:

$$d_E = \sqrt{\sum_{i=1}^n (a_i - b_i)^2}$$

Step 11: Similar images retrieved in step 10 are sorted based on similarity distance. Finally, most similar images are displayed as a result.

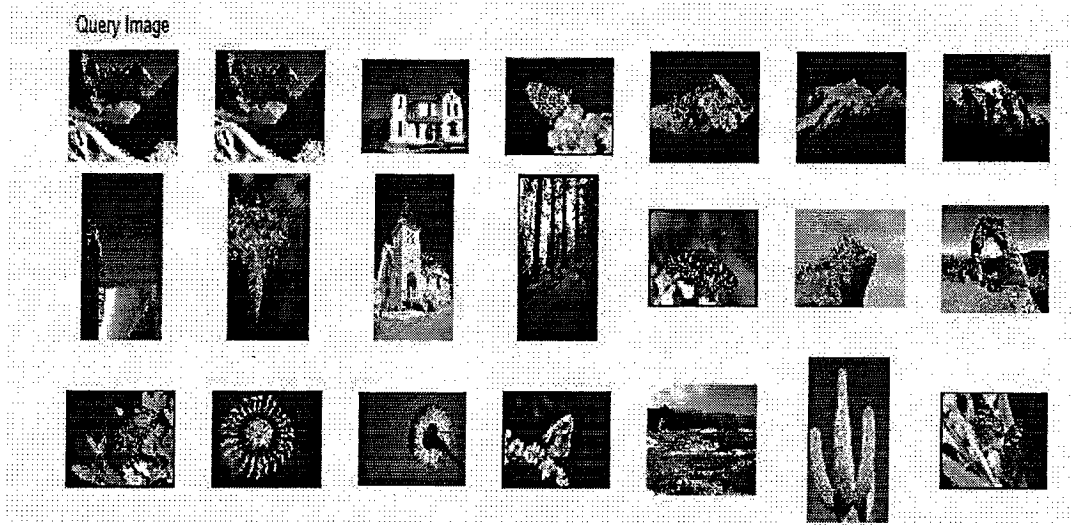


Fig. 3 Query Image and Output generated

RESULT AND DISCUSSION

The approach discussed here is implemented in MATLAB. The interface is developed which select image database and generate (load) feature database. Further user selects query image whose feature vector is compared with vectors in feature database and output is displayed. The system developed is tested on standard IMAGEVARY dataset containing 600 images. After giving query image as an input, the system gives output after indexing (sorting). The first 20 images are displayed here. It is observed that the system after combining many features like EHD, Color Auto-correlogram, color moment and Gabor wavelet transform generate the effective output.

CONCLUSION

Image feature extraction is main issue in developing any CBIR system. Feature extracted must effectively represent and interpret the image contents in a database. If number of features are combined together to generate the feature space, the image content can more effectively represented. Hence it will result in effective CBIR system. The methodology presented here uses MPEG-7 Edge Histogram Descriptor (EHD), as main feature extraction technique. For further improvement, these features extracted are combined with Color Auto-correlogram, color moment and Gabor wavelet transform. The system developed using the approach is effective to represent any image contents and eventually generates good output.

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Attendance System Based on Face Recognition

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ABSTRACT: Daily attendance marking is a common and important activity in schools and colleges for checking the performance of students. Manual Attendance maintaining is difficult process, especially for large group of students. Some automated systems developed to overcome these difficulties, have drawbacks like cost, fake attendance, accuracy, intrusiveness. To overcome these drawbacks, there is need of smart and automated attendance system. This paper describes the attendance system implementation using face recognition. Since face is unique identity of person, the issue of fake attendance and proxies can be solved. The system uses Eigenface face recognition technique as it is fast, simple and has greater success rate. Also, it has provision to deal with intensity of light problem and head pose problem which makes it effective. This smart system can be an effective way to maintain the attendance records of students and to reduce fake attendance.

KEYWORDS: Attendance System, Face Detection, Face Recognition, Eigenface Method, Viola and Jones Algorithm

I. INTRODUCTION

The Face Recognition technique is one of the most efficient biometric techniques for identification of people. It can be utilized in the field of education for managing the attendance of students. There are a lot of colleges and schools in which thousands of students are taking education. To maintain the attendance and records of these many numbers of students is a very difficult task. To avoid these difficulties, there is a need of an automated system which provides accurate attendance reducing chances of fake attendance. It can be achieved using face recognition approach.

In this paper, we propose an attendance system that captures image using a camera and recognizes student using eigenface recognition technique. Viola and Jones face detection algorithm is applied before actual recognition task. The attendance of the student is then marked in the attendance log. The system also provides attendance percentage on monthly basis and reminds the teacher of the defaulter students, if any. The proposed system is aimed to design and implement uniquely identifiable face detection and recognition system which can be easily implemented and operated for marking attendance. The aim is to automate the attendance marking system which is efficient and accurate. This will help to reduce hard-work and time and also reduce possibilities of proxy attendance.

II. RELATED WORK

We all know that today's attendance marking system is completely manual where teacher calls student's name and relies on his/her reply to mark the attendance. This is very tedious task especially when there is large group of people. There are efforts by various researchers towards automating this task. Different technologies have been tried and implemented for implementing such an automated system which is highly efficient in terms of accuracy, speed and cost.

Michael Dobson, Douglas Ahlers, Bernie DiDario [1] proposed the concept of Automated Attendance System in 2006. The system includes identification tags, with wireless communication capabilities, for each potential attendee. There are scanners for detecting the attendees' tags as they enter a given room, at least one server in communication with the scanners. This study provided a way to get rid of tedious work of marking and recording attendance.

Vishal Bhalla, Ankit Gahlot, Vijay Gupta [2] proposed the concept of Bluetooth Based Attendance Management System in 2013. Sumita Nainan, Romin Parekh, Tanvi Shah [3] proposed the concept of RFID Technology Based Attendance Management System in 2013. This concept introduces the distinctive components of RFID technology and focuses on its core competencies: scalability and security.



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These systems tend to depend on external devices and tags which are to be externally possessed by students/attendees. One can easily handover these to others and hence there is high probability of fake attendances. For this, biometric based attendance is a good solution. O. Shoewu and O.A. Idowu [4] proposed the concept of Development of Attendance Management System using Biometrics in 2012. The system takes attendance electronically with the help of a finger print device and the records of the attendance are stored in a database. Attendance is marked after student identification.

Some system implementations have been tried based on face recognition techniques as well. Face is unique identity of a person and helps identify persons accurately. Face recognition has been widely studied subject from way long back in 1964.

During 1964 and 1965, Bledsoe, along with Helen Chan and Charles Bisson, worked on using computer to recognize human faces [5]. These operators could process about 40 pictures an hour. After Bledsoe, this work was continued at the Stanford Research Institute by Peter Hart. In experiments performed on a database of over 2000 photographs, the computer consistently outperformed humans when presented with the same recognition tasks [5]. This clearly indicates the face recognition capability of computers.

Matthew Turk and Alex Pentland [6] proposed the concept of Face Recognition Using EigenFace Method in 1991. This method tracks a subject's head and then recognizes the person by comparing characteristics of the face to those of known individuals. Initially, a principle component factor "eigenvector" is determined using PCA then the set of characteristic feature image "eigenface" are found. This method is simple and fast as it is an unsupervised method.

Paul Viola, Michael J. Jones [7] proposed the concept of Robust Real Time Face Recognition in 2004. They defined a face detection framework that is capable of processing images extremely rapidly while achieving high detection rates.

Nirmalya Kar, and Dwijen Rudra Pal [8] proposed the concept of implementing automated attendance system using Face Recognition Technique in 2012. They showed that the system will record the attendance of the students in classroom automatically using face recognition approach. Each student is identified by face and the attendance is marked.

Ajinkya Patil, Mrudang Shukla [9] proposed the concept of implementation of class-room attendance system based on face recognition in 2014. In this approach, they used face detection and face recognition system. The face detection differentiates face parts from non-face parts and is therefore essential for accurate attendance. The face recognition for marking the student's attendance uses supervised method LDA. The Raspberry pi module is used for face detection recognition.

III. SYSTEM OVERVIEW

Fig. 1 shows the overall system architecture of proposed system. The complete system is divided into different small independent modules.

Image Acquisition-

This module is initial part of the system. Logitech C270 (3MP) is used for image acquisition. The acquired images are converted to grayscale image. All further operations are performed on this image.

Face Detection-

After capturing the image, the image is given to face detection module. This module detects the image regions which are likely to be human. The Viola and Jones Algorithm, also known as the Ada-Boost algorithm for face detection, is used for face detection purposes. The detected face regions are cropped and scaled to 200x200 resolution and then used for further recognition task.

Face Recognition-

Face recognition is the next step after face detection. The faces cropped from the image are compared with the stored images in the face database. Here, Eigenface method is used for face recognition.

Face recognition involves following two steps-

1. Feature Extraction-

After the face detection, face image is given as input to the feature extraction module to find the key features that will be used for classification. The module composes a very short feature vector that is well enough to represent the face image. Here, it is done with PCA (principal component analysis) method.

2. Feature Classification-

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With the help of a pattern classifier, the extracted features of face image are compared with the ones stored in the face database. The face image is then classified as either known or unknown. If the image face is known, corresponding student is identified.

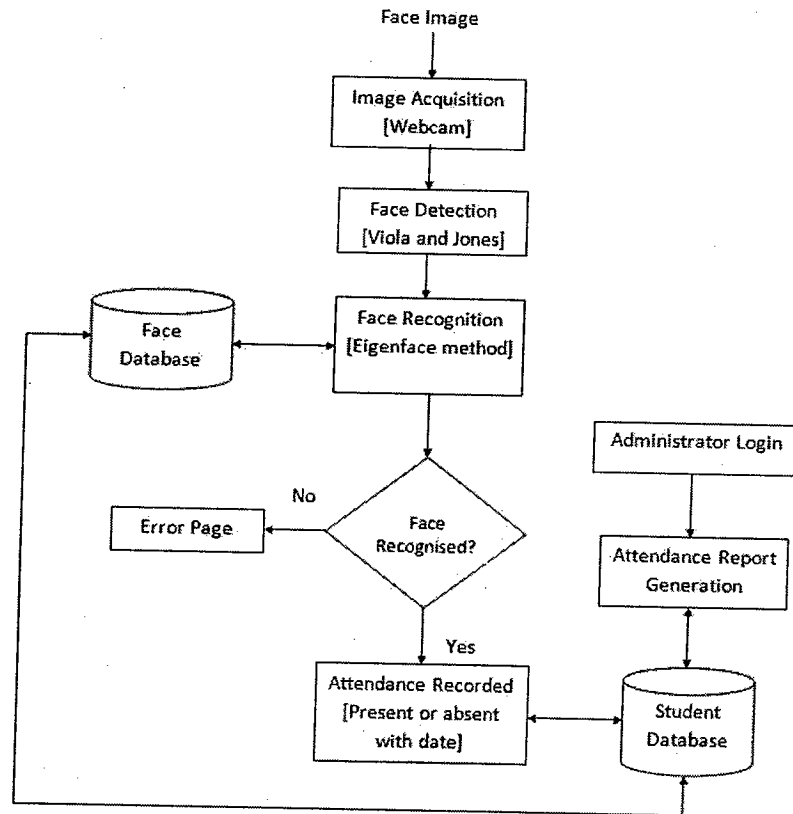


Fig1 Block Diagram for System

Attendance Recording-

After the verification of faces and successful recognition is done, the attendance of the student is marked in front of his/her roll number. If the face is not recognized, an error page is displayed.

Attendance Calculation-

It involves the attendance report generation. The module takes student information and daily attendance status from student database. The attendance is calculated as per requirement. There are options for calculating day-wise, student-wise and class-wise attendance. The attendance reports are generated and saved in a file.

Database-

Databases maintained in this system are student information database, face database and attendance database. Student information database consists of roll number, name and class of student. Attendance database includes attendance status of student for every day. The face database consists of face images of students according to their roll numbers.

IV. FACE DETECTION AND RECOGNITION MODULES IMPLEMENTATION

Viola and Jones Face Detection Algorithm:

Steps for viola and jones algorithm:

It first calculates Haar features which kind of differentiates dark regions like eyes from other bright face regions. These are rectangular features with some dark and bright regions as in structuring element.

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It secondly uses an integral image representation to increase speed of computations. These features are used with a classifier trained on face and non-face images.

In third step, the cascade classifier is used which involves strong decision about face/non-face for all the sub-windows in the image. It is a simple and efficient classifier to select a small number of critical visual features from a very large set of potential features.

The fourth step is to combine classifier in a "cascade". It allows background regions of the image to be quickly discarded while spending more computation on promising face-like regions.

MATLAB provides a face/non-face classifier which is pre-trained on large face database using viola and jones algorithm. We take benefit of these trained features to detect face regions from our data through step function of CascadeObjectDetector.

Eigenface method implementation steps:

1) Acquire an initial set of face images, the training set. This is a characteristic face image database which includes a number of images for each student. Here, we taken 30 students and face images for each student are 4. Hence our database includes 120 faces.

2) Calculate average face of all the images in training set, say F_1, F_2, \dots, F_n , using formula:

$$AF = \frac{1}{N} \sum_{i=1}^N F_i$$

3) Calculate difference face corresponding to each face image in the training set. This is also called the normalized training set of images

$$D_i = F_i - AF$$

4) Find out Covariance Matrix, C:

$$C = \frac{1}{N} \sum_{i=1}^N D_i D_i^T$$

5) Calculate the eigenvalues and eigenvectors for the covariance matrix, C.

6) Choose the N' eigenvectors with the highest associated eigenvalues.

7) Calculate the ($N'=30$) eigenfaces by multiplying difference faces and eigen vectors.

8) For each individual in database, calculate class vector W , by averaging the eigenface pattern vectors calculated from original (Say, 4) images of the individual.

9) Input image I_1 is transformed into its eigenface component using equation:

$$w = u^T (I_1 - AF)$$

10) Calculate difference between w for test image and for each training person's eigenface one by one.

11) Choose a threshold value, T , (We considered it as 110000000). It defines the maximum allowable distance from any face class.

12) The image having error value above threshold is classified as unknown.

V. EXPERIMENTAL RESULTS

Fig 2 shows GUI screenshots at different phases of the implemented system. Time taken by the system to run the complete recognition and attendance report generation task is 15s -20s. Fig. 2 a) shows the input image provided to the system for recognition and recognised student's image for that input image. Also, it shows the calculated average face according to eigen face method. Fig. 2 b) depicts eigenfaces created at the time of training the face database using eigenface method. Fig 2 c) and Fig 2 d) deals with the attendance report generation. Fig 2 c) depicts attendance report for roll number 6 in graphical form i.e. in pie chart and Fig 2 d) shows the attendance report file as generated by the system. It shows daily attendance status of roll no.6 for the month of February 2017.

