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## **LIST OF ABBREVIATIONS**

<b>IOT</b>	<b>Internet of things</b>
<b>LTE</b>	<b>Long Term Evolution</b>
<b>IP</b>	<b>Internet Protocol</b>
<b>LAN</b>	<b>Local Area Network</b>
<b>IIS</b>	<b>Internet Information Server</b>
<b>ARPANET</b>	<b>Advanced Research Projects Agency Network</b>
<b>RSA</b>	<b>Rivest Shamir Adlemen</b>
<b>SSL</b>	<b>Secure Socket Layer</b>

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## **1. INTRODUCTION**

### **1.1 PROJECT AREA**

This project uses Android Technology, Hardware control systems to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization.

For a device, or set of devices to manage, command, direct or regulate the behavior of other devices or system.

As the number of network applications get increased in nowadays world, security has become an important factor in communication and transferring data on a public network. To make the network more secure there are different methodologies used from the ancient time which are still very much effective even in the present scenario.

Main areas of our project to automate and online department. In automation the features like controlling switches, led, fans and lab of the department. In online provide full information about department like staff information of department, online notice board, e-magazine, training and placement cell full information about rules, procedure, and major recruiters' of college, student section, gallery, information of department and college and many more. In online department we also included system monitor for PCs in Lab. Also includes Attendance System using Image Recognition.

In the present era one of the greatest problems faced by the world is water scarcity and agriculture being a demanding occupation consumes plenty of water. Therefore a system is required that uses water judiciously. Smart irrigation systems estimate and measure diminution of existing plant moisture in order to operate an irrigation system, restoring water as needed while minimizing excess water use.

## **1.2 OBJECTIVES**

### **DEPARTMENT AUTOMATION OBJECTIVES**

#### **Part 1: Automation of Department Objectives:-**

- Develop a Smart Automation Remote System.
- Use devices that are easy to install.
- Use low-price materials and devices.
- Make it suitable for professional users.
- Make it scalable for further add-ons.
- Manage multiple control points.
- Encourage standardization.
- Minimize operating costs.
- Improve comfort.
- Simplify use of technologies.
- Ensure security.
- Enhance accessibility.

#### **Part 2: Smart-irrigation at Gardens using Arduino Objectives:-**

- Presents a smart drip irrigation system to water plants using Arduino microcontrollers.
- Control the system wirelessly.
- Develop such a system that will help a farmer to know his field status.
- Propose an automatic irrigation system for the agricultural lands.
- Design a smart irrigation technology in low cost which is usable to Indian farmers.
- Makes the efficient use of water.
- Develop a system that will be more advantageous than the traditional agriculture techniques.

### **ONLINE DEPARTMENT OBJECTIVES**

#### **Part 1: Application Objectives:-**

- To obtain information about department.
- To publish online notice.
- To provide up-to-date information about department.

## **Part 2: System Monitoring Objectives:-**

- To obtain information of the system.
- To record every activity of the user.
- To track the system.
- To control the system.

## **Part 3: Attendance System using Image Recognition:-**

- To automate attendance system.
- To provide easy records.

### **1.3 PROBLEM DEFINITION**

Android application for colleges or departments provides one attractive environment where you can manipulate information's about college easily. In this students and other authorities get all the information's in their hand. It is software which is helpful for students as well as the college authorities. The main principle behind the need of Android app for college is easy supervision of Institute. This software can help us to explore all the activities happening inside the college. It can handle the details of courses, maps, events, news, etc. A smart phone based application using Android can be used to make this process more-easier, secure and less error prone. More efficient information will be achieved through this system. Android is an open source Linux based system developed by Google, and primarily aimed at mobile handsets and other portable devices. Android provides a Java- development platform for applications.

Availability of high speed mobile networks like 3G and Long Term Evolution (LTE) coupled with cheaper and accessible smart phones, mobile industry has seen a tremendous growth in terms of providing various services and applications at the finger tips of the citizens. Applications ranging from smart governance, smart education, smart agriculture, smart health care, smart home etc. can use IoT for effective delivery services with our manual intervention in a more effective manner.

Smart automation systems for education institute face four main challenges , these are high cost of ownership, inflexibility, poor manageability, and difficulty achieving security. The main objectives of that project is to design and to implement a cheap and open source automation system that is capable of controlling and automating most of the appliance through an easy manageable web interface to run and maintain the automation system.

The face is the identity of a person. The methods to exploit this physical feature have seen a great change since the advent of image processing techniques. The attendance is taken in every schools, colleges and library. Traditional approach for attendance is professor calls student name & record attendance. The system described in this paper aims to deviate from such traditional systems and introduce a new approach for taking an attendance using image Processing. This paper describes the working of An Automatic Attendance System in a classroom environment. Initially video clip of classroom is taken and is stored in the database, and these video is converted to frames/images, then we apply Face detection techniques such as Ada-boost algorithm to detect the faces in frames/images and then features are extracted of detected face by Histogram of Oriented Gradients (HOG) and Local Binary Pattern (LBP) algorithm. The system first stores the faces of the students in the database. The detected faces are compared with the faces stored in the database during face recognition by using Support Vector Machine (SVM) classifier. If the system recognizes faces, the attendance gets marked immediately of recognized faces.

The proposed system is an application that is designed to manage and handle the operation of an institution. In proposed system usage Android OS for Online Department and for Automate Department Bluetooth technology to interconnect its modules. That will decrease deployment cost and will increase the ability of upgrading, and system reconfiguration.

## **2. LITERATURE SURVEY**

The paper “A Research Paper on College Management System” [1], this paper is aimed at developing an Online Intranet College Management System (CMS) that is of importance to either an educational institution or a college. The system (CMS) is an Intranet based application that can be accessed throughout the institution or a specified department. This system may be used for monitoring attendance for the college. Students as well as staffs logging in may also access or can be search any of the information regarding college. Attendance of the staff and students as well as marks of the students will be updated by staff. This system (CMS) is being developed for an engineering college to maintain and facilitate easy access to information. For this the users must be registered with the system after which they can access as well as modify data as per the permissions given to them. CMS is an South Asian Journal of Engineering and Technology Vol.2, No.17 (2016) 162–166 165 intranet based application that aims at providing information to all the levels of management within an organization. This system can be used as a knowledge/information management system for the college. For a given student/staff (technical/Nontechnical) can access the system to either upload or download some information from the database. The paper “Android Application for College Management System” [2], this paper proposed that it is a simple yet powerful integrated platform that connects the various entities of the institution, namely Administration, Staff, Students and other specialized modules. It is a handy application that can be used by the students, staff and the administrator to facilitate communication.

The application introduces portability as it is used on a mobile device and can be carried anywhere. Since the application is used on a mobile device with Android OS, it improves connectivity between the students and the staff, thus helping the institution to provide a more transparent system altogether. Not only does the connectivity improve, the application also reduces a substantial amount of paperwork that is otherwise needed for the daily tasks in an institution. It is a useful tool that can be used by all the members of the institution, anywhere, anytime on an Android mobile device. Since all the tasks are done on a mobile device, there is no paperwork involved and it provides direct access to the staff and students. Direct access, here, means that the students can download assignments or they can put up queries and the staff can upload assignments or answer queries irrespective of where they are at a given time. The application provides a portal to them that can be used in a very efficient manner to facilitate communication, improve connectivity and provide transparency. The paper “A Survey on “SMART CONNECT” an Android and Web Based Application for College Management System” [3], this paper provides a generalized solution to monitor the various works that are carried out by a College for managing it. “Smart Connect” provides a simple interface for maintenance of student information. It can be used by educational institutes or colleges to maintain the

records of students. The creation and management of accurate, up-to-date information regarding a student's academic career is critically important in the university as well as colleges. Smart Connect deals with all kind of student details, academic related reports, college details, course details, curriculum, batch details, placement details and other resource related details too. It will also have faculty details, batch execution details, students' details in all aspects, the various academic notifications to the staff and students updated by the college administration. It also facilitate us explore all the activities happening in the college. Different reports and queries can be generated based on vast options related to students, batch, course, faculty, exams, semesters, and certification and even for the entire college.

Though the concept of smart homes is new in India, considerable amount of work has been carried out in other countries, where smart homes are already in place. Kang discusses about acquisition and analysis of sensor data which are going to be used across smart homes. It proposed architecture for extracting contextual information by analyzing the data acquired from various sensors and provide context aware services. Joya Joya Padmini discusses about effective power utilization and conservation in smart homes using IOT. It uses cameras for recognizing human activities through image processing techniques. Andreas Kamilar is discusses the need for Common standards and protocols for developing sustainable IOT based applications for smart home. Pranay P. Gaikwad discusses about challenges and problems arise in smart home systems using IOT and propose possible solutions. Though similar works are carried out elsewhere, authors propose a unique architecture for IOT based home automation using low cost android phones in Indian context.

In order to meet growing needs of the people, two prototype models namely

1. Home Automation using Bluetooth and
2. Home Automation using Ethernet are presented.

The idea of automation can be dated back to 1800s, when Nikola Tesla developed the idea of having a remote control for vessels and vehicles in 1898. Later with the advent of electrical appliances, the idea of smart automation became more important  
Previous Research on existing Home Automation Systems: -

N. Sriskanthan and Tan Karand in their work have presented an application of Bluetooth Technology for Home Automation. The Bluetooth technology which emerged in late 1990's is used for implementing the wireless home automation system. Various appliances such as air conditioners, home theatres, cellular phones etc., are interconnected, thus creating a Personal Area Network in Home Environment. The communication between several client modules and the host server takes place through the Bluetooth module. A Home Automation Protocol has been developed to enhance communication between the host server and the client modules. The system also allows integration or removal of devices to the network which makes the system scalable. The

wireless system aims at reducing the cost of Home Automation. But the system does not use the trending mobile technology.

A. Z. Alkar and U. Buhur have developed an internet based wireless home automation system for multifunctional devices. A flexible, low cost, wireless solution to the home automation is introduced. The transformation of the initial simple functionality control mechanism of devices to more complex devices has been discussed. The home appliances are connected through a server to a central node. The system is secured from unauthorized users by using SSL algorithm. During tests, the wireless communication was found to be limited to <100 meters in a concrete building.

Muhammad Izhar Ramli, Mohd Helmy Abd Wahab, Nabihah developed a prototype electrical device control system using Web. They have developed a web based controller, for controlling electrical devices. Whenever the condition of server is down they also set their server with auto restart. The system does not use mobile technology. Being a web based system; this application is less effective since the use of headphones and Smart phones is increasing rapidly.

E. Yavuz, B. Hasan, I. Serkan and K. Duygu have designed and implemented a telephone and PIC remote controlled device for controlling the home electrical devices. In this Pin check algorithm has been introduced where it was with cable network and not wireless communication. The system ensures safety as it cannot be used by unauthorized users as the system uses Pin-check system. The architecture is very complex, but it gives an idea of remote handling of home automation system.

Shahriyar, E. Hoque, M. M. Akbar, S. Sohan, I. Naim, and M. K. Khan presented a GSM based communication and control for home appliances. Different AT commands are sent to the Home Mobile for controlling different appliances. The drawback of this system is that a Graphical User Interface (GUI) is not provided to the user. Different AT commands have to be remembered by the users to control the connected devices. Also, the system supports Java enabled mobile phones. The system thus becomes less functional as now-a-days the use of Java enables phones are reducing and the use of Android phones are increasing tremendously.

Jitendra Rajendra Rana and Sunil N.Pawar in their paper have implemented a zigbee based home automation system. Zigbee is a high-level communication protocol used to create personal area network. It supports any kind of microcontroller. The system eliminates the complication of wiring in case of wired automation. Considerable amount of power saving is also possible. Operating range is more than Bluetooth. But the system does not allow remote monitoring and controlling of appliances.

R. Piyare and M. Tazil have presented the design and implementation of a low cost, flexible and wireless solution to the home automation. The system uses Bluetooth technology where the cell phone is used for interaction between the host server and the client modules. This system can be used by any appliances that require On-off switching applications without any internet connection. The drawback of this system was that the

wireless communication system was found to be limited to a range less than 50m in a concreted building and maximum of 100m range in an open range. The system supports only the symbian OS cell phones.

Deepali Javale, Shreerang Nandanwar, Mohd. Mohsin and M. Shingate have used Android ADK for implementing a home automation and security system. It presents a system in which the devices are connected to a Bluetooth subcontroller physically. It does not require internet connectivity. The Smart phone is used to access and control the devices using built-in Bluetooth connectivity. Communication is established between the android mobile device and the ADK, by connecting the appliances to the ADK. However, the system restricts mobility and can only be controlled within the specified boundary due to limited range of operation (maximum up to 100 m). Thus the system does not support remote monitoring and controlling of appliances.

