### IoT Based Enterprise Resource Planning for Institutions

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**ABSTRACT-***The Internet of Things is one of the ideas that have become increasingly relevant in recent years. It involves connecting things to the Internet and to obtain information from the things at any time and any location. Sensor Networks are the major organization part of Internet of Things, which are used to exchange information wirelessly via Wi-Fi, Bluetooth, Zigbee or RF are common. In this sense, this paper presents a way in which each classroom control is accessed through Near Field Communication (NFC) with secure facial recognition for authentication and the information is shared via radio frequency. These accurate and appropriate data can be easily be used for building applications from the data collected. As a result, our application collects information from the respected classroom of university or conference room of an organization. The web application gives control of classroom with effective IoT Technologies.* 

KEYWORDS---RFID, Image Processing, Face Recognization, IoT, Web based Management, Autonomous.

#### **I.INTRODUCTION**

Most of The colleges and universities are currently using manually entering attendance system by making signature in an attendance record. Very few of the colleges only having biometric finger print attendance system for staffs or employee attendance monitoring system. In universities and colleges, during examination, the hall superintends taking some time for verification of concern student of presences with looking and checking their ID cards. This smart attendance recording system completely avoiding paper, pen attendance maintenance. The energy saving controlling system can be viewed in the web application of controlled classroom design. The operation of this system is organized by the functionality of the Internet of Things. Our classrooms attendance system is based on a network of connected sensors like RFID, PIR sensor to detect movement of human inside the hall and temperature sensor that collect weather information inside the classroom for maintaining the temperature and brightness of the classroom. Then sensors are activated only if the class room is accessed by the authorized persons. This system comprises of following two phases.

The cloud, which are Internet applications where the data is stored.

In this paper we are using various Near Field Communication technologies for completely monitoring and controlling the classroom activities like opening and closing the door, attendance monitoring, operating electrical and electronics appliances such as lights, Projector, Air conditioning system, with help of Internet of things. This autonomous attendance system can be implemented in the university to track the percentage of attendance of each of the student automatically. Through this system, lecturer workload can be reduced. Overall, this whole system will provide efficiency in terms of attendance monitoring with authorization and energy saving system for classrooms.

#### **II.RELATED WORK**

# A) STUDENT ATTENDANCE SYSTEM IN CLASSROOM USING FACE RECOGNIZATION TECHNIQUE.

Samuel Lukas et al, proposed a method for attendance system using face recognition technique by the combination of Discrete Cosine Transform (DCT) and Discrete Wavelet Transforms (DWT) to extract the features from student's face[3]. This system uses human face recognization for accessing the classroom. User/ Student facial images were taken as training set and captured face image as test image and compared from the image database. Feature Extraction was done by Discrete Wavelet Transforms and Discrete Cosine Transforms, then face recognization was done by Radial Basis Function Network Neural Network due to its fast processing technique. RBFN consist of P input nodes, Q hidden nodes and R output nodes. So the system was giving 82% accuracy.

#### **B)A SMART CAMPUS INTERNET OF THINGS FRAMEWORK**

Yi Wang et al were used machine learning algorithm to achieve smart energy consumption and recognization of dynamic change of schedule in smart meeting room.[4].In this Paper, Smart Campus System was implemented with smart energy consumption for each and every room of a building. All the rooms were connected with internet of things and controlled automatically. If a room has scheduled for meeting on a particular duration of time regularly those schedules' are recorded. Then Status of the room will be shown as unavailable on that time for other than meeting organizers. In case person enters inside the room for scheduled meeting on time, automatically lights, Projector and Air conditioning system will turn 'ON'.

In case no person enters into the room on scheduled time for meeting, then the system checks room occupancy and reschedule the room status as available and lights, Projector and Air conditioning system will turn 'OFF' automatically. Support Vector Machine (SVM) is a supervised machine learning algorithm for classification and regression of data analysis. 'Kernels trick' technique is used for person occupancy and usage of meeting room.

## C)STUDY OF IMPLEMENTING AUTOMATED ATTENDANCE SYSTEM USING FACE RECOGNITION TECHNIQUE

Nirmalya Kar et al, were used frontal faces of students with Principle Component Analysis Algorithm for recognization of student face[1].

### D)RFID AND POSE INVARIANT FACE VERIFICATION BASED AUTOMATED CLASSROOM ATTENDANCE SYSTEM

Baskar . M and Srivignesh were using different head poses for identifying face images[11]. Fast Adaptive Neural Network Classifier was used to get more efficiency. FANNC classifier consist of four level of layers and trained by different head position and face of each student. This system maintains database for attendance and proxy attendance. If the RFID was validated then face was recognized as invalid, proxy database was updated. Accuracy of the system was 79.29% for different head poses.

#### E)IoT BASED SMART CLASSROOM SYSTEM

Two levels of authentication were used to increase the security and accuracy by RFID system and face recognition. [7] This system was implemented using Arduino with Ethernet and sensors. PIR sensor was used for human identification inside the classroom.

