REPORT OF MINI PROJECT

On

Smart Hostel Management and Security

Department of Computer Engineering and Application

GLA University,

Mathura - 281406

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DECLARATION

We hereby declare that the work which is being presented in the Mini project **"Smart Hostel Management & Security"**, is an authentic record of our own work carried under the supervision of Mr.Amir Khan, Technical Trainer, GLAU.

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It is a matter of great pleasure and privilege for us to present this report of mini project. Through this report, we would like to thank numerous people whose consistent support and guidance has been the standing pillar in architecture of this report.

To begin with, our sincere thanks to **Mr. Neeraj Agarwal .** I express thanks to **Mr.Anand Jalal (HOD – CSE)** who gave encouragement and valuable suggestions throughout the training.

I would like to express my sincere thanks to **Mr. Amir Khan**, for guiding me during the completion of the project.

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ABSTRACT

As the name specifies "SMART HOSTEL MANAGEMENT AND SECURITY" is project developed for managing various activities in the hostel. For the past few years the number of educational institutions is increasing rapidly. Thereby the number of hostels is also increasing for the accommodation of the students studying in this institution. And hence there is a lot of strain on the person who are running the hostel and software's are not usually used in this context. This particular project deals with the problems on managing a hostel and avoids the problems which occur when carried manually.

Identification of the drawbacks of the existing system leads to the development of IoT based hostel management system that will be compatible to the existing system with the system which is more users friendly and more sensors oriented.

We can improve the efficiency of the system, thus overcome the drawbacks of the existing hostel management and security. Less human error, Strength and strain of manual labour can be reduced, High security, Easy to handle, Easy record keeping, Backup data can be easily generated.

Contents

INTRODUCTION

1.1-General Introduction:

Internet of Things, as we probably are aware today, had not been around for quite a while. It was not until 1999 that Kevin Ashton was considered as the previous of the idea of Internet of Things (IoT). From that point forward, the IoT has advanced immensely from the individual visitor space to the substantial plant floor by either utilizing conventional innovation, for example, Radio Frequency Identification (RFID), Wireless Sensor Network, Bluetooth or exploiting the Cloud registering offices accessibility. It has offered us a Smart City including keen home, savvy city and clean-living condition. The term of IoT is a straightforward idea that the Internet advances from a path for gadgets to be smarted and interconnected. These gadgets can accumulate prepared information and settle on choices fittingly.

Smart Hostel Management and Security is an IoT based project which comprises of many modules which will be required to make a smart hostel, managing it effectively and to have latest security features.

It will be a new idea of its kind which is believe to bring a lot of new features to the existing model of our hostel system which is becoming old-fashioned day by day.

The project undoubtedly, will deliver lot of new ideas which ranges from making a simple infrastructure to a fully automated system. The project will ensure to have all the latest trends, technologies and equipment which will definitely make this idea to be implemented on real ground.

The need of the hour is to realize the importance of an emerging technology i.e. IoT and its vast-varying applications. The project after completion will ensure a new sighted change and will help today's generation with all the ease of having a smart hostel, managing it on prior basis, security and maintenance.

The benefits of this project will definitely be a helping hand to all the hostel inmates, wardens and staff members which on priority are the first and last beneficiary of it.

The conclusion of the project is to make it a less human interference one and to rely more on our current technologies. This will ensure to have large scale impact on the current use of the hostel system.

1.2-Area of Computer Science:

Internet of Things (IoT) is the networking of physical objects that contain electronics embedded within their architecture in order to communicate and sense interactions amongst each other or with respect to the external environment. In the upcoming years, IoT-based technology will offer advanced levels of services and practically change the way people lead their daily lives. Advancements in medicine, power, gene therapies, agriculture, smart cities, and smart homes are just a very few of the categorical examples where IoT is strongly established.

Over 9 billion 'Things' (physical objects) are currently connected to the Internet, as of now. In the near future, this number is expected to rise to a whopping 20 billion.

There are four main components used in IoT:

1. **Low-power embedded systems –**
   Less battery consumption, high performance are the inverse factors play a significant role during the design of electronic systems.
2. **Cloud computing –**
   Data collected through IoT devices is massive and this data has to be stored on a reliable storage server. This is where cloud computing comes into play. The data is processed and learned, giving more room for us to discover where things like electrical faults/errors are within the system.
3. **Availability of big data –**
   We know that IoT relies heavily on sensors, especially real-time. As these electronic devices spread throughout every field, their usage is going to trigger a massive flux of big data.
4. **Networking connection –**
   In order to communicate, internet connectivity is a must where each physical object is represented by an IP address. However, there are only a limited number of addresses available according to the IP naming. Due to the growing number of devices, this naming system will not be feasible anymore. Therefore, researchers are looking for another alternative naming system to represent each physical object.