S. V. A. Syed Anwaarullah presents the design and implementation of a low cost, compact and secure Android smartphone based home automation system. A single chip microcontroller real time operating system is integrated to the system, to improve the responsiveness of the system and make it more dynamic. The system uses Bluetooth technology. The Bluetooth module that is used is based on the Bluetooth V2.0 protocol and has a range of 10m operating at frequency of 2.4GHz with a maximum data exchange rate of 2.1Mbps. Similar to most of the existing systems, this system also does not support remote monitoring and controlling of devices.

Sr. No	Year	Author	Technique applied with parameters	Advantages
1	2015	Lalit Mohan Joshi	A Research Paper on College Management System. uses web application or desktop application	Lower accessibility, More cost.
1	2012	Ahmed M. Elshafee and Karim Alaa Hamed	<b>System:</b> Wi-Fi based using Arduino <b>Communication Interface:</b> Wireless LAN and Wi-Fi shield <b>Controller :</b> Hardware interface module <b>User Interface :</b> web based Application <b>Applications:</b> Temperature and humidity, Motion detection, Fire detection, Door status, Light level ,Video monitoring, Controlling appliances	Low cost, Secure, Ubiquitously accessible, Auto configurable, Remotely controlled
2	2013	Shahriyar, E. Hoque, M. M.	<b>System:</b> GSM Based Using Arduino <b>Communication Interface:</b> SMS	Simplicity

		Akbar, S. Sohan, I. Naim, and M. K. Khan	<b>Controller :</b> Arduino <b>User Interface :</b> Smartphone App <b>Applications:</b> Control appliances	
3	2014	A. Z. Alkar and U. Buhu	<b>System:</b> Bluetooth Based using Arduino <b>Communication Interface:</b> Bluetooth <b>Controller :</b> Arduino <b>User Interface :</b> Python supported mobile <b>Applications:</b> Control appliances	Secured and Low cost
4	2015	Muhammad Izhar Ramli, Mohd Helmy Abd Wahab, Nabihah	<b>System:</b> Web service and android app Based using Raspberry pi <b>Communication Interface:</b> Web server and interface card. <b>Controller :</b> Raspberry pi <b>User Interface :</b> Android application <b>Applications :</b> Controlling shutter of window	Autonomous, and Quite scalable
5	2016	Bhavik Pandya, Mihir Mehta, Nilesh Jain	<b>System:</b> Android Based Home Automation System Using Bluetooth & Voice Command <b>Communication Interface:</b> Bluetooth and void commands. <b>Controller :</b> Arduino <b>User Interface :</b> Android application <b>Applications:</b> Controlling appliance.	Simplicity and quite scalable

Table 2.1: Comparison of existing system

### **3. SYSTEM DEVELOPMENT**

#### **3.1 Proposed System**

##### **3.1.1 Proposed system for Online and Automate Department:**

The proposed system is an application that is designed to manage and handle the operation of an institution. It is a handy application that can be used by all users to facilitate communication. The application introduces portability as it is used on a mobile device and can be carried anywhere. Since the application is used on a mobile device with Android OS, it improves connectivity between all users, thus helping the institution to provide a more transparent system altogether. It is a useful tool that can be used by all the members from anywhere, at any time on an Android mobile device.

This paper is primarily concerned with the home automation system which uses Bluetooth for interaction between the android mobile application and the appliances under the control of the system. The paper will shed light on the features & design of the system.

The proposed Attendance system consists of a camera that captures the video of the students sitting in the classroom and sends it to the administration server using the web service. For the database, the input are the images of the student, the preprocessing of the image is done and then the features of face are extracted using Local Binary Pattern (LBP) and Histogram of Oriented Gradients (HOG), the features are eyes, nose, and mouth, and then it is subjected to the Support Vector Machine (SVM) classifier. After all this process the images of the student are stored in the database. In the administration server, video is processed. From the video we generate number of frame/images. The preprocessing of the image/frame is done and then image subjected to the Face Detection where faces from the image/frame are detected. The features of the face are to be extracted in the feature extraction module using LBP and HOG; the features are eyes, nose, and mouth. Then the SVM training is done on the faces. Here all the faces are detected from the input image and the algorithm compares them one by one with the face database. If the features of the face match that with the face of the database then the attendance is marked from where anyone can access and use it for different purposes. Teachers come in the class and just press a button to start the attendance process and the system automatically gets the attendance without even the intentions of students and teacher. In this way a lot of time is saved and this is highly securing process no one can mark the attendance of other. Camera takes the video continuously to detect and recognize all the students in the classroom. In order to avoid the false detection we are using the Ada boost technique. Using this technique enhances the efficiency and accuracy of the detection process. Input Images Gray Conversion Resize Feature Extraction (CSLBP & HOG)

SVM Training Frame Generation Pre-processing Face Detection Using Ada boost Pre-processing Feature Extraction (CSLBP & HOG) SVM Classification.

The purposed System Monitor include functionality for monitoring number of PCs in Laboratory and give actual result about usage of applications, by whom(User of computer system), the timing on which application is used. This can be shown at the Server end of application.

### **3.1.1.1 System requirements**

The following list gives an overview of the most important requirements of the proposed system

- 1) User friendly interface: User can easily manage system locally or remotely home automation system, through easy web based interface.
- 2) Low cost per node / High node count: Thinking of building automation, hundreds of nodes may be needed to provide automation. However, the market requires competitive performance (compared to wired networks) to be delivered at this low system cost. Additionally, also protocols need to scale to high node count e.g., ensuring message delivery
- 3) Large area coverage: Another challenge lies in the fact that devices of a building automation system are dispersed over large areas. Since transceivers must not consume so much power, they cannot be built with a transmission range sufficient for sensors to reach associated controllers or actuators directly. Also, they may rely on an infrastructure of access points and a wired backbone network (or particularly sensitive receivers).
- 4) System Scalability: Scalability is the ability of a system, network, or process, to handle growing amount of work in a capable manner or its ability to be enlarged to accommodate that growth. For example, system upgrade/downgrade by adding/removing hardware interface module should be easy and systematic task.

### **3.1.2.2 Components Description**

#### **3.1.2.2.1 Power Supply:**

One of the most exciting updates/upgrades of the new Model B+ is a fancy new power supply. The power supply is what takes the micro USB port voltage and creates the 5V USB, 3.3V, 2.5V and 1.8V core voltages. The 3.3/2.5/1.8 are for the processor and Ethernet.

#### **3.1.2.2.2 Sensor:**

Sensors are the device which converts the physical parameter into the electric signal. The system consists of soil moisture sensor. The output of sensor is analog signal,

the signal is converted into digital signal and then fed to the processor. The moisture sensor is used to measure the moisture content of the soil. Copper electrodes are used to sense the moisture content of soil. The conductivity between the electrodes helps to measure the moisture content level.



Fig 3.1: Soil Moisture Sensor

### 3.1.2.2.3 Arduino:

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike

### **3.1.2.3 Working:**

In this project, webcam is interfaced to Raspberry Pi via Wi-Fi module. Raspberry Pi is the heart of the system. The Raspberry Pi Model B+ incorporates a number of enhancements and new features. Improved power consumption, increased connectivity and greater IO are among the improvements to this powerful, small and lightweight ARM based computer. The Raspberry Pi cannot directly drive the relay. It has only zero volt or 3.3 V. We need 12V to drive electromechanical relay. In that case we need a driver circuit. The driver circuit takes the low level input and gives the 12V amplitude to drive the relay which operates at 12V. We are using here UNL 2003 for driving the relay. Across the relay there are 3 connections R,Y,B so we are using here 3 relay to switch on induction motor LAN port is used for internet connectivity. Soil moisture sensor is connected to Raspberry Pi board through comparator circuit. Soil moisture sensor gives a resistance variation at the output. That signal is applied to the comparator and signal conditioning circuit. The signal conditioning circuit has potentiometer to decide the moisture level above which the output of comparator goes high. That digital signal is given to the raspberry pi board. If the soil moisture value is above the moisture level then the 3 phase induction motor will be off, whereas if the moisture level is low motor will be on through the relay. LDR is used for controlling light automatically, at night light will be ON automatically so that we can observe our farm at night also using mobile phone

### **3.1.2.4 Hardware of Project:**

Fig.4 shows hardware part of project. Here we will be considering connections in our project. Here Raspberry pi is the controller of the project. Webcam is interfaced to the raspberry pi. Here we have two comparator circuits which are connected to the soil moisture sensors. Relay is connected to the motor for ON/OFF of the motor. LDR is used for automatic control of light.

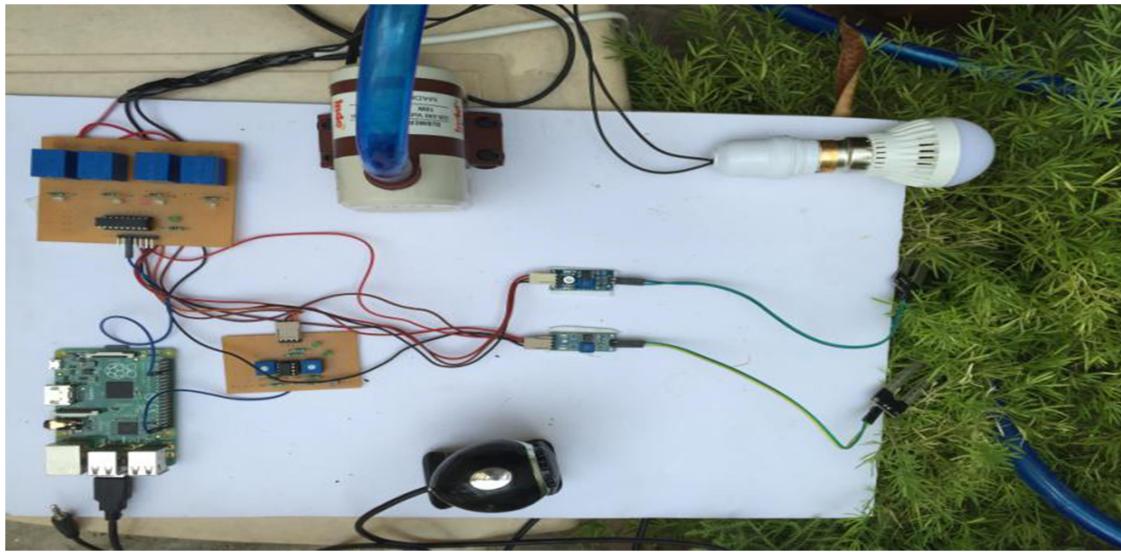


Fig 3.2: Hardware of project

### 3.2: System Implementation/ Block Diagram:

#### Department Online Block Diagram:

##### 1. Attendance System:

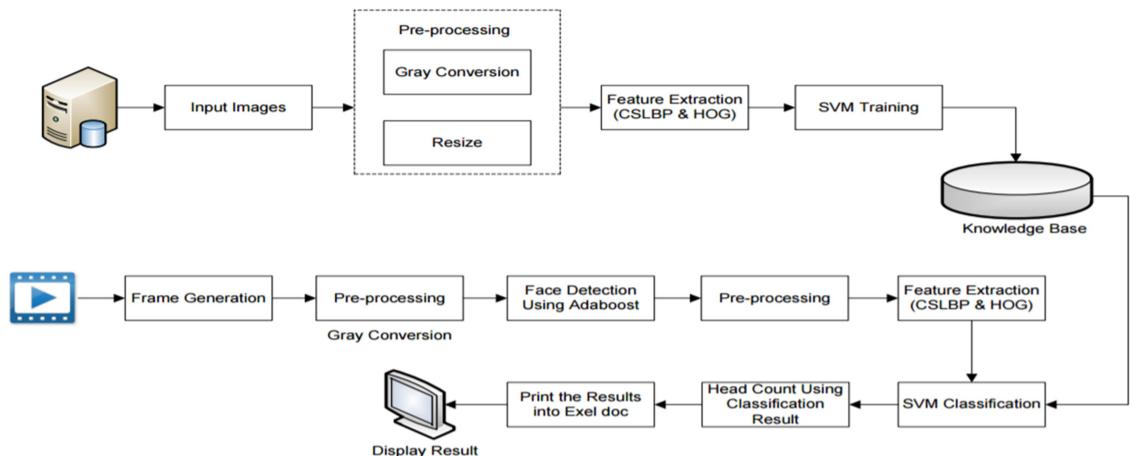


Fig.3.3: Architecture of Attendance System

### Department Automation Block Diagram:

The concept of home automation using IOT is realized using 10w cost micro-controller based Arduino board and an Android mobile phone. Arduino is a open source platform that can be used for prototyping any hardware and software. Arduino can be programmed to receive keyboard input or sensor data and control various electrical appliances connected to output peripherals. Since mobile phone is a wireless communication device, connectivity between Arduino and smart phone is established using Bluetooth, one of the short range wireless communication technologies that can be used for communication in an indoor environment. Operating at universally available frequency of 2.4 GHz, it can connect digital devices within a range of 10-20 meters (theoretically expandable up to 100m, by increasing transmitter power) at the speed of 256 Kbps to 1 Mbps. Since Arduino micro-controller unit does not have inbuilt bluetooth radio, an external HC-05 Bluetooth module is used for establishing wireless connectivity as shown in Fig 2. Once home appliances are connected to Arduino board, they can be easily controlled using any bluetooth enabled smart phone inside a smart-home

