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Smart Intelligence Mirror System

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Abstract: Pakistan is a developing country and there is a need to focus on educational climate/quality to makeover future residents talented and up-to-date. As this is a period of quick innovation and students are more able to learn innovation through creative learning strategies. Teachers additionally need something other than what's expected for students to inspire them. Smart things pull in students and students will propel to see the innovation and consider accomplishing something other than what's expected. Our administration likewise working in the educational areas to make it more astute. The utilization of IoT helps us in creating shrewd homerooms for improving the instruction quality. Participation is a significant factor influencing the exhibition of the student. Keeping this factor alive our venture will attempt to lessen the intricacy of the manual participation framework. Moreover, the speaker can likewise see the examination of the participation of entire class participation also as can see the participation logical of specific students in his/her subject. Student's parents can likewise get reports of the students and in the know regarding his/her activities. This task will help the teacher for arranging scholarly procedures by keeping the principal significance of participation in training. The framework depends on Raspberry Pi that runs Raspbian (Linux) Operating System introduced on a micro SD card. The Camera, just as LCD, is associated with the Raspberry Pi. By confronting the camera, the camera will catch the picture at that point pass it to the Raspberry Pi, which is modified to deal with the face acknowledgment by utilizing the OpenCV library. On the off chance that the student's info picture matches with the prepared dataset picture, the participation results will be put away in the document. In this undertaking, we are utilizing Artificial Intelligence. In man-made brainpower, we utilized Convolution neural organization.

Keywords: Face recognition, attendance, image processing, IoT, Smart mirror, smart education

1. Introduction

In the current daily routine, it is hard to experience and get by without embracing smart innovation. Thus, smartness in the educational areas is necessary and acceptable advance for the student`s future. Students are tired of the old learning systems so it's an ideal opportunity to change the system to motivate students for better learning.

One stage in the education sector is the attendance system. The attendance system we are utilizing is old is paper-based. We are attempting to make it advanced which will engage the student. It's likewise useful for teachers to oversee student attendance reports. Paperwork attendance is hard to oversee and finish the report. An excess of time devours while attendance stamping during class. The utilization of IoT helps us in creating brilliant homerooms for improving schooling quality. The presentation of the Internet of Things (IoT) in instruction, which permits Internet-based

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correspondences to occur between actual articles, sensors, and regulators, has changed educational foundations enormously.

By implanting sensors in articles and coordinating distributed computing, wearable advancements, and huge information in this stage, various boundaries of the educational climate can be estimated and dissected to give valuable data. It likewise has made another collaboration among individuals and the climate in the educational association. The utilization of brilliant articles and wearable gadgets is grounded in various colleges. Empowering advancements like sensors, chips, and other wearable gadgets which are for the most part surely known, effectively mass-created, and modest have gotten omnipresent in training and utilized widely in homerooms.

The Future of Mirrors is here, the smart mirror is a single-direction reflect. Made "Brilliant" by a straightforward LCD show, which sits behind the mirror and shows white UI components with a dark foundation. At the point when the showcase is on, we can see both our appearance and the white components, permitting programming to introduce applicable data while you prepare for the afternoon. A mirror is an intuitive gadget that capacities as a mirror while it reacts to human orders. The mirror is outfitted with peripherals like Raspberry Pi, Speaker, LCD show, and single direction reflect. The mirror shows Newsfeeds, Weather Updates, Time and date, and the student`s attendance report. The current attendance system is manual, it is taken on paper, and it devours a parcel of time. As we are mindful that numerous customary "Attendance system" utilizes attendance register to note down the attendance. It has less precision. Furthermore, the managerial individual requirements to keep up the attendance papers/sheets. In numerous enterprises, an attendance register is utilized to note down the attendance of their workers. In school, attendance is accepted on move call summons, and in universities, separate teachers gauge attendance.

The issue with the existing attendance system is that off-base attendance can be entered. For instance, in industry, in universities, one student can give intermediary attendance of another student. The likelihood of this is less however it occurs. [1] In request to influence the superior grade of the papers, the creators are mentioned to adhere to guidelines given in this example paper. The ordinary length of the papers is 5 to 12 pages.

