International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 05 | May 2022 www.irjet.net p-ISSN: 2395-0072

AUTOMATIC ATTENDANCE SYSTEM MANAGEMENT USING RASPBERRY PI WITH ULTRASONIC SENSOR

Logaraja. M[1], Dr. J. Vijayakumar[2], Thavamani S[3]

[1] PG student, Department of Electronics and Instrumentation, Bharathiar University, Coimbatore-46, Tamil Nadu, India.
[2]Associate Professor & Head, Department of Electronics and Instrumentation, Bharathiar University Coimbatore-46, Tamil Nadu, India.
[3]Research scholar, Department of Electronics and Instrumentation, Bharathiar University, Coimbatore-46, Tamil Nadu, India.

Abstract - *Most educational institutions are following traditional attendance systems based on manpower, while a huge number of persons which is a difficult and time-consuming task. Fast facades the researchers produced more technologies for automatic attendance systems by using different hardware and software units. In this present work, we have used the following hardware and software units for automatic attendance management which is combined with Raspberry pi 3b+ and Haar Cascade algorithms. The main motive of this proposed work is for real-time presenter identification and information shared with the concerned person. Here we have used the Raspberry pi 3b+ for data processing, the Haar Cascade algorithm for object detection and also classifying the presenter data, and Python IDLE 3.8 version as a programming language for automatic attendance. In this work, we tested twenty persons' face data (10 images for each person) for the classifier training. In this work, we have used the ultrasonic sensor to measure the distance between the hardware assembled and the particular person in this sensor will help to maintain the social distance of this pandemic situation.*

Key Words: Attendance management system, Raspberry pi 3b+, Haar Cascade algorithm, Python, Ultrasonic sensor.

1. INTRODUCTION

Early, educational institutions and workplaces are following a manual attendance approach to maintaining the record of students and employees. This manual approach is a time-consuming task. In recent decades researchers invent different approaches to make this difficulty into an easy task with the help of different hardware/ software units. In recent days we are following different types of automatic attendance systems. Commonly attendance is marked manually by teachers or respective persons and they must make sure correct attendance is marked for respective students. The marking or counting time may vary based on the strength of the people This whole process can wastes a lot of time and proxy cases are not intercepted. Face recognition-based attendance is one of the trendy topics among automatic attendance systems [[1]]Based on the requirement the approaches and hardware/ software units may vary, Actually, this type of work has been done through different approaches. Most of the researchers used Radio Frequency Identification (RFID) technology which is facilitated wireless identification with prescribed electronic hardware units for making automatic attendance, and some authors follow the Other biometric techniques like thumb impression, retina, iris, palm identification, and ear recognition to attendance management tasks [0] The RFID tag-based attendance management system is done through an integrated antenna and memory. Information about the person is written on the tag, and RFID has an antenna that emits the radio waves then the tag has been responding by sending it back to the reader. And this information's are stored in memory. This RFID-based attendance management system is not cost-effective, the biometric system is not secure and has been prone to manipulation 0]. To overcome the manpower-based attendance system, some researchers are created another technology based on facial recognition, this task will simplify the time consumption, and eliminate human error as well as accuracy 0] This type of face recognition-based attendance system is most helpful for institutions to make automatic attendance, in this work we additionally include the ultrasonic sensor for distance measurement. Since November 2019 the world caused by Coronavirus, and we are following a lot of appropriate precautions, especially the social distance to prevent it. In this proposed work we used the ultrasonic sensor to measure the distance, this will help to maintain the social distance between the peoples.