1.3-Hardware and Software Requirement:

Software Specification:

- **Technology Implemented** **:** IOT
- **Language Used** **:** Embedded C, Python
- **Database** **:** Cloud
- **User Interface Design** **:** Arduino IDE, Blynk App
- **Web Browser** **:** Chrome, Explorer, Firefox etc.
-

Hardware Requirements:

- **Processor** **:** Core i5
- **Operating System** **:** Windows
- **RAM** **:** 4GB
- **Hardware Devices** **:** Node MCU, Servo Motor,MQ2 Sensor, Ultrasonic Sensor, DHT11 Sensor, Buzzer, Arduino UNO, Wires
- **Hard disk** **:** 1 TB, Graphic Card
- **Display** **:** Laptop Screen

Methodology

The process of developing a complex product that tightly couples hardware devices with high –level software services requires an additional level of planning. For this project, we will exercise a proper product development approach to help you get familiar with the process of creating real –world hardware projects. This method can then be used to plan your own projects and take them to the next level. The following diagram describes a typical prototype development process, which always begins by defining the major goals that you want to achieve with your product:

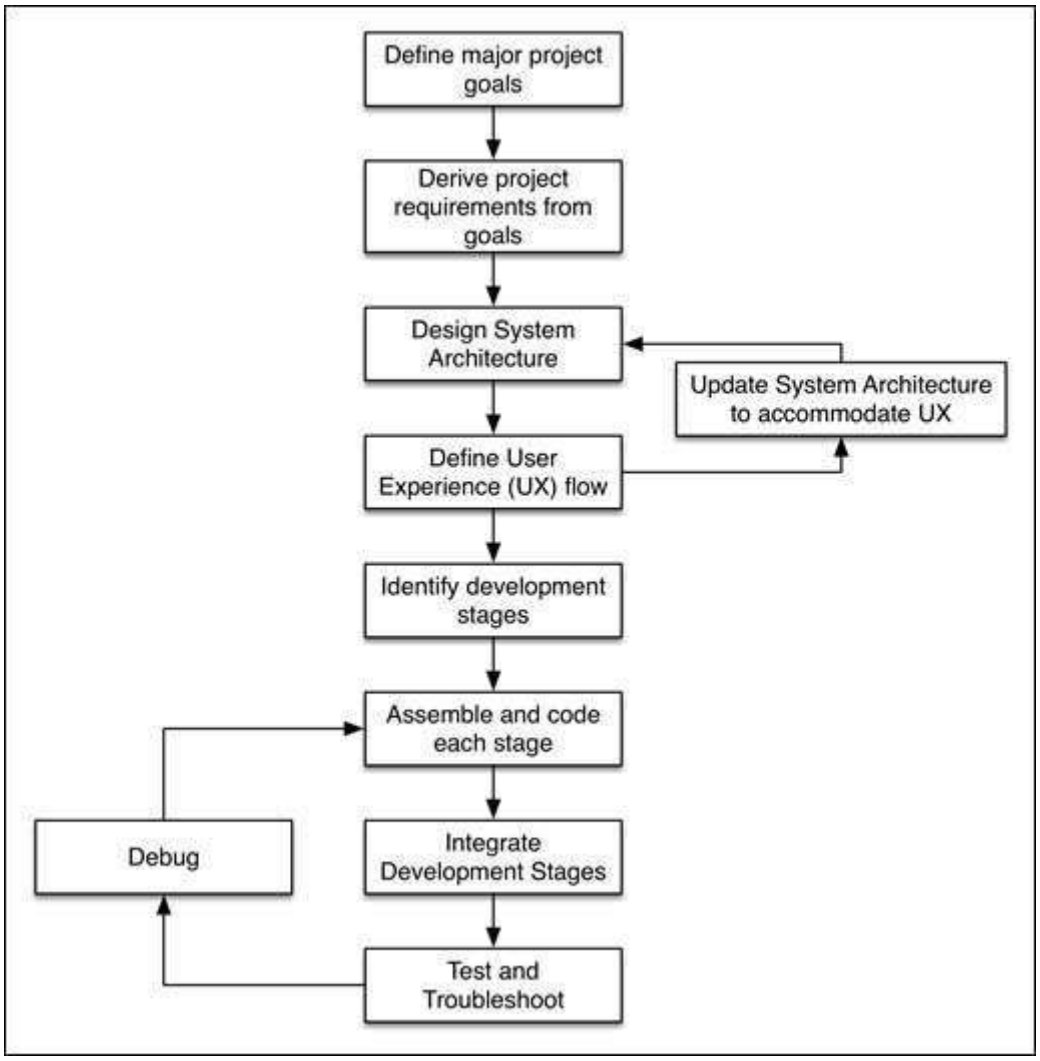

Fig: 2.1 (Methodology used in the project)

