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A Real Time FPGA Based Face Recognition System for Attendance Management & Power Control in Institutions / Corporates

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ABSTRACT

This paper presents an automated system for human face recognition in a real time background for an institution / corporate to mark the attendance of their students. So Smart Attendance using Real Time Face Recognition is a real world solution which comes with day to day activities of handling individuals. The task is very difficult as the real time background subtraction in an image is still a challenge. To detect real time human face, Principal Component Analysis (PCA) is used to recognize the faces detected with a high accuracy rate. Once recognition is done with the matched face, then attendance will be marked and updated in the database. This project gives much more solutions with accurate results in user interactive manner rather than existing attendance and leave management systems. In addition to that we provide ideal solution to the problem of power wastage is appliance available in the class room is controlled through face recognition. The ease of deployment is due to wireless mode of communication. A prototype of the controller is implemented, and shows how the controller can easily and flexibly control the appliances.

KEYWORDS : Face recognition, Attendance, PCA, Power Control, FPGA

I. Introduction

Person Recognition is one of the emerging research fields in computer vision. They are several biometrics used for Person Recognition like Iris, Fingerprints, Face etc. Since Iris and Fingerprints are very short-distance biometrics, but our application requires a person to be at a medium distance from the camera, which is fixed at the centre of each department, so that the view of the camera covers the entire department.

As a worst case, our system should be able to recognise a person who is sitting at the last bench, which might not be possible by using Iris or Fingerprints as a biometric. Hence we go for a medium range Biometric. Humans often use faces to recognize individuals and advancements in computing capability over the past few decades now enable similar recognitions automatically.

Early face recognition algorithms used simple image processing models, but the recognition process has now enhanced into a science of sophisticated mathematical representations and matching steps. Many major improvements and technologies in the past ten to fifteen years have propelled face recognition technology into the spotlight. This system is developed in order to avoid the manual drudgery for entering the data daily while taking attendance and also to avoid proxy. Power management is being an added advantage to this at this point of time which we are integrating along with face recognition system.

The paper is then organized as follows: The detailed literature survey is given in section 2, the proposed model is explained in section 3, and finally conclusion is discussed in section 4.

II. Literature Survey

Face recognition can be used for both verification and Identification (open-set and closed-set). There are two predominant approaches to the face recognition problem: geometric (feature based) and photometric (view based). The research going on for Face Detection and feature extraction are as discussed below:

A. Face Detection Methods:

The techniques used are as classified below:

- Knowledge Based Method
- Feature Invariant Method
- Template Matching Method
- Appearance Based Method

B. Face Feature Extraction Methods:

There are two main categories of face feature extraction techniques.

- Holistic Approach
- Feature-based Approach

In the holistic approach, the whole face is taken as input for recognition purpose. We can use PCA (Principal Component Analysis), for reducing the dimensionality of the data by projecting, it onto a lower dimensional subspace [1]. We can go for LDA (Linear Discriminate Analysis), where the dimensionality reduction takes place such that the within class variance is reduced and between class variance is maximised [2]. In Feature –based Approach, local features on face such as eyes and nose are detected and based upon which recognition is performed [3].

Radio Frequency Identification (RFID) technology is used for the localization of mobile robots and persons in their environment [4].The mobile robot is equipped with an active RFID reader and some tags are placed in the room to provide RF Beacons in order that the robot can localize itself with the known tag geographical locations [5]. Remote monitoring system or manual control system can be implemented used to control the device [6].

III. Proposed Model

As researcher interest in face recognition, many distinct algorithms were introduced in which Principle Component Analysis (PCA) is used here. The system proposed a real time design which takes image as an input through a web camera continuously. The main camera and attendance identification display can be placed at the entrance of the organization to get better result.

It is a way of identifying different conditions of attendance marking. The camera should be installed in a place with good light in the background and free of obstacles. Appliance is automatically controlled depends on presence of students. Android application is implemented for finding the Monthly salary details and no of working days details.

The Principal Component Analysis (PCA) is one of the most successful techniques that have been used in image recognition and image compression. Under the broad title of factor analysis, PCA is one of the suitable statistical methods. In case of strong correlation between observed variables, PCA is used to reduce the large dimensionality of the data Space (observed variables) to the smaller intrinsic dimensionality of feature space (independent Variables). It is also needed to describe the data economically.

Redundancy removal, feature extraction, prediction and data compression, etc. can be done by PCA. Because PCA is a classical technique which can do something in the linear models such as image processing, signal processing system and control theory.

Face recognition is applicable to many functional areas. Moreover, it can be categorized into face identification, face classification, or gender determination. The most useful applications contain video content in-

dexing, crowd monitoring, personal identity (ex. driver's licence), mug shots matching, entrance security, etc. PCA for face recognition which is also called Eigen space projection is to express the large 1-D vector of pixels constructed from 2-D facial image into the compact principal components of the feature space. Eigen space is determined by identifying the eigenvectors of the covariance matrix derived from a set of facial images (vectors).