2. Literature Review

2.1. IOT

The thought of smart rises up out of the keen city thought where anything, wherever can be related with the internet. These related gadgets or things to the internet which has given acceleration to the internet, and this whole idea is known as the internet of things (IoT). Author [2] coded the statements of Mark Weiser seeing development as "The main headways are those that disappear. They network themselves into the surface of ordinary everyday presence until they are unclear from it". The term internet of things first, used by Kevin Ashton in the year 1999. There are various surveys by various examiners to portray IoT in different habits like the internet of cycles, internet of everything, and the internet of anything, and so forth [3] As demonstrated by the Author [3], unquestionably, it is the internet of something besides it depends upon necessities. According to Cisco IoT as IoW is a trap of related actual items. Author [4] describes an internet of everything's (IoE) brings people, cooperation, information, and things that are more significant and important to make network affiliation and changing this information into exercises than at whatever other time that makes new capacities, more lavish experiences, and remarkable monetary opportunities for associations, people, and countries". Cisco uses the term Internet of Everything for both physical and virtual reasons.

2.2. IoT in education

These days there are a lot of instruments for instructive purposes to simplify it, more intelligent, and better, IoT is one of the apparatuses among them. Here is a part of the association that works in such away. IoT helps in education as a route for educating, checking, and research which simplifies the educational life and smart. As the Author [2] describes IoT that ties together IoT in the academic environment as another player which helps people's correspondence both really and basically.

IoT as a subject is significantly invigorating for students and to show the possibility of computer programming, IoT is ideal as the two points. The Open University, UK introduced another IoT – based course My Digital Life for the students of undergraduate in the computer programming division includes IoT thoughts dependent on their importance as an exceptional subject.

This subject guides students in how to utilize ICT as a gadget and study to comprehend the IoT part as a general rule. To fabricate the fundamental thought of programming language IoT is used to show the students. As an appearance instrument IoT, it is used to show English phrasing with the help of a readied IoT-based model that utilizations voice and visual sensors for English students to attempt to out the oration. Some other structure uses objects with names and Learning Management System to total information and researches students learning techniques using learning assessment procedures. [3]

2.3. Raspberry Pi

Raspberry Pi, made in the United Kingdom found by the RASPBERRY PI foundation to propel smart learning and training base computer programming at a youthful age. Pi addresses python arbiter which is a programming language. Collectively with a tech society [2] Broadcom, they began making the minicomputer sheets in the year 2012. Around a similar time, the main Pi model was disseminated. This charge card assessed little board PC can do various tasks what a standard work region or a PC can do sans the size. Raspberry Pi is a nitty-gritty PC, incredibly conservative, it centers on engaging people in learning, and its cost makes it more open to people to those with low compensation or living in a helpless area. Since our association is getting more strong and afterward a few and more trustworthy on PCs, it gets critical to engage such advancement, blending it in with IoT development makes it more brilliant than anyone might think possible. [3]

2.4. Related work

In the world of innovation, there are numerous fields where smart innovation is working. As we realize that for security purposes, we are utilizing brilliant cameras. Smart city projects are working in all around created urban communities. The smart mirror is additionally utilized in safe house projects. Referable to the presentation of IoT, the conventional classes are currently changing in instruction. E-learning components and levels have been under extended weight as a result of commentators and government considering fulfillment rates, costs, work, and vocation readiness. The learning frameworks can be improved by utilizing new ways to deal with decline expenses and upgrade the start to finish following of general learning [4]. In the IoT period, the students and teachers are related and have full access constantly to discuss the issues and find their solutions. It will too raise the connection and participation of teachers for additional students past as far as possible. Also, it will give an admittance to the parent who can follow the advancement of their youngsters and take restorative measures and meddle any place needed through the IoT system. The IoT isn't just helping with instructing and learning, yet it has can offer extraordinary help in smoothing out the activities at school, for example checking participation, online evaluations, online

schoolwork and tasks, moment online input, results, and notices about any dire circumstance, with an exceptionally minimal effort and in a proficient manner [5]. The IoT can be of incredible assistance in overseeing crisis and calamity circumstances, for example interfacing naturally educating and cautioning the police, debacle the board specialists, fire station, and clinics. IoT and cloud frameworks make reconnaissance, computerized and simple. The utilization of new advances takes another action to a study hall where students are loaded up with the learning climate as examined to upgrade the learning and showing strategies, development is applied imaginatively in a situation. [6] Visuals are an exceptionally incredible asset for students which improved the students' abilities and it improves homeroom acquiring and taking care of information by using it. To improve student's basic reasoning capacities visuals can be used to test the students to think on focuses. By utilizing diverse media innovation makes opportunities for educators to deal with the issues of students with various learning styles [7]. By using the shrewd whiteboard for the learning interaction the student's investment appears significantly increments in the study hall. The development of distributed computing and IoT advances outfitted the open instructive assets on cell phones, which is revolutionary from area ward and time for learning concerns. In any case, learning materials are introduced by utilizing data and correspondence advances, learning articles, and LMS-substance.