Hardware Specifications

Ultrasonic Sensor:

Ultrasonic sensors are used around the world, indoors and outdoors in the harshest conditions, for a variety of applications. Our ultrasonic sensors, made with piezoelectric crystals, use high frequency sound waves to resonate a desired frequency and convert electric energy into acoustic energy, and vice versa. Sound waves are transmitted to and reflected from the target back to the transducer. Targets can have any reflective form, even round. Certain variables, such as target surface angle, changes in temperature and humidity, and reflective surface roughness, can affect the operation of the sensors.

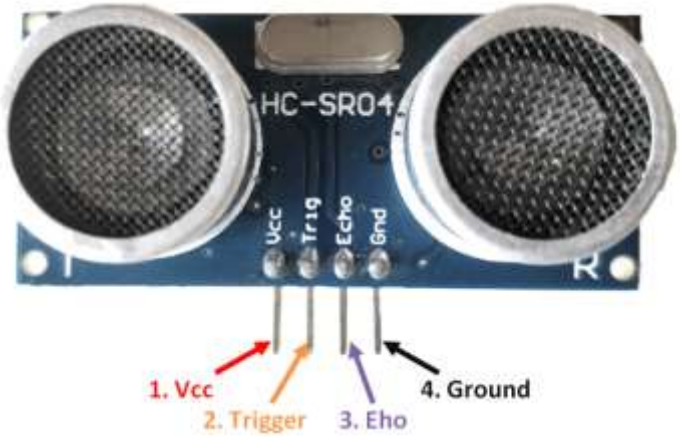

Fig: 3.1 (Image of Ultrasonic Sensor)

There are two types of ultrasonic sensors:

Proximity Detection: An object passing within the preset range will be detected and generate an output signal. The detect point is independent of target size, material or reflectivity.

Ranging Measurement: Precise distance(s) of an object moving to and from the sensor are measured via time intervals between transmitted and reflected bursts of ultrasonic sound. Distance change is continuously calculated and outputted.

Sensor Features:

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

Ultrasonic Sensor – Working:

As shown above the HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

Distance = Speed × Time

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below

Now, to calculate the distance using the above formulae, we should know the Speed and time. Since we are using the Ultrasonic wave we know the universal speed of US wave at room conditions which is 330m/s. The circuitry inbuilt on the module will calculate the time taken for the US wave to come back and turns on the echo pin high for that same particular amount of time, this way we can also know the time taken. Now simply calculate the distance using a microcontroller or microprocessor.

How to use the HC-SR04 Ultrasonic Sensor:

HC-SR04 distance sensor is commonly used with both microcontroller and microprocessor platforms like Arduino, ARM, PIC, Raspberry Pie etc. The following guide is universally since it has to be followed irrespective of the type of computational device used.

Power the Sensor using a regulated +5V through the Vcc ad Ground pins of the sensor. The current consumed by the sensor is less than 15mA and hence can be directly powered by the on board 5V pins (If available). The Trigger and the Echo pins are both I/O pins and hence they can be connected to I/O pins of the microcontroller. To start the measurement, the trigger pin has to be made high for 10uS and then turned off. This action will trigger an ultrasonic wave at frequency of 40Hz from the transmitter and the receiver will wait for the wave to return. Once the wave is returned after it getting reflected by any object the Echo pin goes high for a particular amount of time which will be equal to the time taken for the wave to return back to the sensor.

The amount of time during which the Echo pin stays high is measured by the MCU/MPU as it gives the information about the time taken for the wave to return back to the Sensor. Using this information the distance is measured as explained in the above heading.

Applications:

- Used to avoid and detect obstacles with robots like biped robot, obstacle avoider robot, path finding robot etc.
- Used to measure the distance within a wide range of 2cm to 400cm
- Can be used to map the objects surrounding the sensor by rotating it

- Depth of certain places like wells, pits etc. can be measured since the waves can penetrate through water.

