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Face Recognisation Based IoT Attendance Monitor System Using Raspberry Pi

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ABSTRACT:

Taking attendance is one of the most crucial jobs that must be completed on a regular basis at colleges, universities, organizations, schools, and companies. The main objective of this project is to develop a Face Recognition-based attendance system that will automate the majority of the time that it is currently done manually. Both the criteria for time management and the objectives for modernizing the way attendance is handled are satisfied by this project. Before the related class begins, the student can approach the device, which will start taking photographs and comparing them to the qualified dataset.

The images are extracted using Open CV. The proposed system is a smart attendance system using IoT technology that uses face recognition to share data globally. The suggested method uses face-based technology to recognise the students' faces while they take attendance. A raspberry pi processor, USB camera, and monitor are among the hardware components used in this system. After training, the dataset recognising process will begin with the initial gathering of user image data. The system will recognise and record attendance in an excel datasheet if the live capture images match the dataset. To create this project, deep learning methods were employed. We can track the Face attendance data on a website from anywhere in the world by using IoT.

Keywords: Python, OpenCV, Attendance, Raspberry Pi, USB Camera.

1. INTRODUCTION

The consistency of pupils' academic achievement concerns today's educational institutions. This drop in student achievement can be attributed, in part, to the low attendance. Manual attendance taking is time-consuming and rarely inaccurate because people don't do it very often. There will no longer be a paper-based system for keeping track of student attendance, which is out-of-date. In order to help institutions record student attendance, this project aims to develop a computer-based mechanism for doing so. A "Face Recognition based Smart Attendance System Using IoT" is what we have suggested implementing. Because facial detection eliminates the likelihood of

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proxy attendance, the current solution also includes facial identification.

This saves time. This system will be used right now in a phase of the lesson where student engagement is crucial. Basic components for this system include a Raspberry Pi, Python, and OpenCV.

The webcam is used as an input device by the system implementation to instantly recognise a person's face. With the help of the Internet of Things, this project will create an automatic attendance system to take the place of a manual one. The suggested solution will eliminate the need for offline registers because all the data is saved online, simplifying record maintenance. For both students and the educational institution today, attendance is seen as a key aspect. Manually recording attendance is seen to be a time-consuming task.

It also occasionally happens that a student is missed by the teacher, or pupils may repeatedly report their friends' absences (proxy attendance). An automated way of confirming or recognising a living person's identity based on physical traits, such as fingerprints or facial features, or certain aspects of their behaviour is known as biometric attendance. Biometric systems are challenging to hack since they base a person's identity on bodily characteristics. Attendance is recorded for that person in the related excel sheet once the recognised face matches a saved photograph. The second justification for using facial recognition as a biometric parameter is that it eliminates the need for people to physically touch things or records, creating a contagious-by-touch-free environment that is currently being adopted by everyone.

The automated attendance system automatically detects and recognises faces, records attendance, and keeps track of the collected data. It does this by employing a machine learning technique. If the institution decided to enforce, it could have to spend a lot of time and resources, which is not at all practicable. Because of this, the previous system's entire attendance record cannot be trusted for analysis purposes.

It takes too much time, which is the second issue with the previous system. Parental access to such information is not possible under the prior arrangement, though. In order to increase productivity, ensure data accuracy, and make information accessible to those who have a valid need for it, the prior system must be evolved. In this research, an educational institution's attendance is monitored using a facial recognition system.

This chapter will go into great length on the project's challenge and motivation, as well as the goals of the research, project scope, project contributions, and project background. These days, technology strives to transmit a significant knowledge-based technological innovation. One of the fascinating fields is deep learning, which allows a machine to train itself by using various datasets as input and producing the proper results during testing by using various learning algorithms. The attendance of a student or instructor in an educational institution is now seen as a crucial component.

The system now automatically detects the kids' attendance performance and keeps track of the data it collects thanks to advancements in deep learning technology. By integrating face recognition technology, the Automated Attendance System (AAS)

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can automatically determine if a student is present or not in the classroom. Additionally, it is feasible to tell if a student is dozing off or staying awake throughout class, and it is also possible to use it to guarantee attendance during exam periods. It becomes quite reliable for the computer to know whether every student is present in the classroom by taking pictures of their faces and uploading them to a high-definition monitor video streaming service.