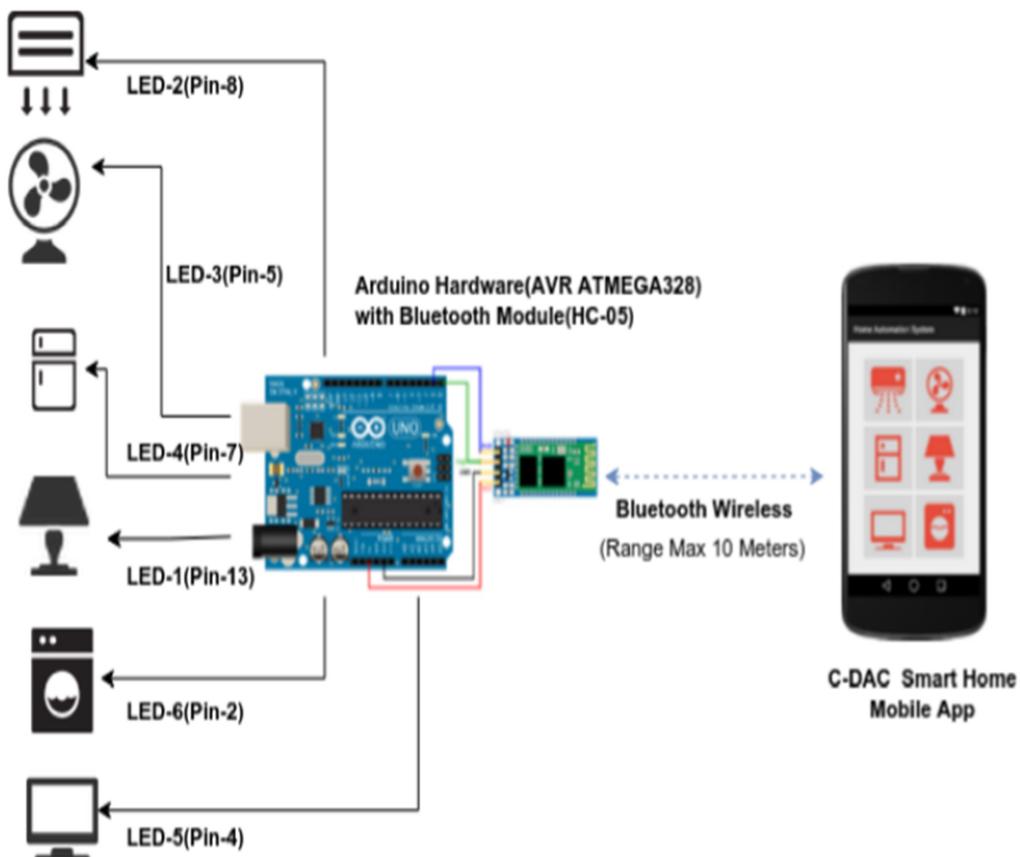


Fig 3.4: Architecture for Home Automation using Bluetooth

Android based mobile application is developed using Android studio (Ver-1.5) that provides complete development environment for developing any mobile application including tools for compilation, verification, debugging and packaging. Android application consists of following two activities. 1. A splash screen showing application home page and 2. Second screen consist of 6 icons corresponding to various electrical appliances namely Lamp, AC, Fan, Refrigerator, TV, Washing Machine. Status of these appliances are indicated using a Light Emitting Diode(LED). RED color indicates that an appliance is in OFF state and GREEN color indicates that an appliance is in ON state. Various steps involved in connecting Arduino board with bluetooth module are explained below.

Step 1: Connect Bluetooth ground and VCC to Arduino ground and VCC respectively.

Step 2: Connect LEDs to Arduino pins with their cathode connected to ground pin.

Step 3: HC-05 Bluetooth module is interfaced with Arduino by connecting Bluetooth's TXD pin to Arduino's Rx and RXD pin to Tx respectively to form serial communication between the devices.

Whenever mobile app is launched, Arduino board gets paired to smart phone using bluetooth connectivity using serial communication protocol. MAC address of HC-05 bluetooth module is used for directly pairing with mobile app without scanning for bluetooth devices in the vicinity, thereby reducing the time. Once connection is established, whenever a user taps an icon on the android phone as shown in Fig 3, data such as "1\" or "a" will be sent. The transmitted data will be received by Arduino's bluetooth module. On Arduino board, six LED's are connected which are mapped to individual home appliances. On the other side i.e. in Arduino board, data transmitted by android mobile application will be received with the help of Bluetooth module connected to the Arduino board. After receiving the data from the phone, data gets verified and respective LED's status will be changed either to ON or OFF state as shown in Fig 4.

For example, if user taps on the LAMP icon in the android phone, LED-1 connected to Pin NO.13 gets switched ON and if user again taps on the same LAMP icon, LED-1 gets switched OFF. The key logic here is, Bluetooth based smart phone is acting as a client, while Arduino board is acting as a Server. Whenever Arduino board is powered ON, HC-05 Bluetooth module's RED LED starts blinking. Once Android application connection is established, RED LED becomes solid indicating that a communication channel is established. Though a prototype smart home automation system using bluetooth is realised, there are some practical challenges associated with it. This bluetooth based solution can not be used from a distant location, as it uses short range wireless communication technology which can work up to 10-20 meters only. This application can only be used by a person to control and manage appliances in an indoor environment.

It has been designed Arduino board with Bluetooth board were developed for home automation .Android program is used on the cell phone to provide the user interface. The Bluetooth board has I/O ports and relays are used for interfacing with the devices which are to be controlled and monitor. The Bluetooth is password protected to ensure that the system is secure from intruders. The Bluetooth has a range of 10 to 100.

### 3.2.1 Implement work:

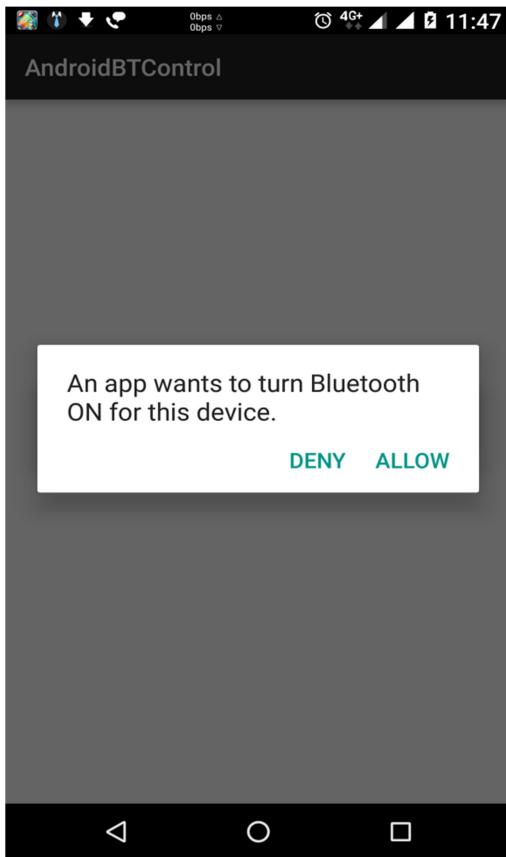


Fig 3.5: Bluetooth permission screen

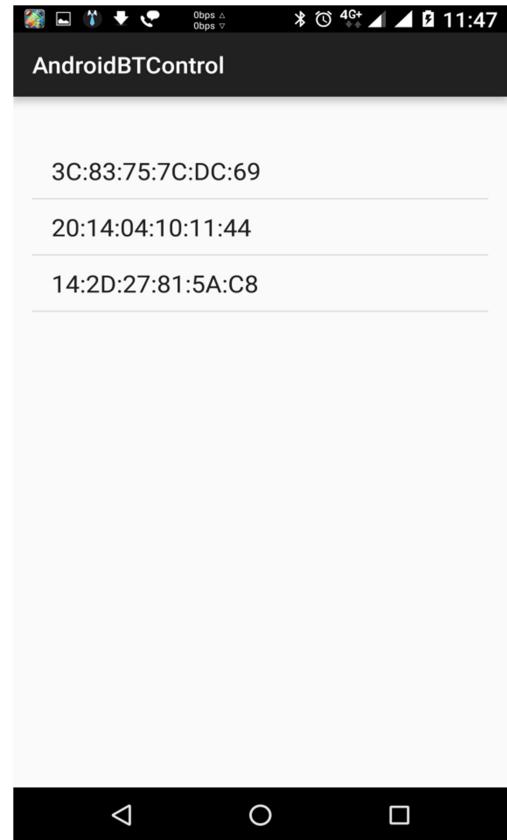


Fig 3.6: Paired devices list screen

The Bluetooth system module is implemented with following components:

1. Android App
2. Arduino Mega 2560
3. HC-05 Bluetooth module

#### 1. Android App:

The android app has 4 screen. The 1<sup>st</sup> screen ask for permission to switch on Bluetooth. The 2<sup>nd</sup> screen shows the paired devices with their Bluetooth Mac Id. Select HC 05 device from the list. Then use TURN LED ON button to turn on the led on Arduino side. TURN LED OFF button to turn off the led and VOICE CONTOL to give on or off led using voice command. Currently only two voice commands are supported as shown in 3<sup>rd</sup> and 4<sup>th</sup> screen.

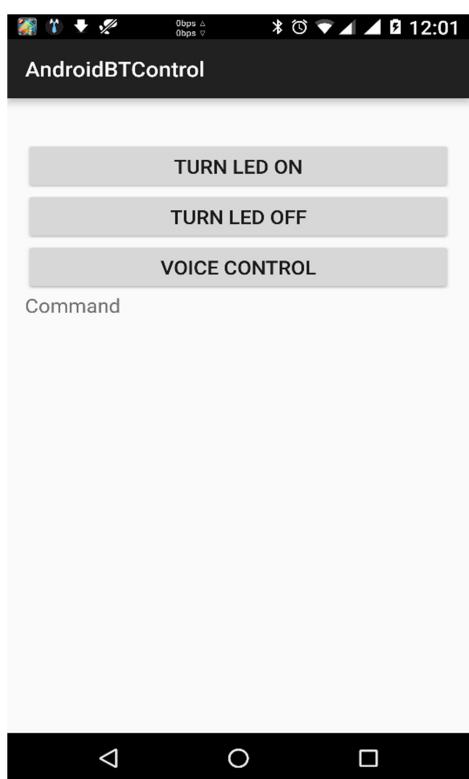


Fig 3.7: Command screens

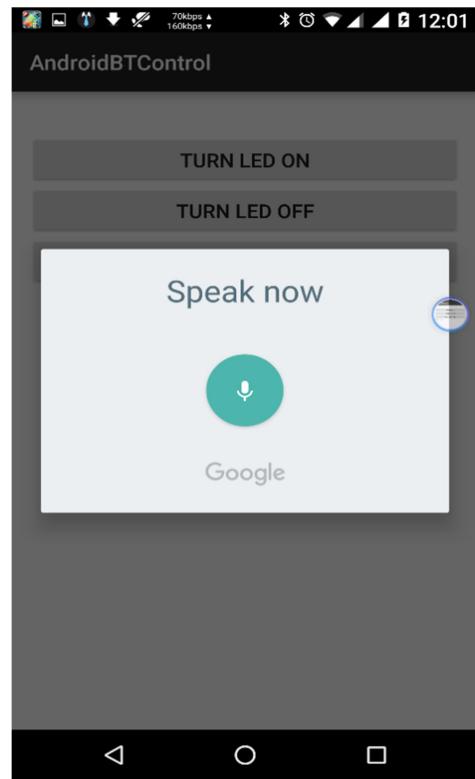


Fig 3.8: Voice command screen

“Light on” to turn the led on and “Light off” to turn the led off.