MQ-2 SENSOR:

MQ2 gas sensor can be used to detect the presence of LPG, Propane and Hydrogen, also could be used to detect Methane and other combustible steam, it is with low cost and suitable for different application. Sensor is sensitive to flammable gas and smoke. Smoke sensor is given 5 volt to power it. Smoke sensor indicate smoke by the voltage that it outputs .More smoke more output. A potentiometer is provided to adjust the sensitivity. Sn02 is the sensor used which is of low conductivity when the air is clean. But when smoke exist, an analog output is produced based on the concentration of smoke. The circuit has a heater. Power is given to heater by VCC and GND from power supply. The circuit has a variable resistor. The resistance across the pin depends on the smoke in air in the sensor. The resistance will be lowered if the content is more. And voltage is increased between the sensor and load resistor.

Fig: 3.2 (Image of MQ2 Sensor)

Specifications:

- Wide range sensitivity to combustible gas.
- Better sensitivity to Propane, LPG and Hydrogen
- Low cost and better life
- Drive circuit is simple.
- Sensor Type : Semiconductor
- Concentration : 300-10000ppm (Combustible gas)
- Supply voltage =5v

Working Principle:

Using an MQ sensor it detects a gas is very easy. You can either use the digital pin or the analog pin to accomplish this. Simply power the module with 5V and you should notice the power LED on the module to glow and when no gas it detected the output LED will remain turned off meaning the digital output pin will be 0V. Remember that these sensors have to be kept on for pre-heating time (mentioned in features above) before you can actually work with it. Now, introduce the sensor to the gas you want to detect and you should see the output LED to go high along with the digital pin, if not use the potentiometer until the output gets high. Now every time your sensor gets introduced to this gas at this particular concentration the digital pin will go high (5V) else will remain low (0V).

You can also use the analog pin to achieve the same thing. Read the analog values (0-5V) using a microcontroller, this value will be directly proportional to the concentration of the gas to which the sensor detects. You can experiment with this values and check how the sensor reacts to different concentration of gas and develop your program accordingly.

Applications:

- Detects or measure Gases like LPG, Alcohol, Propane, Hydrogen, CO and even methane
- Air quality monitor
- Gas leak alarm
- Safety standard maintenance
- Maintaining environment standards in hospitals

DHT-11 SENSOR:

This DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity sensor capability. It is integrated with a high-performance 8-bit micro controller. Its technology ensures the high reliability and excellent long-term stability. This sensor includes a resistive element and a sensor for wet NTC temperature measuring devices. It has excellent quality, fast response, anti-interference ability and high performance.

Each DHT11 sensors features extremely accurate calibration of humidity calibration chamber. The calibration coefficients stored in the OTP program memory, internal sensors detect signals in the process, we should call these calibration coefficients. The single-wire serial interface system is integrated to become quick and easy. Small size, low power, signal transmission distance up to 20 meters, enabling a variety of applications and even the most demanding ones. The product is 4-pin single row pin package. Convenient connection, special packages can be provided according to users need.

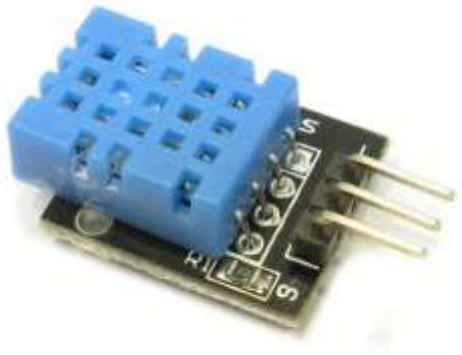

Fig: 3.3 (Image of DTH-11 Sensor)

Specifications:

- Supply Voltage: +5 V
- Temperature range :0-50 °C error of ± 2 °C
- Humidity :20-90% RH ± 5% RH error
- Interface: Digital

Working of DHT11 Sensor:

DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form.

For measuring temperature this sensor uses a Negative Temperature coefficient thermistor, which causes a decrease in its resistance value with increase in temperature. To get larger resistance value even for the smallest change in temperature, this sensor is usually made up of semiconductor ceramics or polymers.

The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree accuracy. Humidity range of this sensor is from 20 to 80% with 5% accuracy. The sampling rate of this sensor is 1Hz .i.e. it gives one reading for every second. DHT11 is small in size with operating voltage from 3 to 5 volts. The maximum current used while measuring is 2.5mA. DHT11 sensor has four pins- VCC, GND, Data Pin and a not connected pin. A pull-up resistor of 5k to 10k ohms is provided for communication between sensor and micro-controller.