2.5. IoT based Interaction in eLearning

To build a framework in the public arena to improve standard-directed learning, a Raspberry Pi camera portrays that. According to this report, the raspberry pi camera can be used to separate the student's lead and correspondences in the study hall (like educator student cooperation). This report proposes to lead concealed perception so the student continues typically. It applies to students going to addresses containing electronic learning, LMS part of their subjects. Execution and openness of any association can be raised with the help of interoperability. This interoperability can be across spaces from the perspective of net-associated things or accentuation and semantic. It will in general be used for the exchanging of information between heterogeneous devices and academic plans. To get an IoT framework is definitely not a basic task if contraptions are not reasonable. The limit of computational with the help of AI and related domains for the improvement of collaboration charts can be valuable for teacher-student interaction (TSI) frameworks. Most learning, business adventure, delight, and balance are by and by dismissing the cross-segment, and the information, the estimation is rising a direct result of the data available for taking care of as an end. The collection of information for the appraisal strategy by hoarding the more humble pieces of information is shown to drive the affiliation brilliantly. The Data Analytics from the e-learning Moodle LMS – based is another field in the assessment locale. Information examination is used to refine the instructive movement and for the assurance of learning openings for student benefits and their necessities [8]. Student's experience on the internet to investigate practical unclear system s for removing data from internet learning structures have been praised by inspectors. Internet-based learning structures are used in online courses or instructive learning issues. The assessment shows that the lead of students is routinely expressive during their scholarly activity and this direction can be utilized as a center individual estimation of care and backing in the examination corridor. To expect students learning procedure a comparative kind of information is created for this examination. Fig. 2 is the different evened-out presentation that got an ontological presentation for profitable learning and ontological presentation is amazing for plan assurance similarly as adjusting too. Additionally, this information can be utilized for different computational points in like the way the total time spends the student in LMS Moodle. Students have eaten up a class or not. Homeroom records of students like students' direct, care, interchanges with class partners, and educator are utilizing to expect students learning

experiences. Student's association with Moodle and various wellsprings of information predict the students' understanding of learning. To break down the students' activities, the Raspberry camcorder-based plan can be utilized, therefore. Authors [9] inspected that AI computations can be used to explore Moodle data. Students work together with the help of IoT based framework. As the author upholds the association in these words that to achieve the target for the teacher, learning assessment gives a part to help improve the profitability in their courses through the return approach [10].To take apart students' direct and qualities learning examination device stash license the educator to explore it. This guides the teacher and students for inventiveness, refreshes the strategy for the display, and saw the odds for action and required change as the fundamental and outrageous inspiration driving the learning examination instrument compartment [11]. To achieve the looking at technique even more profitably, a sharp estimation expects a huge part to do it in a motorized manner. To deal with these automated computations AI is the field that goes under the umbrella of man-made mental aptitude. Data mining, administering unstructured data (gigantic data) information, getting test data and detaching semantically enormous data by using AI procedures. Teacher student interaction (TSI) is a crucial piece of student learning evaluation. In this paper the author reason a design to measure the activities of students, their lead, and care in the class by seeing their visible presentation. [12]

2.6. Approaches towards proposed

Students' behavior and activities can analyze from the data that arise from their facial expressions. Ekman's studies in the early 1970s have been classified the facial expression. According to him, humans have six senses where each sense represents a specific emotion like anger, fear, happiness, surprise, and disgust, and sad we summarize the process of facial expression in three major steps:

- Face detection technology
- Feature Extraction
- Classification based on facial expression

In the first step, face detection is used to detect facial expression which is the vital need to develop a system for recognition of facial expression. In the next step extract the facial features like, eye, nose, mouth, etc., which is a feature extraction phase. This phase is very essential and its contribution is very high facial expression recognition. In the last step classification of facial expression, it classifies the feature based on the extraction of relevant features. There are different methods for feature extraction like appearance-based method, geometric-based method, texture-based method, and so forth. Geometric-based method and appearance-based method mainly used in this research. The geometric base method extracts the information regarding shape, size, and position of the face, and the appearance base method extracts the information i.e., pixel, intensity regarding the face image. In the next step after receiving the features move towards classification methods for facial expression recognition. However, the entire organization is split into 3 modules- Database creation, preparing the dataset, Testing, sending data to Moodle as an annex.

Database Creation

- Initialize the camera and set an alert message to grab the attention of the students.
- Get user-id as input.
- Convert the image into grayscale, detect the face.
- Store it in a database by using given input as a label up to 20 frames.