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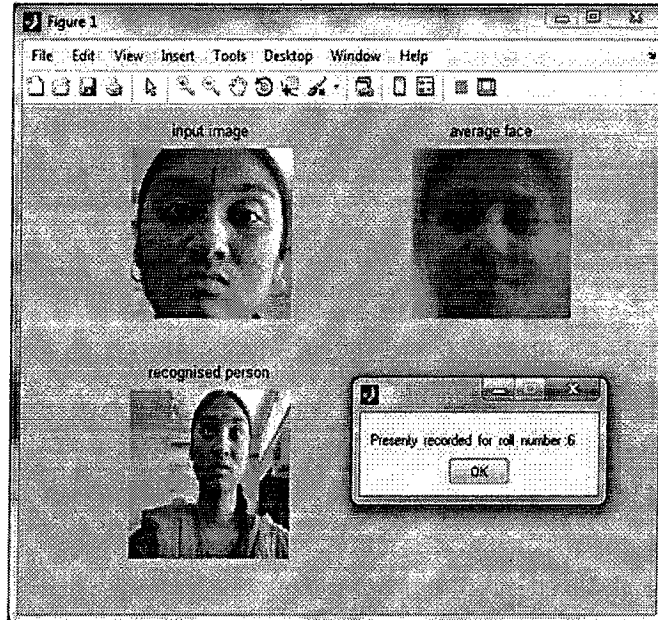


Fig. 2 a) The cropped face part of input image, average face for the student and the corresponding recognised image. The recognised person's roll number is indicated in message box

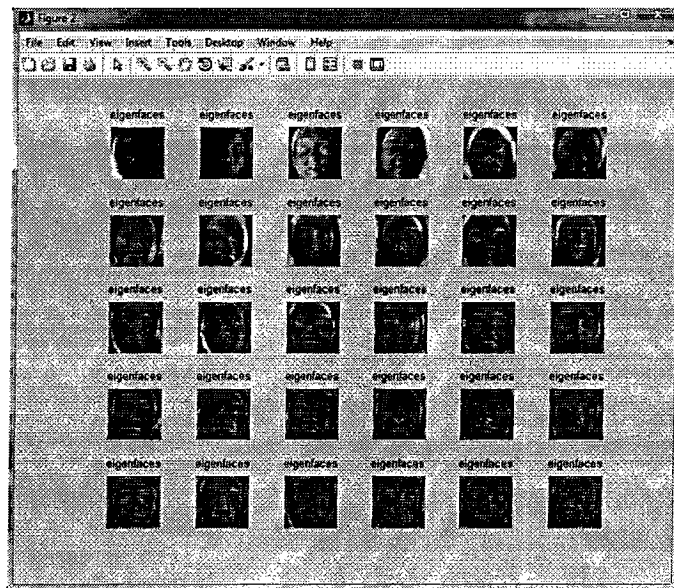


Fig. 2 b) Different eigen faces made by the system during training.

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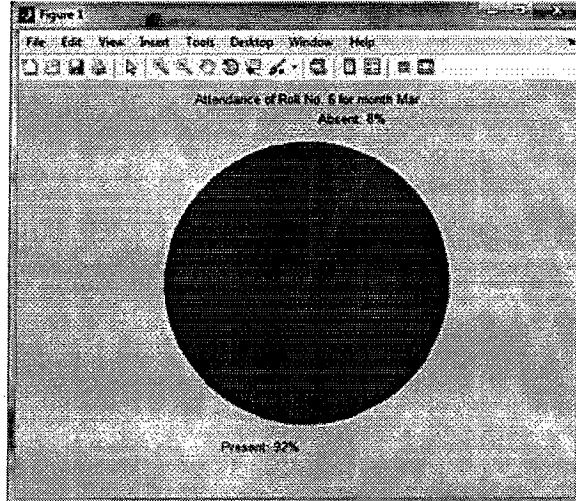


Fig. 2 c) Monthly attendance report of a student indicated using pie chart.

Mar6 - Notepad		
File Edit Format View Help		
Attendance Record		
Month:	Mar 2017	
Student Name:	Kalyani	
Roll No:	6	
Date	Attendace	Status
1		Absent
2		Present
3		Present
4		Present
5		Absent
6		Absent
7		Present
8		Present
9		Absent
10		Present
11		Present
12		Present
13		Absent
14		Absent
15		Absent
16		Present
17		Present
18		Absent
19		Absent
20		Absent
21		Present
22		Absent
23		Absent
24		Absent
25		Absent
26		Absent
27		Absent
28		Absent
29		Absent
30		Absent
31		Absent
Total Attendance:		11
No. of Working Days:		12
Percentage Attendance:		91.67

Fig. 2 d) Monthly attendance report of a student as recorded in a file.

Experimental results are summarized in Table1. The experiment is taken on 30 students. The analysis of eigenface face recognition method is done by various imaging conditions.



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Table 1 Results

Imaging condition	No. of Students	Correctly identified	Wrongly identified	Identified as unknown
Simple	30	20	5	5
Head tilting	30	10	0	20
Varying background	30	19	5	6

VI. DISCUSSION

The proposed system can be used at any places where attendance is taken and one need to maintain its record e.g, colleges, offices, etc. The project as a system of face recognition, can have applications such as: Information Security, Surveillance, Access Control, Identification System.

The complete system is very simple to implement and takes very less time to run. Fast execution and non-intrusive nature along with the reduction in fake attendance makes the system very effective.

However, the system is not 100 percent accurate. Face detection can hardly cope with 45° face rotation both around the vertical and horizontal axis. It is sensitive to lighting conditions and performs badly in dark or shadowy environment. While detecting face parts, we might get multiple face detections in an image even though only one face exists. This face detection problem leads to false recognition and hence inaccurate attendance marking.

VII. CONCLUSION AND FUTURE SCOPE

As face provides a unique identity of a person, it can be used to identify a person and verify his/her identity. Face recognition provides non-intrusive way to recognize a person. By using this system, the chances of fake attendance and proxies can be reduced. The facerecognition using eigenface method helps overcome problems related to lightning issues and head pose problems in some cases. However, the system accuracy is still not up to the mark owing especially to the face detection method sensitive to head tilt problems. We need to look for some robust face detection method. Other supervised methods may tend to be quite useful in the system.

Besides, we can simplify the system and make more efficient by taking advantage of multiple face detections to mark attendance of all the visible faces in single attempt. This will be economical and more efficient use of face recognition for attendance marking. We also consider to develop an android application for this system in near future.

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COMPREHENSIVE ANALYSIS OF SOME RECENT COMPETITIVE CBIR TECHNIQUES

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Abstract

In today's real life applications complexity of multimedia contents is significantly increased. This is highly demanding the development of effective retrieval systems to satisfy human desires. Recently, extensive research efforts have been carried out in the field of content-based image retrieval (CBIR). These research efforts are based on various parameters; feature extraction (to find content of image), similarity matching (compare the content of a query image with content of other images), indexing (index images based on their content), and relevance feedback (consider users view to get better output). The efforts result many promising solutions in designing effective and interactive CBIR systems. This paper mainly includes study of some recent CBIR techniques with the goal to design efficient system. Additionally, this study presents a detailed framework of CBIR system. Further it includes improvements achieved in the major areas like feature extraction, indexing, similarity matching, relevance feedback.

Keywords:

Content Based Image Retrieval (CBIR), Feature extraction, Indexing, Relevance feedback

1. INTRODUCTION

Due to exponential growth of imaging devices such as digital camera and scanner, multimedia contents are massively generated and used [1][2][3]. If there is no computer aided browsing, searching and retrieving mechanism to obtain the desire content, all this data is nearly useless. To use this enormous data for particular purpose, need an effective method which allows moving data according to interest of user. The content based image retrieval provides a hopeful solution to this problem. Content based image retrieval (CBIR), is a technique, which uses the visual content to search the images from large scale image database as per user's interest [1][2][3][4][5]. It matches the features of the query image with that of image database through some image-image similarity evaluation. In the CBIR system, the input is in the form of image and the output produce is not a single image, but it is the list of images.

To develop an efficient CBIR system a lot of work has been done in this field. In recent years, CBIR has drawn much interest of many researcher contributing new solutions and techniques. Most of research in this area is based on low level feature extraction like color, shape and texture [2][3][4][6]. Although low-level feature extraction methodologies produces good result, such systems cannot be effectively used by a learner due to semantic gap between users perception and understanding. So bridging the gap between low-level and high-level (semantic)

feature is emerged as a promising area of research [2][3][4]. To get quick output matching contents of query image and that of images in databases, is needed so there is a necessity of matching techniques [1][2][3][4]. Relevance feedback [1][2][3] treats the retrieval session as repetitive query reformulation operations. It presents retrieved images to the user after submitting query image(s) and solicits user's relevance judgments over the course of several rounds of interaction. It also proves prominent area of research in order to develop interactive CBIR systems. To efficiently access desire images, ranking [2][3][4] of output images based on some factors, emerges another area of research in the field of CBIR system.

2. GENERAL FRAMEWORK FOR CONTENT BASED IMAGE RETRIEVAL SYSTEM (CBIR)

This section describes the complete framework of content based image retrieval system. It consists of different and correlated components. The following figure shows a general framework of CBIR [1][4].

The retrieval process begins with the submission of query image to the system. Both the query image and all images in the database are processed and represented in the same way in order to retrieve only relevant images. Then some preprocessing methods (if required) might be applied to the image which mainly depends on the aim of the retrieval application. For instance, the image could be segmented into many smaller blocks or regions that are further processed to represent some image objects. In addition, these smaller parts of the image might be classified or clustered in some categories to be used as region-based retrieval or for learning purposes. Other preprocessing tasks include image resize, rescale, de-noise, etc.

Feature extraction is next main step in the process. Visual/textual descriptors are extracted from images and represented in certain way into the data space. Some common extracted features are color, texture, shape or local descriptors. Some techniques apply some preprocessing tasks such as classification or spatial processing after feature extraction, thus the preprocessing of images could be conducted before or after feature extraction.

Finally, the system computes the distance between the transformed features of query image and all images in the database in order to return the most relevant images based on some distance measures.



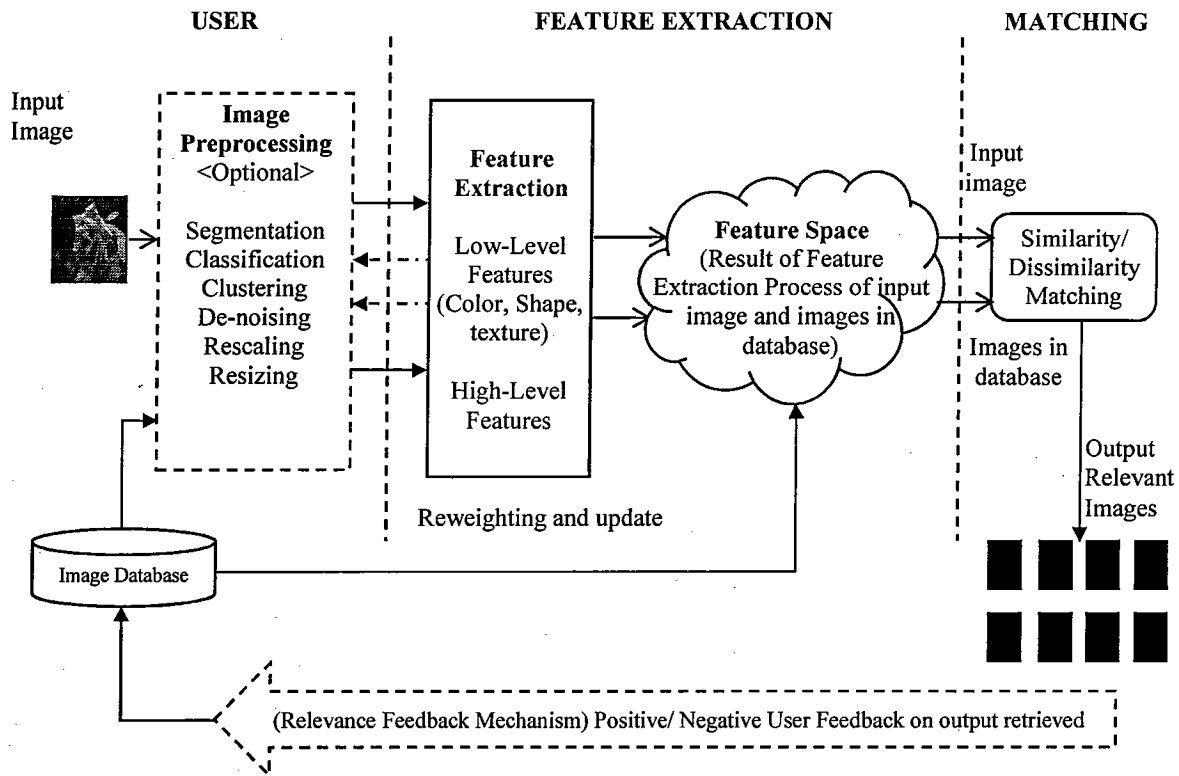


Fig.1. General Framework of CBIR System

The returned images are usually presented as a ranked list. Some retrieval approaches enable users to decide the relevancy degree of retrieved images as a satisfaction measure, i.e. relevance feedback. The returned images are usually presented as a ranked list. Some retrieval approaches enable users to decide the relevancy degree of retrieved images as a satisfaction measure, i.e. relevance feedback. This may improve the accuracy of retrieval by updating the query and similarity measures according to the user's preferences. Automatic feedback and system self-training are preferred for reducing the user intervention and conducting multiple iterations of refinements.

Data visualization being an integral part of the CBIR framework, recently perceived a significant utilization. This addresses the problem of designing graphical user interfaces (GUI) for image representations, query submission and refinement, relevance feedback and browsing mechanisms. A proper visualization during human-machine interaction guarantees the improvement of retrieval accuracy, maximum flexibility with minimum complexity, and intuitive retrieval environment.

3. RECENT CBIR SYSTEMS

To overcome the challenges faced by CBIR system, various techniques are developed by different researchers in recent years. They focused to overcome the limitations found in previous work by suggesting some new methods and techniques. This will help to generate more efficient and interactive CBIR systems. The next section includes some of the recent techniques/methods used to develop CBIR system. Research work done in CBIR system is divided among four major areas namely feature extraction,

similarity matching, indexing and relevance feedback. The working in these areas is not completely independent, but depends on each other.

3.1 FEATURE EXTRACTION

Feature extraction plays crucial role in designing of any CBIR system. A good visual content descriptor should be unaffected to the accidental alteration introduced by the imaging process [1]. There are two types of visual contents (features) in CBIR: primitive (low-level) features and domain specific (high-level) features. The primitive feature includes color, shape, and texture while domain specific features includes for instance, fingerprints, handwriting, and human faces, is application dependent and may involve domain knowledge. Feature extraction is the method to find visual contents (feature) of image like color, shape, texture or any combination of it [1][2][3]. The use of specific feature depends on the specific image processing application. However, the most of the system uses combinations of these features for more accurate results. However, MPEG-7 standard feature extraction algorithm is also used in some cases [3].

3.1.1 CBIR System with Low Level Feature:

Color is the most widely used visual content for image retrieval. Its three-dimensional values make it superior to describe image contents than the single dimensional gray values. Color space must be identified before selecting an appropriate color descriptor. Many color description has been found like color moments, color histogram, color coherence vector, color correlogram etc. [1][2][3][4].

Another important property to represent image is texture. There are two types of texture descriptors; structural and



statistical. Structural methods, includes morphological operator and adjacency graph which describes texture by identifying structural primitives and their placement rules. These features found to be most effective when applied to regular structures. Statistical methods, includes Fourier power spectra, co-occurrence matrices, shift-invariant principal component analysis (SPCA), Tamura feature, Wold decomposition, Markov random field, fractal model, and multi-resolution filtering techniques such as wavelet and Gabor transform. Statistical distribution uses image intensity to characterize an image [1][2][3].

