



# FACIAL RECOGNITION BASED ATTENDANCE MONITORING SYSTEM USING ARM PROCESSOR

Mrs. V. UVARANJANI<sup>1</sup>, M. INDIRA DEVI<sup>2</sup>, P. RANGEELA<sup>3</sup>,  
K. SANGEETHAPRIYA<sup>4</sup>, S. VIDHYA<sup>5</sup>

Asst. Prof, Department of ECE, Krishnasamy college of Engineering and Technology<sup>1</sup>

Department of ECE, Krishnasamy college of Engineering and Technology<sup>2-5</sup>

**Abstract:** The main purpose of this project is to build a face recognition-based attendance monitoring system for educational institution to enhance and upgrade the current attendance system into more efficient and effective as compared to before. The current old system has a lot of ambiguity that caused inaccurate and inefficient of attendance taking. Many problems arise when the authority is unable to enforce the regulation that exists in the old system. Thus, by means of technology, this project will resolve the flaws existed in the current system while bringing attendance taking to a whole new level by automating most of the tasks.

**Keywords:** Arm 11 controller, Attendance, IoT.

## I. INTRODUCTION

Traditional method of attendance marking is a tedious task in many schools and colleges. It is also an extra burden to the faculties who should mark attendance by manually calling the names of students which might take about 5 minutes of entire session. This is time consuming. There are some chances of proxy attendance. Therefore, many institutes started deploying many other techniques for recording attendance like use of Radio Frequency Identification (RFID), iris recognition, fingerprint recognition, and so on. However, these systems are queue based which might consume more time and are intrusive in nature. Face recognition has set an important biometric feature, which can be easily acquirable and is non-intrusive.

Face recognition based systems are relatively oblivious to various facial expressions. Face recognition system consists of two categories: verification and face identification. Face verification is an matching process, it compares face image against the template face images and whereas is an 1:N problems that compares a query face images. The purpose of this system is to build a attendance system which is based on face recognition techniques. Here face of an individual will be considered for marking attendance. Nowadays, face recognition is gaining more popularity and has been widely used. In this paper, we proposed a system which detects the faces of students from live streaming video of classroom and attendance will be marked if the detected face is found in the database. This new system will consume less time than compared to traditional methods.

## II. LITERATURE SURVEY

Real Time Face Recognition using Raspberry Pi [1]. Face recognition is a fast growing and challenging area in the field of computer vision and real time applications. A lot of techniques and algorithms are available with varying degrees of accuracy and speed. Face recognition has a lot of applications in the field of advertising, healthcare, security, accessibility, and even payments. Hence, there is a need for low cost, reliable and accurate face recognition systems in today world. The aim is to implement a face recognition system using a Raspberry Pi device. This system is part of an assistive device created by us for visually impaired people. The setup consists of a Raspberry Pi 3 Model B device with a camera module attached to it. The Raspberry Pi has a 1.2 GHz 64-bit CPU along with 1 GB RAM and the camera module has a resolution of 5 MP.

Implementation of IOT based Attendance Management System on Raspberry Pi [2]. The biometric-based attendance monitoring system replaces the manual method of taking attendance and reduces the time to take attendance and avoids proxy. There are many biometric methods developed based on the fingerprint recognition, DNA matching, face



recognition, Iris recognition and voice recognition. Out of all, the methods based on face recognition are proved to be the best methods. In this paper we are presenting the implementation of attendance monitoring system based on the facial recognition. In this method the image database of the classroom is created first and the database is used to train the system. Then in recognition phase the camera is fixed at the focal point in the classroom and it will capture the images, then from the captured images student's faces are recognized & compared with the database and lastly the attendance is marked based on the faces identified. The marked attendance is directly reported to the students/parents and to the faculty handling the respective course. In this method, Haar cascade classifier is used to detect the faces and captured images are compared with the database by using local binary pattern histogram algorithm. The face recognition system is implemented on the Raspberry Pi 3B hardware.

A Novel Face Recognition Approach Based on Genetic Algorithm Optimization[3]. In the field of image processing and recognition, discrete cosine transform (DCT) and principal component analysis (PCA) are two widely used techniques. In this paper we present a face recognition approach based on them. Feature selection (FS) is a global optimization problem in machine learning, which reduces the number of features, removes irrelevant, noisy and redundant data, and results in acceptable recognition accuracy. It is the most important step that affects the performance of a face recognition system. Genetic Algorithms (GA), one of the most recent techniques in the field of feature selection, are a type of evolutionary algorithms that can be used also to solve this issue.