## 2. Arduino Mega 2560:-



Fig3.9: Arduino Mega

Arduino mega has been connected with Bluetooth module hc-05. It process the commands received from HC-05 and based on that command it either turn on or turn off the led. The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTS (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

#### 4. Bluetooth Module HC-05

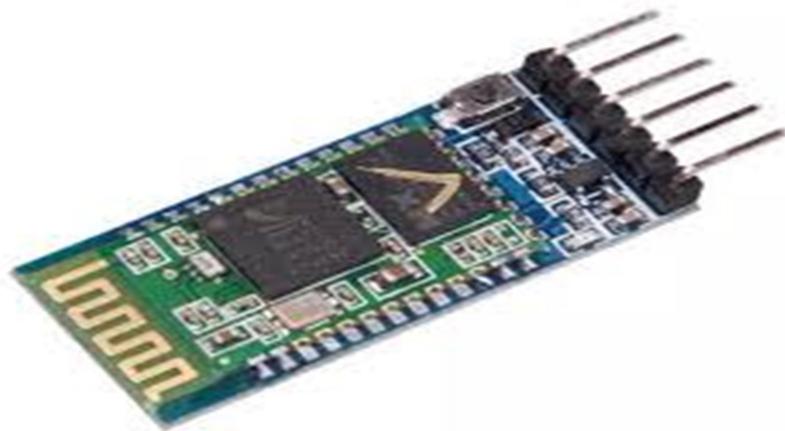


Fig 3.10: Bluetooth module hc-05

It connects with the smartphone's Bluetooth and receives commands from it, then forward the command to arduino. HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

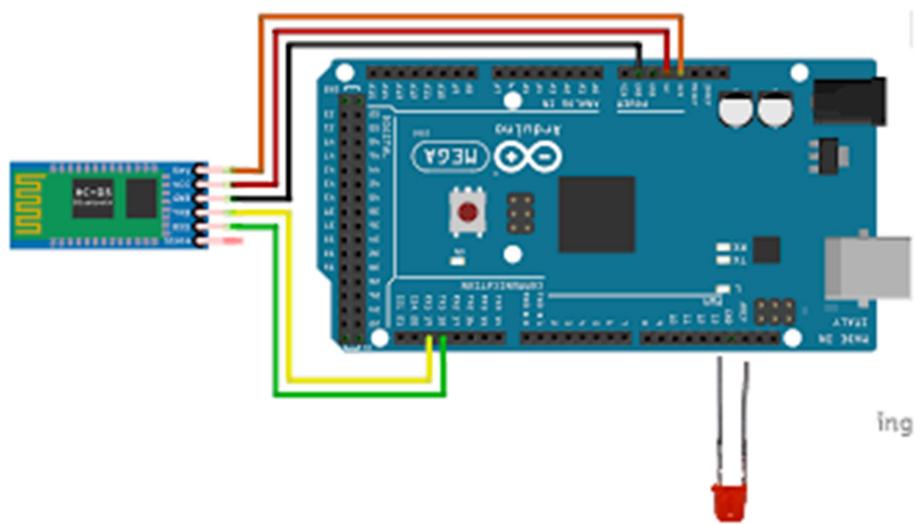


Fig 3.11 Connection diagram:

### **3.3 ALGORITHMS**

This section describes the software algorithm for the system.

The algorithm consists of the following steps

1. Creation of database
2. Video acquisition
3. Frame generation
4. Pre-processing
5. Face detection
6. Face recognition
7. Attendance An Automatic

#### **Creation of Database**

In this module we are going to maintain student details in the database which include information like Branch, SEM, Name, USN etc. and we also store the image of all students in the database for further process. These images are preprocessed, in this the RGB image is converted to binary image, then from the binary image we extract the features, the features to be extracted are eyes, nose, and mouth using Histogram of Orientation Gradients(HOG) and Linear Binary Pattern(LBP) algorithms. These features extracted are loaded into SVM for training the features where SVMs are set of related supervised learning methods used for classification and regression. They belong to a family of generalized linear classification. A special property of SVM is that, SVM simultaneously minimize the empirical classification error and maximize the geometric margin. So SVM called Maximum Margin Classifiers. Here we are creating a double matrix so our training data are no. of row vectors and column vectors.

- 1) The SVM classification function  $F(x)$ ,  $F(x) = w \cdot x - b$ .  $w$  is the weight vector and  $b$  is the bias.
- 2) Compute Lagrange's Function LP.  $LP = L(w, b, \alpha) = 1/2w.w - \sum \alpha_i \{y_i(w \cdot x_i - b) - 1\}$  Where  $\alpha_i$  is a Lagranges multiplier.
- 3) The kernel used is Radial Basis Function (RBF):  $K(x_i, x_j) = \exp(-\gamma \|x_i - x_j\|^2)$ ,  $\gamma > 0$   $\gamma$  is kernel parameter.
- 4) Samples along the hyperplanes are called Support Vectors (SVs). All the support vectors SVs are stored in the format as follows:

[SVs from Class 1, SVs from Class 2, ... SVs from Class L]; We use nonlinear kernel to solve classification problems, so we need the cost parameter (C) and kernel parameters ( $\gamma$ ). Then we will load the features extracted when applied HOG and LBP along with the above algorithm result leads to SVM training and these is stored in the database.

## Face Detection and Feature Extraction of Face

Detecting a face is in essence an object detection task, where the object of interest in this case is the face. However, many factors can interfere with the face detection algorithms, factors such as face pose, scale, position, rotation, light, image colors etc. There are plenty face detection algorithms which can effectively detect a face (or any other specific object) in a picture. In the system presented here, most students face the camera frontally hence we chose to use the HAAR classifier for face detection. The integral image computes a An Automatic Attendance System Using value at each pixel for example  $(x,y)$  that is the sum of the pixel values above to the left of  $(x,y)$ . This is quickly computed in one pass through the image Haar classifier is nothing but scalar product between the image & some haar like structures. Feature is selected through Ada-boost. Ada-Boost provides an effective learning algorithm and strong bounds on generalization performance. The overall form of the detection process is that of a degenerate decision tree, what we call a —cascade|. A positive result from the first classifier triggers the evaluation of a second classifier which has also been adjusted to achieve very high detection rates. A positive result from the second classifier triggers a third classifier, and so on. A negative outcome at any point leads to the immediate rejection of the sub-window. The cascade training process involves two types of tradeoffs. In most cases classifiers with more features will achieve higher detection rates and lower false positive rates. At the same time classifiers with more features require more time to compute. In principle one can use following stages.

- i) the number of classifier stages,
- ii) the number of features in each stage, and
- iii) the threshold of each stage, are traded off in order to minimize the expected number of evaluated features.

A target is selected for the minimum reduction in false positives and the maximum decrease in detection. Stages are added until the overall target for false positive and detection rate is met. After a face has been detected, it will display the result as face detected with the faces of the student. After the face detection next procedure is to extract the features of face which is called the feature extraction, algorithms used are Local Binary Pattern (LBP) and Histogram of Oriented Gradients (HOG).

1) Histogram of Oriented Gradients 1) Gradient Computation For the gradient computation first the gray scale image is filtered to obtain x and y derivatives of pixels using `conv2( image, filter, 'same')` method with those kernels: = [ -1 0 1] = [ , for an

image I, we obtain x and y derivative's by using convolution operation: then the magnitude and orientation of the gradient is also computed: G and  $\Theta = \arctan$  at orientation calculation  $\text{rad2deg}(\text{atan2}(\text{val}))$  method is used, which returns values between  $[-180^\circ, 180^\circ]$ .

2) Orientation Binning The next step is to compute cell histograms for later use at descriptor blocks. For 8x8 pixel size cells are computed with 9orientation bins for  $[0^\circ, 180^\circ]$  interval. For each pixel's orientation, the corresponding orientation bin is found and the orientation's magnitude  $|G|$  is voted to this bin.

3) Descriptor Blocks To normalize the cells' orientation histograms, they should be grouped into blocks. From the two main block geometries, the implementation uses R-HOG geometry. Each R-HOG block has 2x2 cells and adjacent R-HOGs are overlapping each other for a magnitude of half-size of a block.

4) Block Normalization L1-Norm normalization is implemented using  $\text{norm}(\text{vec})$  method: e is a small constant.

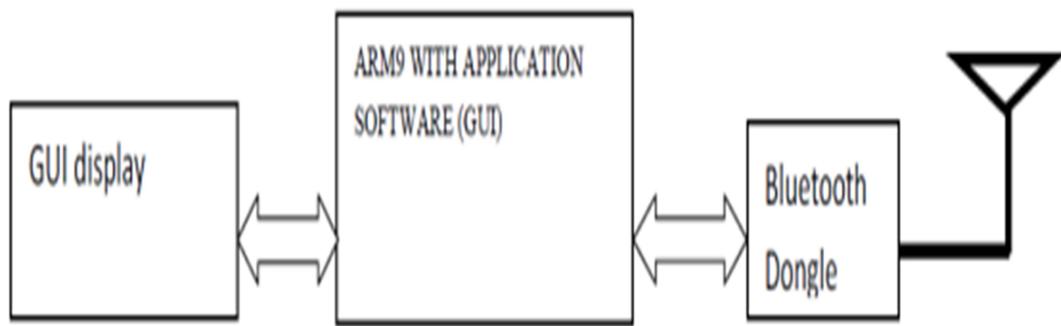
5) Detector Window The detector window will be computed based on the size image.

**Local Binary Pattern** Given a pixel in the image, an LBP code is computed by comparing it with its neighbor's s where  $g_c$  is the gray value of the central pixel,  $g_p$  is the value of its neighbors, P is the total number of involved neighbors and R is the radius of the neighborhood. Suppose the coordinate of  $g_c$  is  $(0, 0)$ , then the coordinates of  $g_p$  are  $(R\cos(2 p / P), R \sin(2 p / P))$ . After the LBP pattern of each pixel is identified, a histogram is built to represent the texture image:

An Automatic Attendance System  $k \in [0, K]$  where K is the maximal LBP pattern value. Then it return the histogram of the center pixel calculated. Finally, the system does recognize the face. After extracting the features from the given image, a recognizer is needed to recognize the face image from the stored database. This phase involves a SVM classification algorithm. The features extracted by HOG and LBP for the faces of student are loaded into the SVM classifier, SVM Classifier here is mainly used to do the input parameter checking if the features of a face of particular student matches with the features of face of student in the database then the decision value for that face will be 1 then attendance is marked automatically. An error message is displayed if there are faces that does not with the faces of database. In this way faces of students are verified one by one with the face database using the SVM classification and attendance is marked on the server.