Shape features of objects or regions are also required in many applications. Shape features unlike color and texture are usually described after images segmentation into regions or objects. As it is hard to perform accurate and perfect image segmentation, the shape features for image retrieval are application oriented. The shape description methods can be categorized into boundary-based and region-based methods. A good shape descriptor for an object should be able to handle translation, rotation and scaling [1][2][3].

In literature many CBIR system using low-level features are found. Some example includes Chabot[7] developed by Department of Computer Science, university of California, USA, represents each image using the Color histogram. Other systems such as C Bird [7] developed by school of computing science, Canada, CHROMA[7], developed by School of computing engineering and technology, Sutherland, U.K. uses color vector to represent each images. ADL [7], developed by University of California, Santa Barbara, CBVQ[7], developed by Image and advance television lab, Colombia, CIRCUS[7] user texture features to represent the image. SQUID[7], Center for Vision speech and signal processing, University of Surrey, UK, SYNAPSE[7], developed by Centre for intelligent, Information retrieval, uses the pure shape features to developed the system.

In this section some recently developed CBIR system using low level features are discussed.

Jaehyun A et al. (2014) [6], propose an object-based color image retrieval algorithm using the spatial distributions of colors in the salient regions. The proposed method first extracts the content object regions using a color contrast approach, and finds a few dominant colors for each salient region. Then, the spatial distribution of each dominant color is modeled as a binary map. The binary map defines the spatial distribution of dominant color in the salient region, which considers the object shapes with the same color. A matching method has also been proposed to evaluate the similarity of binary maps. According to the experiments using several color image databases, the proposed method is shown to provide better retrieval performance than the conventional and previous color-based methods.

Izem H et al. (2015) [8], propose a new feature extraction method based on texture segmentation. The method first fixes a converging point α . It determines Main analysis Window (MW) starting from α to the bottom left corner of the image. Then several probable windows are extracted and further from each window the feature extracted using appropriate method. Finally, using similarity measure the window is decided whether relevant or not. This process is repeated until the size of the MW reaches a minimum size. Each significant window increases the relevance of the desired texture in the output image. At the end, an image of relevance is obtained by considering the most relevant area.

Shaoyan Sun et al. (2015) [9], deal with the fundamental issue of image representation to improve the retrieval performance. Here a novel image retrieval framework is proposed with compact image representation from generic object regions. It first identifies regions of interest with a generic object detector. The fusion of the CNN and VLAD features is used to describe the detected regions, for a more effective representation. This representation is efficient in memory overhead, and the retrieval process is time efficient.

Kommineni J et al. (2015) [10], present a new content based image retrieval approach based on the database classification using Support Vector Machine (SVM) and color string coding feature selection. The paper handles fundamental issue to select the image features that the best represent the image contents in a database in designing any CBIR system. The feature extraction is done using color string coding and string comparison.

Menglin L et al. (2015) [11], propose a new method of calculating chroma texture. Large numbers of experiments are performed which proves that the chroma texture feature was a very important supplement to the traditional luminance texture. However, combination of luminance texture and chroma texture with a lower-dimensional vector, significantly improves the effectiveness of the image retrieval.

3.1.2 CBIR System with High Level Feature:

As low-level features are not sufficient to represent the image contents properly, leads to number of mismatches in the output. Therefore high-level features (semantic features) are used to develop the system. These high-level contents are obtained by textual description or by complex inference procedures based on visual content [1][2][3][4]. Some recent CBIR systems which use semantic (high level) features are discussed in next section.

Michal B et al. (2013) [12], address the problem from a general perspective and presented a new annotation model that allows to combine different image and text-processing techniques. In the experimental evaluation, it focused on the web image annotation task and demonstrated that the annotation quality can be significantly improved by combining various expansion techniques.

Zhiyong C et al. (2014) [13], document a set of comprehensive experiential studies on large social images showing the effects of multiple query evidence. The search performance based on the social tags, different kinds of visual features and their combinations are systematically studied and analyzed. A novel quantitative metric is proposed to calculate the visual query complexity. It is applied to evaluate the influences of different visual queries based on their complexity levels.

Hanwang Z et al. (2014)[14], propose a novel attribute-augmented semantic hierarchy (A2SH) which organizes semantic concepts from general to specific and augments each semantic concept with a set of related attributes. This is specifications of the multiple facets of the concept and act as an intermediate bridge connecting the concept and low-level visual features. Here the concepts of classifiers, attribute classifiers, and hierarchical similarity function were discussed. Based on the proposed A2SH, the developed a unified content-based image retrieval system supports both automatic retrieval and interactive retrieval with user feedback. A hybrid feedback mechanism was developed to collect a broad array of feedback based on both attributes and



images. This feedback then use to improve the retrieval performance based on A2SH.

Alex Papushoy *et al.* (2015) [15] propose the query by saliency content retrieval (QSCR), image retrieval method. It is based on human visual attention models. In the system, each image is segmented and a set of characteristic features is calculated for each region. Based on the perceived saliency, the weight is assigned to each region. Image similarity is evaluated using Earth Mover's Distance (EMD). This automated method outperforms another approach using visual attention.

3.1.3 CBIR System with Combination of Features:

The use of particular feature depends on the specific image processing application. However, most of the system uses combinations of these features for more accurate results. In literature Photo Finder [7], developed by the Alta Vista, uses the color, shape and texture features, Blob world [7], CANDID [7], Draw Search [7] also uses all three features collectively to develop system. Recently developed CBIR systems that use combination of features are discussed in next section.

Romain R *et al.* (2013) [16], propose an automatic system to annotate and retrieve images. It assumes that regions in an image can be described using a vocabulary of blobs. Blobs are generated from image features using clustering. Features are locally extracted on regions to capture Color, Texture and Shape information. Regions are processed by an efficient segmentation algorithm. Images are structured into a region adjacency graph. With adjacency graph, it is easier to map spatial relationships between regions. This representation is used to perform a similarity search into an image set. Hence, the user can express own need by giving a query image, and thereafter receiving as a result all similar images.

Emir S *et al.* (2014) [17], present a new idea to extract Fourier descriptors from the simplest shape signature – complex coordinates. Here, the sum of magnitudes of all harmonics is used, rather than using scale normalization with the magnitude of the first harmonic. This leads to improve shape scale normalization. All the experimental results indicate that the method proposed outperforms many other state-of-the-art Fourier descriptors based methods, as compare to retrieval performance and computational time.

Cong B *et al.* (2015) [18] propose K-means based histogram (KBH) method using combination of color and texture for better performance. Here, multi-resolution feature vector (combination of color and texture) is generated from coefficients of Discrete Wavelet Transform (DWT). K-means algorithm is used to partition the vector space which will reduce number of histogram bins. With fusion of z-score normalized Chi-square distance similarity measures the proposed method gives the improved retrieval performance.

Anu Bala *et al.* (2015) [19], propose local text on XOR patterns (LTxXORP), a new descriptor for content-based image retrieval. This method gathers the text on XOR pattern which results in the structure of the query image or image in database. The feature vector is constructed based on the LTxXORPs and HSV histograms. The performance of the proposed method is evaluated by testing on benchmark database, Corel-1K, Corel-5K and Corel-10K in terms of precision, recall, average retrieval

precision (ARP) and average retrieval rate (ARR). The method proposed show a significant improvement for image retrieval.

Jing-Ming G *et al.* (2015) [20], present a new approach to index color images using the features extracted from the error diffusion block truncation coding (EDBTC). The EDBTC produces two color quantizers and a bitmap image. These quantizers and bitmap image is then processed using vector quantization (VQ) results in image feature descriptor. Here, two new features are used color histogram feature (CHF) and bit pattern histogram feature (BHF), to compare the similarity between a query image and the target image in database. The difference obtained from CHF and BHF is used to measure the similarity between two images.

Min H *et al.* (2015) [21], present multi-feature fusion method which combines the color moment in RGB color space and color histogram in HSV color space for color feature extraction. The shape based features are extracted using improved Zernike moments and the texture feature extraction is done using gray level co-occurrence matrix. It combines these three features to describe an image. Finally, the experimental results are shown using color features, shape features, texture features as well as the fused features. The results show that the image retrieval method based on multi-feature combination has better retrieval performance.

3.1.4 Feature Extraction based on Standard Descriptors:

Some standard descriptors like MPEG-7 and SIFT are also used to develop the CBIR system. The main advantage of these descriptors is its interoperability.

Suraya A *et al.* (2013) [22], presents an approach using Scale Invariant Feature Transform (SIFT) algorithm for binary and gray scale images. As SIFT is invariant to scale, rotation and translation and it partially invariant to alteration and illumination changes. Due to these fundamental properties of SIFT, it is used for development of robust CBIR by using MPEG-7, COIL-20 and ZuBuD image databases. The approach first detects keypoints from images and further it is used to match between the query images and images from the database.

Yusuke M *et al.* (2014) [23], propose magna image retrieval using a sketch-based method. Here users can draw sketches via a Web browser; these sketches considered as an input to the system. It further results in list of similar images from a magna database. The nature and characteristics of manga images are different as compare to natural images. To retrieve manga images effectively a fine multi-scale edge orientation histogram (FMEOH) is proposed by which a number of differently sized squares on a page can be indexed efficiently.

Gholam A *et al.* (2015) [24], introduces two novel methods as image descriptors. First method is based on feature extraction using scale invariant feature transform (SIFT) algorithm. On the extracted features, k-means clustering is applied, and then dimensionality reductions are applied which makes SIFT features more efficient and realistic for image retrieval problem. Using the proposed approach along with benefits of SIFT features, memory storage is also decreased. The second method is based on color auto-correlogram and wavelet transform to extract the features. As a result, our first retrieval system using SIFT and k-means is fast and accurate. It can also able manage large databases efficiently.



3.2 SIMILARITY MATCHING

Instead of exact matching, CBIR calculates the visual similarity between a query image and images in database. Based on this similarity measures output of CBIR system is not a single image, but it is the list of images. Many similarity measures have been developed for image retrieval some of them are Minkowski-Form distance, Quadratic Form (QF) distance etc. It forms the search part of the CBIR [1][2][3].

Chahooki M (2012) [25], uses dissimilarities of contour and region-based shape retrieval methods which results in more retrieval accuracy. It is supposed that the combination of two categories of shape description gives significant improvement in retrieval performance. The study proposes a new feature vector to coincide semantic and Euclidean distances. To achieve this, the chosen topological manifold is learnt by a distance-driven non-linear feature extraction method. From the experimental results, it can be seen that geometrical distances between the samples on the manifold space are more related to their semantic distance.

Anuja K et al. (2014) [26], propose content based image retrieval system reduce semantic gap and provides highly accurate, efficient and effective image retrieval result. Ontology is an inner body of knowledge which enfolds representations and descriptions of types of objects found in the domain. Here, core semantic multiple ontology is a used which combine ontologies such as feature ontology, semantic feature ontology, user ontology and metadata ontology for improving accuracy of feature matching.

Nishant S et al. (2014) [27], presents a novel technique for image retrieval based on selective regions matching using region codes. All images in the database are equally divided into number of regions. For each region a 4-bit region code is assigned depending on its relative location to the central region. Then, from these regions Dominant color and Local Binary Pattern (LBP) based texture features are extracted. Feature vectors together and their region codes are further stored and indexed in the database. Feature vectors of regions having similar region codes to the query image region are used for comparison.

Geetharaman K et al. (2014) [28], proposes a CBIR method, which is based on an efficient combination of multi-resolution based color and texture features. It considers color auto-correlogram of the hue (H) and saturation(s) components of HSV color space for color features, and value (V) component of HSV color space for texture features. These two features are calculated by using co-occurrence matrix at optimum level. It also contains a few dominant wavelet coefficients. The efficiency of the proposed system is tested with standard image databases, which show the proposed method achieves better accuracy and fast retrieval.

Mostafa R et al. (2015) [29], proposed a content-based image retrieval (CBIR) system based on intra-class and inter-class features. Intra-class features are a new layout for color distribution of an image based on the concept of co-occurrence matrix in RGB color space called as Distribution of Color Ton (DCT). Inter-class features are extracted using dual-tree complex wavelet transform, singular value decomposition (SVD), and conceptual segmentation based on human vision system. The system developed by this method has many advantages like choosing and extracting the appropriate visual feature, low

complexity of feature extraction method, rich feature vector for image describing, proper use of SOM as classifier, simple similarity measures, low complexity and high accuracy.

3.3 INDEXING/RANKING:

Indexing is a technique to efficiently retrieve images from the image database based on feature extracted. Traditionally indexing is achieved manually by assigning descriptive metadata in the form of keywords or classification codes to each image and then uses this keyword for image retrieval. Again manual indexation suffered from complexity and subjectivity. Effective indexing and fast searching of images based on the visual features become an important issue in field of CBIR. As feature vectors of images have high dimensionality, indexing is achieved by the dimension reduction. Commonly used technique for dimension reduction is PCA (principal component analysis), some researchers also use KL (Karhunen-Loeve) transform. For multi-dimension data reduction R-trees, R*-trees, grid files are used [1][2][3].

Sibendu S et al. (2012) [30] presented directional line edge binary pattern (DLEBP) for texture image retrieval application. DLEBP extracts line edge information as well as eight directional line edge values from images. The experimental results show significantly improvement in terms of ARR as compared to other existing methods.

Lingyang C et al. (2013) [31], propose a rotation invariant PDIR method, which improves the image retrieval performances by exploiting the group spatial consistency of visual word matches. It first propose the Combined-Orientation-Position (COP) consistency to softly quantize the relative spatial relationship between visual word matches in a rotation invariant way; then embed the COP consistency into a simple consistency graph model to efficiently find the group of most consistent visual words. The high descriptive power of the COP consistency and the noise-proof property of the spatially consistent feature group enables to accurately match the visual words between partial duplicate images, which is effective in alleviating the influences of over-dominance, random rotations, scale changes and slight affine transformations.

Bin Xu et al. (2015) [32], propose the Efficient Manifold Ranking algorithm to prolong the original manifold ranking scheme. This algorithm overcomes the limitation of traditional MR like scalable graph construction and efficient ranking computation. It uses an anchor graph on the database to design a new form of adjacency matrix used to speed up the ranking. Experimental results on large scale image databases show that EMR is a hopeful method for real world retrieval applications. Thus EMR proved a promising method for real world retrieval applications.

Daniel C et al. (2014) [33], present a novel approach for the re-ranking problem. It relies on the similarity of top-k lists produced by efficient indexing structures, rather than considering the distance information from the whole collection. With many indexing structures, wide experiments are conducted on a large image collection. Rigorous experimentation result shows that the proposed method can obtain significant effectiveness and, at the same time, efficiency is improved considerably.

Jun Y et al. (2015) [34], propose a novel ranking model based on the learning to rank framework. Specifically, it is based on



large margin structured output learning. Here, the visual consistency is combined with the click features through a hypergraph regularizer term. In accordance with the fast alternating linearization method, a novel algorithm is stated which alternately minimizes two different approximations of the original objective function by keeping one function unchanged and linearizing the other.

Ko-Jen H *et al.* (2015) [35], propose a novel algorithm that combines the Pareto front method (PFM) and efficient manifold ranking (EMR) for multiple query image retrieval. Based on ranking generated by EMR, it creates Pareto points, which correspond to dissimilarities between a sample and every query. Then, sets of Pareto-optimal points, Pareto fronts, are computed. The second Pareto front (depth two) is obtained by removing the first Pareto front, and finding the non-dominated points among the remaining samples. It is repeated until the computed Pareto fronts contain enough samples to return to the user, or all samples are exhausted. The experimentation proves that the Pareto approach is better than linear combinations of ranking results.