Training

- Initialize LBPH face recognizer
- Get faces and IDs from the database folder to train the LBPH face recognizer.
- Save the trained data as an XML or YML file.

Testing
Load Decision tree classifier, LBPH face recognizer, GINI INDEX classifier, and trained data from XML or YML file.
- Capture the image from a raspberry pi camera.
- Convert it into grayscale.
- Detect the face in it
- Predict the face using the above recognizer.

This proposed system uses a Decision tree algorithm for face detection, which uses GINI INDEX for a facial classifier. Raspberry Pi is the principal factor in the project. It uses by mounting the camera to capture activities in the class. Firstly, the algorithm needs plenty of good images and bad images to create the classifier which is based on a decision tree [13]. Good images are images with clear faces where bad images are those without any lather. Each feature is represented as a single value obtained from the variance of the sums of pixels in a white rectangle from the aggregate of all picture elements in the black rectangle. All different possible sizes and locations of a classifier are applied for calculating plenty of features. As the amount of classifiers increases the arithmetic computations seem to shout out for a long time. To ponder this, we use the concept accuracy for a high facial recognition needs to remove noise in the phase of preprocessing face image that is given in Gaussian function which is discussed by the author [9].To smooth the facial image Gaussian function produced a convolution matrix. Gaussian function 2D is gained by applying the convention.

3. Hardware used with technical specifications Raspberry pi

Raspberry Pi is the name of a series of single-board computers made by the Raspberry Pi Foundation, a UK charity that aims to educate people in computing and create easier access to computing education. . The Raspberry Pi launched in 2012, and there have been several iterations and variations released since then. The original Pi had a single-core 700MHz CPU and just 256MB RAM, and the latest model has a quad-core 1.4GHz CPU with 1GB RAM.

Figure 1. Raspberry Pi

3.1. Face Recognition Module

In this proposed paper, face recognition through a pi camera is used to scan the face that will mark student attendance.

Figure 2. Pi Camera

3.2. LCD Display

The display has an LED backlight and can display two rows with up to 16 characters on each row. You can see the rectangles for each character on the display and the pixels that make up each character. The display is just white on blue and is intended for showing text. LCD screen functions as an interface between the user and raspberry pi, which displays messages that attendance has been marked.

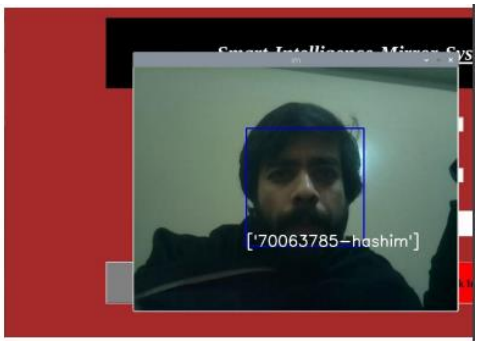

Figure 3. LCD Display

3.3. SD-Card

This card is used in raspberry pi to store the data and files of the raspberry pi. There is no personal storage of raspberry pi when we insert the SD card then OS install in it and run on raspberry pi.

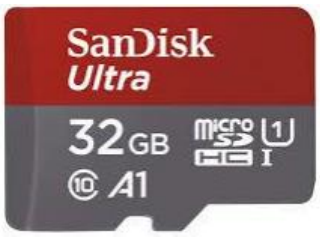

Figure 4. Class10 SD Card

4. Software(s), simulation tool(s) used Raspbian

Raspberry Pi OS (formerly Raspbian) is a Debian-based operating system for Raspberry Pi. Since 2015, it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the Raspberry Pi family of compact single-board computers. Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is a set of basic programs and utilities.

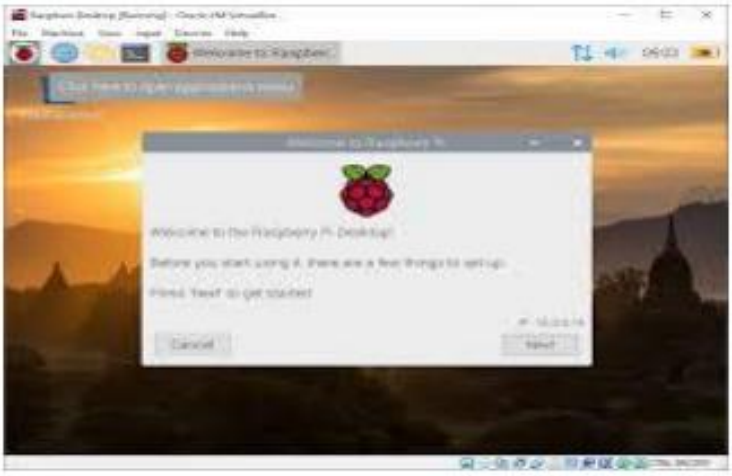

Figure 5. Raspbian OS

5. METHODOLOGIES Smart attendance process algorithm:

Step 1: Start
Step 2: Register the student face for enrolling into the system
Step 3: Scan the student face to mark the attendance
Step 4: Mirror scan your face and check the data in the database
Step 5: If you register into the portal message shows on the screen
Step 6: Message shows attendance has been marked
Step 7: End

