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Automated Attendance Marking

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Abstract— The Internet of Things (IoT) is the network of physical objects — devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity — that enables these objects to collect and exchange data. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. The attendance marking system comprises of manual roll call and involves a lot of paper work, making it difficult to search for any data and perform modifications on them. In this type of system, there is a lot of scope for proxy attendance. To solve these issues, our proposed system has automated the attendance marking process by using RFID and face detection technologies. RFID scanner is used for detecting the RFID tag; a camera captures the image of the student. The Robust Real Time Face Detection Technology detects the face in the image. The face extraction algorithm extracts the inner face to identify the cardholder. The outcome of this system is the automatic marking of attendance.
Keywords— RFID, face detection, ultrasonic, verification, Viola Jones algorithm, extract features

I. INTRODUCTION

The Internet of Things (IoT) is the network of physical objects—devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity—that enables these objects to collect and exchange data. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Currently, the attendance is marked in the institutions by manual roll call. In this type of system, proxy attendance is unavoidable. Maintaining the attendance involves a lot of paper work. Records maintained on papers have the additional problems of difficulty in modifying the data. The records occupy huge amount of physical space for storage. The manpower required for taking attendance, record maintenance, storage, retrieval and modification is huge. Thus, by automating this system, we reduce the requirement of manpower drastically. Our contribution to automating this system is the usage of RFID and face detection technologies. The Radio-Frequency Identification (RFID) tag contains electronically stored information that is read by an RFID scanner. But an RFID access control system involves the problem of the cardholder not being the actual owner. To solve this problem, face recognizes technology is a widely used authentication technique that helps to extract the face from the image. Robust Real Time Face Detection is a powerful face detection technology with high accuracy. The algorithm consists of three major methods: Integral Image, AdaBoost and Cascade Detection. Once the face is detected, since the background and the hair significantly affect recognition, they are removed from the detected face by using face extraction algorithm to extract the “inner face”.

A normalization process is used to adjust the size and intensity of the extracted face. The SURF algorithm is then performed to align the extracted and registered face. Finally, the CW-SSIM is adopted to calculate the similarity of the extracted and registered face. To further improve the system, an ultrasonic sensor is used to detect the interference caused by students trying to pass through when it is activated, thereby, discouraging the students from truanting.

A. Confidentiality

Access to the information stored in the database is governed by an authentication policy provided by username and password. Access is granted only to those who are authorized to access the data. Thus, the information stored in the database is confidential and cannot be modified unnecessarily.

B. Verifiability

Only those who are authorized to access the information regarding the attendance were allowed access. The server checks the level

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of authority before providing access to the information. Those with lesser levels of authority were not allowed to access confidential information.

II. IOT (INTERNET OF THINGS)

The Internet of Things may be a hot topic in the industry but it's not a new concept. In the early 2000's, Kevin Ashton was laying the groundwork for what would become the Internet of Things (IoT) at MIT's AutoID lab. Ashton was one of the pioneers who conceived this notion as he searched for ways that Proctor & Gamble could improve its business by linking RFID information to the Internet. The concept was simple but powerful. If all objects in daily life were equipped with identifiers and wireless connectivity, these objects could be communicate with each other and be managed by computers

At the time, this vision required major technology improvements. After all, how would we connect everything on the planet? What type of wireless communications could be built into devices? What changes would need to be made to the existing Internet infrastructure to support billions of new devices communicating? What would power these devices? What must be developed to make the solutions cost effective? There were more questions than answers to the IoT concepts in 1999. Today, many of these obstacles have been solved. The size and cost of wireless radios has dropped tremendously. IPv6 allows us to assign a communications address to billions of devices. Electronics companies are building Wi-Fi and cellular wireless connectivity into a wide range of devices. ABI Research estimates over five billion wireless chips will ship in 2013. Mobile data coverage has improved significantly with many networks offering broadband speeds. While not perfect, battery technology has improved and solar recharging has been built into numerous devices. There will be billions of objects connecting to the network with the next several years. For example, Cisco's Internet of Things Group (IOTG) predicts there will be over 50 billion connected devices by 2020.