Eleftherios T *et al.* (2015) [36], propose a scheme based on high dimensional image descriptor vectors, by assigning the value cardinalities of their dimensions. The dimensions value cardinalities describe the number of discrete values in the dimensions. The value cardinalities considerably may change significantly with different extraction methods. However, different quantization and normalization techniques have a strong impact on extraction process. Then multiple sort algorithms is used to reorder the descriptors' dimensions according to their value cardinalities, which will increase the probability of two similar images to lie within a close constant range.

3.4 RELEVANCE FEEDBACK

It governs the display of the outcomes, and the type of the user-interaction with possibility of refining the search through some automatic or manual preference (weighting) scheme, etc. Relevance feedback (RF) is useful measure to fill the semantic gap between low-level features and high level (semantic) features [1][2][3][4]. It is supervise active learning technique used to improve the effectiveness of the information system.

Zhongmiao X *et al.* (2014) [37], propose a complementary relevance feedback-based CBIR system which reduces the gap between short-term and long-term learning techniques to improve the retrieval performance. Specifically, it constructs an adaptive semantic repository in long-term learning to store retrieval patterns of historical query sessions. Then high-level semantic

features from the semantic repository are extracted and seamlessly integrate low-level visual features and high-level semantic features. The high-level semantic features are dynamically updated based on users' query concept and therefore represent the image's semantic concept more accurately.

Barrena M *et al.* (2015) [5] develop Quatrisi Manager which describes the main issue in the field of CBIR system, the semantic gap. Based on color, texture and shape features the system provides a broad range of useful operations to facilitate the storage, management, retrieval and browsing of large image collections. Local and remote image loading processes enable the population of image collections. Further classification methods allow users to organize the collections according to their own interests. A multidimensional access method contributes to produce efficiency in similarity searches. Further parameterized similarity functions are used to give flexibility to the search by content processes.

Laxmi *et al.* (2015) [38] come up with a long-term learning scheme in relevance feedback for CBIR. They proposed a system integrates the user feedback from all iterations and instills memory into the feedback system of CBIR without saving any log of earlier retrievals. Here they use a method to update the cluster parameters and weights assigned to features by accumulating the knowledge obtained from the user over iterations. Experiment conducted using this approach leads to better convergence and thereby reduced number of iterations to achieve better retrieval accuracy.

Malay K. *et al.* (2015) [39], builds a system using the Multi-scale Geometric Analysis (MGA) of Non-Subsampled Contourlet Transform (NSCT). It adds Relevance Feedback (RF) mechanism to improve the retrieval performance and reduce the semantic gap. System uses a graph-theoretic approach to rank the images along with the user's feedback. First, a graph of images is constructed with edges reflecting the similarity of pairs of images with respect to the proposed feature representation. Then, images are ranked at each feedback round in terms of the probability that a random walk on this graph reaches an image tagged as relevant by the user before hitting a non-relevant one.

Aun I. *et al.* (2015) [40], proposed a semantic image retrieval system which incorporates Genetic algorithms with support vector machine and user feedback for image retrieval purposes. The method introduced new phenomena of feature extraction, in which the features are extracted through the Wavelet packets tree, and are fused, with the Eigen values of the Gabor filter. It assures the effective retrieval and sharing of images by taking the users considerations into an account.

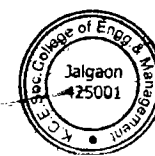


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4. COMPARATIVE ANALYSIS OF SOME RECENT TECHNIQUES

S. No.	Authors and Year	Technique used for feature extraction/ indexing/ matching / relevance feedback/ database used	Comments
1	M.A.Z. Chahooki, N.M. Charkari, 2012 [25]	<ul style="list-style-type: none"> Shape based indexing : contour-based (Centroid and Farthest) and region based (squared and Zernike) method Manifold learning is used for dimension reduction MPEG-7 part B and fish shape dataset 	<ul style="list-style-type: none"> Retrieval accuracy is increased due to combination of four different characteristics of shape Isomap manifold learning method increase the retrieval precision
2	Eleftherios Tiakas, Dimitrios Rafailidis, Anastasios Dimou, and Petros Daras, 2013 [36]	<ul style="list-style-type: none"> Multi-sort indexing (MSINX) for high dimensional image descriptor ImageClef Wikipedia Retrieval 2010, Flickr 1 M, IRISA datasets 	<ul style="list-style-type: none"> System is capable of performing accurate retrieval in low time Mean average precision is calculated It can handle dynamic operations of insertion and deletion in real time
3	Michal Batko, Jan Botoerek, Petra Budikova, Pavel Zezula, 2013 [12]	<ul style="list-style-type: none"> Automatic image annotation and classification (semantic search) Profimedia photo bank and profimedia search log Annotation precision and response time is calculated 	<ul style="list-style-type: none"> Focused on web annotation Combines image and text processing techniques Annotation quality can be significantly improve due to various expansion and reduction techniques used
4	Romain Raveaux, Jean-Christophe Burie, Jean-Marc Ogier, 2013 [16]	<ul style="list-style-type: none"> Image is segmented into regions. Graph based image representation (region adjacency graph) is calculated to show spatial relationship From each region color (color histogram), texture (co-occurrence matrices) and shape (Zernike Moments) features are computed K-means clustering is used to cluster regions Coil-100 dataset is used. 	<ul style="list-style-type: none"> This approach gives good results as compare to tree based approach Structural approach requires fewer number of words to reach its best performance
5	Lingyang Chu, Shuqiang Jiang, Shuhui Wang, Yanyan Zhang, Qingming Huang, 2013[31]	<ul style="list-style-type: none"> Partial Duplicate Image Retrieval (PDIR) using SIFT features Combined orientation position (COP) consistency Graph model for similarity matching Mean Average Precision (MAP) and Average Retrieval Time (ART) is calculated. Uses Holodays/1000k, Sub-Dupimage/1000k, Dupimage1000k, IPDID/1000k and mobile data set 	<ul style="list-style-type: none"> It enable to accurately match visual words between partial duplicate images As PDIR has only one system parameter, it improves robustness in dealing with different data, as it based on SIFT feature extraction. Method proves effective in retrieving near duplicate images.
6	Sibendu Samanta, R. P. Maheshwari, Manoj Tripathy, 2013 [30]	<ul style="list-style-type: none"> Image indexing and retrieval using Line Edge Binary Pattern (LEBP) Brodatz image dataset Performance is measured using Average Retrieval Rate (ARR) 	<ul style="list-style-type: none"> DLEBP extract line edge information as well as eight directional line edge values Image retrieval performance significantly improves in terms of Average retrieval rate (ARR)
7	Suraya Abu Bakar, Muhammad Suzuri Hitam, Wan Nural Jawahir Hj Wan Yussof, 2013 [22]	<ul style="list-style-type: none"> Scale invariant feature transform (SIFT) based feature extraction Experimentation done on MPEG-7, COIL-20 and ZuBuD dataset 	<ul style="list-style-type: none"> Mostly suited and provide excellent retrieval results for images with many corners Good alternative to traditional CBIR system as it is invariant to scale, rotation and translation
8	Jaehyun An, Sang Hwa Lee, and Nam Ik Cho, 2014 [6]	<ul style="list-style-type: none"> Descriptor based on color of salient objects Binary map (spatial distribution of dominant color) roughly describes object shape and relative location Testing is done on corel 1k and corel 10k dataset. 	<ul style="list-style-type: none"> Provide better retrieval performance than conventional color based methods Binary map of dominant color matches the shapes well Therefore mostly suitable for object-based color image retrieval

9	Zhiyong Cheng, Jialie Shen, Haiyan-Miao, 2014 [13]	<ul style="list-style-type: none"> • Color (color histogram, color correlogram) and texture (Gabor, Tamura and Edge histogram) visual features • textual information (social-tag based) retrieval method • relevance feedback • NUS-WIDE and MIRFLICKR dataset 	<ul style="list-style-type: none"> • Retrieval system using textual feature can achieve much better performance than only visual features
10	Hanwang Zhang, Zheng-Jun Zha, Yang Yang, Shuicheng Yan, Yue Gao, 2014 [14]	<ul style="list-style-type: none"> • Tries to reduce Semantic gap • Used Hybrid feedback mechanism to refine search result 	<ul style="list-style-type: none"> • Method can characterize semantic resemblance among image accurately • User can search images quickly
11	Daniel Carlos, Guimarães Pedronette, Jurandy Almeida, Ricardo da S. Torres, 2014 [33]	<ul style="list-style-type: none"> • Image re-ranking using BP-tree, DBM-tree, M-tree and Slim-tree • Result (MAP) evaluated with different feature includes: ACC, BIC,CCV,GCH and LCH • ALOI dataset with 72000 images and 1000 classes of objects 	<ul style="list-style-type: none"> • Rank list is produced by efficient indexing structure • it is scalable • Well suited to large dataset
12	Nishant Shrivastava, Vipin Tyagi, 2014 [27]	<ul style="list-style-type: none"> • Region based segmentation • Dominant color and local binary pattern (LBP) based feature extraction of each region • MPEG7 CCD and Corel image dataset • Average Normalized Modified Retrieval Rank (ANMRR) is employed to evaluate the performance 	<ul style="list-style-type: none"> • ROI also used to specify spatial locations of regions • It improves efficiency through features set containing a dominant color and LBP • It also consumes less computation time
13	Emir Sokic, Samim Konjicija, 2014 [17]	<ul style="list-style-type: none"> • Fourier descriptor based feature extraction • MPEG-7 CE-1 set B, Swedish leaf dataset is used. 	<ul style="list-style-type: none"> • Method outperforms both in effectiveness and efficiency • Not suitable for region based approaches. • This descriptor is essentially a contour based
14	K. Seetharaman, M. Kamarasan, 2014 [28]	<ul style="list-style-type: none"> • Multi-resolution (color and texture) based features extraction • Vistex texture DB and Brodatz texture image dataset is used. • Average precision and recall rate is calculated. 	<ul style="list-style-type: none"> • System is conceptually simple and memory efficient • It reduces the computational complexity • Desirable for large size image database
15	Zhongmiao Xiao, Xiaojun Qi, 2014 [37]	<ul style="list-style-type: none"> • Relevance feedback • Combines High level semantic and low level visual features • Datasets used are: COREL images, Flickr Images, NUS-WIDE images 	<ul style="list-style-type: none"> • It exploits synergism between short term and long term learning technique to overcome weakness of individual learning
16	Ahmad Alzu'bi, Abbas Amira, Naeem Ramzan, 2015 [4]	<ul style="list-style-type: none"> • Semantic image retrieval to reduce semantic gap is discussed. • Various relevance feedback scheme are explained. 	<ul style="list-style-type: none"> • Affect the performance of system in terms of accuracy, speed is discussed.
17	Cong Bai, Jinglin Zhang, Zhi Liu, Wan-Lei Zhao, 2015 [18]	<ul style="list-style-type: none"> • Multiresolution feature vector are created using Color and texture features • K-means histogram for classification of number of histogram bins. • Widely used texture databases are selected: VisTex, A LOT and Stex 	<ul style="list-style-type: none"> • Easy implementation • Improves retrieval performance compare to state-of-art techniques.
18	A. Laxmi, Malay Nema and Subrata Rakshit, 2015 [38]	<ul style="list-style-type: none"> • Relevance feedback by axis re-weighting scheme is proposed • Caltech and corel dataset is used for testing 	<ul style="list-style-type: none"> • Approach leads to better convergence • reduces number of iterations required to achieve better retrieval accuracy
19	Alex Papushoy, Adrian G. Bors, 2015 [15]	<ul style="list-style-type: none"> • Defining salient regions at local and global level • Earth movers distance (EMD) is used for similarity comparison • Benchmark dataset: SIMPLicity and Corel 1K 	<ul style="list-style-type: none"> • Method outperforms using visual attention



			<ul style="list-style-type: none"> • produces comparable results to relevance feedback based retrieval system • provides consistent results for large variety of image categories
20	Izem Hamouchenel, Saliha Aouat, 2015 [8]	<ul style="list-style-type: none"> • Texture segmentation using neighbors based binary pattern (NBP) method • Brodatz dataset is used. 	<ul style="list-style-type: none"> • Research textures have been well recognized, Produces better segmentation results compare to classical decomposition method • Improve accuracy of segmentation.
21	M. Barrena, A. Caro, M. L. Durán, P. G. Rodríguez, J. P. Arias-Nicolás, T Alonso, 2015 [5]	<ul style="list-style-type: none"> • Color, texture and shapes feature extraction • Classification using automated learning • Indexing and relevance feedback is used to increase the retrieval performance 	<ul style="list-style-type: none"> • Three spaces in combination improve results for recall and precision • Relevance feedback enhance quality of retrieval process • Query finding are listed and sorted
22	Shaoyan Sun, Wengang Zhou, Qi Tian, and Houqiang Li, 2015 [9]	<ul style="list-style-type: none"> • Region identification with generic object detection • Fusion of CNN (Convolutional Neural Network) and VLAD (Vector of Locally Aggregated Descriptors) features • Benchmark dataset: Holidays and UKBench dataset 	<ul style="list-style-type: none"> • Promising accuracy is achieved • System developed is scalable • Image representation is efficient in memory overhead • Retrieval process is time efficient
23	Anu Bala , Tajinder Kaur, 2015 [19]	<ul style="list-style-type: none"> • Local texton XOR patterns feature descriptor • Corel dataset is used in experimentation. 	<ul style="list-style-type: none"> • Feature vector is constructed based on LTxXORPs and HSV histogram • Shows significant improvement in terms of Recall and Precision
24	Yusuke Matsui, Kiyoharu Aizawa, Yushi Jing, 2015 [23]	<ul style="list-style-type: none"> • Fine multi-scale edge orientation histogram based feature extraction is proposed. • Magna dataset is used for comparision 	<ul style="list-style-type: none"> • Proposed good solution to sketch based image retrieval • Could retrieval images from MANGA database (not for other sketches)
25	Anuja Khodaskar , Siddarth Ladhake, 2015 [26]	<ul style="list-style-type: none"> • CBIR system using Ontology • Tries to reduce Semantic Gap using shared vocabulary(semantic features) 	<ul style="list-style-type: none"> • Bridges the semantic gap between low and high level features • Improves semantic image retrieval with high accuracy, precision and recall
26	Mostafa Rahimi , Mohsen Ebrahimi Moghaddam, 2015 [29]	<ul style="list-style-type: none"> • Color ton distribution descriptors based on color co-occurrence matrices • Classification using self-organizing map • Corel and VisTex dataset 	<ul style="list-style-type: none"> • It chooses and extracts appropriate visual features with rich contents • Low complexity of feature extraction method • Proper use of SOM as classifier • Can be used as structural and signal processing feature description • System fail to provide satisfactory result in image with intense color distribution
27	Malay Kumar Kundu, Manish Chowdhury, Samuel Rota Buló, 2015 [39]	<ul style="list-style-type: none"> • Feature extraction using Multi-scale geometric analysis (MGA) of non-subsampled contourlet transform (NSTC) • Graph based relevance feedback for ranking • SIMPLIcity dataset, OLIVA dataset and Caltech dataset is used for testing purpose. 	<ul style="list-style-type: none"> • Reduces dimensionality of feature representation • User can process retrieval loop to reduce semantic gap • Ranking mechanism effectively exploits user's feedback to improve quality of retrieval process
28	Aun Irtaza, M. Arfan Jaffar, Mannan Saeed Muhammad, 2015 [40]	<ul style="list-style-type: none"> • CBIR using Genetic Algorithm and SVM • Assures effective retrieval by taking users considerations into an account (i.e. Relevance feedback) • Corel set A, corel set B dataset 	<ul style="list-style-type: none"> • Genetically optimized SVM overcomes limitations of regular SVM like classifier instability, hyperplane biasness • Image retrieval results shows superiority in terms of recall and precision



operation mode, the grid side inverter is responsible for stable DC bus voltage and injects only active power to the grid with zero reactive power.