2. LITERATURE SURVEY

According to the writers, many computations that were divided up should move away from being based solely on a prototype and appearance. In the strategy's based on appearance, three straight subspace investigations are shown. Additionally, non-direct difficult investigation for face recognition is explained [1].S.T. Gandhi suggests using "distinctive experimentation" to recognise people by their faces. By using a biometric face, this framework validates the framework. Numerous applications, including an access control system, a framework for distinguishing proof, and report control, were proposed using this framework [2]. Layout coordination with face recognition calculations was Anil K's proposal. This process gives facial recognition to the problem that has been raised. First of all, edge see is where the appearances are addressed. Layout coordination is then used absurdly at that stage. The picture is addressed in one measurement via restlessness-based methodology. Individual ID is carried out based on the coordination with score

[3]. Face recognition framework audits were suggested by Sujatha G. The main focus of this work is the delicate processing methods, including as SVM, ANN, and others, that can be used to distinguish faces. Better results might be obtained using these approaches. The numerous calculations for extracting highlights, such as ICA, PCA, and LDA, were discussed in this study [4]. The picture quality, present variety, and enlightenment modifications are a few other issues mentioned that reduce precision [5]. Face acknowledgment is a strategy that was proposed by Rhiddi Patel, who also explores how it operates. Various methods of face recognition are also taken into consideration. It includes techniques with high aptitude for enlightenment modifications and unique ecological circumstances [6].

AI calculations are a key component of the current facial recognition system. 11 people were recorded while they glanced in various locations, creating the knowledge base [7]. At that stage, outlines are subtracted from the recordings after the face is recognised. An iPhone's 13MP camera is used to create the database. There are 234 photos in every class. The image has a 244x244 [8] objective. Faces as well as non-face elements can be seen in the photographs. To improve accuracy, a specific face component is used for face affirmation in this way. The primary goal of this cycle is to identify the face [9].[21]. This approach employs a face area technique based on deep neural networks (DNN).

The DNN-based technique is more accurate than recognisable proof systems that are based on the current state of handicraft [10]. For important learning face acknowledgment, the pre-arranged module of Caffe prototxt archives is utilised. With the Open CV library, this restriction is connected. The ResNet-based Single Shot

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Detector (SSD) architecture was used by the DNN-based face locater [11].

We must resize all of the cut images to the same size because the original images may have been of different sizes. The identified images were subsequently cropped and made 128x128 in size. A further resizing was performed on the images to create a 1D cluster with a size of 1X (128)2. A key component of the facial recognition calculation is highlight extraction [12].

To distinguish one person from another, each face has distinctive features. Highlight extraction in this process is done using PCA and LDA. A train picture and a test picture are separated from the data set [13]. This programme may be required for photo processing because face recognition is used in so many different fields. One of these uses of individually identifiable facial recognition within a company for attendance. A crucial part of any organization's performance analysis is keeping and keeping track of attendance statistics [1].[15].

The system's creation is intended to computerise the current approach to managing attendance. The daily tasks of managing and analysing attendance are carried out by an automated system, reducing the need for human intervention [14]. Scaling, positions, changing illumination, spinning, and occlusion are among the issues that conventional face detection and recognition approaches and methodologies cannot solve.

The system that is being proposed includes features such as face detection, feature extraction, extracted feature detection, and student attendance analysis in an effort to address the shortcomings of the current system. The system makes use of feature detection technologies like cascading classifiers, integrated colour features in integrated images, and image contrast. A variety of facial features, including shape, colour, and LBP swell auto-connection, are used by the system to increase accuracy. The Euclidean distance and the determination of the k-most-limited point are used to perceive faces. The framework applies the appropriate learning computation and takes into account the progressions that occur in the face over a period of time to produce more precise results [16].