### 3.4 DATA FLOW DIAGRAMS (DFD)

#### TRANSMITTER:



#### RECIEVER:

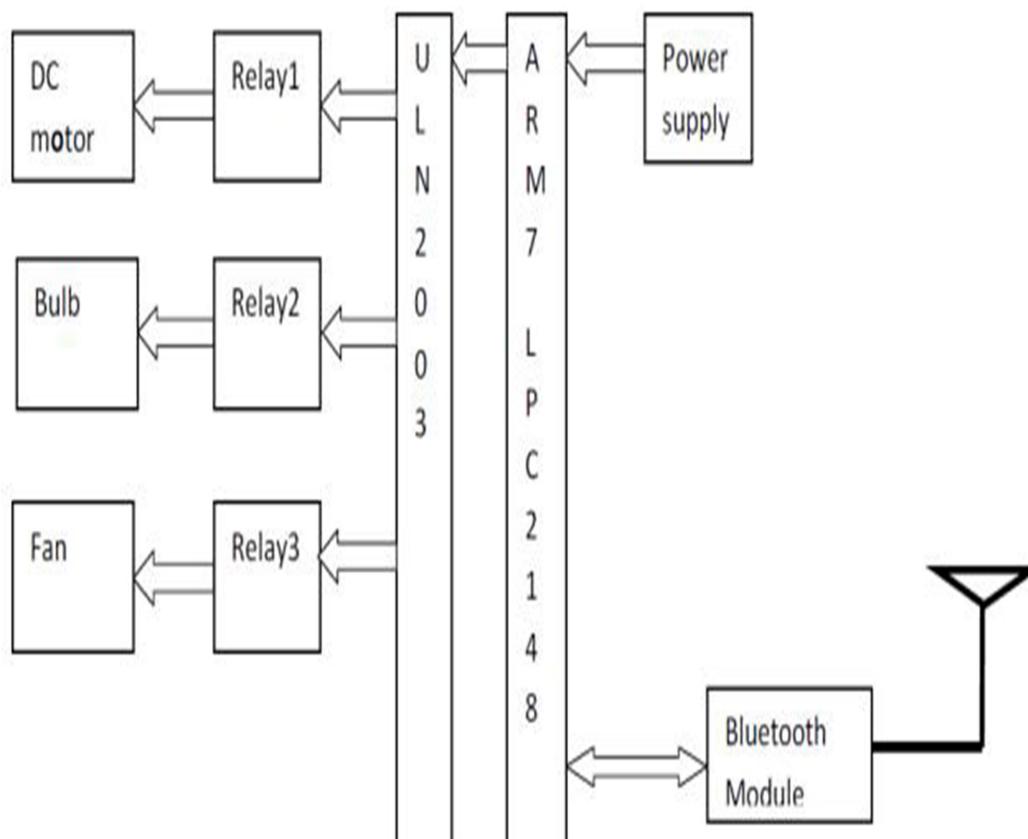


Fig 3.4.1: DFD of bluetooth based home automation

### GSM Based Control System

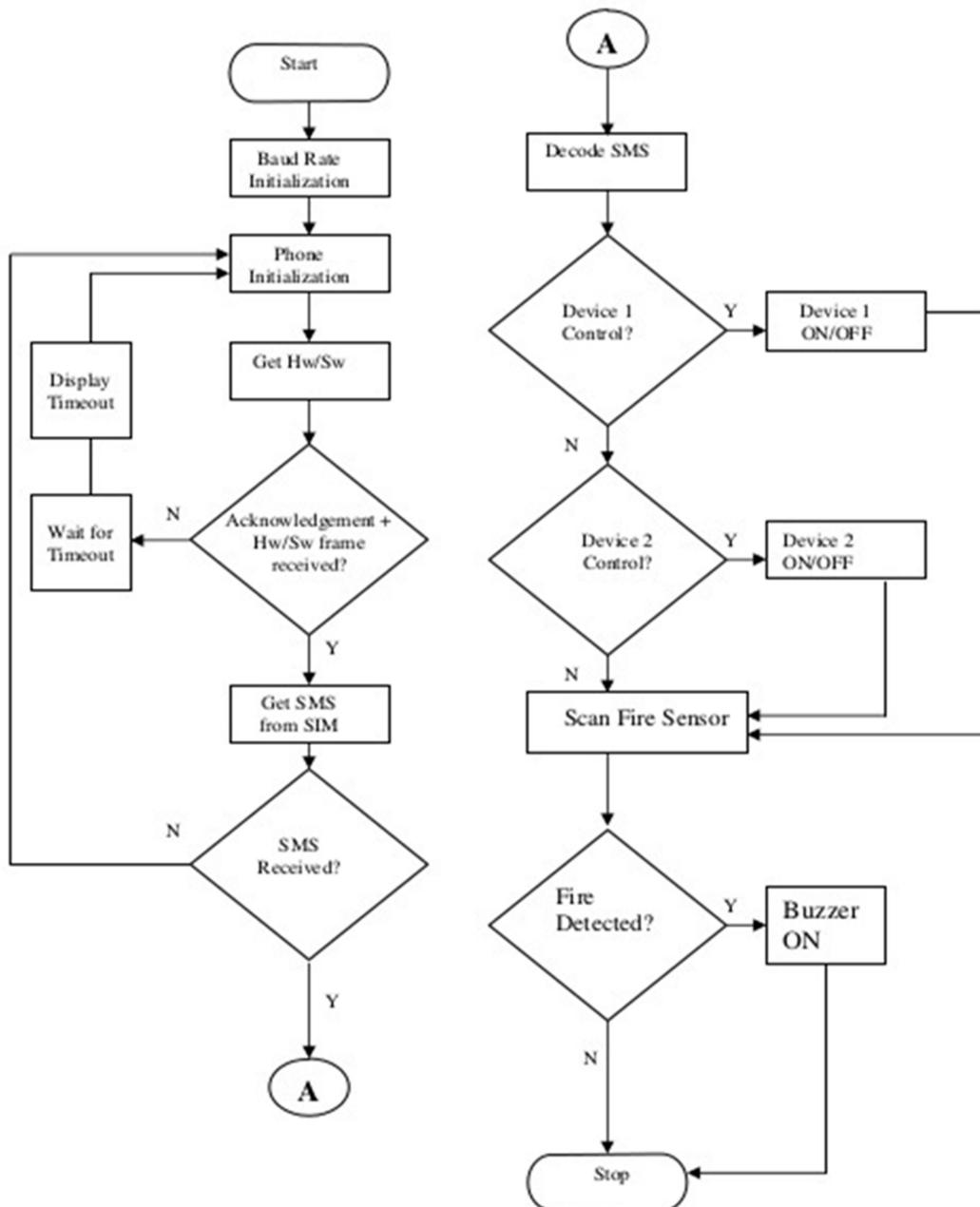


Fig 3.4.2 : DFD of GSM based home automation

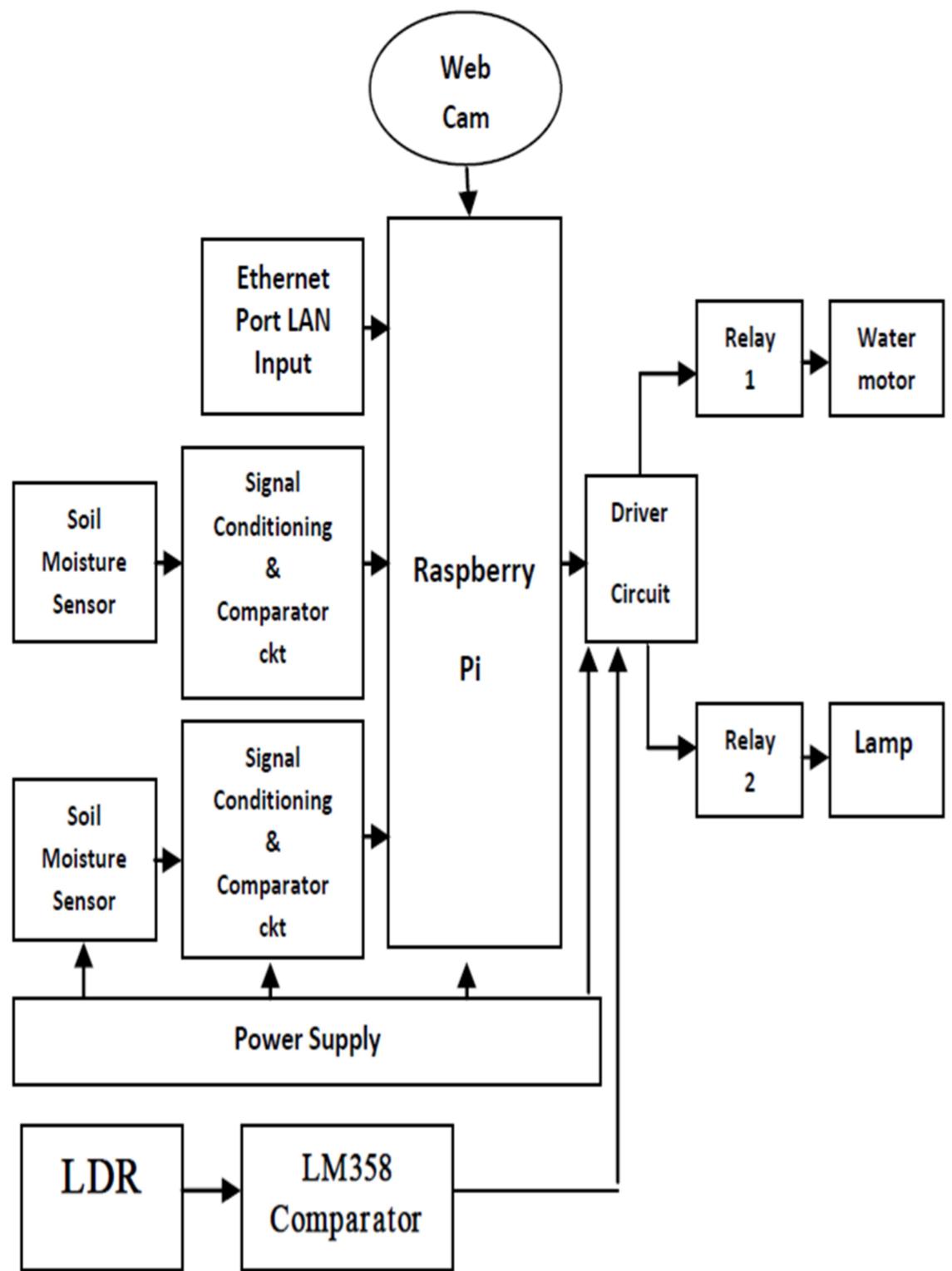


Fig 3.4.3: DFD of smart irrigation

### 3.5 UML DIAGRAM

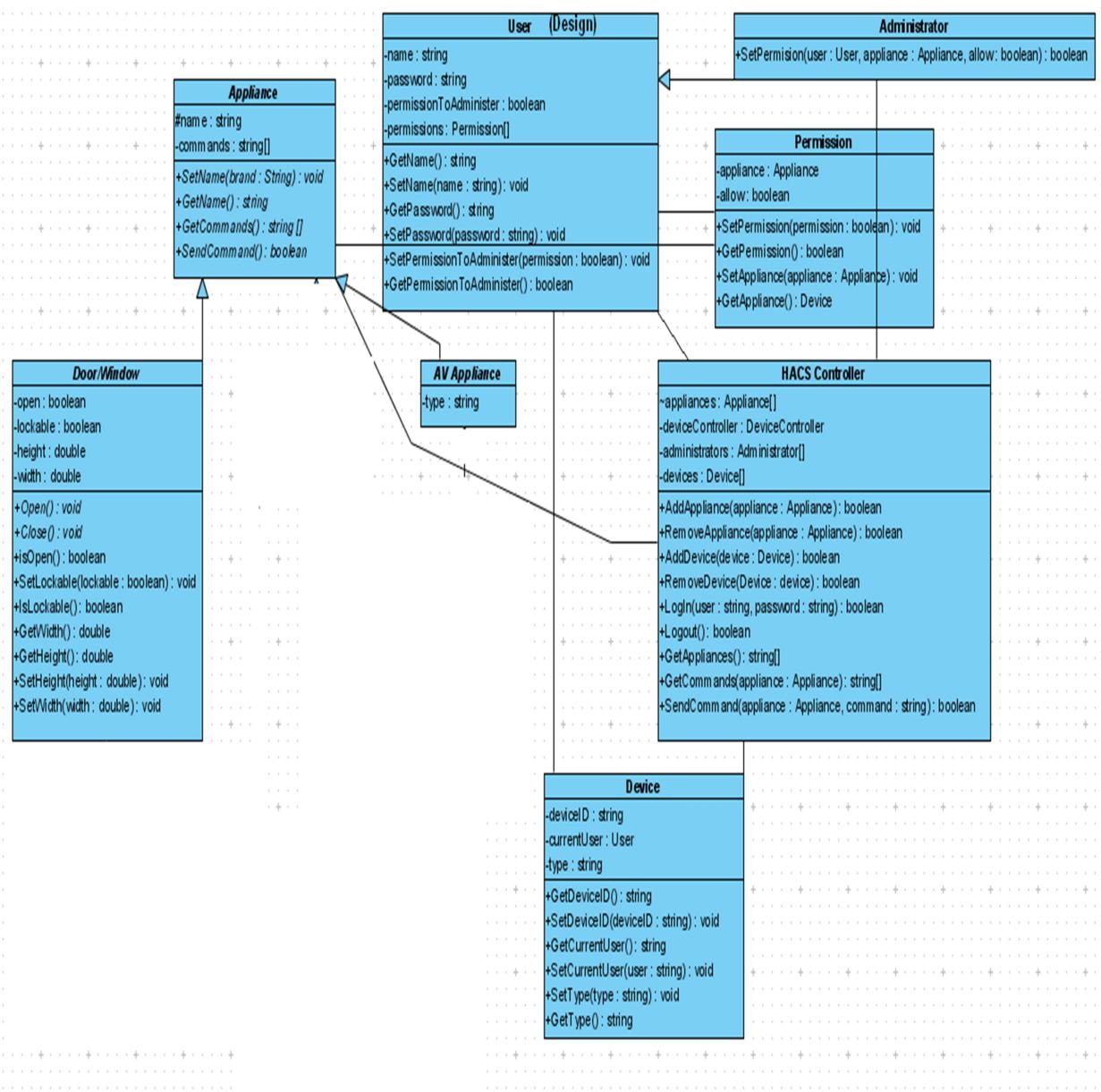


Fig 3.4.4: UML Diagram of Department automation.

## **3.6 SYSTEM MODULES**

### **1. Bluetooth based automation module:**

In this module all the required appliance will be controlled via bluetooth using the bluetooth module hc-05 and arduino mega 2560. Just the communication interface here is bluetooth while all other configurations are same.

