

Multiple Face Recognition using MATLAB for Attendance Management

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Abstract - We are living in a world where everything is automated and linked online. The internet of things, image processing and machine learning are evolving day by day. Many systems have been completely changed due to this evolve to achieve more accurate results. The attendance system is a typical example of this transition, starting from the traditional signature on a project sheet to face recognition. In this project we are proposing an automatic attendance system which can be used in every organization to mark the attendance of employees. The main application of Automatic attendance system is seen in teaching institutions, where the attendance of students has to be regularly monitored on daily basis. The method developed provides a secure and effective attendance record. Automatic attendance system uses mainly two algorithms i.e. Viola Jones algorithm and local binary pattern algorithm. Viola Jones algorithm is used for face detection and local binary pattern is used for the feature extraction and face recognition

Key Words: MATLAB, Face Detection, Arduino Uno, Facial Recognition

1. INTRODUCTION

Face recognition is the analysis of characteristics of a person's face image taken from a camera. It measures overall facial feature like distances between eyes, length of nose, distance between mouth and length between jaw edges. These measurements are stored in a database and used for comparison when a user stands in front of the camera. Camera can be placed a distance of 2 feet to 10 feet from the person to be identified, without waiting for a long periods of time or do anything more than look at the camera. Face recognition has become a popular area of research and successful application of image processing. Traditional method of attendance is manual to maintain the record of lectures, salary and working hours. This attendance is generally maintained using attendance sheet. The traditional marking methods are monotonous and time consuming.

Manually recorded attendance can be easily manipulated. Because these problems being faced in manual attendance system, some of the organizations have shifted to biometric but biometric system serves one person at a time.

2. LITERATURE SURVEY

A. Facial Recognition

[7] Facial Recognition are a set of methods and algorithms that make a computer capable of classifying and recognizing a face in each image or video. Facial Recognition uses genetic algorithms i.e. the way humans perceive faces and identifies them and inspired by the mutations and modification of gene and genetic engineering.

B. Arduino Uno

[8] The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable or by an external voltages between 7 and 20 volts

C. MATLAB

[9] MATLAB (matrix laboratory) is a multi-paradigm numerical computing environment and proprietary programming language developed by Mathworks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces and interfacing with programs written in other languages.

Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic computing abilities. An additional package, Simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems.

3. METHODOLOGY

A. Enrollment Phase

1) Image Acquisition: For Image acquisition, camera is used to capture an image of the employees working in an organization.

2) Face Detection and Face cropping: For face detection cascading algorithm is used. Further face cropping is done using imcrop (image) command that separates the facial area from the rest of the background image. This faces is stored in the database.

3) Feature Extraction: Feature extraction is done by using linear binary pattern algorithm. Feature extraction is helpful for face detection and recognition.

4) Database: Extracted features of employees or persons will be stored in Database.

B. Routine Attendance after Enrollment Phase

[3] Routine attendance will start after extracting the features of all the images stored in the database. We have followed the same steps as given in enrollment phase i.e. image acquisition, Face detection, and face cropping.

Face recognition is done by using the Local binary pattern by taking 3x3 block a time and comparing central block with surrounding blocks and compare with features stored in the database. If after face recognition face of the person is matched in the database then update the attendance otherwise show the dialog box with invalid person.

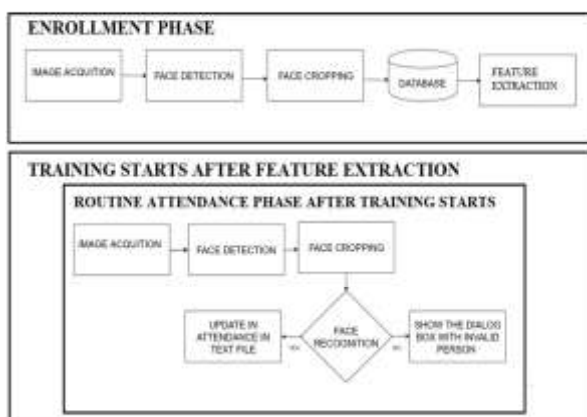


Fig- 1: Sample Intent

Our paper tries to approach this problem in a very straightforward and easy to implement way. We ask the user for input through voice, identify them through facial recognition and get information from the cloud and process the data locally and then reply to the user in

way they can understand. The internet is a vast place to teach the computer all the ethics and values of a human receptionist and let it respond in the same pleasing way.

