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Development of Smart Classroom

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Abstract: *Human face plays an important role in our Social interaction, conveying people's identity but it is a dynamic object and has a high degree of variability in its appearances. So to overcome this variability Face Detection and face recognition methods have been introduced. Face detection is the basic step of face recognition. In this paper, we present a comprehensive and critical survey of face detection and face recognition techniques.*
Keywords: *Face detection, Face recognition.*

I. Introduction

The present day attendance system is manual. It wastes a considerable amount of time both for teachers and students. The waiting time of the students is increased if attendance is taken manually. Manual attendance always a have a cost of human error. This proposed solution for the current problem is through automation of attendance system using face recognition. Face is the essential recognizable proof for any human. This project describes the method of detecting and recognizing the face in real-time. Internet of Things (IoT) is a novel paradigm that is gaining ground in the Computer Science field. The first Internet of Things appliance was a vending machine in early 1980s, which was developed at Carnegie Melon University.

In a broader sense (IoT) is interconnectedness of multiple devices that can report, monitor, or provide other value or services that are of value to end users. IoT can refer to devices from Smart

Thermostats that allow homeowners control temperature over the internet to medical wearable Devices that can alert emergency services of any abnormality in vital signs. There's little doubt that IoT has the potential to make people's everyday life easier as interconnected devices become more and more ubiquitous. This project describes an efficient algorithm using open source image processing framework. Our approach has five modules – Face Detection, Face Preprocessing, Face Training, Face Recognition and Attendance Database. The face database is collected to recognize the faces of the students. The system is initially trained with the student`s faces which is collectively known as student database. The system uses user friendly User interface to maximize the user experience while both training and testing which are collecting student images and taking attendance with the system. This project can be used for many other applications where face recognition can be used for authentication.

II. Literature Survey

[1] M. Turk and A. Pentland, "Eigen faces for recognition," Journal of Cognitive Neuroscience Eigen face technique: This process is used for completing reduction in the dimensionality. This algorithm is frequently used for the recognition of faces. Eigen face acts as a core component for dividing of face into separate feature vector. Covariance matrix used for finding the data from the article vector. The faces are differentiated by using the highest Eigen values. The image having a face is then measured as grouping of Eigen expressions. The difference among faces is then measured using that of the Eigen vectors. Face space is defined as the top M Eigen faces that match with the outline of M dimensional space. Eigen picture helps to obtain the weights of each face. The image can be minimized to the dimension size in short period of time can be done by PCA. The result that is satisfactory can be achieved by image pre-processing.

[2] Sushma Jaiswal, Sarita Singh Bhadauria and Rakesh Singh Jadon 2011:

The technology of face recognition has become mature within these few years. System, using the face recognition, has become true in real life. The methods for face recognition. One of the approach is eigen face, fisher faces and other one is the elastic bunch graph matching.

[3] Kirby M and L.Sirovich 1990Application of the Karhunen-Loeve:

The exploitation of natural symmetries (mirror images) in a well-defined family of patterns (human faces) is discussed within the framework of the Karhunen-L&ve expansion. This results in an extension of the data and imposes even and odd symmetry on the eigen functions of the covariance matrix, without increasing

the complexity of the calculation. The resulting approximation of faces projected from outside of the data set onto this optimal basis is improved on average.

[4] Laurenz Wiskott, Jean-Marc Fellous, Norbert Krüger, and Christoph von der Malsburg 1997 Face Recognition.

We present a system for recognizing human faces from single images out of a large database containing one image per person. The task is difficult because of image variation in terms of position, size, expression, and pose. The system collapses most of this variance by extracting concise face descriptions in the form

of image graphs. In these, fiducial points on the face (eyes, mouth, etc.) are described by sets of wavelet components (jets). Image graph extraction is based on a novel approach, the bunch graph, which is constructed from a small set of sample image graphs. Recognition is based on a straightforward comparison of image graphs.

[5] Face Detection and Recognition using Raspberry Pi Ishita Gupta1, Varsha Patil2, Chaitali Kadam 3, Shreya Dumbre4 Kennedy Road, Pune:

In today's world, face recognition is an important part for the purpose of security and surveillance. Hence there is a need for an efficient and cost effective system. Our goal is to explore the feasibility of implementing Raspberry Pi based face recognition system using conventional face detection and recognition techniques. This paper aims at taking face recognition to a level in which the system can replace the use of passwords and RF I-Cards for access to high security systems and buildings.

[6] Xia Mao, YuLi Xue, Zheng Li, Kang Huang, ShanWei Lv, "Robust facial expression recognition based on RPCA and AdaBoost", Image Analysis for Multimedia Interactive Services 2009:

The problem of robust facial expression recognition and propose a novel scheme for facial expression recognition under facial occlusion. There are two main contributions in this work. Firstly, a novel method for facial occlusion detection based on robust principal component analysis (RPCA) and saliency detection performs efficiently to detect facial occlusions. Secondly, a novel method based on occlusion reconstruction and reweighted AdaBoost classification is prosed for facial expression recognition.

[7] Mohamed, B.K. and C. Raghu, 2012. "Fingerprint attendance system for classroom needs:In this paper we propose an automated attendance management system. This system, which is based on face detection and recognition algorithms, automatically detects the student when he enters the class room and marks the attendance by recognizing him. The system architecture and algorithms used in each stage are described in this paper.