### **2. Wi-fi based automation module:**

In this module all the required appliance will be controlled via wifi using the bwifi shield and arduino mega 2560. Just the communication interface here is wifi while all other configurations are same.

### **3. GSM based automation moduel:**

In this module all the required appliance will be controlled via sms using the GSM module and arduino mega 2560. Just the communication interface here is GSM while all other configurations are same.

### **4. Smart Irrigation moduel :**

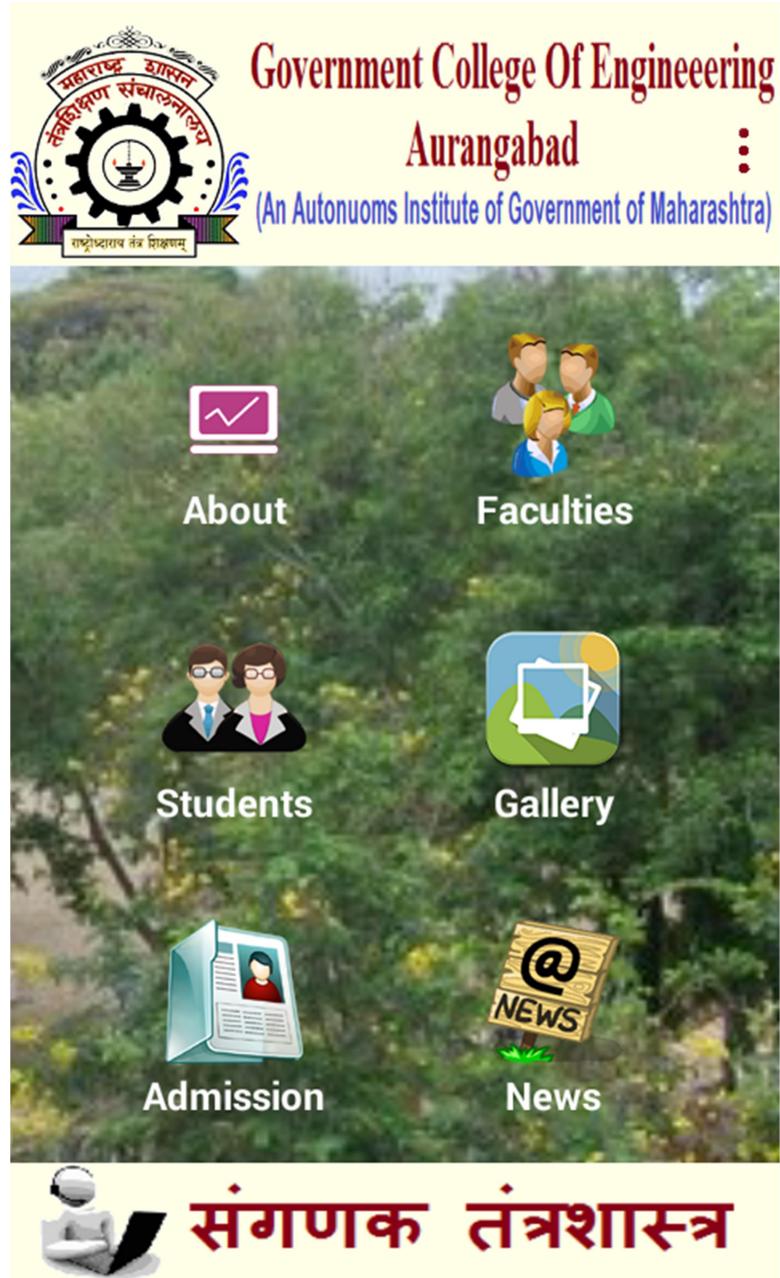
In this module, an pumping motor is controlled via arduino using the moisture sensor. If the input from the moisture sensor is below threshold then motor is turned on otherwise it is turned off.

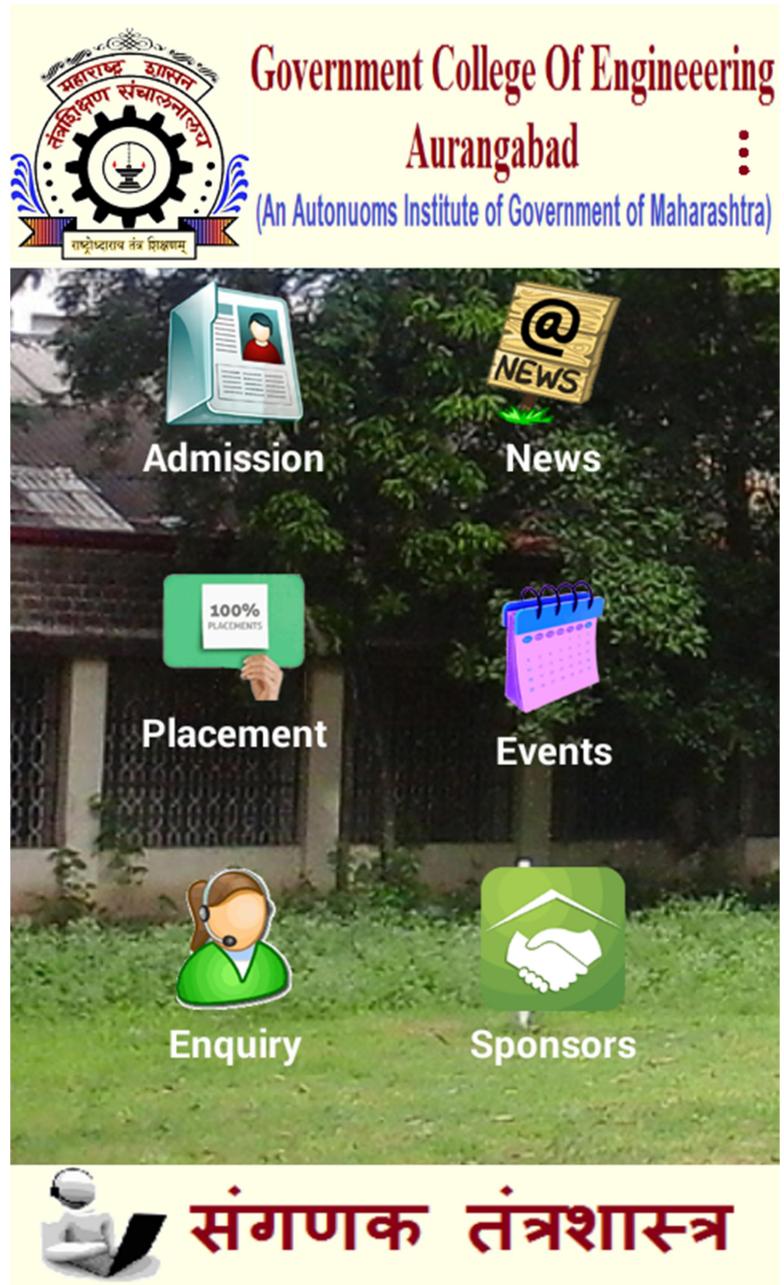
### **5. Remote lab control and monitoring:**

In this moduel, a lab monitor can monitor and control whole lab remotely form a computer or android phone. The function included monitoring who connected and removed what type of external hardware, which programs run and closed by which user and controlling options such as shutting down pc, logging off etc.

## RESULTS

Android Application CompSa:







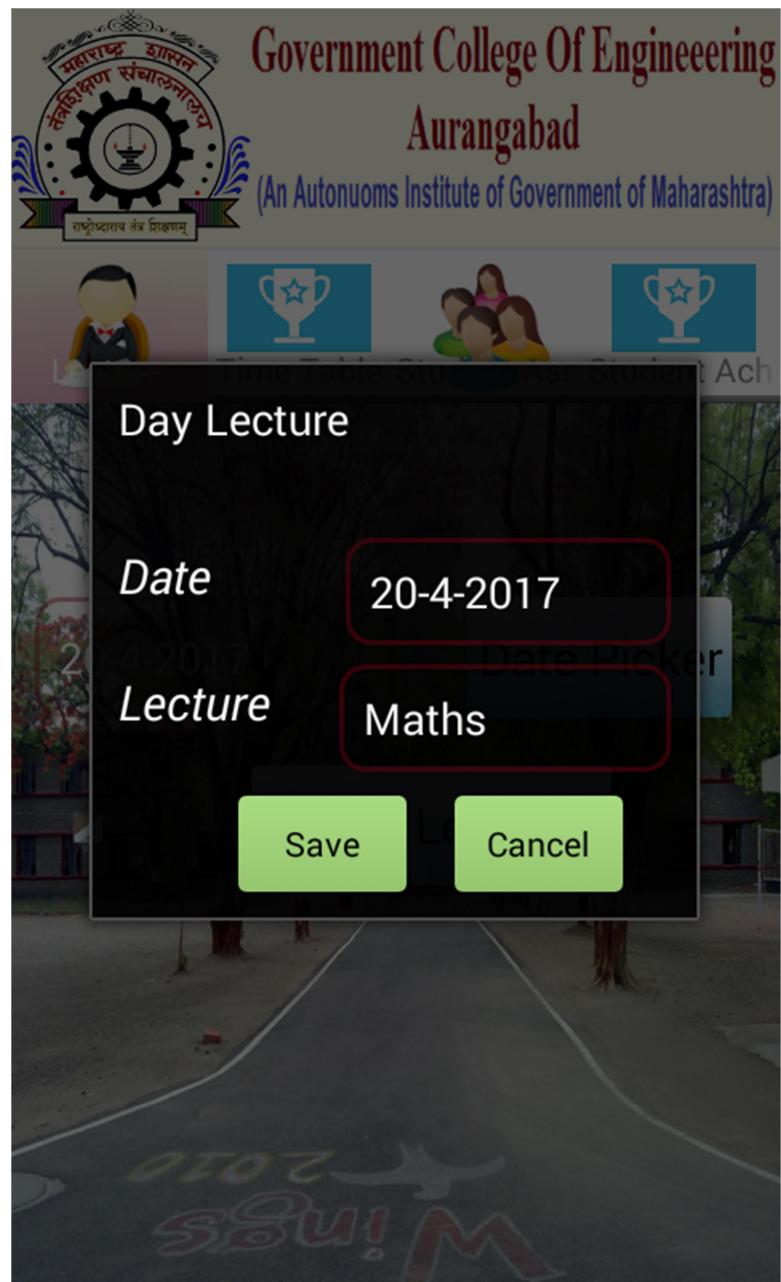
# About Compsa

**Computers have captured the world. Today there is no single field where computers have not left a mark. The Department of Computer Science and Engineering established in 1986 is dedicated to produce students who excel in this field. The department aims at IT based Learning, Development of Entrepreneurship among students and become a Centre of Excellence. The Department places high priority on establishing and maintaining innovative research programs that enhance the educational opportunity and encourage a broad base of extramural support to prepare future generations of computer professionals for long term careers in research, technical development and applications. The department has organized many series of expert lectures for the**



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	<p><b>Mrs. P.V. Kulkarni</b> Assistant Professor</p>

**संगणक तंत्रशास्त्र**





## Students Association

Year 2015

Vikas Desale General Secretary

Vikas Desale President

Vikas Desale Vice President

Vikas Desale Joint Secretary

Vikas Desale Technical Secretary

Vikas Desale Cultural Secretary



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Campus Life

Department Life

Aurangabad Life

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First Year Computer Sci.  
& Engg.(FE CSE)

Second Year Computer  
Sci. & Engg.(DSE CSE)

The Candidate must be  
passed Post-SSC or Post-HSC  
Diploma Course in  
Engineering/Technology. The  
Candidate must be B.Sc.  
Degree from a UGC /  
Association of Indian  
Universities recognized



संगणक तंत्रशास्त्र



This Month Most  
Placement of  
Department  
May 2015

CS  
computer  
science



Government College Of Engineering  
Aurangabad

(An Autonomus Institute of Government of Maharashtra)