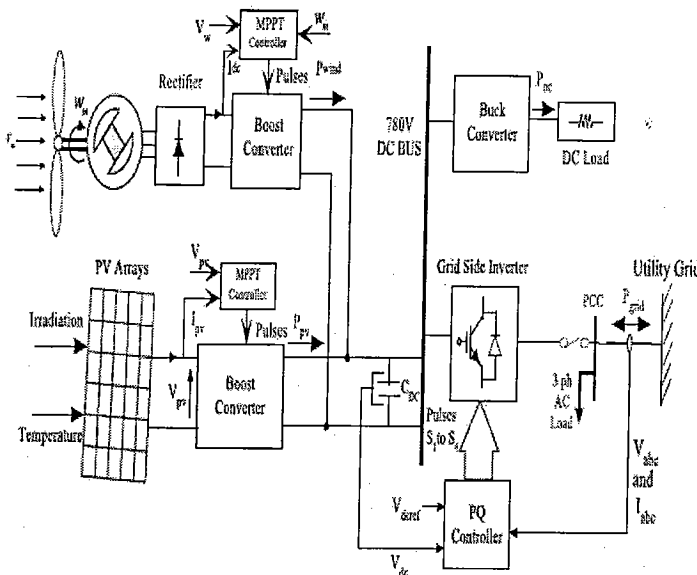


Fig. 4: Schematic diagram of hybrid system with and PV based DG system

Table 1. Main challenges and possible solutions for grid-connected system

SR. NO.	AUTHER'S NAME	CHALLENGES	SOLUTIONS
1.	B. Ernst, F. Reyer, and J. Vanzetta[11]	Voltage fluctuation due to variations in wind speed and irregular solar radiation	Series and shunt active power filters.
	S. K. Khadem, M. Basu, and M. F. Conlon [12]		Power compensators.
	N. T. Lihz [13]		Fixed/switched capacitor or static compensator.
2.	F. O. Resende and J. A. P. Lopes [14]	Frequency fluctuation for sudden changes in active power by loads	PWM inverter controller for regulating frequency in a micro grid.
3.	B. Ernst, F. Reyer, and J. Vanzetta[11][12][13]	Harmonics by power electronics devices and non-linear appliances.	PWM switching converter and appropriate filters.
4.	B. Ernst, F. Reyer, and J. Vanzetta[11], B. Ernst, F. Reyer, and J. Vanzetta [15]	Intermittent energy's impacts on network security	Accurate statistical forecasting and scheduling systems. Regression analysis approaches and algorithms for forecasting weather pattern, solar radiation and wind speed.
	D. A. Halamay, T.K. A. Brekken[16]		Increase or decrease dispatch able generation by system operator to deal with any deficit/surplus in renewable power generation.
	Y. J. Liu and C. W. Jiang [17] E.F. Camacho, T. Samad, M. García-sanz, and I. Hiskens[18]		Advanced fast response control facilities such as Automatic Generation Control and Flexible AC Transmission System.
5.	B. Ernst, F. Reyer, and J. Vanzetta[11]	Synchronization	The most popular grid synchronization technique is based on phased-locked loop. Other techniques for synchronization include detecting the zero crossing of the grid voltages or using combinations of filters coupled with a non-linear transformation.



Table 2. Main Challenges and Possible Solutions for Stand-Alone System

SR. NO	AUTHER'S NAME	CHALLENGES	SOLUTIONS
1.	B. S. Borowy and Z. M. Salameh [19] Z. M. Salameh and B. S. Borowy [20]	High storage cost	Combining both PV solar and wind power will minimum the storage requirements and ultimately the overall cost of the system.
2.	R. Chedid and Y. Saliba [21]	Less usable energy during the year.	Integration of renewable energy generation with battery storage and diesel generator back-up systems.
3.	R. Chedid and Y. Saliba [21] A. N. Celik [22]	Intermittent energy / power quality	Integration of renewable energy generation with battery storage or fuel cell and in some cases with diesel generator back-up systems.
4.	A. N. Celik [22]	Protection	Suitable protection devices need to be installed for safety reasons including up grading of existing protection scheme in particular when distributed generators are introduced.
5.	D. B. Nelson, M. H. Nehrir, and C. Wang [23] N. A. Ahmed, M. Miyatake, and A. K. Al-Othman [24]	Storage runs out	Integrate PV and wind energy sources with fuel cells.
6.	D. B. Nelson, M. H. Nehrir, and C. Wang [23] N. A. Ahmed, M. Miyatake, and A. K. Al-Othman [24]	Environmental and safety concerns of batteries and hydrogen tanks.	Integrating PV and wind energy sources with fuel cells instead of large lead-acid. Batteries or super storage capacitors, leads to a non polluting reliable energy source. and reduces the total maintenance costs.

VIII. CONCLUSION

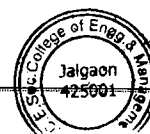
The performance of SOFC based DG system connected to grid has been conceded. In grid-connected mode, the voltage and frequency are controlled by the grid. Thus, the DG units are controlled to provide specified amount of real power depending upon the rating of the units. A control strategy has been developed using decouple method to control the active and automatic powers independently from the solid oxide fuel cell. It has provided a review of challenges and opportunities on integrating solar PV and wind energy sources for electricity generation. The main challenge for grid-connected system as well as the independent system is the irregular nature of solar PV and wind sources.

IX. ACKNOWLEDGMENTS

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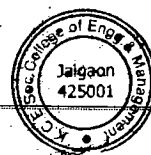


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GRID INTEGRATION OF HYBRID GENERATION

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ABSTRACT

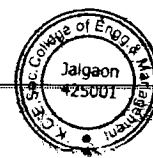
In all over the world the wind and solar energies are the most available among other renewable energy sources. In the current years, the power electronic systems the production of electricity from wind and photovoltaic energy sources have increased significantly. In grid integration of hybrid generation, the performance of the wind/PV hybrid system is studied under different grid perturbation conditions. Based on the level solid oxide fuel cell (SOFC) dynamic model for power system studies and the analysis of the SOFC operating conditions. To determine the maximum electrical efficiency the nonlinear programming(NLP) method was used. SOFC focus on the constraints of fuel utilization factor, stack temperature and output active power. The grid-connected SOFC were obtained by solving the NLP problem using by the power consumed by the air compressor, In order to deliver the stable power to the load, a large battery bank is required, which enhances the size of the system, cost and also causes environmental pollution. The use of battery can be avoided by directly connecting the hybrid system to the grid. The work consists of modeling and simulation of wind and photovoltaic hybrid energy system inter-connected to electrical grid through power electronic interface. The power conditioning of the system is implemented to control power electronic circuits and system performance which is evaluated for different input power levels and load variation.

Keywords: SOFC, NLP Method, PVC Cell.

I. INTRODUCTION

Wind energy scheme generates power in the form of AC with different voltage and frequency levels in case of variable speed operation. Solar energy system generates power in the form of dc voltage and the level of DC voltage depending on temperature and irradiation levels. Both of these systems require power electronic interface for inter-connection with the grid. Varying DC output voltage of the photovoltaic system suitable to change in input parameters like irradiation and temperature can be controlled using a boost up converter. AC voltage generated by the wind turbine generator can be converted to DC by using unrestrained rectifier and then, be synchronized using a boost converter[1]. A key problem is the integration of renewable energies into the existing grid. The grid system is used for analyzes the reasons for this deficit and assesses possible solutions.

A Hybrid Power System (HPS) utilizes two or more energy sources, power converters and storage devices. The main purpose of HPS is to combine multiple energy sources and storage devices which are set off of each other. Thus, higher efficiency can be achieved by taking the benefit of each individual energy source and device while overcoming their limits [2]. Current development in FC technology for grid improvement has showing its significant potential and considers an crucial energy source for the future power system. FC is a static energy source that generates electricity from hydrogen during electrolysis. The superior reliability, with practically zero





noise level or no moving parts is an extra benefit of FC system as compared to the diesel generator. Main characteristics of FC include modularity, near zero emissions, fuel flexibility, best power quality, high efficiency and practically low noise levels. Other advantages of FC are the distributed and centralized configurations, variety of fuels, cogeneration options and reusability of exhaust gases for heating of buildings [3].

The combined use of FC with an Electrolyser (ELZ), hydrogen storage tanks and compressor component provide a new energy storage concept. Since, hybridization of FC loads with PV panels will, therefore, form an interchange energy conversion system where the FC acts as back up during low PV outputs to convince continued load demands. There are several types of FCs which are classified on the basis of their operating temperature ranges and type of electrolyte. For this Solid Oxide Fuel Cell (SOFC) is selected, because, it works at high temperatures (800 – 1000 °C) [4]. But, the main weak point in SOFC is their poor energetic response, gas starvation and load tracking delays [5]. When a SOFC is subjected to a step increase in load, it shows an immediate drop off of the voltage in the V-I curve and take several seconds to provide the required power. In the meantime, the SOFC may be starved of fuel, which can seriously affect the life time of SOFC [6]. This problem can be addressed by using a high energy density device such as a battery. Thus, the SOFC should be utilized under inhibited steady-state environment while the battery is supplying the demanded power. Without the battery bank, the SOFC system have to provide all the power demand, thus massive and increase the cost of the SOFC power plant.

II. LITERATURE REVIEW

The design and control strategy of an autonomous photovoltaic fuel-cell energy system has been developed and simulations have been performed in order to supply electricity to a DC-load without being connected to the electric grid. The all work is divided into two parts. In the first part each subsystem and different parameters are identified for each subsystem. The second part dealt with the design and setting up of various equipment which includes voltage and current sensors. The energy system having a photo voltaic (PV) panel, wind turbine and fuel cell (SOFC) for incessant power flow management. Fuel cells (storage & generating) are added to ensure constant power supply due to the discontinuous nature of solar and windresources.

The grid integration system used to design and modelling of grid connected hybrid renewable energy power generation. The energy system having a photo voltaic (PV) panel, wind turbine and fuel cell (SOFC) for continual power flow management. Fuel cells (storage & generating) are added to ensure continual power supply due to the discontinuous nature of solar and wind resources. There are some drawbacks. For example, some authors include short energy system in their studies, while others concentrate on long term storage medium. Some authors describe power control of PV system while others challenge to tackle the energy management without providing power sharing among different energy sources and/or storage system. Most of the authors supported their work on the basis of virtual generated solar irradiance, temperature and weather patterns.

III. RENEWABLE ENERGY SOURCES

1. **SOLAR ENERGY** -The solar energy is an limitless source of energy which is originated from the sun. When Without changing the form the light and heat from the sun are used directly, then the technology



operation mode, the grid side inverter is responsible for stable DC bus voltage and injects only active power to the grid with zero reactive power.

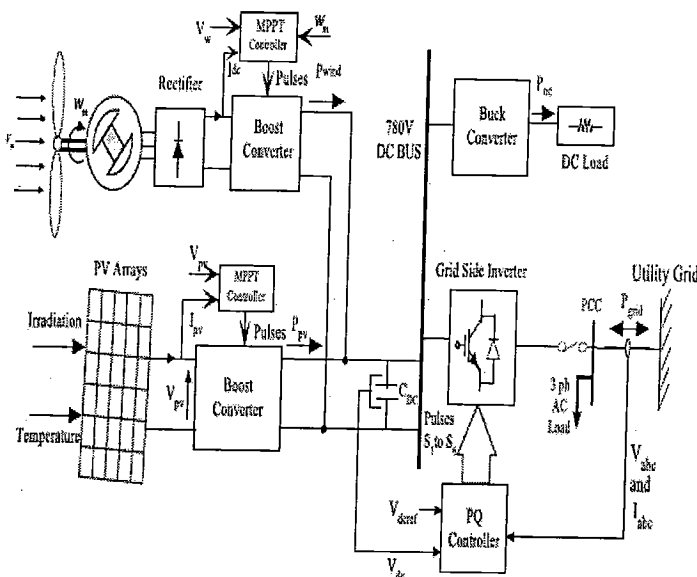


Fig. 4: Schematic diagram of hybrid system with and PV based DG system

Table 1. Main challenges and possible solutions for grid-connected system

SR. NO.	AUTHER'S NAME	CHALLENGES	SOLUTIONS
1.	B. Ernst, F. Reyer, and J. Vanzetta[11]	Voltage fluctuation due to variations in wind speed and irregular solar radiation	Series and shunt active power filters.
	S. K. Khadem, M. Basu, and M. F. Conlon [12]		Power compensators.
	N. T. Linh [13]		Fixed/switched capacitor or static compensator.
2.	F. O. Resende and J. A. P. Lopes [14]	Frequency fluctuation for sudden changes in active power by loads	PWM inverter controller for regulating frequency in a micro grid.
3.	B. Ernst, F. Reyer, and J. Vanzetta[11][12][13]	Harmonics by power electronics devices and non-linear appliances.	PWM switching converter and appropriate filters.
4.	B. Ernst, F. Reyer, and J. Vanzetta[11], B. Ernst, F. Reyer, and J. Vanzetta [15]	Intermittent energy's impacts on network security	Accurate statistical forecasting and scheduling systems. Regression analysis approaches and algorithms for forecasting weather pattern, solar radiation and wind speed.
	D. A. Halamay, T.K. A. Brekken[16]		Increase or decrease dispatch able generation by system operator to deal with any deficit/surplus in renewable power generation.
	Y. J. Liu and C. W. Jiang [17], E.F. Camacho, T. Samad, M. Garcia-sanz, and I. Hiskens[18]		Advanced fast response control facilities such as Automatic Generation Control and Flexible AC Transmission System.
5.	B. Ernst, F. Reyer, and J. Vanzetta[11]	Synchronization	The most popular grid synchronization technique is based on phased-locked loop. Other techniques for synchronization include detecting the zero crossing of the grid voltages or using combinations of filters coupled with a non-linear transformation.



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6.	D. B. Nelson, M. H. Nehrir, and C. Wang [23] N. A. Ahmed, M. Miyatake, and A. K. Al-Othman [24]	Environmental and safety concerns of batteries and hydrogen tanks.	Integrating PV and wind energy sources with fuel cells instead of large lead-acid. Battanes or super storage capacitors, leads to a non polluting reliable energy source. and reduces the total maintenance costs.

VIII. CONCLUSION

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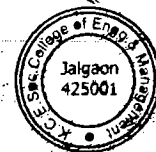



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ABSTRACT

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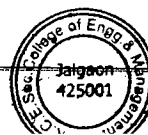
Keywords: SOFC, NLP Method, PVC Cell.