### F)REAL TIME LOCATING SYSTEM USING RFID FOR INTERNET OF THINGS

Kishore and Sai mounika were used the Raspberry Pi 3 model was connected with IOT. RFID Readers and IR sensors were used for tracking system[7]. If RFID tag was read by the RFID reader then IR sensor starts counting the person entering inside the room. If the person was leaving from the room, then IR sensor decreases persons count.

#### G)IOT BASED BIOMETRICS IMPLEMENTATION ON RASPBERRY PI

Dhvani Shah et al, were using Raspberry Pi with webcam to capture the users biometric face image and fingerprint information [6]. AES-256 algorithm was proposed for biometric encryption before sending the information to the cloud (Azure). Decryption was done before storing the details in the Azure database. Decryption time, Memory usage and CPU usage were calculated and compared with existing system.

#### H) EPSSR: ENERGY PRESERVING SYSTEM FOR SMART ROOMS

In this paper[5], real time energy preservation model was designed with IOT for automation control of rooms. IR sensors were used person count present in the room. If person was available in the room, automatically lights, projectors and Air conditioning system will be turned 'ON'. If the count was reduced to zero, then lights, projectors and computer will be turned 'OFF'. So the energy consumption of each room will be reduced. User interface was created and the status of room was organized on web interface.

Among various biometrics recognition like fingerprint, hand vein, DNA, face, signature, and iris, the face biometrics is used in this paper. In this paper we use students face image recognition for authentication and RFID tag for tracking system. So that the system will provide high availability in its accuracy and security. Local Binary Patterns with Histogram is used for Face recognization[8] and Kullback–Leibler divergence (KLD) is used for duplication detection from the image database[10].

#### **III.PROPOSED SYSTEM**

This smart classroom controlling system is divided into three parts. The first part is used for entering and accessing the classroom. Classroom door will be opened by Administrator or Lecturer who will be using the classroom. Door opening can be authorized via facial recognition and RFID tag. The second part is Energy saving System by Wireless Sensor Network. Once the door opened, PIR motion sensor will notice the movement of human and activates the temperature sensor and automatically switch "ON" or "OFF" the lights, projector and air conditioning system or fans inside the classroom depending on the situation. The attendance monitoring system can be divided into the prototype design and the web design part. The prototype design will capture face of each students entering into classroom and recognize for authorization, then their RFID card also scanned to send the appropriate RFID number information, with entry time, date and location or classroom information to the cloud database.

The web page is designed to view the information of the student as well as attendance statistical. The third part of this project is room occupancy status is updated to the database through Ethernet, whether the classroom is free or occupied. Security aspects' of this system includes facial recognition for getting inside of classroom. While entering in to Room, the system first recognizes the user's face and then their RFID tag number is read by RFID scanner. So in-time of the user will be updated. While leaving from the classroom, it is mandatory to enter the out-time as well. Because if the user skip to enter the out-time then, their ID will be monitored and automatically access will be deactivated.

Therefore out-time entry of each students and staff are monitored. Once the ID was deactivated, that user should raise request to the admin to activate his/her ID. Until the admin provides activation to that relevant ID, that user will not be allowed inside the classroom. So no one could not easily miss their ID. Based on the entry status we can easily, fastly and accurately track the staff or lecturer who is occupied in which classroom.

#### **ADVANTAGES OF PROPOSED SYSTEM**

- Completely monitor and control the classroom activities.
- Track the percentage of attendance of both student and staff.
- Control electrical and electronics appliances inside the classroom.(such as lights, Projector Air conditioning systems).
- Reduce campus power consumption.



Fig.1.System Architecture

#### **III.EXPERIMENTAL RESULTS**

Based on the local binary operator and histogram intensity values the Local Binary Pattern algorithm is used for implementing this system. An NxM image is read as input and cropped with same width and height of MxM regions. Then color image is converted to gray scale image. The preprocessing phase includes de-noising, which is done by applying adaptive mean filter and Weiner filter for removing noise like, impulse noise, blurring, salt and pepper noise, Rayleigh noise and the Gaussian noise present in the image. The local binary operator is applied on each region to compare the center pixel value with its closest neighbor pixel value. If the value of neighbor pixel is greater than the center pixel value, the algorithm returns '1' in this case. Otherwise '0' is returned by the algorithm. The resulting binary number has to be translated into a decimal value in the range of 0 to 255. Example of LBP operator is shown in Fig.2. A Probability Density Function (PDF) is calculated based on the histogram of a given block or region. So the histograms have 256 values on the X-Axis and Y-Axis shows the number of pixels having the same intensity.



Fig.2 LBP Operator Example



Fig.3 Captured original Image



Fig.4 Cropped and Denoised image



Fig.5 LBP image in database

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| tace crop  | of faces detected:', 1)<br>ped<br>: Bhuvana.M.K<br>: ME final year<br>:2018-10-05 20:15:47<br>n<br>t available in class', 1)<br>: Bhuvana.M.K<br>: ME final year<br>:2018-10-05 20:15:56<br>n                          |
| 179        |                                                                                                                                                                                                                        |
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| door oper  | 1                                                                                                                                                                                                                      |
| ('student  | available in class', 0)                                                                                                                                                                                                |
|            |                                                                                                                                                                                                                        |

Fig.6 Attendance System's result

The above resulted entries will have been sending to the cloud database through Internet of things to maintain the application.