## E-News Letter

This Month Most  
Placement of  
Department



May  
2015

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fyyyyyyyyyyyyyyyyyyyy

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संगणक तंत्रशास्त्र



## Government College Of Engineering Aurangabad

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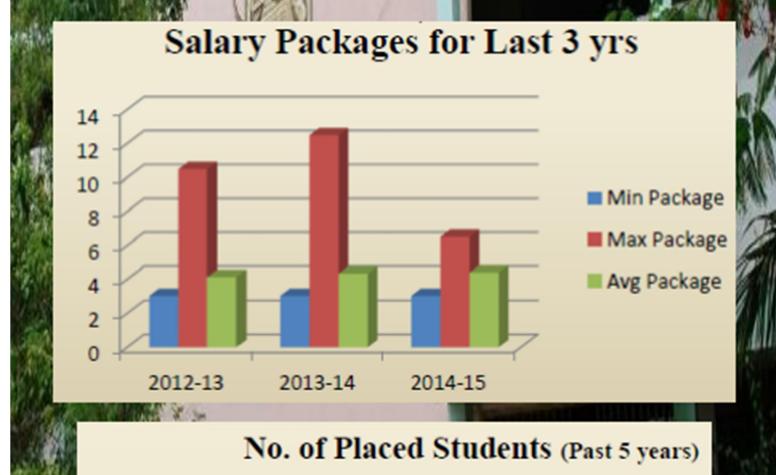
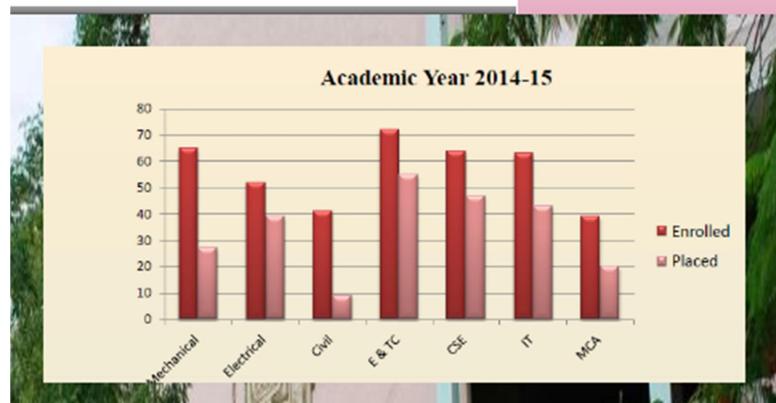
### Placement Procedure

1. At the end of VI semester, data base is created based on the information asked to submit in the format provided by T And P office.
2. T And P office scrutinize and verify the details provided by the students and certify the data base.
3. The Placement Office sends invitations to companies/ organizations along with relevant information.
4. Company/ Organization send the details of the job offer ( Company profile, Eligibility criteria, pay package, place of posting and allowances) to the placement



Government College Of Engineering  
Aurangabad  
(An Autonomus Institute of Government of Maharashtra)

Placement Process Main Recruiters Record Placement



No. of Placed Students (Past 5 years)



2015-06-29

11:00:00    College is Started and  
Workshop on PHP



Name :

Email :

Contact Number :

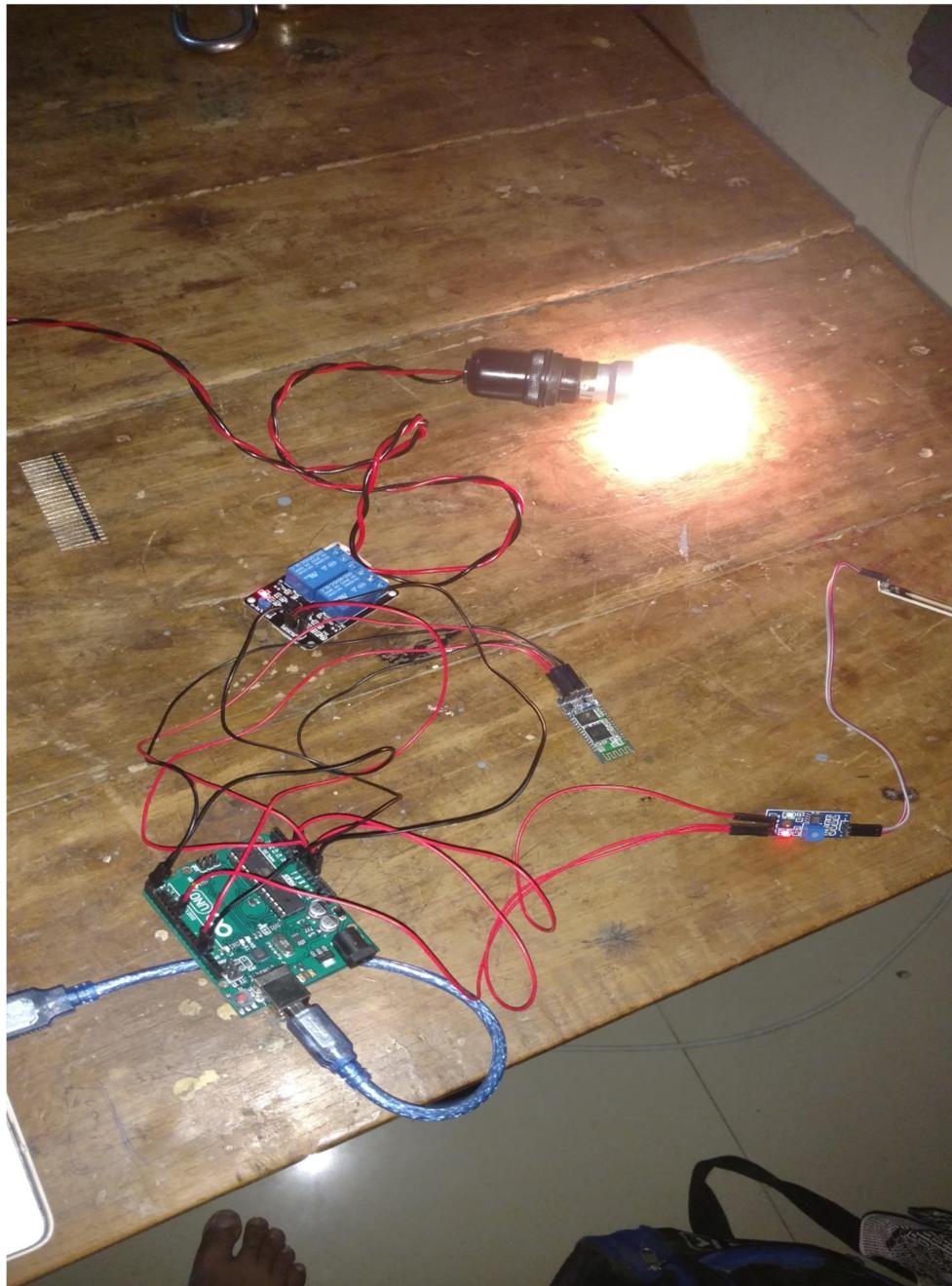
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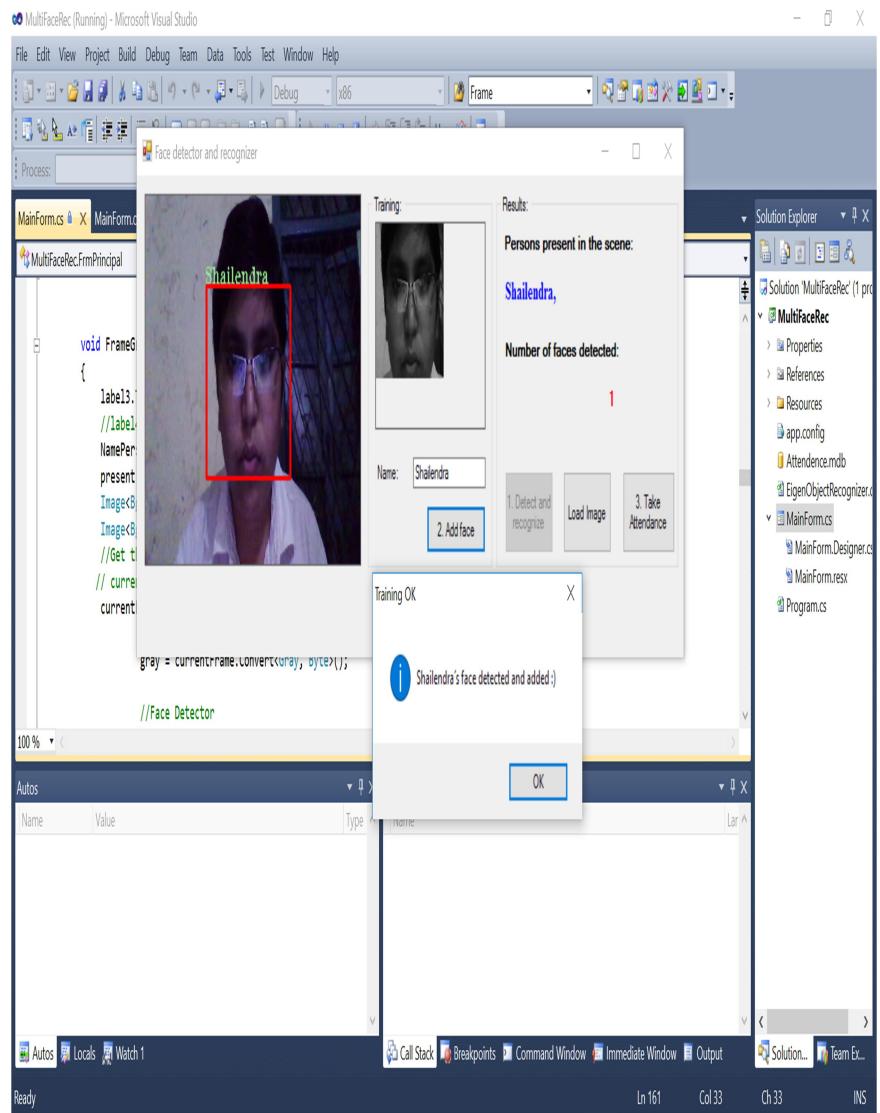
Submit