It was created to indicate teacher attendance without any influence from the teacher personally, and it is incredibly useful for institutions and offices to quickly display attendance. Using the staff enrollment on the website created for this article, individuals can learn their level of engagement from anywhere, saving time thanks to this framework. The majority of the time, RFID-based, biometric-based, and MATLAB-based systems are utilised to automatically update attendance. Generally speaking, going to the toilet is a troublesome and boring process [17]. As a result, it is essential to develop a reliable system for managing naturally occurring participation. This type also has the advantage of preventing participation that is not genuine [18]. A useful tool in the subject of vision, such as for managing pictures, is Open-CV (Open Command Visualization), an open-source library whose source code is accessible to the general public. The fundamental tenet of the task is to use facial recognition to identify and manage participation

[19]. The practice of acknowledging people's faces is not new in the community

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where we live. It is impressive how well humans can understand other people. It is amazing how the human brain can maintain consistency with the distinctive evidence of a single person despite the passage of time and, for all intents and purposes, small changes [20].

2.1Existing System

The security for the door accessing system in the current system is based on RFID and KEYPAD. That system prevents the current system from being securely protected. The current system has a number of drawbacks. We integrate new technology called facial recognition to get beyond the restrictions of the current method. A finger impression is currently used as a biometric parameter in the current technique of taking attendance. The analysis of student performance is inaccurate when manual or traditional attendance is done by contacting students by name. This method is time-consuming, prone to error, and involves proxies. It takes time and resources to maintain a record of this kind of attendance. With the recent pandemic in mind, it is not safe to touch the finger print recognition sensor repeatedly without a significant gap in time. Attendance by using finger impression as a biometric parameter is accomplished by using the widely used finger print as a biometric parameter. This kind also requires a lot of care. A new attendance method that is contactless and doesn't interfere with lecturers is therefore required.

3. METHODOLOGY

Each student's face will be photographed as part of the proposed system, and that information will be stored in a database to track attendance. To be able to recognise the student's seating and posture, it is necessary to take a picture of the student's face in a well-lit environment. The system records a video, and through image processing and image training, the face is recognised and the attendance database is updated in a spreadsheet, eliminating the need for the teacher to manually take attendance in the class. The suggested system makes use of a webcam and a Raspberry Pi as its computer. The author of this project used a Raspberry Pi to build a face recognition-based attendance system. The USB web camera, attendance switch, and buzzer were all integrated into the suggested system. The facial recognition system's physical hardware model is shown in the image below.

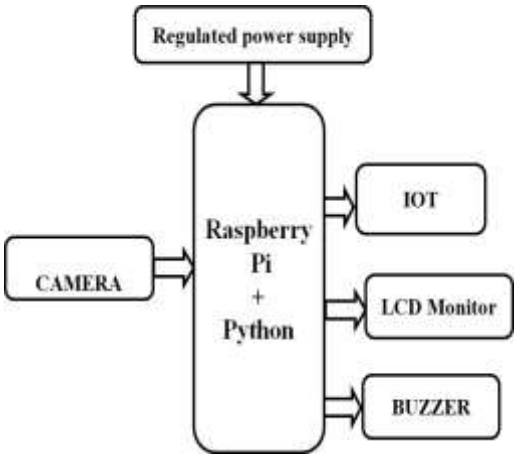

Fig.1. Proposed Block diagram

Due to its various benefits, facial recognition methodology is frequently employed in projects. The system needs data in order to identify, track, and record the person and record his or her attendance.

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Each person's photograph is given an associated id and name before the data is imported. The option to take an image is available as soon as the system is running, with the input of an ID and a name serving as prerequisites. Using OpenCV, more than 100 photos in grayscale will be captured.

These pictures will serve as the Haar cascade's input. After being transformed into binary images, Haar Cascade converts the images into binary code. After receiving input, the system is trained using the Trainer.yml file, which is written in a human accessible data serialisation language, by selecting the train picture option on the interface.

The facial features will be recognised and saved for later use. To further recognise the faces when necessary, the dataset must be built in the manner mentioned above. The track pictures feature is used to find and identify particular faces. Each person's attendance will be recorded in a spreadsheet after their faces are recognized, along with the appropriate date and hour.