#### **V.WEB PAGE RESULT**

The web page is designed for viewing attendance report of both students and staffs. Screen shots of web page implementation are shown in below figures.



Fig. 7 .Home Page



| Fig.                                        | 8 Sti                                                                                                                                               | ide                                        | ent Logi                                                                                                                                                                | in Page                                                                                                                                                       |                                                                                                                                                                          |       |
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| Welcome "Bhuvana M K"                       | Card No                                                                                                                                             | Date                                       | In Time                                                                                                                                                                 | Out Time                                                                                                                                                      | Location                                                                                                                                                                 |       |
| Welcome " <b>Bhuvana.M.K"</b>               | Card No<br>700135A721                                                                                                                               | Date                                       | In Time                                                                                                                                                                 | Out Time<br>2018-10-22 06:31:00.702073                                                                                                                        | Location<br>class room 1                                                                                                                                                 |       |
| Welcome " <b>Bhuvana.M.K"</b>               | Card No<br>700135A721<br>700135A721                                                                                                                 | Date                                       | In Time<br>-<br>2018-10-22 06:50:06.731252                                                                                                                              | Out Time<br>2018-10-22 06:31:00.702073<br>-                                                                                                                   | Location<br>class room 1<br>class room 1                                                                                                                                 |       |
| Welcome " <b>Bhuvana.M.K"</b>               | Card No<br>700135A721<br>700135A721<br>700135A721                                                                                                   | Date                                       | In Time<br>-<br>2018-10-22 06:50:06.731252<br>2018-10-22 06:50:20.981671                                                                                                | Out Time<br>2018-10-22 06:31:00.702073<br>-                                                                                                                   | Location<br>class room 1<br>class room 1<br>class room 1                                                                                                                 |       |
| Welcome " <b>Bhuvana.M.K"</b>               | Card No<br>700135A721<br>700135A721<br>700135A721<br>700135A721                                                                                     | Date                                       | In Time<br>-<br>2018-10-22 06:50:06.731252<br>2018-10-22 06:50:20.981671<br>-                                                                                           | Out Time<br>2018-10-22 06:31:00.702073<br>-<br>-<br>2018-10-22 06:52:46.120443                                                                                | Location<br>class room 1<br>class room 1<br>class room 1<br>class room 1                                                                                                 |       |
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|                      | Anisha.E 50    | 07359691 | 22/10/18/08:40:20 | class room 1 |          |   |  |
|                      | Anisha.E 50    | 07359691 | 22/10/18/08:40:34 | class room 1 |          |   |  |
|                      | Anisha.E 50    | 07359691 | 22/10/18/08/41:57 | class room 1 |          |   |  |
|                      | Anisha.E 50    | 07359691 | 22/10/18/08:42:11 | class room 1 |          |   |  |
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|                      | Bhuvana.M.K 70 | 0135A721 | 22/10/18          | class room 1 |          |   |  |
|                      | Anisha.E 50    | 07359691 | 22/10/18/08:46:51 | class room 1 |          |   |  |
|                      | 8huvana.M.K 20 | 0135A721 | 22/10/18 -        | class room 1 |          |   |  |
|                      | Anisha.E 50    | 07359691 | 22/10/18/08:47:07 | class room 1 |          |   |  |
|                      | Anisha.E 50    | 07359691 | 22/10/18/08:50:56 | class room 1 |          |   |  |
|                      | Anisha.E 50    | 07359691 | 22/10/18/08/51:09 | class room 1 |          |   |  |
|                      | Anisha.E 50    | 07359691 | 22/10/18/08/51:25 | class room 1 |          |   |  |
|                      | Bhuvana.M.K 70 | 0135A721 | 22/10/18 -        | class room 1 |          |   |  |
|                      | Anisha.E 50    | 07359691 | 22/10/18 08:54:08 | class room 1 |          |   |  |
|                      | Anisha E 50    | 07359691 | 22/10/18/08/59:57 | class room 1 |          |   |  |

Fig.10. All Students Report



Fig.11 Single Person Detail

#### VI.CONCLUSIONAND FUTURE WORK

This automatic attendance tracking system will be helpful to universities and organization to avoid malpractice in making attendance. This system can be developed using Python Programming Language for face recognition and obtaining and sending data to the cloud database, which are generated by the respected users. MySql database can be used to maintain the database of received data from the users. Meanwhile autonomous electric energy saving technology will reduce the energy consumption of the classrooms in universities or conference rooms in an organization. This system has more advantages which includes green computing system as well. Only for necessary situations, we can print the attendance report otherwise the database is used to maintain and keep tracking of sensing data. In the future, classroom automation will be implemented and monitored through web page.

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