Applications:

This sensor is used in various applications such as measuring humidity and temperature values in heating, ventilation and air conditioning systems. Weather stations also use these sensors to predict weather conditions. The humidity sensor is used as a preventive measure in homes where people are affected by humidity. Offices, cars, museums, greenhouses and industries use this sensor for measuring humidity values and as a safety measure.

Servo Motor:

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.

The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models.

More sophisticated servomotors use optical rotary encoders to measure the speed of the output shaft and a variable-speed drive to control the motor speed. Both of these enhancements, usually in combination with a PID control algorithm, allow the servomotor to be brought to its commanded position more quickly and more precisely, with less overshooting.

Fig: 3.4 (Image of Servo motor)

Servo motor has three pins for its operation as:

•+VCC (RED)

- Connect +VCC supply to this pin. For SG90 Micro Servo it is 4.8 V (~5V).

•Ground (BROWN)

- Connect Ground to this pin.

•Control Signal (ORANGE)

- Connect PWM of 20ms (50 Hz) period to this pin.

Principle of Operation of Servo Motors:

• It consists of dc motor, gear assembly and feedback control circuitry. PWM signal is used to control the servo motor. It is applied on control signal pin.

• Servo feedback control circuitry contains comparator which compares the control signal (PWM) and potentiometer reference signal to generate error signal which is later amplified and given to the DC motor.

• DC motor shaft is connected to potentiometer shaft (knob) through gear assembly. So rotating DC motor rotates potentiometer, which in term changes potentiometer reference signal given to the comparator.

• At some position of shaft, both potentiometer signal and control signal strength match, which produces zero error signal output. Hence rotation continues till comparator output error signal becomes zero and DC motor stops.

Buzzer:

It's simple, tone(buzzer, 1000) sends a 1KHz sound signal to pin 9, delay(1000) pause the program for one second and noTone(buzzer) stops the signal sound. The loop() routine will make this run again and again making a short beeping sound. Buzzers can be found in alarm devices, computers, timers and confirmation of user input such as a mouse click or keystroke.
There are also tone() and noTone() function.

A piezo buzzer is pretty sweet. It's not like a regular speaker that you might think of. It uses a material that's piezoelectric, it actually changes shape when you apply electricity to it. By adhering a piezo-electric disc to a thin metal plate, and then applying electricity, we can bend the metal back and forth, which in turn creates noise.

The faster you bend the material, the higher the pitch of the noise that's produced. This rate is called frequency. Again, the higher the frequency, the higher the pitch of the noise we hear.

So basically, by shocking the plate over and over really fast, we can make noise. I don't know who comes up with this stuff, but they're frigging mean.

Fig: 3.5 (Image of Buzzer)

Features:

1)Use an S8550 PNP transistor for drive
2)Convenient control by program
3)Working voltage: 3.3 - 5V; PCB size: 2.0 x 2.0 cm
4)With power light and indicator of digital signal output

Applications:

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows.

Arduino:

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Its products are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form or as do-it-yourself (DIY) kits.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (For prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers can be programmed using C and C++ programming languages. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats and motion detectors.

The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

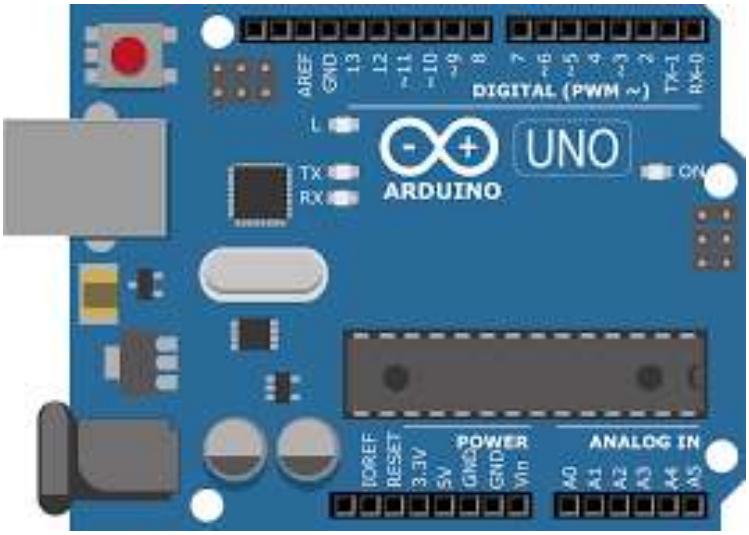

Fig: 3.6 (Image of Arduino Uno Board)

Features of Arduino Uno Board:

The features of Arduino Uno ATmega328 includes the following.