I. INTRODUCTION

Wind energy scheme generates power in the form of AC with different voltage and frequency levels in case of variable speed operation. Solar energy system generates power in the form of dc voltage and the level of DC voltage depending on temperature and irradiation levels. Both of these systems require power electronic interface for inter-connection with the grid. Varying DC output voltage of the photovoltaic system suitable to change in input parameters like irradiation and temperature can be controlled using a boost up converter. AC voltage generated by the wind turbine generator can be converted to DC by using unrestrained rectifier and then, be synchronized using a boost converter[1]. A key problem is the integration of renewable energies into the existing grid. The grid system is used for analyzes the reasons for this deficit and assesses possible solutions.

A Hybrid Power System (HPS) utilizes two or more energy sources, power converters and storage devices. The main purpose of HPS is to combine multiple energy sources and storage devices which are set off of each other. Thus, higher efficiency can be achieved by taking the benefit of each individual energy source and device while overcoming their limits [2]. Current development in FC technology for grid improvement has showing its significant potential and considers an crucial energy source for the future power system. FC is a static energy source that generates electricity from hydrogen during electrolysis. The superior reliability, with practically zero

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noise level-or no moving parts is an extra benefit of FC system as compared to the diesel generator. Main characteristics of FC include modularity, near zero emissions, fuel flexibility, best power quality, high efficiency and practically low noise levels. Other advantages of FC are the distributed and centralized configurations, variety of fuels, cogeneration options and reusability of exhaust gases for heating of buildings [3].

The combined use of FC with an Electrolyser (ELZ), hydrogen storage tanks and compressor component provide a new energy storage concept. Since, hybridization of FC loads with PV panels will, therefore, form an interchange energy conversion system where the FC acts as back up during low PV outputs to convince continued load demands. There are several types of FCs which are classified on the basis of their operating temperature ranges and type of electrolyte. For this Solid Oxide Fuel Cell (SOFC) is selected, because, it works at high temperatures (800 – 1000 °C) [4]. But, the main weak point in SOFC is their poor energetic response, gas starvation and load tracking delays [5]. When a SOFC is subjected to a step increase in load, it shows an immediate drop off of the voltage in the V-I curve and take several seconds to provide the required power. In the meantime, the SOFC may be starved of fuel, which can seriously affect the life time of SOFC [6]. This problem can be addressed by using a high energy density device such as a battery. Thus, the SOFC should be utilized under inhibited steady-state environment while the battery is supplying the demanded power. Without the battery bank, the SOFC system have to provide all the power demand, thus massive and increase the cost of the SOFC power plant.

II. LITERATURE REVIEW

The design and control strategy of an autonomous photovoltaic fuel-cell energy system has been developed and simulations have been performed in order to supply electricity to a DC-load without being connected to the electric grid. The all work is divided into two parts. In the first part each subsystem and different parameters are identified for each subsystem. The second part dealt with the design and setting up of various equipment which includes voltage and current sensors. The energy system having a photo voltaic (PV) panel, wind turbine and fuel cell (SOFC) for incessant power flow management. Fuel cells (storage & generating) are added to ensure constant power supply due to the discontinuous nature of solar and windresources.

The grid integration system used to design and modelling of grid connected hybrid renewable energy power generation. The energy system having a photo voltaic (PV) panel, wind turbine and fuel cell (SOFC) for continual power flow management. Fuel cells (storage & generating) are added to ensure continual power supply due to the discontinuous nature of solar and wind resources. There are some drawbacks. For example, some authors include short energy system in their studies, while others concentrate on long term storage medium. Some authors describe power control of PV system while others challenge to tackle the energy management without providing power sharing among different energy sources and/or storage system. Most of the authors supported their work on the basis of virtual generated solar irradiance, temperature and weather patterns.

III. RENEWABLE ENERGY SOURCES

1. **SOLAR ENERGY** -The solar energy is an limitless source of energy which is originated from the sun. When Without changing the form the light and heat from the sun are used directly, then the technology

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If it reaches the steady-state the DGs autonomously operate with load. The phase difference between the DGs output voltage and the grid voltage decreases until the DGs output voltage is in phase with the grid voltage. After the DGs output voltage is synchronized with the grid voltage, the grid is connected to DGs and then the grid starts providing electric power to the load. For interfacing DGs to the distribution system there are various control strategies. The DG is operated either to control DG output current, active power and voltage at the point of common coupling (P-V mode) or active and reactive power output of DG.

V. INTEGRATION IN EXISTING GRID

To understand the problem of why the potential of renewable energy sources is not shattered, and have to consider the actual grid conditions and the resulting barriers. Grids are designed to transmit electrical electricity by large conventional power plants. An aggregation occurs by using transformers between the transmission and the distribution grid. The interconnection directly or indirectly allocates the electricity to connected users in a central way. In the distribution grid the voltage falls in the direction of the current flow. The refuse depends on resistance and inductance in the cable. These two factors grow with rising cable length. To provide all clients with enough voltage, a transformer somewhat increases the voltage at the beginning of a cable. Energy generation from renewable sources requires an installation of the plant in locations with a high energy supply, for example, in areas with a majestic wind velocity. Therefore, the installations are connected at different local points to the grid. In contrast to large power plants, renewable plants have less capacity and are integrated in lower grid levels. When decentralized generators integrate electricity in low-voltage lines, conditions can change and the power flows in the direction of the transformer. Voltage rise aggravates in practice if more and more distributed generators, particularly in rustic areas with mostly weak grids, are integrated. This barricade of insufficient grid capacity available for renewable energy is the main problem.

The integration of distributed energy producers critically influences the operation of the whole grid and calls for new requirements of the mains operation. Thus central large power plants are forced to work in part load and have other starts. These actions have negative effects on materials, efficiency, costs of generation and lead to additional input of fossil fuels and output of carbon dioxide. To avoid voltage rises, the grid has to be partially extended. The costs of grid support are often very high. The benefits of producing energy from renewable sources are often considered less important than the costs. Moreover, different power developers have highlighted that it is impossible to determine the available grid capacity so that they are unable to verify the technical and cost data of the grid connection presented to them by the grid operator. Furthermore, Distribution System Operators (DSO) are often linked to electricity generation companies. It is arguable whether such a DSO is fully objective towards independent renewable energy producers when the electricity generation company is involved in-developing alternative energy programs. The insufficient simplicity of grid connection causes long lead times to obtain grid connection authorization.

VI. GRID INTEGRATION OF HYBRID SYSTEM

The integration of combined solar and wind power systems into the grid can help in dipping the overall cost and improving reliability of renewable power generation to supply its load. The grid takes overload renewable power from renewable energy site and supplies power to the site' loads when required. Common DC and



common AC bus grid-connected to solar PV and wind hybrid system, respectively. The complete system is designed in two buses i.e., DC and AC bus. PV, SOFC, ELZ and battery make the architecture of DC bus, and the power conversion and transferring occurs between the components during a CEMCA. Domestic load and national grid are the parts of AC bus. The output voltages of PV and SOFC are synchronized and attuned through two non-isolated DC-DC boost converters. The boost converter is controlled during Proportional Integral Differentiator (PID) controller. The bidirectional power flow of battery with the rest of the system occurs through a buck boost converter. The buck boost converter is controlled through Proportional Integral (PI) controller. The output of DC bus provides the required power to the grid and grid-connected load through three phase inverter even if only one source is available. The inverter is controlled via hysteresis current control approach. It is important to describe that the projected HPS is flexible and, therefore, easily upgradable as long as a new PV, SOFC and battery are added to the existing ones without increasing the circuit complexity. In addition, it is also possible to add another parallel inverter to apply the said design with high efficiency[10] as shown in Fig 3.. The evaluation of the performance and stability of the proposed CEMCA necessitates the simulation of the integrated system over a period of time. Therefore, steady-state simulation models have been employed for each different unit.

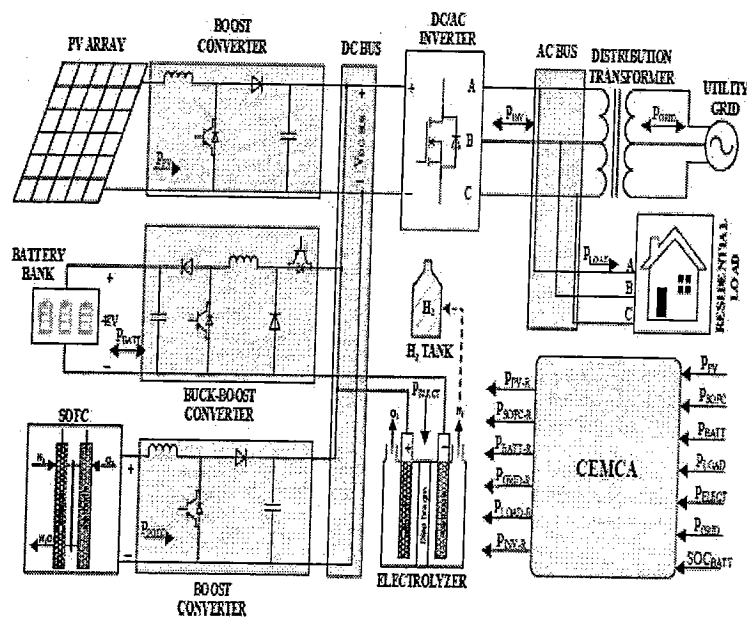


Fig. 3: Architecture of Proposed Hybrid Power System

VII. HYBRID SYSTEM CONFIGURATION

The block diagram of the wind/PV system for its grid connection is presented in Fig. 4. The wind power system with uncontrolled rectifier and dc-dc boost converter is connected to a DC bus. To connect the PV arrays are connected to DC bus, for that connection dc-dc boost converter is used. The wind and photovoltaic generators are controlled locally to get the maximum power extraction. For the analysis of the grid connected hybrid system, the DC and AC loads are considered[25]. The DC load is connected through a dc-dc resist converter to the DC bus. The rated voltages for DC load and AC load are 500 V and 415 V RMS respectively. In grid fixed

refers as a direct or passive technology of solar energy and when it used by converting the form of energy, that is called indirect or active technology of solar energy. The photovoltaic technology is the popular indirect way and the solar thermal system is the direct way to harvest the abundant energy. There are different types producing electricity from renewable energy sources. Accordingly, there are several ways of connecting the gained electricity with the existing grid.

2. **WIND ENERGY**-Wind energy is extracted from the wind. For extraction used the wind mill. It is renewable energy sources. For generation of electricity the wind energy needs less cost and maintenance cost is also less for wind energy system. Wind energy is present nearly 24 hours of the day. It has less emanation. Initial cost is also less of the system.

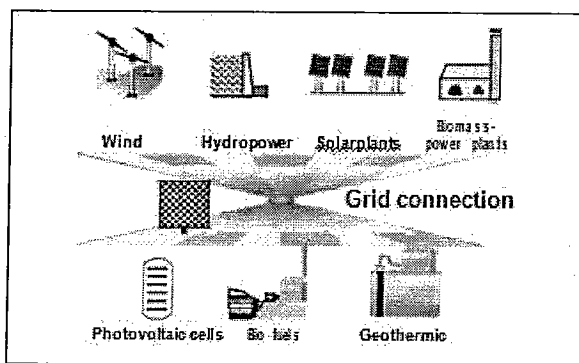


Fig. 1. Grid Connection

The sources are wind, hydro, solar, biomass, photovoltaic cells, bio fuels and geothermic as shown in Fig. 1. Except for photovoltaic cells the electricity is induced by asynchronous or synchronous generators. This operation creates co-current flows and gets throughout an inverted rectifier into the power grid.

IV. GRID INTERFACE TOPOLOGY OF SOFC

Fuel cells are electrochemical energy conversion devices like to batteries. The case of a SOFC based DG connected to a grid is considered in which the capacity of power supply by the DGs is less than the load demand i.e., the active power demand of load is more than DG capacity and hence grid and DG both will supply active power to the load. Thus, in this mode of operation a certain amount of power is scheduled to the load from the fuel cell DG and remaining power to load is supplied from the utility grid.

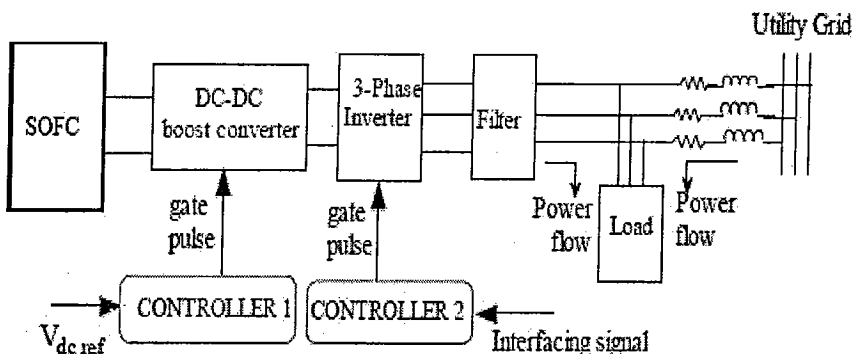


Fig. 2. Schematic diagram of grid connected DGs

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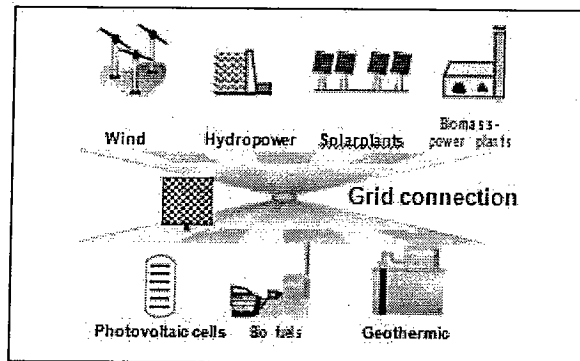


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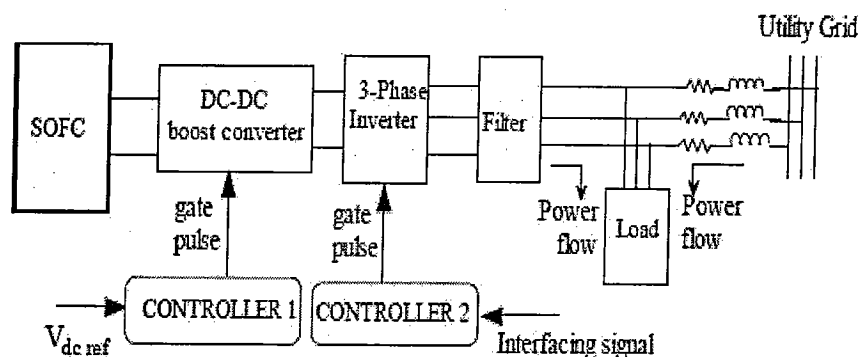


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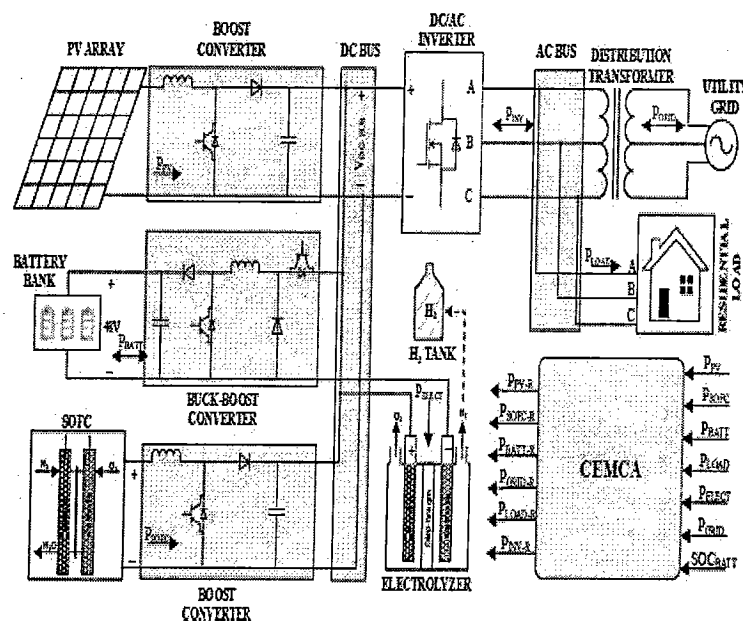


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Simulation Analysis of low Voltage DC Micro Grid – An Investigation of Load Sharing by Using MATLAB

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Abstract – The DC microgrid consists of PV panel, wind rotary engine, battery, dc loads and a grid connected converter system. Microgrids with important renewable penetration will possible need storage devices to keep up a stable bus voltage thanks to the random behavior of renewable sources and grid loads. In power electronics-based microgrids, the procedure requirements required to implement associate optimized on-line management strategy may be preventative. The DC microgrid consists of PV panel, wind rotary engine, battery, dc hundreds and a grid-connected converter system. Thus on make sure the stableness of a DC microgrid, the flexibility flow at intervals the DC little grid ought to be balanced the smallest amount bit times to require care of a relentless dc bus voltage. Wholly totally different with the centrally management methodology, the droop management supported the dc-bus signaling (DBS) technique is used throughout this paper.