6. Analysis procedures

Use Case Diagram:

Use case diagrams model lead inside a framework and engages the organizers to handle what the client requires. The stick man tends to what's called a performer. Use a case outline can be significant for getting a general perspective on the framework and explaining who can do and considerably more through and through what they can't do. Use case chart incorporates use cases and entertainers and

shows the connection between the utilization case and entertainers. The objective is to show the joint endeavors between the use case and the entertainer. To address the framework necessities from the client's point of view. An entertainer could be the end-client of the framework or outside as appeared in the figure underneath.

Flow Chart:

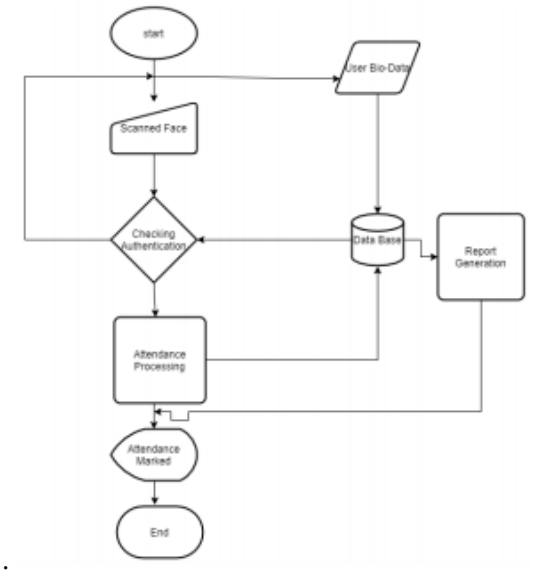

Figure 6. Flow Chart

7. Implementation procedure

This system is based on the concept of a smart attendance system using a smart intelligence mirror system which required the following components:

1. Face recognition camera (Pi Camera)
2. Raspberry Pi 4 to run the OS
3. SD Card used in Raspberry Pi
4. Smart Mirror/LCD for display the data

8. Accuracy

In the initial step, we simply have taken 100 pictures as per the given dataset the precision of our system is 58% as it has been the same that as we increment the dataset values it will build the accuracy of the system as it appeared in the chart.

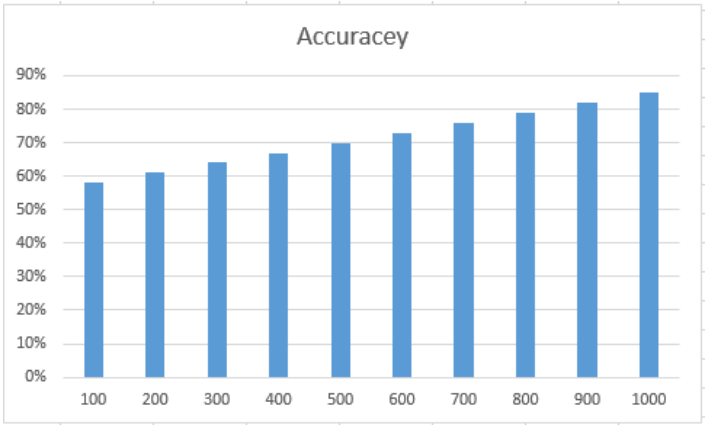

Figure 7. Accuracy Graph

9. Conclusion

We conclude an Image processing-based Student Attendance System using Raspberry pi using the Open CV tool as software for image processing and attendance is provided to the students. We can track the attendance of the students by using the language Python and Open CV software, which is very easy to install and is open source software and can be used in a real-time application quickly. Attendance is an important factor affecting the performance of the student. Keeping this factor alive over the project will try to reduce the complexity of the manual attendance system. Our project will utilize IoT technology for automatic attendance during the lecture. Lecturer through over project the lecturer and the students will be able to view their attendance during the lecture. Furthermore, the lecturer can also view the analytics of the attendance of whole class attendance as well as can view the attendance analytic of particular students in his/her subject. This project will help the teacher for planning academic strategies by keeping the fundamental importance of attendance in education.

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