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Easy Monitoring and Mentoring of Class Environment using Facial Recognition System

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ABSTRACT: Due to the ever-changing world which is progressing towards automation and making the small tasks that are usually time consuming and obsolete, the task of taking attendance in a daily environment would not be transparent between the parents and the college authorities. Most of the existing systems are not reliable and have loopholes which fails to be efficient enough and lacks the proper security which is expected from this modern day world. This modern day system needs to be updated and has to be scalable enough to handle all future enhancements and keep up with the current technology. This system is suitable for the current educational society which aims to improve the productivity of students and hold up the institution's performance up to a certain mark. Utilizing this, we can reduce the rate of human errors that could occur while doing this process manually. This will reduce the work considerably and could keep a better track record of users.

KEYWORDS: Internet of Things (IoT); Raspberry Pi; Attendance System; Python; OpenCV; PiCamera.

I. INTRODUCTION

The growth and the popularity of Internet of Things (IoT) has been on the rise where even the simplest of tasks that were done manually are being automated. It's a process of putting a computer processor and a Wi-Fi connection into everyday items where we have the ability to control these devices using computer programming and enables us to create solutions which ensures that the devices communicate and work together. The main intention of IoT is to allow all the smart devices in our environment to work together by automation and makes our lives easier.

Internet of Things is the future where it is going to be vastly different where not only our phones and computers but everything else will be. It can drastically reduce the time that is being spent in manually going through the process of troubleshooting a device when it could automatically find the appropriate solution for you and would completely skip the additional steps that were needed to solve the particular problem.

The methodology is designed in such a way that an administrator could keep a list of all students that are present in a particular class and when the device is triggered by the application, It automatically checks for the students that are present at the current class at small intervals to reduce the error rate in case the significant student is in a unique position which does not confirm his presence in the class. The camera module at first takes a picture of the students that are in the class and compares it with a list of all the students in a database where it is checked whether that particular student is present for the class and his attendance is updated on the database and is retrieved when a concerned parent requests for it on the web application.

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II. EXISTING SYSTEM

A. Traditional Attendance System.

The traditional method of manually marking the attendance has been there throughout the beginning of the educational system either by marking them with a tick mark or a dot mark and a black dot for absent or the alphabet 'a' for them. In this method, utilization of paper and keeping hard copy records has been throughout the generations and has been considered to use a lot of paper for keeping tracks and records of students and is prone to damage by external sources as human errors, climatic conditions etc.

B. RFID based Attendance System

Radio Frequency Identification has been a solution that has been tried and tested comprises of students using their Identification Card(ID) to check-in and logout their times for their respective classes. The system is connected to a computer which consists of databases and stores the attendances that is taken inside the database and is viewed by an additional software or is referenced from the database. There are many security risks regarding this which could compromise the entire purpose of the system as users could easily manipulate the attendance system by using a stolen ID card or could ask someone else to check-in for them without being present.

III. PROPOSED SYSTEM

In this paper, we have proposed a system in which the entire setup ensures that the attendance of a student is marked at the button's click.

The given fig.1 shows the building blocks of the methodology that had been proposed. It comprises of a power supply of 5V which is used to power up the raspberry PI 3 B+ which has raspbian OS installed on it. It consists of a 16GB memory card and a PI camera which is used to take the photo of the classroom when it is triggered for it. The application is used to manage the device and ensures that all the processes are worked upon.

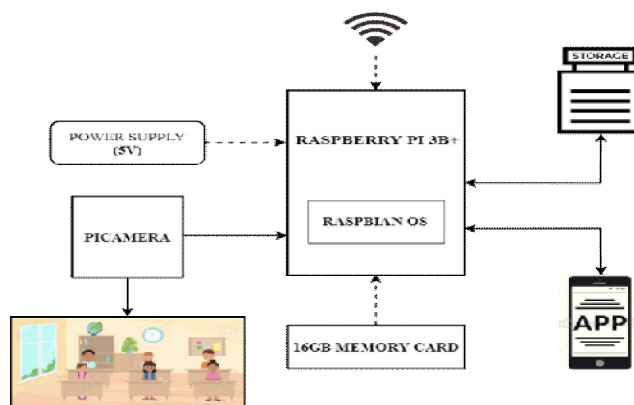


Fig.1 System Design

A. Hardware Components

The module would require the use of a device that is used to capture the image and is self-sustaining enough to maintain the program running in the background with consumes less energy and is portable enough to be placed comfortably in a classroom which covers the entire room.