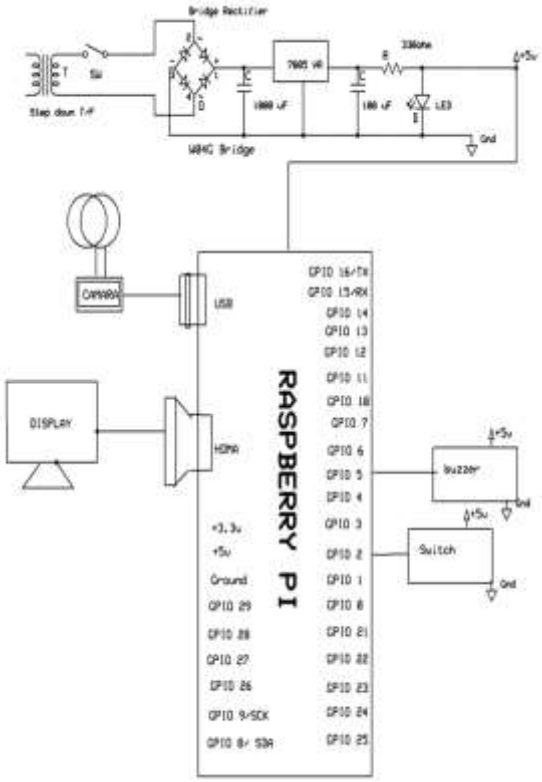

Fig.2. Schematic diagram

The suggested system operates in the manner depicted above. When the system is turned on, it requests the live image of the student, together with the student's name and ID. The system will be ready to track photos and provide attendance reports after being stored and trained.

1. Take a picture of the student
2. Search the image data base.
3.Applying the haar alagorithm.
4 Grayscale conversion, histogram equalization, and 100x100 resizing
5. If updating a database, store the updated data there; otherwise, use LBPH (for feature extraction). post-processing is complete The system takes in a brief video as input, recognizes a face using image processing and image training, and updates the attendance database in a spreadsheet as seen in the pseudo code above.

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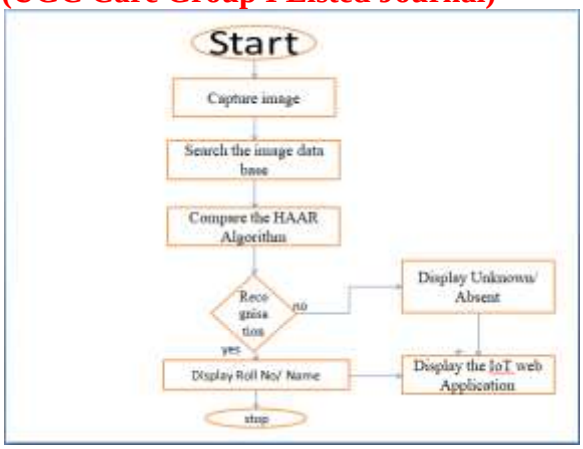

Fig.3. Flow diagram

Author initially trained photos of all kids in the classroom for the suggested method. After clicking "face training," we must enter a roll number, take a few specific pictures, and record them in a database. Figure below illustrates face training and recognition. Webcam opens once the facial recognition software has begun processing all of the photographs in the training database. The user should then hit the attendance button for those who were acknowledged within the time slot and kept as present attendance. When the attendance switch is turned off, a summary of the pupils who were present or absent will be posted on an IoT-based web application.

4. RESULTS AND DISCUSSIONS

In this project author have built face recognisation based attendance system using raspberry pi. This proposed system integrated USB web camera along with attendance switch and buzzer. Below figure describe the physical hardware model of face recognisation system.

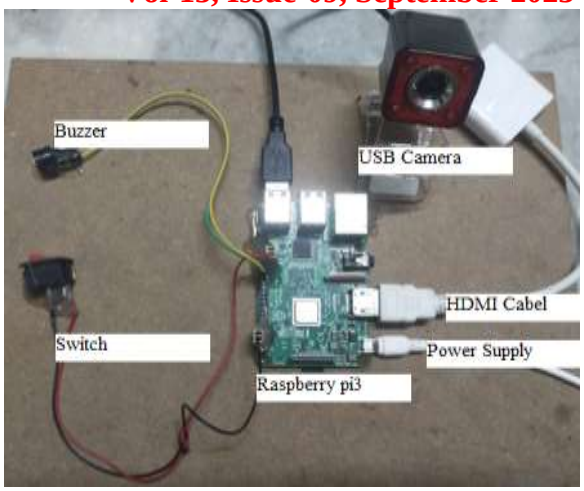

Fig.4. Hardware setup of face Recognisation based attendance system

In the proposed system author first trained the images of the all students in class room. Once the click on face training we need to give roll number and capture the certain images and that are stored in database. The figure below shows that face training and recognisation.