## 2. DEPARTMENT AUTOMATION



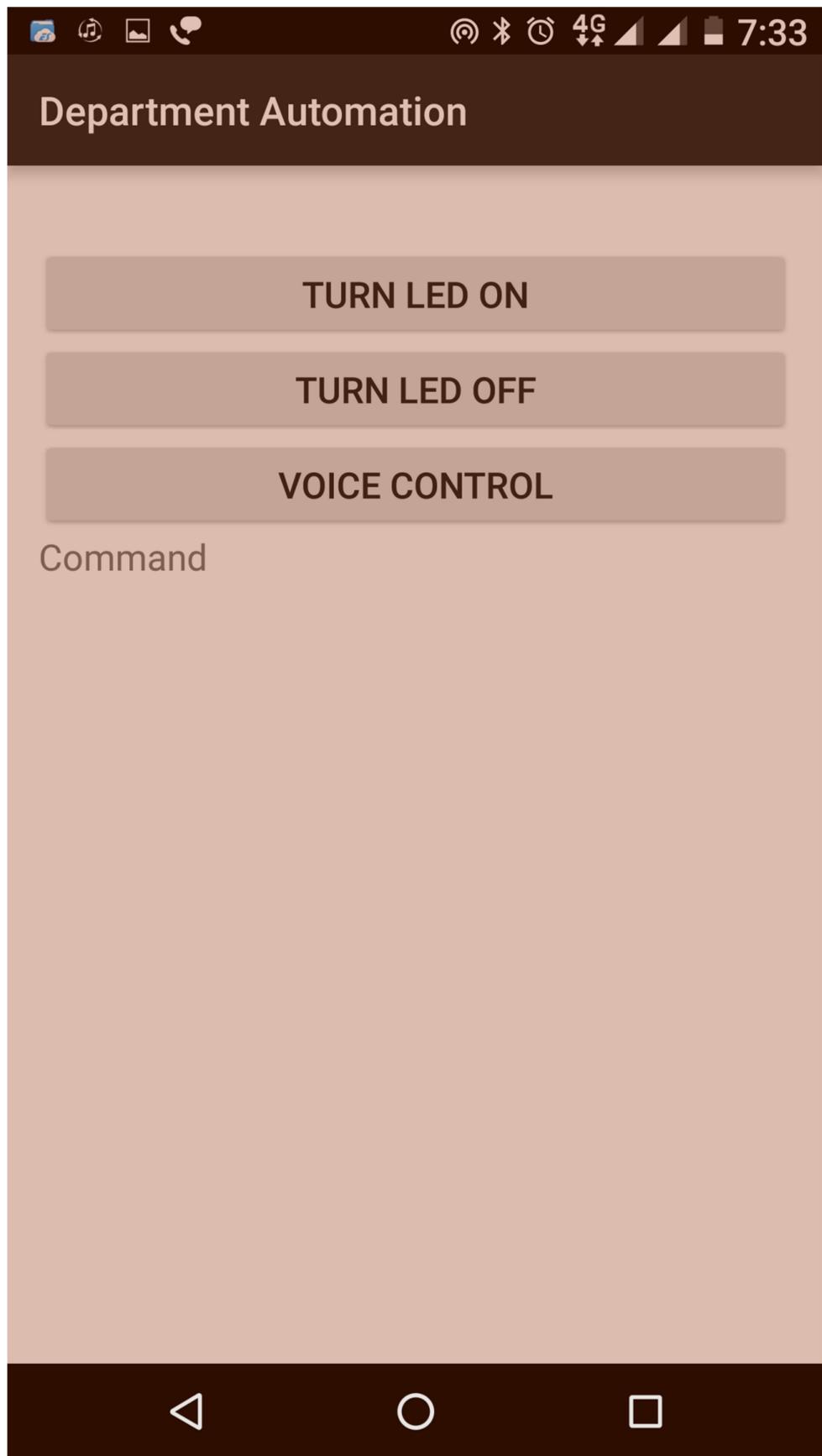


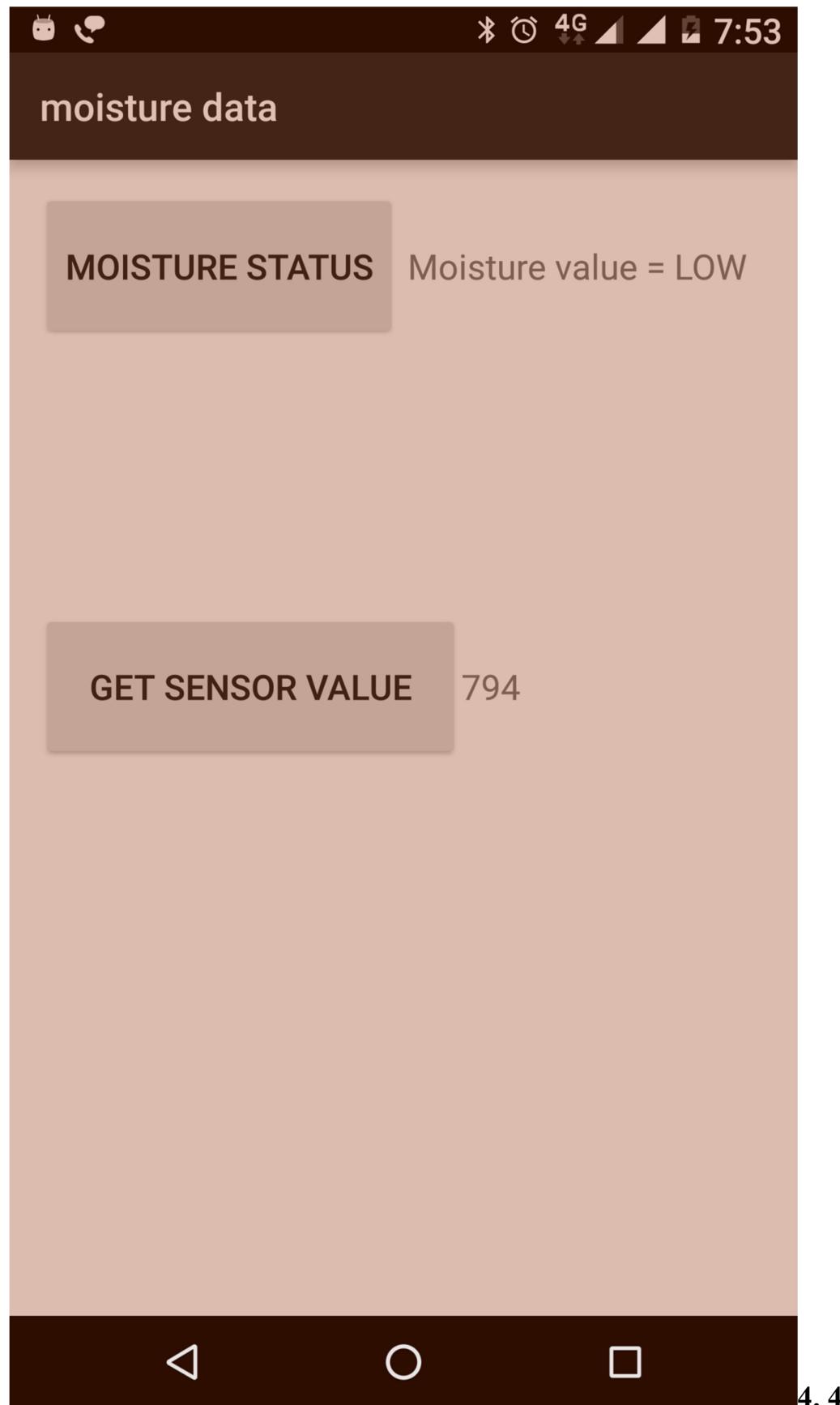




## Department Automation







## **4. CONCLUSION**

### **4.1 ADVANTAGES/DISADVANTAGES**

#### **4.1.1 Advantages of Department Automation:**

- Easy to use.
- Reduce doing work manually.
- Reduce Time.
- Up to date report.
- Automation using voice.
- Finds bug quickly.
- More secure.
- Less cost.
- Control every object using android mobile.

#### **4.1.2 Disadvantages of Department Automation:**

- Cost.
- Slight Learning Curve.
- A smart automation will be extremely reliant on your internet connection.

#### **4.1.3 Advantages of Smart Irrigation for Department:**

- It not only provide comfort but also reduce energy, efficiency and time saving.
- Control the water motor automatically.
- Reduce time.
- Reduce waste of water.
- Reduce the human resources.
- Easy to use or user friendly.
- Record every detail.
- Gives the report on the basis of soil humidity, pH value of soil, temperature and light.

#### **4.1.4: Disadvantages of Smart Irrigation for Department:**

- Networking problem.
- Requires electricity.
- Requires knowledge.

- Require high cost sensor for pH values of soil, temperature and light.
- If one sensor fails then whole system will fail.

#### **4.1.5: Advantages of System Monitor:**

- Secures the system.
- Easy to find any bug.
- Track every activity of the user.
- Monitor computer and Internet usage by the user.
- Detected every peripheral.

#### **4.1.6: Disadvantages of System Monitor:**

- Monitor every activity.
- It records every personal and confidential details of the user.

#### **4.1.7: Advantages of Face Recognition base Automation System:**

While using the face-recognition technology based time attendance system, you can get a number of benefits which could enhance the management process. Few of them are listed below:

- **MAINTAINS OVERALL RECORDS:**

An automated face recognition time attendance system maintains the overall presence record of the employees in the organization. Through the maintained time and data sheet the overtime, under time, the sick leaves taken by the employees, the unpaid leaves of the employees etc. everything can be very well managed and accordingly work distribution can be planned. Scheduling of the staffs can also be known through it which can ultimately upraise the productive hours.

- **GET RID OF PEN & PAPER SYSTEM:**

The newest technology helps in replacing the older paper register method efficiently. It also saves money that the organization used to spend behind manual security guards and then also it was lacking satisfaction. Face-recognition time attendance system gives better maintenance of data as, it supports the electronic medium of data storage. Also the system gives a good impression about the organization in front of the business clients and other concerned people.

- FINANCIAL BENEFITS:

The face-recognition time attendance system helps in saving time, eliminates the manual mistakes and controls over the employee theft. Since the face recognition system controls every single event electronically therefore, reduces the possibility of error. The attendance is noted down electronically therefore it saves time of the employees which they can efficiently indulge in their productive hours.

- PAYROLL MANAGEMENT:

The crucial business process is the payroll management. It consumes not only hard work but also immense amount of time when it is calculated manually. The HR and other financial departments give their 100% but still the result comes unexpected. The only way to get the calculation accurately is with the help of face-recognition time attendance system. If the time related data can be maintained automatically then with the help of payroll software, payroll can be generated instantly.

- DO NOT HAVE TO REMEMBER!

Once you have implemented the device there is no issue of remembering anything as, the device is reliable enough to be trusted. Just set the device according to your organizational requirement and enjoy the services. All these advantages are mainly responsible for gaining the existence in the present market. Not only the time attendance system but the face-recognition access control system is also being in use nowadays for controlling the access at the premises.

#### **4.1.8: Disadvantages of Face Based Recognition System:**

- IMAGE QUALITY

Image quality affects how well facial-recognition algorithms work. The image quality of scanning video is quite low compared with that of a digital camera. Even high-definition video is, at best, 1080p (progressive scan); usually, it is 720p. These values are equivalent to about 2MP and 0.9MP, respectively, while an inexpensive digital camera attains 15MP. The difference is quite noticeable.

- IMAGE SIZE

When a face-detection algorithm finds a face in an image or in a still from a video capture, the relative size of that face compared with the enrolled image size affects how well the face will be recognized. An already small image size, coupled with a target distant from the camera, means that the detected face is only 100 to 200 pixels on a side. Further, having to scan an image for varying face sizes is a processor-intensive activity. Most algorithms allow specification of a face-size range to help eliminate false positives on detection and speed up image processing.

- FACE ANGLE

The relative angle of the target's face influences the recognition score profoundly. When a face is enrolled in the recognition software, usually multiple angles are used (profile, frontal and 45-degree are common). Anything less than a frontal view affects the algorithm's capability to generate a template for the face. The more direct the image (both enrolled and probe image) and the higher its resolution, the higher the score of any resulting matches.

- PROCESSING AND STORAGE

Even though high-definition video is quite low in resolution when compared with digital camera images, it still occupies significant amounts of disk space. Processing every frame of video is an enormous undertaking, so usually only a fraction (10 percent to 25 percent) is actually run through a recognition system. To minimize total processing time, agencies can use clusters of computers. However, adding computers involves considerable data transfer over a network, which can be bound by input-output restrictions, further limiting processing speed. Clearly, privacy concerns surround this technology and its use. Finding a balance between national security and individuals' privacy rights will be the subject of increasing discussion, especially as technology progresses.

## **4.2 APPLICATION**

### **4.2.1: Application of Department Automation:**

- Smart home.
- Wearables.
- Smart City.
- Smart grids.
- Connected Health (Digital health/Telehealth/Telemedicine).
- Smart retail.
- Smart supply chain.
- Smart farming.
- Industrial internet.
- Connected car

### **4.2.2: Application of Smart Irrigation:**

- Farmers uses it for monitoring water and reduces much of the wastage.
- Can be used in institute to monitor the soil moisture condition in their huge gardens.

### **4.2.3: Application of System Monitor:**

- Applicable in business to record every activity of employee.
- Is also used in universities to track the activities of students.

### **4.2.4: Application of Face Recognition bases automation system:**

- Used to take attendance of student in institutes.

### **4.2.5: Application of Department:**

- Application uses are many for online noticeboard.
- The application also used for getting up-to-date information of department , Staff and other activities in department like online magazine, enquiry purpose, to access gallery and many more.

## **4.3 FUTURE SCOPE**

### **4.3.1: Future Scope of Department Automation:**

- Control of Fan Speed through the app.
- Control of AC temperature through the app and before a person enter in the room.
- Control of water motor to prevent wastage of water when the water tank is full.
- Automatic detection of person in room and turn off the power supply of the room if no one is present.
- Use of ZigBee to interconnect various devices.

### **4.3.2: Future Scope of Smart Irrigation:**

- GSM can be added for sending SMS to concerned person in case of any problem.
- Other Parameters such as ambient temperature, light intensity and humidity can be measured.
- Pesticides and fertilizers can also be added automatically in the water.

### **4.3.3: Future Scope of System Monitor:**

- Automatic report generation of the status of all the system in the lab.
- More authority to admin to take control of the infected system like disabling the USB port, monitoring the open TCP ports, control of network device.
- Notification to admin when a suspicious activity takes place in the system.

### **4.3.4: Future Scope of Face Recognition based Attendance System:**

- Face Recognition based attendance system can be combined with other biometrics system for more security.
- As technology improves, higher-definition cameras will become available. Computer networks will be able to move more data, and processors will work faster. Facial-recognition algorithms will be better able to pick out faces from

an image and recognize them in a database of enrolled individuals. The simple mechanisms that defeat today's algorithms, such as obscuring parts of the face with sunglasses and masks or changing one's hairstyle, will be easily overcome.

- An immediate way to overcome many of these limitations is to change how images are captured. Using checkpoints, for example, requires subjects to line up and funnel through a single point. Cameras can then focus on each person closely, yielding far more useful frontal, higher-resolution probe images. However, wide-scale implementation increases the number of cameras required.
- Evolving biometrics applications are promising. They include not only facial recognition but also gestures, expressions, gait and vascular patterns, as well as iris, retina, palm print, ear print, voice recognition and scent signatures. A combination of modalities is superior because it improves a system's capacity to produce results with a higher degree of confidence. Associated efforts focus on improving capabilities to collect information from a distance where the target is passive and often unknowing.

#### **4.3.4: Future Scope of Department Application:**

- Can be implemented in all platform.
- Can provide chat messenger for user in group.
- Can provide rights to user to share and exchange information
- Provide facility to notify thought email.
- automated update of news and notices using notification.
- Provide facility to share .doc, .pdf and images.

\

## **5. MECHANISM TO COLLECT DATA**

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