The application of a GA in the resolution of a problem requires the coding of the potential solutions to this problem in finite bit chains in order to constitute the chromosomes coming from a population formed by candidate points. The aim is to find a selective function allowing good discrimination between chromosomes and to define the genetic operators that will be used. In this sense, this approach seeks to develop a system of face recognition using Genetic Algorithm and a DCT-PCA combination for feature selection and dimensionality reduction, to be applied to an archive of images of human faces. The proposed approach is applied on various Face Databases. Experimental results demonstrate the effectiveness of this approach compared to state of the art in face recognition.

A Survey on Facial Recognition based on Local Directional and Local Binary Patterns [4]. The goal of this research project was to come up with a combined face recognition algorithm which out-performs existing algorithms on accuracy. The identification of individuals using face recognition techniques is a challenging task. This is due to the variations resulting from facial expressions, makeup, rotations, illuminations and gestures. Facial images also contain a great deal of redundant information, which negatively affects the performance of the recognition system.

This paper proposes a novel approach for recognizing facial images from facial features using feature descriptors, namely local binary patterns (LBP) and local directional patterns (LDP). This research work consisted of three parts, namely face representation, feature extraction and classification. The useful and unique features of the facial images were extracted in the feature extraction phase. In classification, the face image was compared with the images from the database. The face area was divided into small regions from which local binary and directional patterns (LBP/LDP) histograms were extracted and concatenated into a single feature vector (histogram). Experiments performed on the Cohn-Kanade facial expression database obtained a good recognition rate 99% indicating superiority of the proposed method compared to other methods. The proposed included a combination of local binary pattern (LBP) and local directional patterns (LDP+LBP+ Voting Classifier) as the feature extractor and voting classifier classification algorithm which is an aggregate classifier composed of k-Nearest Neighbor, decision trees and support vector machines. The results showed improved accuracy results as compared to other local binary pattern variants in both scenarios where small datasets or huge datasets were used.

### III. PROPOSED SYSTEM

It saves time and effort, especially if there are a large number of students in the class. The proposed method is a simple approach to track a student's attendance by using face recognition and a camera. Once the faces are matched, they are recorded in a database to assure their presence or absence. In this project, face databases will be created to pump data into the recognizer algorithm. Then, during the attendance taking session, faces will be compared against the database to seek for identity. When an individual is identified, its attendance will be taken down automatically saving necessary information into a database system. At the end of the day, the attendance information regarding an individual can be accessed from a web server hosted by the raspberry pi ARM 11 controller. In short, this upgraded version of attendance monitoring system not only saved many resources, but also provides huge convenience to the authority as many processes are automated monitoring IOT platform.

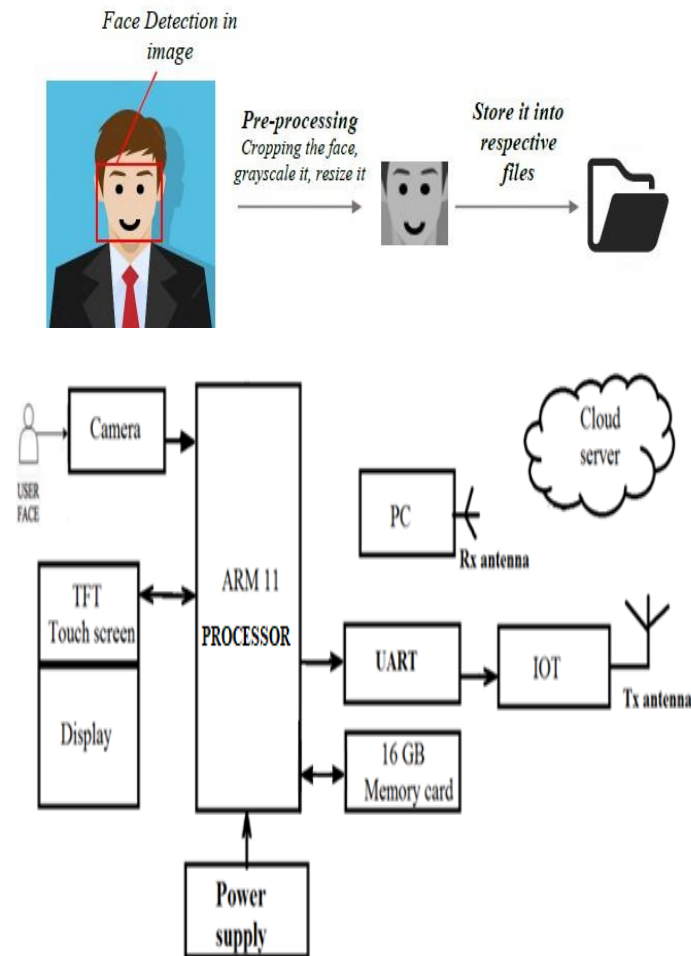


Fig.1.BLOCK DIAGRAM

#### IV. HARDWARE REQUIREMENT

- ARM Processor
- UART
- Internet of Things (IOT)
- Camera Module
- TFT Touch screen & display
- PC
- 16Gb Micro SD Card Class 10
- Power Supply cable