III. OBJECTIVE

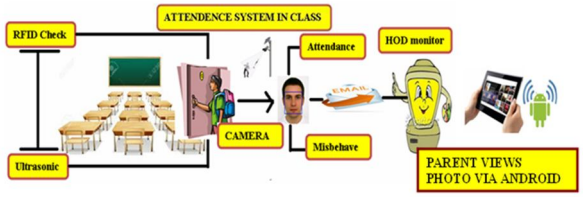
Our objective is to enhance the attendance marking system, taking into account the factors such as reliability, time saving and easy control.

A. Existing System

In the existing system, attendance marking is done manually by roll-call. Proxy attendance is a quite common occurrence, since it is virtually impossible for the staff to check for each student during roll-call. It is a time consuming process that requires a lot of man-power and also involves a lot of manual work for recording and maintaining the attendance of the students.

B. Proposed System

In the proposed system**,** RFID and face detection technologies are used to monitor the student attendance. The student shows the RFID tag to the RFID sensor which initiates the camera that captures the face of the student and sends to the verification application which, recognizes and extracts the face using the Viola-Jones algorithm. The extracted features are compared with the registered features and the tag number is sent to the server by the verification application. Upon receipt of the tag number, the server marks the attendance for that tag. During the class hours the ultrasonic sensor is activated. If a student leaves in between class hours or comes late to class, the ultrasonic sensor is triggered due to the interference, the camera is initiated and image of the student is captured, which is updated into the monitoring application that may be accessed by the Head of the department and the guardians. This method drastically reduces the man-power required and maintaining the attendance registerbecomes very efficient with easy search and modification options.



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System Architecture for Automated Attendance Marking System

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IV. SYSTEM DESIGN

A. System Architecture

Student shows the RFID tag card to the RFID sensor, which initiates the camera. Camera captures the face of the student and sends to the server. Attendance is marked for the student and is stored in the database. Ultrasonic sensor detects interference and activates the camera, which captures the face of the student. An alert message is sent to the HOD and guardian.

V. SYSTEM IMPLEMENTATION

A. Registration

In this module we are going to create an application by which the user is allowed to access the data from the server of the cloud service provider. The user must first create an account to access the network. The user then logs in and requests a job from the cloud service provider. Based on the request, the service is granted. The details of all users are stored in the cloud database. To implement this function, we are going to design a user interface frame to communicate with the cloud through network coding using the JAVA programming languages. By sending the request to cloud service provider, the user can access the requested data if he/she is authenticated successfully.

B. RFID Detection

In this module, a passive RFID tag is used to store the details of the student. When scanned at the RFID sensor it transmits the tag details to the sensor, which in turn activates the camera.

C. Face Recognition

In this module, the camera captures the face of the student and sends it to the verification application. This extracts the features of the face using the Viola Jones face detection algorithm. The extracted features are then compared with the registered features and on successful comparison, the tag number is sent to the server .This tag number is used to mark the attendance for the student.

D. Misbehavior

This module is used to track any misbehaving students. During class hours, an ultrasonic sensor, which is placed above the entrance of the classroom, detects any interference caused by student movement. If someone leaves in between the class hours, the ultrasonic sensor is triggered and automatically initiates the camera, which captures an image of the student and sends it to the server.

E. HOD and Guardian Notification

In this module, the server uploads this image into an android application. The HOD and parents are required to download this Android application, which is used to monitor the students. Each time the ultrasonic is triggered and an image is captured by the camera that image is uploaded into the application and is viewable on request the application user.

VI. CONCLUSION

Thus, the attendance was marked successfully by detecting the face in the captured image, extracting its features and comparing them to the registered features. If the comparison of the features was not successful, the attendance was not marked for the student. When the ultrasonic was disturbed, the camera was automatically activated to capture the image of the defaulter and uploaded into the monitoring application developed for the Head of the Department and the guardians.