- The operating voltage is 5V
- The recommended input voltage will range from 7v to 12V
- The input voltage ranges from 6v to 20V
- Digital input/output pins are 14
- Analog i/p pins are 6
- DC Current for each input/output pin is 40 mA
- DC Current for 3.3V Pin is 50 mA
- Flash Memory is 32 KB
- SRAM is 2 KB
- EEPROM is 1 KB
- CLK Speed is 16 MHz

Applications of Arduino Uno Board:

The applications of Arduino Uno include the following.

- Arduino Uno is used in Do-it-Yourself projects prototyping.
- In developing projects based on code-based control
- Development of Automation System
- Designing of basic circuit designs.

How to Use an Arduino Uno:

Arduino Uno can detect the surroundings from the input. Here the input is a variety of sensors and these can affect its surroundings through controlling motors, lights, other actuators, etc. The ATmega328 microcontroller on the Arduino board can be programmed with the help of an Arduino programming language and the IDE (Integrated Development Environment). Arduino projects can communicate by software while running on a PC.

Once the Arduino IDE tool is installed in the PC, attach the Arduino board to the computer with the help of USB cable. Open the Arduino IDE & select the right board by choosing Tools–>Board..>Arduino Uno, and select the right Port by choosing Tools–>Port. This board can be programmed with the help of an Arduino programming language depends on Wiring.

Node MCU:

NodeMCU is an open source IoT platform.It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as la-cjson and SPIFFS.

NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems[6] began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core,[*citation needed*] widely used in IoT applications (see related projects). NodeMCU started on 13 Oct 2014, when Hong committed the first file of nodemcu-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glibto NodeMCU project,enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.

In summer 2015 the creators abandoned the firmware project and a group of independent contributors took over. By summer 2016 the NodeMCU included more than 40 different modules. Due to resource constraints users need to select the modules relevant for their project and build a firmware tailored to their needs.

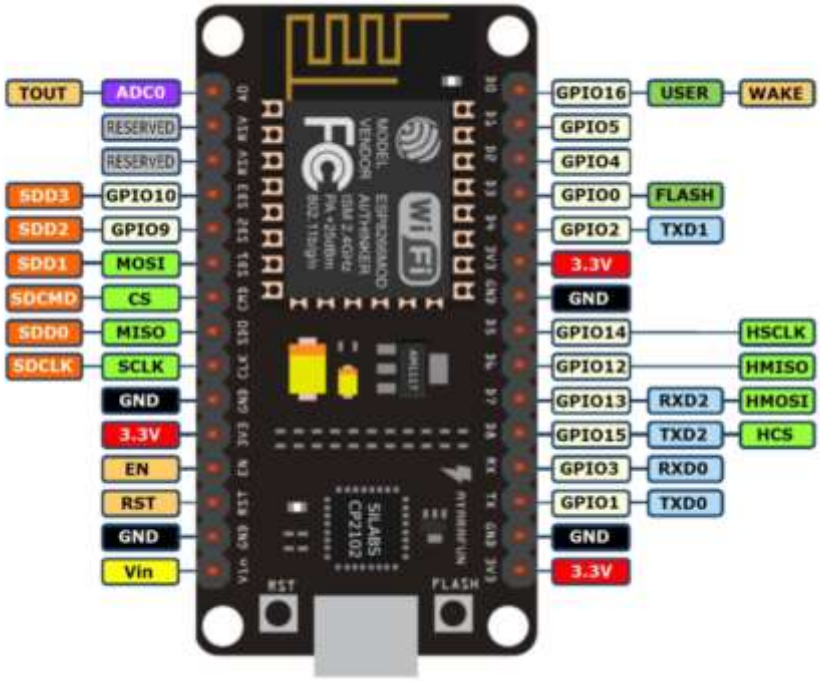

Fig: 3.7 (Image of Node MCU Board)

NodeMCU V3 Features:

- Open-source
- Arduino-like hardware
- Status LED
- Micro USB port
- Reset/Flash buttons
- Interactive and Programmable
- Low cost
- ESP8266 with inbuilt Wi-Fi
- USB to UART converter
- GPIO pins

BLYNK APP:

4.1 Introduction:

Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets.