#### ARM PROCESSOR:

An ARM processor is one of a family of CPUs based on the RISC (reduced instruction set computer) architecture developed by Advanced RISC Machines (ARM). ARM makes 32-bit and 64-bit RISC multi-core processors. RISC processors are designed to perform a smaller number of types of computer instructions so that they can operate at a higher speed, performing more millions 8 of instructions per second (MIPS). The ARM processors smaller size reduced complexity and lower power consumption makes them suitable for increasingly miniaturized devices. ARM is the industry's leading supplier of microprocessor technology, offering the widest range of microprocessor cores to address the performance, power and cost requirements for almost all application markets. Combining a vibrant ecosystem with



over 1,000 partners delivering silicon, development tools and software, and more than 50 billion processors sold, ARM truly is "The Architecture for the Digital World".



**Fig.2.ARM Processor UART**

A universal asynchronous receiver/transmitter is a type of "asynchronous receiver/transmitter", a piece of computer hardware that translates data between parallel and serial forms. UARTs are commonly used in conjunction with other communication standards such as EIA RS-232.

A UART is usually an individual (or part of an) integrated circuit used for serial communications over a computer or peripheral device serial port. UARTs are now commonly included in microcontrollers. A dual UART or DUART combines two UARTs into a single chip. Many modern ICs now come with a UART that can also communicate synchronously; these devices are called USARTs.

The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications subsystem of a computer. The UART takes bytes of data and transmits the individual bits in a sequential fashion. At the destination, a second UART re-assembles the bits into complete bytes. Serial transmission of digital information (bits) through a single wire or other medium is much more cost effective than parallel transmission through multiple wires. A UART is used to convert the transmitted information between its sequential and parallel form at each end of the link. Each UART contains a shift register which is the fundamental method of conversion between serial and parallel forms.

### **INTERNET OF THINGS (IOT)**

The IOT concept was coined by a member of the Radio Frequency Identification (RFID) development community in 1999, and it has recently become more relevant to the practical world largely because of the growth of mobile devices, embedded and ubiquitous communication, cloud computing and data analytics. A world where billions of objects can sense, communicate and share information, all interconnected over public or private Internet Protocol (IP) networks. These interconnected objects have data regularly collected, analyzed and used to initiate action, providing a wealth of intelligence for planning, management and decision making. This is the world of the Internet of Things.

### **CAMERA MODULE**

The camera module can be used to take highdefinition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users if you're looking to expand your knowledge. There are lots of examples online of people using it for time-lapse, slowmotion and other video cleverness.

Libraries are bundle with the camera to create effects. Ultimately it gives the amount which aids to fix the camera in the desired position as well as provides protection for the camera board.

1) Camera Module Mount – Acrylic is an adjustable mount setup for the camera. These are cut out of acrylic sheet. Camera Module Mount is a great accessory for Pi shutterbugs. The Pi camera can be attached using little screws; also the design allows multiple positions. Ultimately it gives you amount which aids to fix the camera in the desired position as well as provides protection for the camera board.

2) The camera module can be used to take highdefinition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users if you're looking to expand your knowledge.



### TFT TOUCH & COLOUR SCREEN

When you use this display with a, please edit config.txt to set the HDMI to the native 800x480 in case it doesn't detect the resolution properly. The easiest way to edit the config.txt is to put the Pi TF card into an everyday computer and edit config.txt with any text editor. Save it and it is ready to rock.

#### Characteristics :

- ❖ Display : 2.8-inch TFT Color Screen
- ❖ software: ZK Time 5.0
- ❖ Communication: TCP/IP , USB HOST
- ❖ Fingerprint Capacity: 500
- ❖ ID Card Capacity: 500
- ❖ Records Capacity: 50,000
- ❖ Standard Function: Work Codes 24
- ❖ Power supply :DC 5V 1A
- ❖ Operating Temperature: 0 °C- 45 °C
- ❖ Operating Humidity: 20%-80%
- ❖ Dimension (L\*W\*T): 185(L) x 140(W)x30(T) mm



Fig .3. TFT Touch Screen

#### Working with PC

Turn on the "backlight" switch on the back of the LCD. For the Windows OS on PC with Wifi connection, the resolution of the LCD is automatically identified. Hence, you do not need to make the relative settings. When working with Raspberry Pi, you should set the resolution of the LCD by yourself, or else the LCD screen will not work.