2. LITERATURE SURVEY

The researchers developed many approaches to overcome the traditional attendance systems in institutions. Here we include several existing works specifically in the area of the institutional automatic attendance management system. In [0] authors the work is based on face recognition, they have used a web camera for student image collection, an OpenCV platform

used to extract the exact face data from collected data, and a Raspberry pi module as the processor. In this work, the authors used 12 numbers of students' face data, and this proposed work achieved 92% of identification accuracy. The face recognition system [0] they proposed the work used Raspberry Pi Camera Module V2 attached to Raspberry Pi3 a for data collection and processing, and they used OpenCV database, Principal Component Analysis algorithm, and cascade classifiers for feature extraction and classification. In [0] the authors proposed a real-time face recognition approach for an automatic attendance system, this works they used the OpenCV framework for image pre-processing and Haar's Cascades algorithm for face detection and uses LBP histograms for face recognition and uses SQLite along with MYSQL to update the database to concerned persons.

In [0] the researchers proposed the work for IoT and face recognition-based automatic attendance systems. In this work, they were used Raspberry Pi 3Model controller Built with 1.2GHz, 64-bit quad-core processor, Broadcom2837 chipset, Bluetooth 4.1 connectivity, 40 pins extended GPIO, 1GB RAM, 802.11bgn wireless LAN, 4USB Ports, CSI camera port, Micro SD port, full-size HDMI, and Micro USB Power source. This proposed work used only ten persons' data for recognition and detection. In [0] authors followed IoT with a Raspberry Pi processor for a smart attendance system. This entire work is divided into three steps database creation, training, and testing. For databased creation, they collected the images with 20 frames per second, LBPH algorithm was used for face recognition and the Viola-Jones algorithm for face detection which uses modified Haar Cascades for detection. Raspberry pi 2 with Eigen Faces algorithm for face recognition-based attendance system this work was proposed by [0]. In this proposed work they used the Eigen Faces algorithm for face recognition and detection, this proposed work got 88% of detection accuracy.

3. PROPOSED METHODOLOGY

This section describes the hardware and software requirements, such as the Raspberry Pi3+ processor, camera, ultrasonic sensor, Haar Cascade algorithm, and python IDLE 3.8 version.

3.1 HARDWARE AND SOFTWARE REQUIREMENTS

3.1.1Raspberry Pi Processor:

Raspberry Pi 3Model B+ is a credit card size computer built on the Broadcom BCM2837B0 chipset, 1.2GHz, ARM Cortex-A53, 64-bit quad-core processor, 40 pins extended GPIO, 802.11bgn wireless LAN, WIFI, Bluetooth 4.1 connectivity, 1GB RAM, 4USB Ports, CSI camera port, Micro SD port, full-size HDMI, and Micro USB Power source. In our project 32 GB, a micro-SD card was used as a hard disk.

3.1.2 Raspberry Pi Camera:

Raspberry pi CSI camera, is a 5megapixel sensor with an OV5647 camera module capable of 1080p video. This camera is connected to the CSI camera port in raspberry pi. It is used to capture images for making the automatic attendance system.

3.1.3 Ultrasonic Sensor:

The ultrasonic sensor works on the same principles as a radar system. An ultrasonic sensor can convert electrical energy into acoustic waves and vice versa. The acoustic wave signal is an ultrasonic wave traveling at a frequency above 18 kHz. In this project famous HC-SR04, the ultrasonic sensor is used to detect the person's presence and, it generates ultrasonic waves at a 40 kHz frequency.

The following equation calculates the distance to an object placed in front of an ultrasonic sensor:

$$distance = \frac{time\ taken\ \times speed\ of\ sound}{2}$$

3.2.1 Python IDLE & Python Language:

IDLE is integrated development environment for editing and running python programs. We can check the output in this IDLE. Python is a high-level programming language. It has easy syntaxes and flow, so programmers will be easy to code for different customized applications.

3.2.2 Haar Cascade Algorithm:

Haar Cascade is a machine learning object detection algorithm used to identify objects in an image or video and is based on the concept of features proposed by Paul Viola and Michael Jones in their paper "Rapid Object Detection uses a Boosted Cascade of Simple Features" in 2001. It is a machine learning-based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

The algorithm has four stages:

- Haar Feature Selection
- Creating Integral Images
- Adaboost Training
- Cascading Classifiers

3.2.2.1 HAAR FEATURE SELECTION

Haar features are similar to these convolution kernels which are used to detect the presence of that feature in the given image. Each feature results in a single value which is calculated by subtracting the sum of pixels under the white rectangle from the sum of pixels under the black rectangle.