MATLAB and Simulink, which are pre trained highly optimized models for face detection and recognition are given to an intermediate agent which processes all this information and predicts the best matching intent. After the intent has been found, we can act on it accordingly.

A. Facial Detection

[1] The implementation of the face detection and tracking by MATLAB and Arduino first starts with the Initializing the camera position. Then the camera gives the Video as input to MATLAB. The MATLAB detects the face in the video input given by the webcam. The MATLAB sends the data to the Arduino and the Arduino tracks the face by moving the servo motors to which the webcam is attached

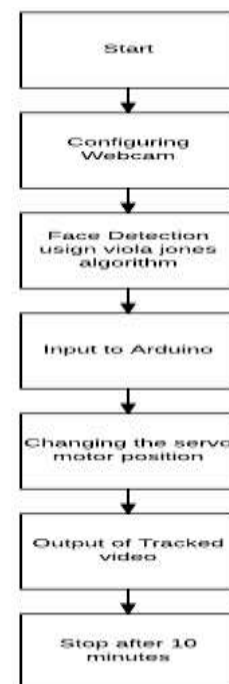


Fig- 2: Flowchart of Facial Detection

Initially, the camera position is set to the default state i.e., at zero degrees by configuring the servo motor position. Then the video input is given to the MATLAB for face detection based on viola jones algorithm. Detects a face from every frame of the live video stream and inserts a bounding box face. Now, the centroid of the bounding box is calculated. The co-ordinates of the centroid are sent to the Arduino Micro controller in the form of a string through the serial cable connected to the computer and Arduino Micro controller. The Arduino micro controller gets the position of pan and tilt servo motors. The pan servo motor is used for the tracking the face horizontally while the tilt servo motor is used for

tracking the face vertically. Now, the frame is divided into 4 portions i.e., right, left, top and bottom halves respectively. The Arduino micro controller checks the position of centroid comes in right half or left half of frame. If the centroid falls into the right half then the camera is panned to left and if it falls into the left half of the frame then the camera is panned to right. Likewise, the camera is tilted using the bottom and top halves of the frame. Finally, the camera is moved in such a way that always the centre of the frame coincides with the centroid

B. Facial Recognition

[2] Facial Recognition is used to identify the person to better serve him/her. This personalized approach tends to provide better results and greater customer satisfaction. Facial Recognition follows the following flow diagram.

It works by first finding a face in the given video stream or image. It then converts that image to gray scale and uses some algorithms like Genetic Algorithm to identify the facial feature and correlate with an existing trained image and present its probabilities

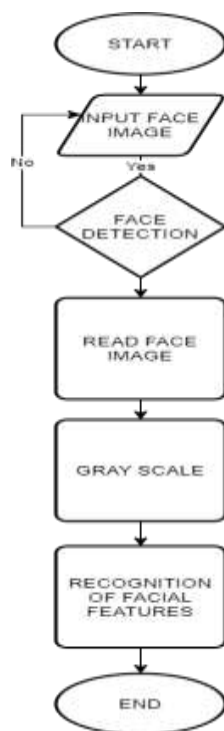


Fig- 3: Flowchart of Facial Recognition

C. Attendance Management

[5] Every institute has its own way of taking attendance. Some uses this old manual way for marking attendance some uses RF Id for marking attendance.

Other biometric techniques such as iris, retina, thumb impression, palm identification, ear recognition is used. But all these methods also waste students’ time as long queues are formed for marking attendance. Face recognition on the other hand advantage over these above mentioned techniques as it is nonintrusive, contact-free and has natural acquisition. Universality, permanence, uniqueness, performance and measurability are the factors which need to be satisfied by a biometric identifier.