Fig.5.Capturing the Images through the Camera

Once the face recognisation application starts web camera open and it processes the all images in trained database. Then user should press on attendance button on those who are recognized in the time slot keep as attendance presented. After attendance switch off it give the summery of

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students who attended or absent report will post in IoT based web application.

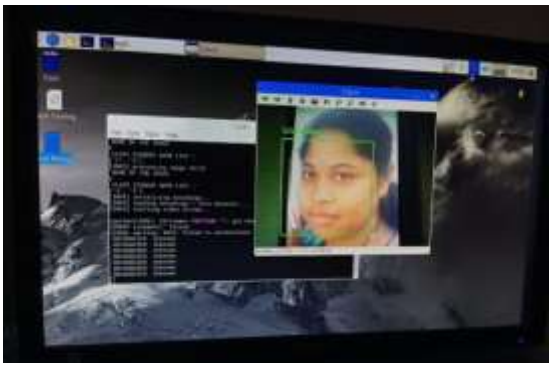

Fig 6.Prediction Result

99	21H51D5505	PRESENT	30/07/2023 13:01:55
100	21H51D5501	PRESENT	30/07/2023 13:01:57
101	21H51D5502	ABSENT	30/07/2023 13:01:57
102	21H51D5507	ABSENT	30/07/2023 13:01:57
103	21H51D5505	PRESENT	16/08/2023 10:31:50
104	21H51D5501	ABSENT	16/08/2023 10:31:50
105	21H51D5502	ABSENT	16/08/2023 10:31:50
106	21H51D5507	ABSENT	16/08/2023 10:31:50
107	21H51D5505	PRESENT	16/08/2023 13:59:16
108	21H51D5501	ABSENT	16/08/2023 13:59:16
109	21H51D5502	ABSENT	16/08/2023 13:59:16
110	21H51D5507	ABSENT	16/08/2023 13:59:16
111	21H51D5505	PRESENT	16/08/2023 14:19:01
112	21H51D5501	PRESENT	16/08/2023 14:19:02
113	21H51D5502	ABSENT	16/08/2023 14:19:02
114	21H51D5507	ABSENT	16/08/2023 14:19:02

30/07/2023 13:01:57

Fig.7.Present or absent will be posted on an IoT Application.

After attendance is switched off, the summary of students who attended or were absent will be posted in an IoT-based web application. In this thesis I am collecting the data for four students.
Am comparing results who are present who are absent in the class.

(Fig .7) I am absorbing the results on the date is 16/ 08/2023 Two students are present and two students are absent. In the IoT Application monitor through the attendance whether the student is present or not.

5. CONCLUSION:

This paper on facial recognition-based smart attendance system utilising IoT features one of the best methods of attendance marking system that is time-saving, more efficient, real-time, and precise, delivers automatic report in spreadsheet, and makes online updating easy. Python, a Raspberry Pi, a webcam, OpenCV, a Haar cascade, and other tools have been used to construct the system. One of the best face identification algorithms, Haar cascade, is employed to verify the system's standards.

The IoT-based Smart Attendance System with Face Recognition is easy to use and effective. Once each student has finished their registration and a dataset has been produced, the system begins to operate automatically. Numerous problems with current manual systems and finger print-based biometric systems are addressed by the project's architecture. The idea of using face recognition to record student attendance improves and streamlines the operation. This project performs effectively and can replace all other attendance systems. facial recognition software has begun processing all of the photographs in the training database. The user should then hit the attendance button for those who were acknowledged within the time slot and kept as present attendance. When the attendance switch is turned off, a summary of the pupils who were present or absent will be posted on an IoT-based web application.

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