3.2.2.2 CREATING INTEGRAL IMAGES

For generating the sum of values in a rectangular subset of a grid in the image processing domain it is known as an integral image. In an integral image, the value at pixel (x, y) is the sum of pixels above and to the left (x, y) inclusive.

$$(x,y) = \Sigma\, i\,(x',y')$$

$$x' \leq x, y' \leq y$$

(x, y) = coordinates of original image

(x', y') = coordinates of integral image

3.2.2.3 ADABOOST TRAINING

Adaboost essentially chooses the best features and trains the classifiers to use them. It uses a combination of **"weak classifiers"** to create a **"strong classifier"** that the algorithm can use to detect objects. Weak learners are created by moving a window over the input image, and computing Haar features for each subsection of the image. This difference is compared to a learned threshold that separates non-objects from objects. Because these are "weak classifiers," many Haar features are needed for accuracy to form a strong classifier. The next step combines these weak learners into strong learners using **cascading classifiers**.

3.2.2.4 CASCADING CLASSIFIER

The cascade classifier is the last stage used for composed of stages each stage contains a strong classifier when all the features are combined into different stages where each stage has a number of features. That each stage is used to determine whether it's a face or not a face.

4. WORKFLOW

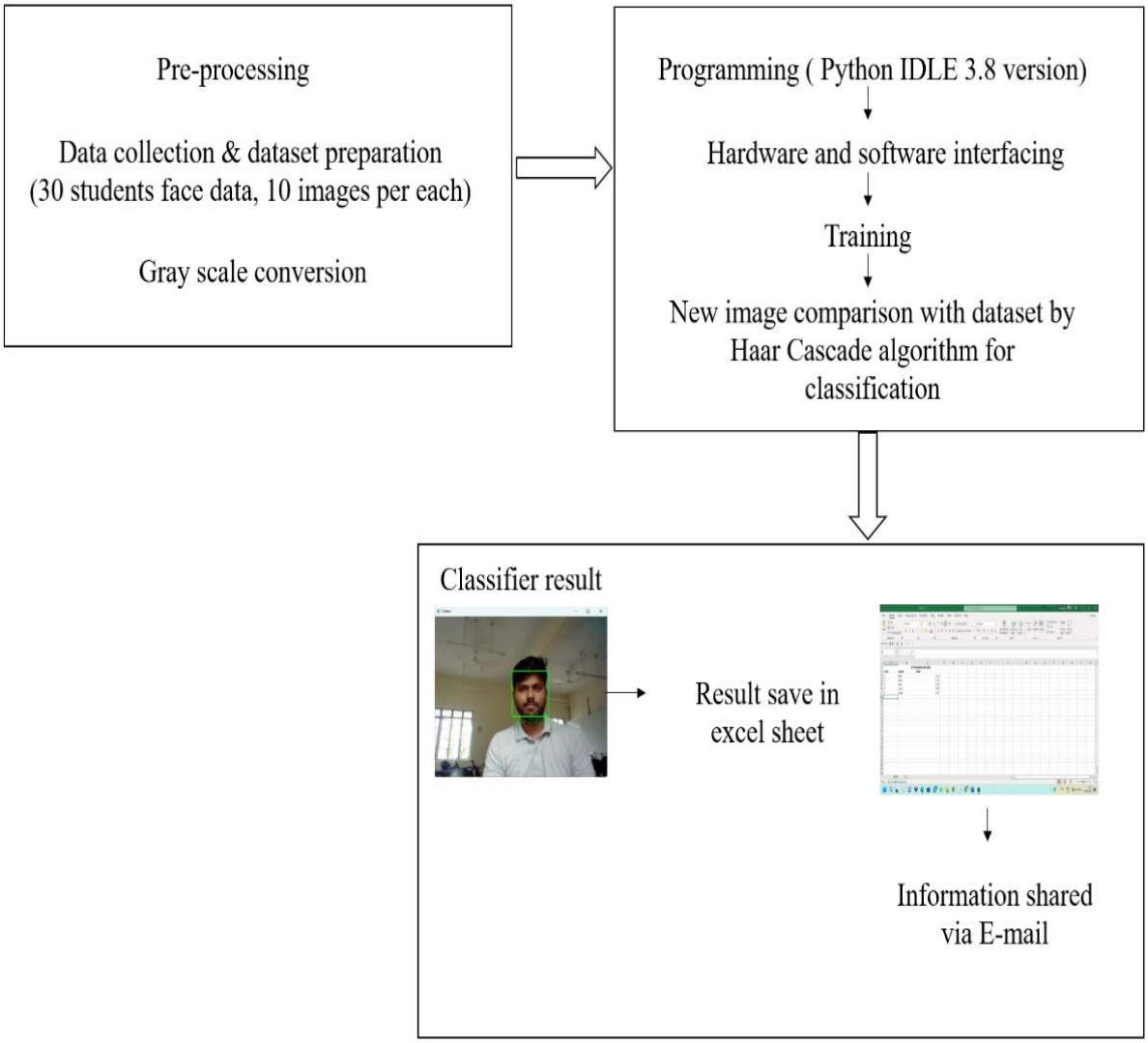

Fig -1: this figure shows the work flow of proposed system.

5. RESULT AND DISCUSSION

In this present work We have implemented an automatic attendance management system for educational institutions, it will help to reduce time and effort. This entire work is implemented based on the Python programming language and Raspberry piB3+ processor, we have used face recognition techniques for the purpose of identifying the exact persons. In this entire work, we used 30 students' face image datasets were used for training, from each person we collected 10 images. In this proposed work we used the ultrasonic sensor network which helps us to maintain the social distance during this pandemic time.