[8] Noura, A Semary and Ahmed Fawzi Gad, 2014. "A Proposed Framework for Robust Face Identification":

Human face is the most representative part of body that can be used to differentiate one person among others. Accurate face identification system is still a challenge to Image Processing and Pattern Recognition researchers. In this paper, a complete framework for face-based personal identification system is proposed. The proposed frame work is composite of three basic stages; face skin detection (FSD), facial features positioning (FFP), representative features extraction (RFE) and face matching (FM). For FSD stage, RGB-H-CbCr color model is used after a comparative study between different color models. Enhanced Haar-like features are utilized for FFP stage. After accurate features position in the representative features are calculated using the centers of eyes, nose and mouth organs.

[9] Viola, P and M.J. Jones, 2004. "Robust Real-Time Face Detection":

There are three key contributions. The first is the introduction of a new image representation called the "Integral Image" which allows the features used by our detector to be computed very quickly. The second is a simple and efficient classifier which is built using the AdaBoost learning algorithm (Freund and Schapire, 1995) to select a small number of critical visual features from a very large set of potential features. The third contribution is a method for combining classifiers in a "cascade" which allows background regions of the image to be quickly discarded while spending more computation on promising face-like regions.

[10] Gargesha, M. and S. Panchanathan, 2002. "A Hybrid Technique for Facial Feature Point Detection":

Existing techniques for facial feature point detection from color images include template matching, facial geometry and symmetry analysis, mathematical morphology, luminance and chrominance analysis, and PCA. However, these techniques are plagued by poor performance in the presence of scale variations. In this paper, a hybrid technique is proposed that employs a combination of the above approaches along with curvature analysis of the intensity surface of the face image in order to provide a superior performance with reduced computational complexity, even in the presence of scale variations.

[11] Priyanka Dhoke and M.P. Parsai, "A MATLAB Based Face Recognition Using PCA with Back Propagation Neural network":

Face recognition is one of those challenging problems and up to date, there is no technique that provides a robust solution to all situations. There are many techniques used for this purpose. Face recognition is an effective means of authenticating a person. In this paper, a face recognition system for personal identification and verification using Principal Component Analysis (PCA) with Back Propagation Neural Networks (BPNN) is proposed. The dimensionality of face image is reduced by the PCA and the recognition is done by the BPNN for face recognition. The system consists of a database of a set of facial patterns for each individual. The characteristic features of pca called eigenfaces" are extracted from the stored images, which is combine with Back Propagation Neural Network for subsequent recognition of new images.

III. Proposed Methodology

The following modules will be used in the work,

Face detection: Viola jones algorithm for face detection will be used in order to find the location of the face from the image.

1. Face recognition:

Wavelet and structural features will be used for face recognition. SVM classifier will be used to train and test the images for face detection and matching.

2. Camera :

A camera is an optical instrument for recording or capturing images, which may be stored locally, transmitted to another location, or both. The images may be individual still photographs or sequences of images constituting videos or movies. The camera is a remote sensing device as it senses subjects without any contact.

3. Power Supply :

The Power Supply is a Primary requirement for the project work. The required DC power supply for the base unit as well as for the recharging unit is derived from the mains line. For this purpose center tapped secondary of 12V-012V transformer is used. From this transformer we getting 5V power supply.

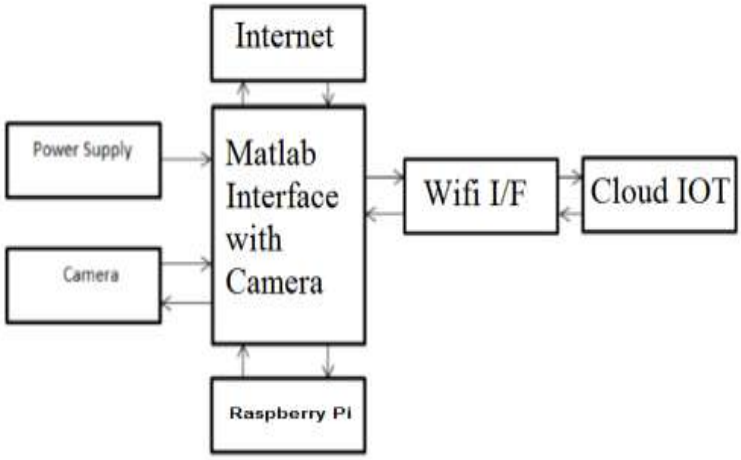

Fig 1: Block Diagram

IV. Applications

1. **Payments** :

Now-a-days, face recognition system is already used in mall but next concept is to use for online Payments which human being free from the cards and cash.

2. Access & Security :

Face recognition is used as a security for our smart phones to access that. In recent, this is great level security access.

3. Criminal Identification :
Face Tech can be used to keep unauthorized person out of facilities. It requires a Machine learning algorithm to identify that particular person.

4. Verification :
Aadhar card, banking, passport ID verification etc.

5. Healthcare :
There are some patient types who cannot properly talk but person authentication is must. For these patient, face recognition is important, only looking at the cameras will authenticate the patient easily and simply.

V. Expected Result

The following are the results which obtained from this work.

- A system for automating the process of attendance will be implemented using Image processing and IoT technology.
- The proposed system can prove to be utilitarian for not only academic institutions but also in other professional environments.
- By using this system the chances of human error, time theft and proxies can be reduced.
- We can implement a reliable and efficient system for classroom attendance which can work for multiple face recognition at a time
- In further work, this system can be extended to mobile based face recognition application using more effective image processing – machine learning algorithms.

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