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1. Raspberry Pi 3B+

The Raspberry Pi is a portable device which was manufactured with the intention to promote the learning of computer programming and making it easy. It's a new upgraded version of the original which consists of a faster GPU, a Dual-band 802.11ac wireless LAN adapter as well as Bluetooth 4.2 with a 40 pin GPIO support as well as 4 USB2.0 ports running the raspbian OS.

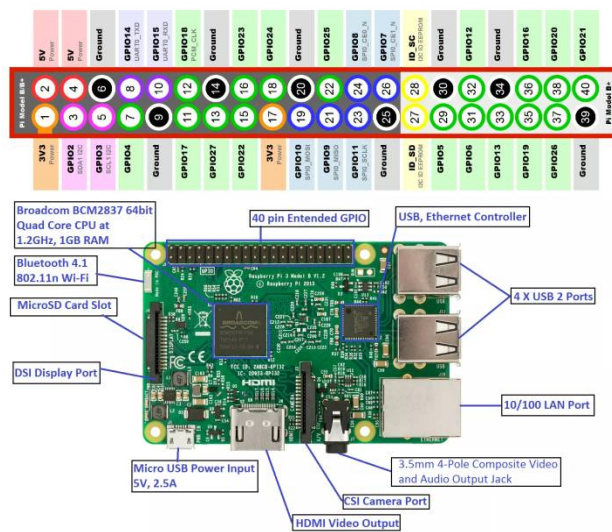


Fig 2. Raspberry Pi 3B+

2. PiCamera

The raspberry PI camera module is a small portable camera which has a resolution of 8 Mega-Pixel which is capable of recording 4K in 30fps, 1080p in 60fps. It uses a Sony Exmor IMX219 sensor which is compatible with all models of the Raspberry Pi and are capable of taking 3280x2464 static images and is connected to the Raspberry Pi via a 15cm long flexible ribbon which is connected to the dedicated CSI interface which is designed specifically for the interaction with the camera.



Fig.3 Pi Camera

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3. Power Supply

The Raspberry Pi 3B+ has a standard input voltage requirement of 5V and the recommended input current as 2A. However, it could also be powered via the Micro USB port which is on the side of the unit. The power requirements of the Raspberry Pi increase if we make use of various interfaces such as the camera module and the HDMI port by 250mA and 50mA.



Fig 4. Power supply

IV. PROPOSED SYSTEM ARCHITECTURE

The entire system comprises of a web application which is used to access and use the raspberry Pi to which python scripts are embedded into the application so that they could be executed at a click of a button.

There are 3 steps which are used to train the program to recognize a face:

- Creating a dataset – In this step, we start by taking at least 20-25 photos using the camera when it recognizes a face while using the camera. It stores in a folder called dataset with the name of the person as the label.
- Training the dataset – In this step, we train the dataset and map all the faces with their names and is stored in a matrix form (i.e. numpy array) and is used to match the face when the recognizer is tested.
- Testing the model to recognize – The model file is then used to identify the person in front of the camera and the user is then stored in a temporary storage.

This user would be then looked up and the photo of him/her would be attached to the email and would be sent as a mail to the corresponding person of interest who had requested for the attendance status.

V. CONCLUSION

The main intention of this paper is to give a brief explanation of the technologies which were already implemented and use a better interface to interact with the application and enable users to be able to use the application with a click of a button and ensures simplicity and easy to understand the basic functioning of the recogniser and automating the attendance system thereby reducing the time consumed by taking it manually.

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