Index Terms – DC micro grid, voltage droop control, power electronics devices, and renewable energy resources.

1. INTRODUCTION

Due to increasing issues on a generic intergrid idea, microgrid has attracted intensive interest. A small grid is generalized into 2 types: AC microgrid and DC microgrid. Compared to the standard ac microgrid design, dc microgrid have several benefits, it would like fewer power converters, higher system efficiency and easier interface of renewable energy sources to dc system, there aren't any would like of frequency, phase, or reactive power management. THE INCREASING range of renewable energy sources and distributed generators needs new methods for the operation and management of the electricity grid so as to take care of or perhaps to enhance the power-supply dependableness and quality. In DC microgrid, the key purpose of power management is to maintain the ability balance between energy sources, utility units, device and dc loads at any time, it means, the voltage stability management is that the vital factor in DC micro grid[3]. DC-BUS is technology for reliable and economical communication over noisy DC or AC Power lines. The DC-BUS was originally developed by Yamar electronics Ltd. in conjunction with the DC-BUS Alliance for. During grid-connected operation, a grid-tied

converter balances the ability of the microgrid by dominant the DC voltage. All masses are connected to the microgrid, and operate ordinarily. throughout islanded operation, distributed generators (DGs), a backup generator, or an energy storage system balances the ability. . Power systems composed of small-scale distributed energy resources, like wind turbines, fuel cells, electrical phenomenon, storage devices, etc. could also be stand alone and grid connected. Several of these generation sources directly prove either dc or variable frequency/voltage ac outputs and, thus, power-electronics technologies became the key a part of the various distributed generation systems. The protection of low-tension dc small grids was studied in where varied protection devices were mentioned and fully totally different fault detection and grounding ways that were investigated. DC voltage management and power sharing terribly} very dc microgrid was investigated considering the dc-side impedance. In , the most focus was placed on the coordination of the dc voltage controllers for varied thus sources so on reduce the present currents. Fully totally different operation modes for dc distribution networks along with ac association fault and islanding are studied. terribly} very dc microgrid, fully totally different| fully different} system components may need different objectives to understand. Also, there's conjointly fully {different| totally different| completely different} |many various| several alternative} transient things happening among the system at different instants. Multiple reverse conversions required in individual ac or dc grids would possibly add additional loss to the system operation and may build the current home and workplace appliances extra tough. The electrical network is that the set of transformers and infrastructures that carry electricity from the centers of production to any or all customers. These networks ar responsible to maneuver and distribute the electricity generated from the supply to the ultimate purpose of consumption. they're designed to work since the center of last century, wherever main production centers were distant from the ultimate costumers, so from the position of customers and also the



An Overview on Power Quality Problems by Using D- STATCOM

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ABSTRACT— Voltage sag and harmonics are every now and again occurred issues related while, non-linear loads are placed. This impacts the basic loads connected at same line of basic coupling of the distribution line. Here this paper shows a diagram to beat the power quality issues and examination of different harmonics and sag disturbing the distribution line by FACTS devices known as Distribution Static Compensator (D-STATCOM). The control method of Unit Template Algorithm for reference current age is proposed in this paper. The model of distribution line and D-STATCOM are implemented by MATLAB-SIMULINK programming.

KEYWORDS- Sag, Harmonics, D-STATCOM, Distribution line, Unit Template Algorithm.

I. INTRODUCTION

Electric utilities and end clients of electrical power has been continuously concerned about the electric power quality. In the power industry and shopper premises the term control quality issues has turned into the most essential part. The Electricity control part exchange issue isn't cramped to just vitality proficiency and condition yet more significantly on direction and nature of supply or nature of energy. The nature of Electrical Power can be describe as the degree of any deviation from the negligible estimations of the recurrence and voltage magnitude. Power quality may likewise be describe as the degree to which both the delivery of electric power and influences the execution of electrical gear during the operation. From a client point of view, an issue of energy quality is defined as any power issue manifested in current, voltage, or recurrence deviations that outcome in control wastage of client of hardware or disappointment. It is beyond a noteworthy worry in the present time; it particularly turns out to be preeminent with the introduction of profoundly evolved devices, whose execution is exceptionally touchy to the nature of energy supply. Nowadays modern industrial procedures are built on a lot of energy electronic devices, for example, adjustable speed drives and programmable rationale controllers (PLC). The vast majority of electronic devices are extremely delicate to disturbances and subsequently industrial loads turn out to be less agreeable to control quality issues, for example, harmonics, voltage dips, voltage swells, interferences, flashes, and indents.

For producing the reference current a unit template algorithm is discussed in this paper. Genuine source current in the hysteresis controller compared with the reference current [3]. Hysteresis controller produces exchanging heartbeats and it is given to the IGBT of the voltage source converter. The DSTATCOM is connected at distribution line to discharge or ingest the responsive current at PCC. The disposal of harmonics are done by repaying current, keeps the information waveform sinusoidal during the operation of nonlinear loads. Subsequently in this paper two power quality issues i.e voltage sag and harmonics are addressed.

A Review on Implementation of UPFC for improvement of active power flow capability in power system using IEEE 14 bus system

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Abstract - Flexible AC Transmission System (FACTS) Flexible alternating current transmission systems (FACTS) technology opens up new opportunities for controlling power and enhancing the usable capacity of present, as well as new and upgraded lines. The Unified Power Flow Controller (UPFC) is a Flexible AC transmission system (FACTS) uses the thyristor controlled devices that can control all the three system variables namely can change parameters like impedance, voltage and phase angle difference of voltage across the line. For governing, UPFC is the most complex but promising power electronics system. This paper presents control and performance of Unified Power Flow Controller (UPFC) is investigated in controlling the flow of power over the transmission line. It can be present real and reactive power flow control through a transmission line by place Unified Power Flow Controller is studied to improve the power flow over a transmission line in a standard IEEE 14 bus system.

Key Words: FACTS, real and reactive power flow, IEEE 14 bus system, IGBT, UPFC

1. INTRODUCTION

The Flexible ac transmission a system (FACTS) is the combination of the power "electronics" devices to controls the power flow and the quantities in power system. Its first concept was introduced by N.G Hingorani, in 1988 (FACTS) is very popular and essential device in power systems [1].

In order to have a better use of the transmission capabilities of the transmission lines, different types of FACTS devices have been studied: Static VAR Compensator (SVC), Thyristor controlled series capacitor (TCSC), Static synchronous compensator (STATOM), Static series compensator (SSSC), Unified Power Flow Controllers (UPFCs), thyristor switched capacitor (TSC) thyristor controlled reactor (TCR) [4-12]. Several FACTS-devices have been introduced for various applications in power system.

UPFC is the most flexible multi-functional FACTS device which is a new generation of FACTS devices proposed by Gyugyi in 1991. UPFC is a Combined Series-Shunt Controllers. The UPFC is one of the most versatile devices. In interconnected power systems, it is important to have control over power transfer [5]. This can improve stability and allow transmission lines to be loaded closer to their

thermal limits. In UPFC, the transmitted power can be controlled by changing three parameters of power transmission line namely transmission magnitude voltage, impedance and phase angle.

This device combination of two other FACTS devices: the Static Synchronous Compensator (STATCOM) and the Static Synchronous Series Compensator (SSSC). Practically, these two devices are two Voltage Source Inverters (VSI's) connected respectively in shunt with the transmission line through a shunt transformer and in series with the transmission line through a series transformer. These are connected to each other by a common DC link, which is a typical storage capacitor [7-12].

2. LITERATURE REVIEW

Tanushree Kaul, Pawan Rana et. al. 2013[12] In the recent years ecological concerns and high installation costs have put constraints over construction of new plants and overhead lines in many countries, thereby forcing existing system to be used more efficiently rather than constructing new lines, industry has tended towards the development of technologies or devices that increase transmission network capacity while maintaining or even improving grid stability. Our main objective is to meet the electric load demand reliably while simultaneously satisfying certain quality constraints imposed on the power supply.

Mithilesh Singh, Shubhrata Gupta et.al. 2016 [15] FACTS devices which can change the routes of exchanged powers through the transmission lines by changing angle of bus voltage, amplitude as well as reactance of transmission lines. In this paper technological development with modeling of FACTS devices shown to increase line load ability and reduce the transmission congestion by voltage profile improvement. The UPFC is one of the FACTS controllers that can manage the power flow in transmission line by inserting reactive and active voltage component in series with the line. The effectiveness of the FACTS controller mainly depends on their location so main objectives are voltage stability and voltage profile improvement, loss reduction, fuel cost reduction and economical approach for minimize the overall system cost.

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IMPLEMENTATION OF POWER ELECTRONIC TRANSFORMER BASED DYNAMIC VOLTAGE RESTORER (DVR) TO IMPROVE POWER QUALITY AT DISTRIBUTION SIDE (LOAD)

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Abstract— In this paper, a three phase four wire Dynamic Voltage Restorer (DVR) with bidirectional power electronic transformer structure is proposed to inject required compensating series voltage to the electric power system in such a way that continuous sinusoidal voltage is seen at load side ever at heavy fault occurrences at utility side. Now a day's equipment are more sensitive to power quality. In power system there may be fluctuation in power quality at the sensitive load due to faults and switching operation of breakers. This disturbance may result in failure of the equipment. Recent development in power electronic devices helps us to mitigate such problem. The main power quality problems like voltage sag and swell are studied in this paper. Here the new component PET Based Dynamic Voltage Restorer is provide the most cost effective solution to mitigate voltage sags and swells that is required by customer. The PET is a new type of power transformer which has the advantage of increasing of the frequency to reduce the size. Application of high frequency transformers increases the power density and reduces the overall cost of the system. This PET based distributed DVR for load side protection against voltage disturbance is investigated in MATLAB simulation package. The 33KV / 11KV Distribution substation At Rahata is taken for study. Number of readings are taken at feeder at every hour each for 24 hour . From the model, it is seen that the power quality improved with the help of PET Based DVR with higher controllability and reliability.

Keywords— DVR , PET, 3DSVM , PWM , SLG

I. INTRODUCTION

With the increasing use of non-linear loads and complexity of the network, the power system network faces challenges to deliver quality power to the consumers. This paper describes the effectiveness of using dynamic voltage restorer (DVR) in order to mitigate voltage sags and swells in low voltage distribution systems. Dynamic Voltage Restorer provide the most cost effective solution to mitigate voltage sags and swells that is required by customer. The Dynamic Voltage Restorer (DVR) is a rapid, flexible and resourceful solution to power quality problems.

Power quality is of great importance in all current environments where electricity is involved, power quality can be essentially influenced by an important factor like quality service. One of the major concerns in electricity industry today is power quality problems. Presently, most of the power quality problems are due to different fault conditions. These conditions effects voltage sag, voltage swell, transients, voltage interruption and harmonics in the system. These problems may cause the apparatus tripping, shutdown commercial, domestic and industrial equipment, and miss process of drive system. Dynamic voltage restorer can provide the worthwhile solution to mitigate voltage sag by establishing the appropriate voltage quality level, necessary. It is recently being used as the active solution for mitigation of power quality problems

A] Voltage sag/dip:

The voltage sag or dip can be stated as decrease in nominal voltage level by 10-90% for short duration for half cycle to one minute as shown in fig.1.1. Sometime, voltage sag last for long duration such prolonged low voltage profile referred as 'under-voltage'. Voltage sag is further divided in three categories: instantaneous, momentary and temporary sags respectively. Voltage sag

Shifting of Loyalties: Perception of Telecom customers after launching of “Jio” in Jalgaon city

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Abstract: India is the world's second-largest telecommunications market, with over 1.0 billion subscribers as of May 2015. The wireless segment (97.36 per cent of total telephone subscriptions) dominates the market. It has also been growing at a brisk pace. During FY07-15, wireless subscriptions witnessed a CAGR of 24.78 per cent to 969.8 million. . It is also the second largest country in terms of internet subscribers. India had 267.39 million internet subscriptions as of December 2014. India's telecommunications market is expected to experience further growth, fuelled by increased non-voice revenues and higher penetration in rural market. Telecom penetration in the nation's rural market is expected to increase from 46.14 per cent as of December 2014 to 70 per cent by 2017. The emergence of an affluent middle class is triggering demand for the mobile and internet segments. Availability of affordable smartphones, along with a rise in the security level of mobile transactions, is expected to boost growth of transactions conducted via phones, with the overall transaction value being tripled in 2014 from last year. Strong policy support from the government has been crucial to the sector's development. FDI cap in the telecom sector has been increased to 100 per cent from 74 per cent. In January 2015, the Government of India recommended reduction in license fees of telecom by 6 per cent for operators; telecom operators currently pay 8 per cent of adjusted gross revenue as licence fee. In this paper researcher have tried to study the changing perception among the user along with the revolutionary changes in the telecommunication sector with the arrival of Jio scheme.

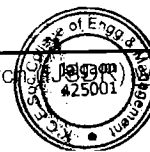
Keywords: Jio, mobile, consumer behaviour

Introduction:

India's telecommunication network is the second largest in the world based on the total number of telephone users (both fixed and mobile phone). It has one of the lowest call tariffs in the world enabled by the mega telephone networks and hyper-competition among them. It has the world's third-largest Internet user-base. According to the Department of Telecommunication of India (DoT), as on March 2015, India has 302.35 million internet connections. Major sectors of the Indian telecommunication industry are telephony, internet and television broadcast industry in the country which is in an ongoing process of transforming into next generation network, employs an extensive system of modern network elements such as digital telephone exchanges, mobile switching centres, media gateways and signalling gateways at the core, interconnected by a wide variety of transmission systems using fibre-optics or Microwave radio relay networks. The access network, which connects the subscriber to the core, is highly diversified with different copper-pair, optic-fibre and wireless technologies. DTH, a relatively new broadcasting technology has attained significant popularity in the Television segment. The introduction of private FM has given a fillip to the radio broadcasting in India. Telecommunication in India has greatly been supported by the INSAT system of the country, one of the largest domestic satellite systems in the world. India possesses a diversified communications system, which links all parts of the country by telephone, Internet, radio, television and satellite.