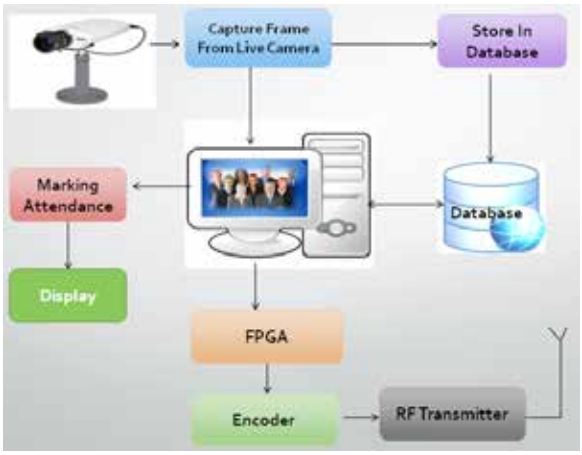


Fig. 1 Block Diagram of Attendance management in Transmitter section

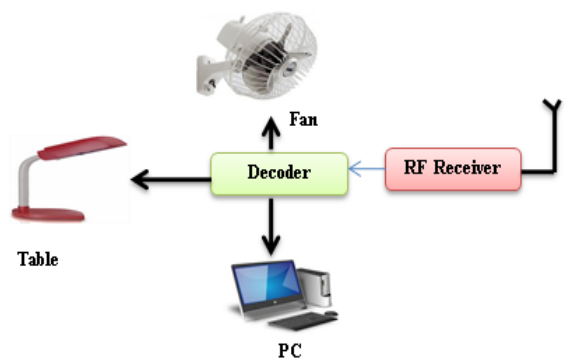


Fig. 2 Block Diagram of Power control in Receiver section

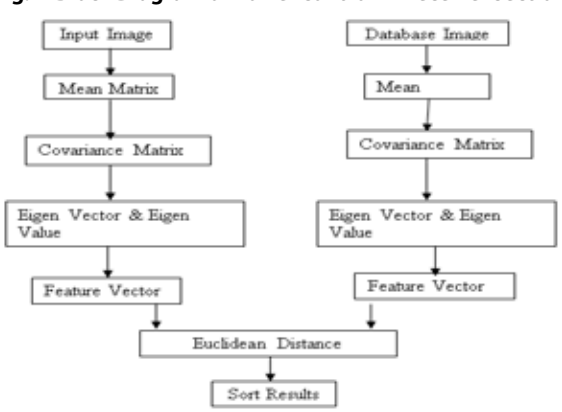


Fig. 3 Working principle of face recognition method

IV. Experimental results

While evaluating our proposed model we consider that an Face recognition is done with the help of above working principle and the same has been successfully implemented in database. Below are the snapshots of the same.

Home Page:



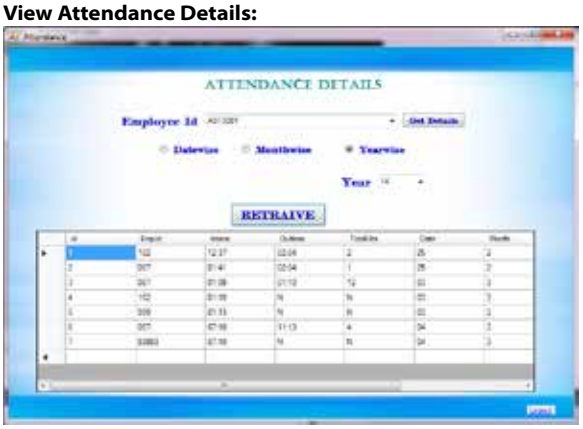
Registration:



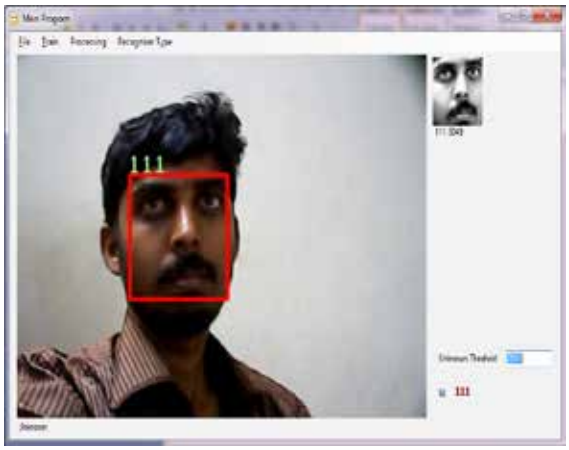
Face Registration:



View Attendance Details:



Face Authentication:



V. CONCLUSION AND FUTURE WORK

Due to the mounting demands for an Automated Attendance System, Person Recognition, systems have gained a lot of importance these days. Hence, depending upon the size of the Training Database, recognition rate varies for both of these algorithms. And also we have observed that the recognition rate achieved for real time is much lesser when compared to offline images. With the help of face recognition technique electric appliances will be triggered ON or OFF by means of FPGA design. In future the same can be enhanced with 3D camera and motion capturing technologies for achieving best results.

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