Many ideas have been proposed by researchers for biometric attendance system. A system for managing students with Open CV and raspberry pi module that is interfaced with fingerprint device is also developed. An automatic attendance structure using techniques such as Adaboost for face detection and local binary pattern and histogram of orientation for features extraction is also proposed.

4. ARCHITECTURE

The flowchart of the user flow is as follows:

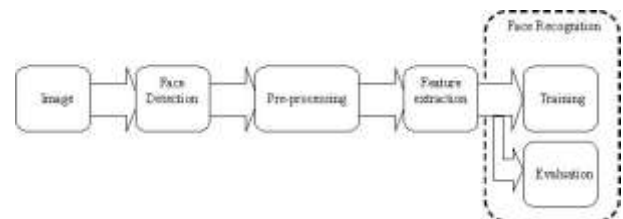


Fig- 4: Flowchart of User flow

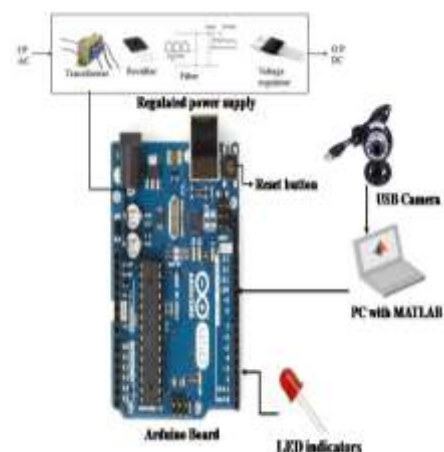


Fig- 5: Arduino Uno interfacing PC with MATLAB

[4] Face recognition is the main step for this paper because it really contributes a greatest part in the surveillance application. Without Recognition it is simply not useful when it comes to surveillance application. In order to recognize a

face, we used the following approach, Face is a completely a complex multidimensional structure. Therefore, there is a need to compute better recognition techniques. Out of which we follow some approaches to process face recognition. They are Principle Component analysis (PCA) and Eigen face approach. These are explained below,

1) PCA: It is a variable reduction method of an image. The method can be described below:

a) The given image is converted into gray scale images because it is easier for computation.

b) The converted gray scale image is scaled to particular size because the input images that we collect are of different size.

c) Therefore, we develop a training set where we have for different conditions. We have images of different sizes, illuminations, expressions etc. for face recognition.

d) Testing Conditions: If there will be a change in expression or illumination or size of image or the recognition procedure may change.

2) Eigen Face Approach: Face Image Testing: An example image is tested for recognition by comparing with stored data set. Mean Face: Mean face is given by, Eigen Face: The Eigen vectors corresponding to covariance matrix gives the Eigen Face, which appears like a ghost face and a match is found if this new face is close to this image

[6] To interface MATLAB with Arduino, certain Arduino libraries are downloaded in MATLAB IDE, this creates a Arduino to run in MATLAB environment. Communication of hand gesture algorithm with Arduino board is done through serial data transfer. To access the serial port of a computer using MATLAB, couple of lines of coding should be done. MATLAB function for serial port access is shown below.

```
ser =serial('COM18');
```

Here, COM18 is a serial communication port on which Arduino board is connected. Moreover, a Recent Advances in Technology and Engineering, Department of Computer Science and Engineering, T John Institute of Technology, Bangalore, has to be uploaded to ATmega328P using Arduino IDE. This program makes serial communication port as an input port for the Arduino board.

5. CONCLUSIONS

This paper implements a computer-based face recognition system that can be used in the offices, schools and industries to automate the job of a taking down attendance of working humans. Automation, though is good, still requires a human touch for it work efficiently and continuous incremental learning can be implemented at all stages so that the computer has the latest knowledge and answers in an innovative and customer satisfactory way.

Future expansion of the project may include but not limited to giving more services and embedding the entire logic into a embedded system that makes it a truly mobile system that

can be deployed anywhere. Can be extended using high efficiency GPS receiver and a GPRS module. The GPRS module gives the intimation of the person or student identification details to the predefined web link

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