VII. FUTURE ENHANCEMENT

In the future, more sophisticated face detection algorithms may be employed to improve the recognition and also to make it possible to recognize faces from a side angle. The range of the ultrasonic may be improved for better coverage of the doorway. Sophisticated face detection algorithms that recognize faces even at a side angle may be useful for identifying the defaulters who are truanting from class.

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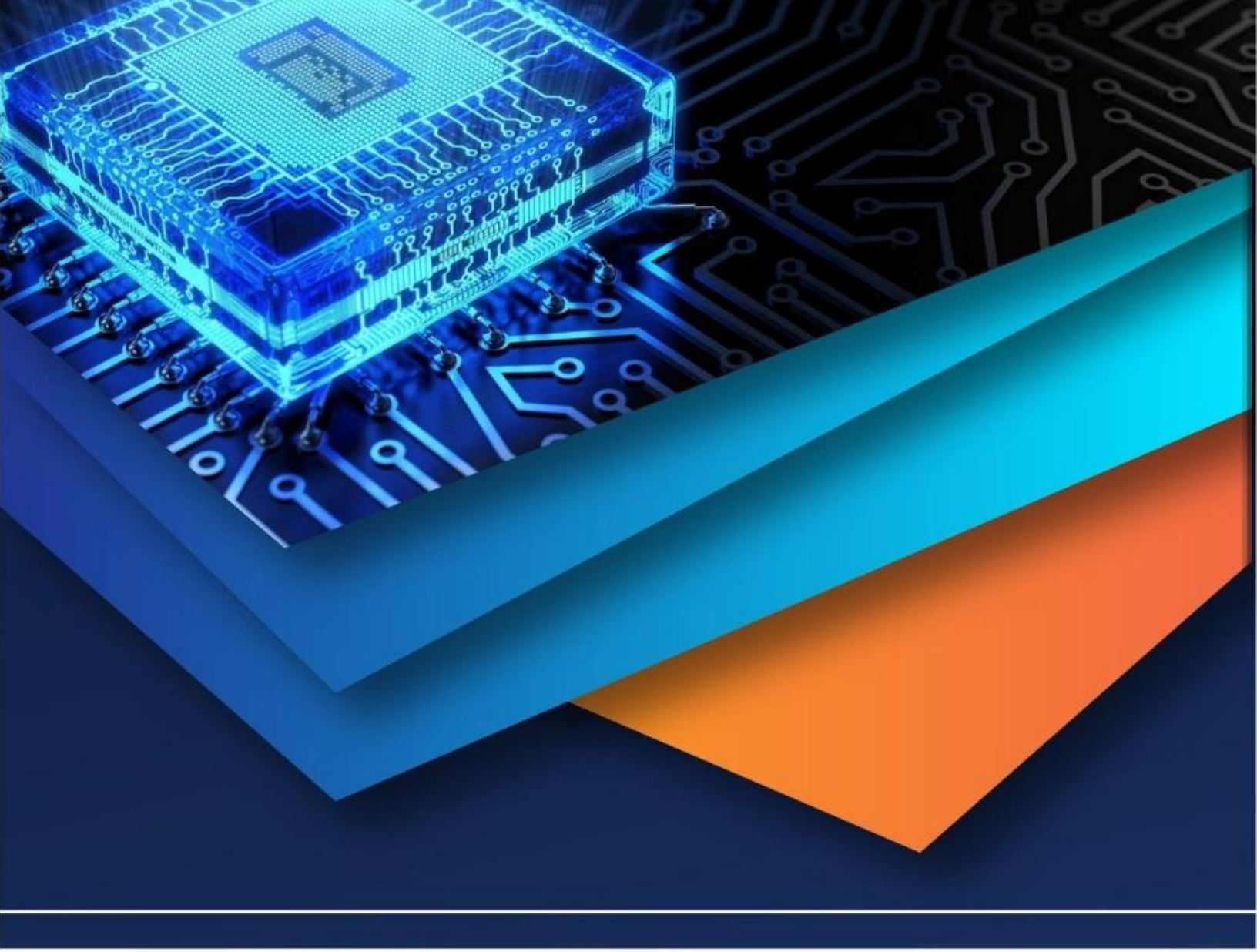
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