For more detail information, please read the following section.

- Turn on the "backlight" switch
- Connect the LCD to your Pi (HDMI Port of LCD -> HDMI Port of Pi; 26
- Connect USB Port of LCD -> USB Port of Pi; 5V~2A power supply).
- Download the Raspbian image from Raspberry Pi web site
- Write the image to a TF card and append the following lines to the config.txt file which is located in the root of your TF card:

#### POWER SUPPLY:

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

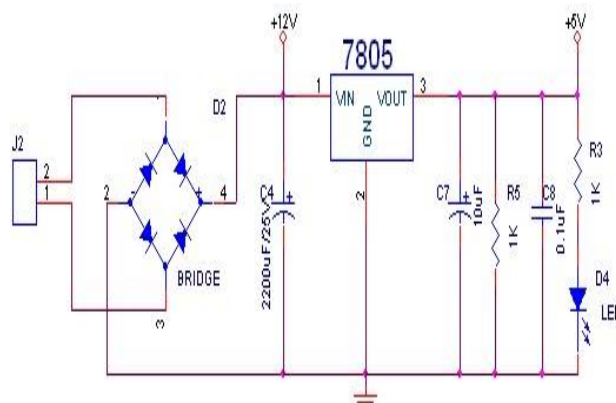


Fig.4. Power Supply

A 230v, 50Hz Single phase AC power supply is given to a step down transformer to get 12v supply. This voltage is converted to DC voltage using a Bridge Rectifier. The converted pulsating DC voltage is filtered by a 2200uf capacitor and then given to 7805 voltage regulator to obtain constant 5v supply. This 5v supply is given to all the components in the circuit. A RC time constant circuit is added to discharge all the capacitors quickly. To ensure the power supply a LED is connected for indication purpose.

## V. SOFTWARE REQUIREMENT

- Embedded C.
- Python.

### EMBEDDED C

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixedpoint arithmetic, multiple distinct memory banks, and basic I/O operations.

In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing.

Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, data type declaration, conditional statements (if, switch, case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc. A Technical Report was published in 2004 and a second revision in 2006.

## VI. DATASET

A Self created dataset adjustable was used to train the model. The pictures were taken using the Pi camera module. We trained the model to recognize the people.

The dataset consists of more than 100 images.

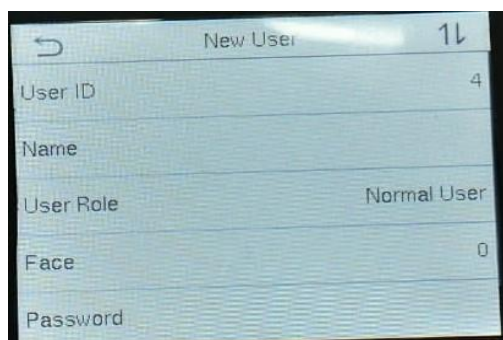


Fig.5.Dataset



## VII. EXPERIMENTAL SETUP

The Experimental setup consists of Linux device and a camera module.

**Processor:** 1.4GHz

**RAM:** 2GB

**Camera resolution:** 5 Mega Pixel

The device is running a Linux operating system specifically designed for the device. The Programming language used is Python and Embedded C and Android Lollipop (5.0) user interface.



Fig.6.Experimental Setup

## RESULT

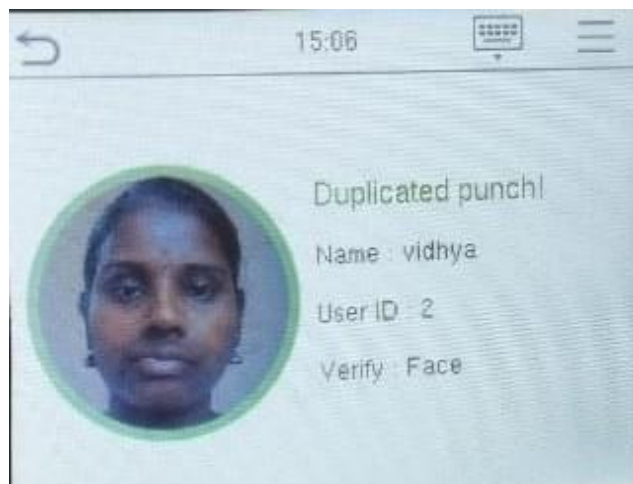


Fig.7.Output

The system recognized all the trained faces. The average accuracy obtained over a duration of 5 seconds was 72.01% with a maximum value of 98.53% at a frame rate of 3 FPS. These numbers indicate that the ARM Processor can be used for simple real time android applications despite its modest hardware capability.