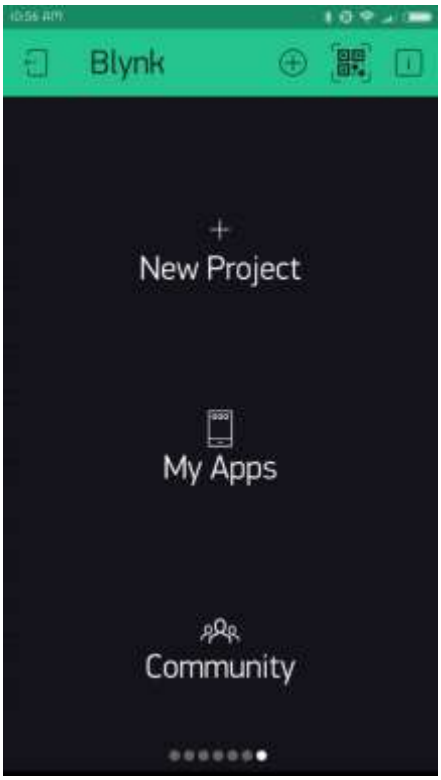

Fig: 4.1 (Home Page Of Blynk App)

Blynk application can be found from the following links –

1. Android Blynk App

2. IOS Blynk App

After downloading the app, create an account and log in. (If possible than log in with your real mail id for better connectivity later.)

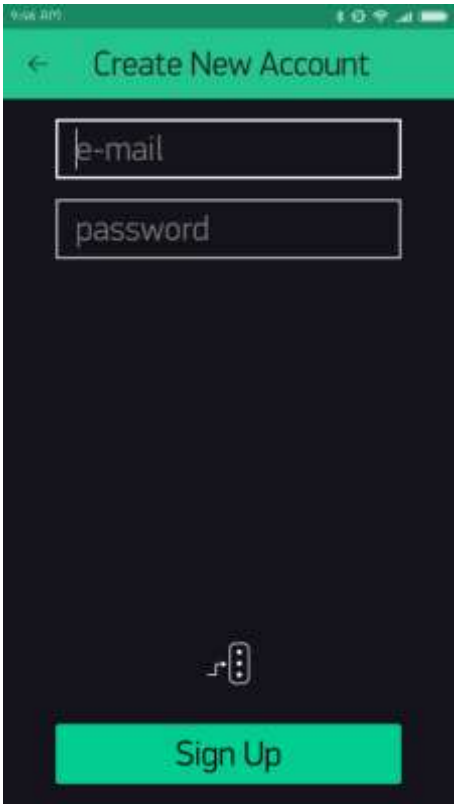

Fig: 4.1.1 (Sign Up Page Of Blynk App)

You'll also need to install the Blynk Arduino Library, which helps generate the firmware running on your ESP8266. Download the latest release from https://github.com/blynkkk/blynk-library/releases , and follow along with the directions there to install the required libraries.

4.2 Create a Blynk Project:

Click the "Create New Project" in the app to create a new Blynk app. Give it any name.

Blynk works with hundreds of hardware models and connection types. Select the Hardware type. After this, select connection type. In this project we have select WiFi connectivity.

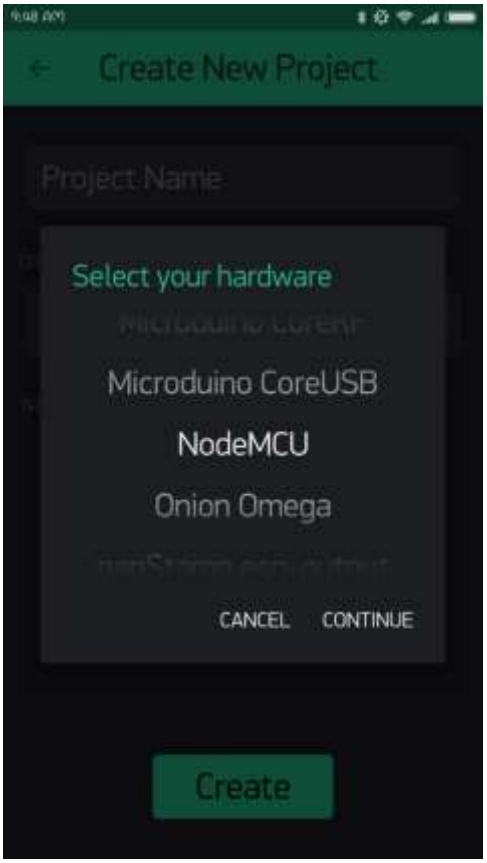

Fig: 4.2.1 (Select Board Page)