Indian telecom industry underwent a high pace of market liberalisation and growth since the 1990s and now has become the world's most competitive and one of the fastest growing telecom markets. The Industry has grown over twenty times in just ten years, from under 37 million subscribers in the year 2001 to over 846 million subscribers in the year 2011. India has the world's second-largest mobile phone user base with over 929.37 million users as of May 2012. It has the world's second-largest Internet user-base with over 300 million as of June 2015. Mobile based internet is a key component of Indian Internet usage, with seven out of eight users accessing internet from their mobile phones.

The total revenue of the Indian telecom sector grew by 7% to 2,832 billion (US\$42 billion) for 2010–11 financial year, while revenues from telecom equipment segment stood at 1,170 billion (US\$17 billion). Telecommunication has supported the socioeconomic development of India and has played a significant role to narrow down the rural-urban digital divide to some extent. It also has helped to increase the transparency of governance with the introduction of e-



governance in India. The government has pragmatically used modern telecommunication facilities to deliver mass education programmes for the rural folk of India.

Jio India

A month ago India was all about Jio 4G. There were long queues outside Reliance Digital stores, you could hear people talking about Jio 4G speeds and fawning over the free data and voice calls. A month later, long queues are still there with people hoping to get a SIM, many are still talking about Jio 4G data but sadly not quite cheerfully.

Ever since the Jio SIMs were made available to everyone on September 5, even murmurs heard of slow internet, bad call qualities and, of course, unavailability of the SIMs in the first place.

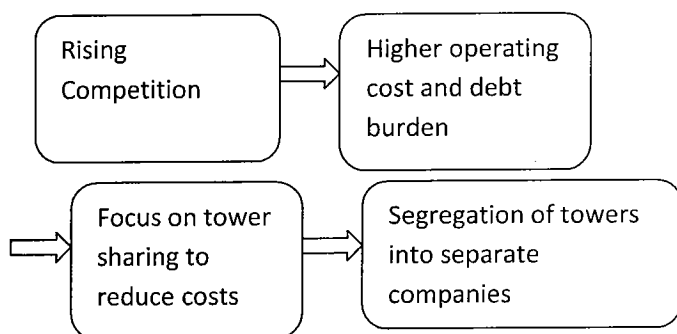
Reliance, on its part, has blamed Airtel, Idea and others for whatever woes people are facing with the Jio 4G service. Here the service has gone downhill in terms of speed, although at the same time the reliability of the connection and the scene with voice calls, which are free, has improved. So it's kind of a mixed bag.

Reliance jio is one of the emerging network provider in the wireless 4G market of India. While jio is giving more emphasis on their wireless network at the moment, this does not mean that they have no plans of extending their services.

Currently limited operators like Act Broadband, BSNL, and some local operators are providing FTTH in India. But jio is trying to capture the complete wire line broadband market rather than some limited areas. If the trend continues ftth plans will be groundbreaking.

Reliance jio is currently testing its Fiber to Home broadband services in Navi Mumbai. The testing phase is providing broadband to many customers for nominal charges.

Inspired by the success seen by Indian players in towers business, most of the operators around the world are replicating the model.



Approach designed for customer while penetrating telecommunication market by Jio:

- Go to Google Play Store and search for MyJio.
- Download and Install the Application.
- After Installation, Open the MyJio App.
- Now you can able to find the button "Click to Install All" Hit on the button.
- Install all the applications.
- Once you install the entire applications exit from MyJio Application.
- Disconnect both your Wi-Fi and Mobile data.
- Next open the MyJio application, the pop up is encountered with the message "No network connection" Ignore the message and Click on GET Jio SIM.
- Again the pop up will come showing the message "No Network" Toggle back and connect to the internet by enabling Wi-Fi or Mobile Data.
- Now when you click the button, you will see Preview Offer code instruction.
- Follow the instructions to get the code and proceed further by submitting your documents etc

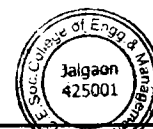
Objectives of the Study:

1. To study the perception of customer with changing scenario in Indian telecom industry.
2. To study the impact of arrival of Jio schemes on customers' mentality in Jalgaon city

Hypothesis of the Study:

H_0 - There is not significantly perception about changing scenario in Indian telecom industry.

H_0 - There is no significant impact of arrival of Jio schemes on customers' mentality in Jalgaon city.



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Scope of the Study:

1. The study deals with 'Shifting of Loyalties : Perception of Telecom customers after launching of "Jio" in Jalgaon city'
2. The study evaluates only impression of customers associated with Jio schemes.
3. Telecom penetration in the nation's rural market is increasing also government of India has introduced digital India program under which all the sectors such as healthcare, retail, etc. will be connected through internet.
4. The study will be restricted up to Jalgaon city but it will definitely useful for rural and semi urban areas.

Research Methodology of the Study:

The study is based on critical evaluation and analysis of basically Primary Data. The primary sources include customers. A study is undertaken in the sampled regions to see its impact for which a detailed questionnaire is prepared to collect relevant information from the primary source for the guidance of the researchers. With the help of the questionnaire, detailed discussions were made with the certain sources of primary data to understand their views, thinking and attitude which would help to give the researchers useful recommendations, if any. The questionnaire is processed with the help of statistical tools like tabulations, grouping, percentages, averages, testing of hypothesis etc. Questionnaire is used mainly to analyze the opinion of the students

Research Area:

Researchers selected respondents from Jalgaon city. Researcher collects data through Primary and Secondary sources. Researcher distributed over 450 questionnaires among the respondents.

Review of literature:

A Brief report on Telecom sector in India (January 2015) .this report give detail study on Government policies and regulatory framework implemented by Telecom Regulatory Authority. In last two decades, the Indian Telecom Sector and mobile telephony in particular has caught the imagination of India by revolutionizing the way we communicate, share information and through its staggering growth helped millions stay connected. In Indian telecom sector the number of telephone subscribers in India increased growth of 0.52 %. The monthly growth rates of urban and rural subscription were 0.18 % and 1.03% respectively.

"A pragmatic approach of analyzing Consumer Behavior in India telecom Sector" by Vikram Singh, Rishiraj Vyas and Jitendra Rathi have clearly highlighted the reasons for buying a particular operator service in India is governed by three important parameter- High quality of service, price sensitivity and effective advertisement.

"Critically Analyze the customer preference and satisfaction measurement in Indian Telecom Industry" by Naman Shah 2008, IIPM Ahmadabad, Guided by Prof. Pabitra Ranjan Chakravorty, Senior Research Associate, IIPM Ahmadabad. This study lays emphasis on Quality Measurement of Telecom Industry, certain service parameters of telecom industry like Customer care services, Per call charges , Network , tariff schemes , Value Added services(VAS) , billing system , voice clarity & suggested them as the most important ingredients of service Quality Measurement of telecom industry.

Enhancing Competition In Telecommunications: Protecting and empowering consumers- OECD (Organization For Economic Co-Operation and Development) Directorate for Science, Technology and Industry Committee for Information, Computer and Communications Policy. Ministerial Background Report, OECD Ministerial Meeting on the Future of Internet Economy, Seoul 17-18 June 2008, Hosted By Korea Communications Commission.

This study examines the available evidence of consumer behavior and satisfaction levels in the telecommunications industry and of the influences on such behavior and satisfaction surveys need to be treated with some caution in that the results may vary widely according to how, and in what context, a question is formulated. For this reason, it is useful to analyse consumer satisfaction surveys side by side with consumer complaints data, where available to get the fuller picture of the market.

Limitations of the study

1. The study is based on limited geographical area.
2. Further variables could be added for the purposes of detail study.

Data Analysis

Researcher prepared the questionnaire for customers and distributed it among them in Jalgaon city. After receiving the questionnaire researcher analyse the questionnaire and make two groups viz. Working customers such as businessman, salaried employee, professionals etc and Non working customers such as student, housewife, retired persons.



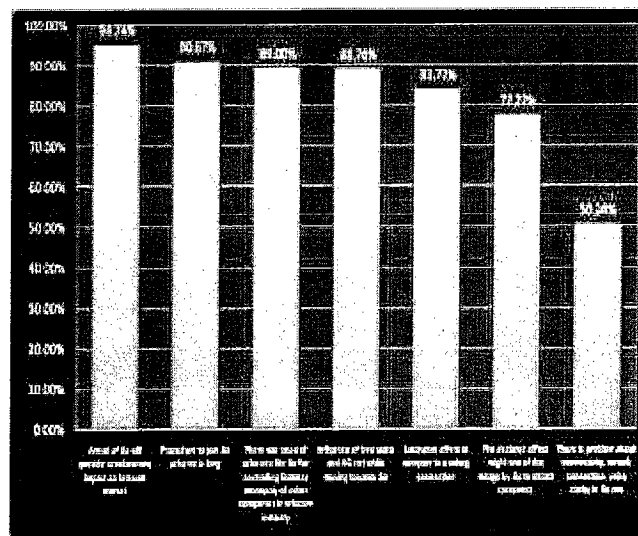
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Sr. No	Faculty wise group	Questionnaire distributed	Questionnaire received	Questionnaire rejected	Sample size for study
1	Working customers such as businessman, salaried employee, professionals	250	219	13	206
2	Non-working customers such as student, housewife, retired persons	250	227	15	212
Total		500	446	28	418

Table No 1
Number of respondents

There are 219 questionnaire received from group one and 227 from group two, after analysis, researcher rejected incomplete questionnaires.

Graph No 1
Graphical Presentation about 'Aspects of Jio schemes'



Testing of Hypothesis:

Hypothesis I

H_0 : The proportion of customers whose perceptions about change in Indian telecom industry is positive is 0.50

H_1 : The proportion of customers whose perceptions about change in Indian telecom industry is positive is more than 0.50

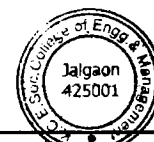
Mathematically

$$P = 0.5$$

Vs

$$P > 0.5$$

Table No 2
Testing of Hypothesis I



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Sr No	Aspects	Proportion of respondents who stated the aspects as either very important or important	SD	Z value	Z_table	P value	Decision
1	There was need of schemes like Jio for controlling limitless monopoly of other companies in telecom industry	0.89	0.02	25.48	1.64	0.0000	Reject H_0
2	Influence of free voice and 4G net while moving towards Jio	0.89	0.02	25.08	1.64	0.0000	Reject H_0
3	Lucrative offers as compare to existing connection	0.84	0.02	18.73	1.64	0.0000	Reject H_0
4	The declared offers might one of the mirage by Jio to attract customers	0.77	0.02	13.31	1.64	0.0000	Reject H_0
5	There is problem about connectivity, netwrk connection, voice clarity in Jio sim	0.50	0.02	0.10	1.64	0.4610	Accept H_0

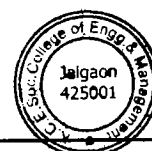
Here level of significance is 0.05

Thus, our null hypothesis The proportion of customers whose perceptions about change in Indian telecom industry is positive is 0.50 is rejected. Alternatively we accept our alternative hypothesis The proportion of customers whose perceptions about change in Indian telecom industry is positive is more than 0.50.

Testing of Hypothesis II

H_0 : The proportion of customers whose perceptions about there is significant impact of arrival of Jio schemes in Indian telecom industry is 0.50

H_1 : The proportion of customers whose perceptions about there is significant impact of arrival of Jio schemes in Indian telecom industry is more than 0.50



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Mathematically

$$P = 0.5$$

$$V_s$$

$$P > 0.5$$

Table No 3
Testing of Hypothesis II

Sr No	Aspects	Proportion of respondents who stated the aspects as either very important or important	SD	Z value	Z_table	Decision
1	Arrival of Jio will provide revolutionary impact on telecom market	0.95	0.01	40.96	1.64	Reject H_0

The Impending Challenges:

With success of implementing it in market Company is facing the challenges as-

- **Competitive Rivalry :**
 - Customers' low switching cost and price sensitivity are increasing competition among players.
 - High exit barriers are also intensifying competition.
 - There are around 6 to 7 players in each region, leading to intense competition.
- **Threat of new Entrants :**
 - Strict government regulations.
 - Extremely high infrastructure setup cost.
 - Difficulty in achieving.
 - Economies of scale.
- **Substitute products :**
 - Hardly any threat of substitute products as there is no substitute available in the market.
- **Bargaining power of suppliers :**
 - High bargaining power of suppliers as there are just a few suppliers in the sector
 - High cost of switching suppliers
- **Bargaining power of customers**
 - Low switching cost and mobile number portability give customers high bargaining power.
 - Customers are price sensitive.

Findings:

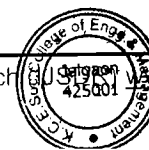
- The most influencing factor about Jio scheme among the customers' perception is that, "Free Data and voice calls".
- As far as customers' opinions are concerned, "There was need of schemes like Jio for controlling limitless monopoly of other companies in telecom industry" will be the most impact factor in this regard.

Conclusion:

With this research we may say that India has the second-largest telecom network in the world having subscriber of nearly 1022.61 million. The telecommunication growth has gone through multiple generations in a short span of a few decades. Speedy adoption of the 4G technology is expected to be critical for the success for the Indian government's 'Digital India' initiative.

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Considering past few years since the launch of its services, chalisgaon city has been able to acquire the highest revenue market share among its competitors with comparable market coverage. Going forward, given its focus on service expansion and 4G spectrum holding in select circles, the company is poised to rise above its competitors in delivering high quality internet services to consumers.

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Microgrid Power Quality Improvement by using Dual Output Four-Leg Inverter

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ABSTRACT

In this paper, a new system is proposed for connecting a microsource to a weak utility. The proposed system simultaneously conditions the quality of the power supplied to the microgrid loads. This system employs a recently introduced reduced switch count dual-output inverter in a so-called equal frequency mode which offers its best operation features such as maximum dc bus voltage utilization and minimum device ratings. Compared to the counterpart system, the proposed configuration enjoys an integrated structure and uses less number of semiconductor switches. Moreover, it retains the desirable features of the conventional system such as ability to compensate unbalanced/sagged utility and to supply three-phase unbalanced loads with balanced and ceaseless voltage. The proposed system is introduced and its carrier-based modulation scheme is elaborated. Subsequently, a detailed study on the maximum achievable modulation index under different working conditions is carried out. The report concludes with a discussion on control of the system and its controller design. The validity of operation of the proposed system is verified through simulation.

Keywords—Distributed generation (DG), dual-output four leg inverter, microgrid.

1. INTRODUCTION

Power quality is a term used to broadly encompass the entire scope of interaction among electrical suppliers, the environment, the system and the products. The widespread use of non-linear loads is leading to a variety of undesirable phenomena in the operation of power systems. The harmonic components in current and voltage waveforms are the most important among these. Conventionally passive filters have been used to eliminate line current harmonics. Current controlled voltage source inverters can be utilized with appropriate control strategy to perform active filter functionality. However, the extensive use of power electronics based equipment and non-linear loads at PCC generate harmonic currents, which may deteriorate the quality power. Recently various control strategies for grid connected inverters incorporating PQ solution. In an inverter operates as active inductor at a frequency to absorb the harmonic current. A similar approach in which a shunt active filter acts as active conductance to damp out the harmonics in distribution network is proposed. But the exact calculation of network inductance in real-time is difficult and may deteriorate the control performance. Generally current controlled voltage source inverters are used because of their faster response compared to voltage controlled voltage source inverters as it power is controlled by switching instant. And also in current controlled voltage source inverters active and reactive power is controlled independently.



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