## VIII. FUTURE SCOPE

Attendance management system keeps track of daily attendance, working hours, breaks, login, and logout time. It prevents staff's time theft. An attendance management system integrates all attendance devices such as smart cards, biometric, and facial recognition devices in real-time



## IX. CONCLUSION

Smart attendance management system is designed to solve the issues of existing manual systems. We have used face recognition concept to mark the attendance of student and make the system better. The system performs satisfactory in different poses and variations. In future this system need be improved because this system sometimes fails to recognize students from some distance, also we have some processing limitation, working with a system of high processing may result even better performance of this system

## REFERENCES

- [1] Face Detection and Recognition using OpenCV, Article, <http://shervinemami.info/faceRecognition.html>, Published by Shervin Emami, 2010
- [2] Seeing with OpenCV, Article, [http://www.cognotics.com/opencv/servo2007\\_series/pa rt\\_1/index.htm](http://www.cognotics.com/opencv/servo2007_series/pa rt_1/index.htm), Published by Robin Hewitt, 2010 56
- [3] OpenCV Homepage, <http://opencv.willowgarage.com>
- [4] FacebRecognition Homepage, <http://www.facerec.org/algorithms/>
- [5] Wikipedia, Three-dimensional face recognition, [http://en.wikipedia.org/wiki/Threedimensional\\_face\\_recognition](http://en.wikipedia.org/wiki/Threedimensional_face_recognition)
- [6] Wikipedia, Active appearance model, [http://en.wikipedia.org/wiki/Active\\_appearance\\_model](http://en.wikipedia.org/wiki/Active_appearance_model)
- [7] Computer Vision Papers, <http://www.cvpapers.com/>
- [8] Kamesh V, Karthick M, Kavin K, Velusamy M and Vidhya R, "RealTime Fraud Anomaly Detection in E- banking Using Data Mining Algorithm", South Asian Journal of Engineering and Technology, Vol.8, supplementary issue.1, PP.144-148, April 6, 2019.
- [9] Vijayakumar M and Prabhakar E, "A Hybrid Combined Under - Over Sampling Method for Class Imbalanced Datasets," International Journal of Research and Advanced Development (IJRAD), Volume 02, Issue 05, pp. 27 - 33, December 2018.
- [10] V S. Sureshkumar, D. Joseph Paul, N.Arunagiri, T. Bhuvaneshwaran ,S, Gopalakrishnan "Optimal Performance And Security Of Data Through FS- Drops Methodology," International Journal of Innovative Research In Engineering Science and Technology , pp:1-7, Issue 3, volume5, 2017
- [11] J.D. Irawan, E. Adriantantri and A. Farid, "RFID and IOT for attendance management system," MATEC Web of Conferences (ICESTI), volume 164, 01020, 2018.
- [12] Li, Xiang-Yu, and Zhen-Xian Lin. "Face recognition based on HOG and fast PCA algorithm." The EuroChina Conference on Intelligent Data Analysis and Applications. Springer, Cham, 2017. 57
- [13] Arsenovic, Marko, et al. "FaceTime—Deep learning based face recognition attendance system." 2017 IEEE 15th International Symposium on Intelligent Systems and Informatics (SISY). IEEE, 2017.
- [14] Rekha, N., and M. Z. Kurian. "Face detection in real time based on HOG." International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) 3.4 (2014): 1345-1352.
- [15] Kwolek, Bogdan. "Face detection using convolutional neural networks and Gabor filters." International Conference on Artificial Neural Networks. Springer, Berlin, Heidelberg, 2005.
- [16] Ashwini, C., et al. "An Efficient Attendance System Using Local Binary Pattern and Local Directional Pattern." Journal of Network Communications and Emerging Technologies (JNCET) www. jncet. org 8.4 (2018).
- [17] Karnalim, Oscar, et al. "Face-face at classroom environment: Dataset and exploration." 2018 Eighth International Conference on Image Processing Theory, Tools and Applications (IPTA). IEEE, 2018.
- [18] Mian, Ajmal. "Realtime face detection and tracking using a single pan, tilt, zoom camera." 2008 23rd International Conference Image and Vision Computing New Zealand. IEEE, 2008.
- [19] Mehta, Preeti, and Pankaj Tomar. "An Efficient Attendance Management Sytem based on Face Recognition using Matlab and Raspberry Pi 2." International Journal of Engineering Technology Science and Research IJETSRS 3.5 (2016): 71-78