REFERENCES

[1] Pasumarti, P. and Sekhar, P.P., 2018. Classroom attendance using face detection and Raspberry-Pi. International Research Journal of Engineering and Technology (IRJET), 5(Muqeet, M.A., 2019. Face recognition-based attendance management system using Raspberry Pi. J. Inform. Comput. Sci, 9(10), pp.86-90.

[2] D. Narendar Singh, M. Kusuma Sri, K. Mounika "IOT Based Automated Attendance with Face Recognition System" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075.

[3] https://www.edusys.co/blog/rfid-attendance-system.

[4] Devi, R., Srivasanthi, B., Suvathi, T. and Umamaheswari, S., Automatic Attendance System Based On Face Recognition and Face Detection.

[5] Muqeet, M.A., 2019. Face recognition-based attendance management system using Raspberry Pi. J. Inform. Comput. Sci, 9(10), pp.86-90.

[6] Kumar, R.K. and Mekala, S., 2018. Face Recognition attendance system using Raspberry pi. International Journal of Pure and Applied Mathematics, 115.

[7] Pasumarti, P. and Sekhar, P.P., 2018. Classroom attendance using face detection and Raspberry-Pi. International Research Journal of Engineering and Technology (IRJET), 5(03), pp.167-171.

[8] Singh, D.N., Sri, M.K. and Mounika, K., 2019. IOT based automated attendance with face recognition system. Int. J. Innov. Technol. Explor. Eng.

[9] Yashwant, C.C., Sanjay, G.K. and Bangal, S.P., DEVELOPMENT OF IOT BASED SMART ATTENDANCE SYSTEM USING RASPBERRY PI.

[10] Gaddam, S.C., Ramesh, N.V.K. and Dhanekula, H., 2016. Face recognition-based attendance management system with raspberry pi 2 using eigen faces algorithm. ARPN Journal of Engineering and Applied Sciences, 11(13), pp.8107-8112.