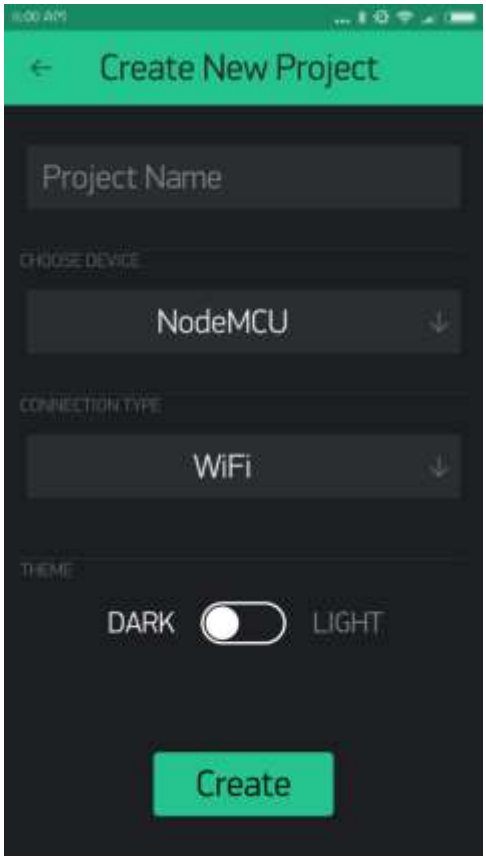

Fig: 4.2.2 (Create New Project Page)

The Auth Token is very important – you'll need to stick it into your ESP8266's firmware. For now, copy it down or use the "E-mail" button to send it to yourself.

4.3 Add Widgets To The Project:

Then you'll be presented with a blank new project. To open the widget box, click in the project window to open.We are selecting a button to control Led connected with NodeMCU.

1. Click on Button.
2. Give name to Button say led.
3. Under OUTPUT tab- Click pin and select the pin to which led is connected to NodeMCU, here it is digital pin 2, hence select digital and under pin D2. And Click continue.

Under MODE tab- Select whether you want this button as "push button" or "Switch".

You have successfully created a GUI for Arduino.

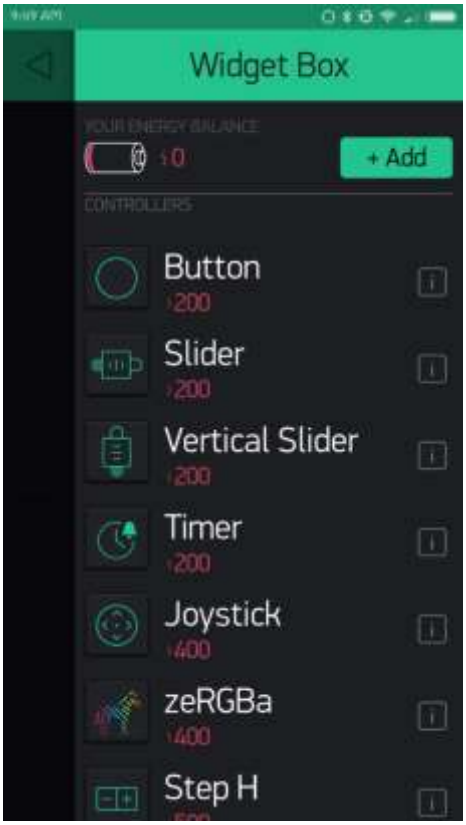

Fig: 4.3.1 (Widget Box Page)

Fig: 4.3.2 (Button Setting Page)

Full Working of Project

Ultrasonic Sensor with LED:

Ultrasonic Sensor is placed in student's room which is operating on Arduino UNO board and LED is also connected with the output coming from ultrasonic sensor. Whenever there is student present in student's room it will detect its present and automatically turn ON the lights of the room and also turns ON an LED in warden's room. So, that warden knows that you are present in the room.

Smoke Sensor with Buzzer and LED:

A smoke sensor (MQ2) is also present in the student's room and a buzzer is connected with the output coming from it. Whenever there is any smoke detected with room through fire on any other activity, the buzzer start beeping and an LED will turn ON in the wardens monitoring room.

Temperature and Humidity Sensor:

There is a temperature and humidity sensor is also placed in the student's room which will give the temperature and humidity reading on the serial monitor of the laptop.

Servo Motor:

Servo motor is connected through nodemcu and is controlled with blynk app by sending data to cloud. It is being controlled by a simple switch button and a slider. Switch control the simple opening and closing of the gate and slider controls how much you want to open the door.

Controlling LED:

With the help of blynk app two LED is controlled in the student's room where both LED's are representing as two appliances but as a demo we are using LED.

Data Flow Diagram

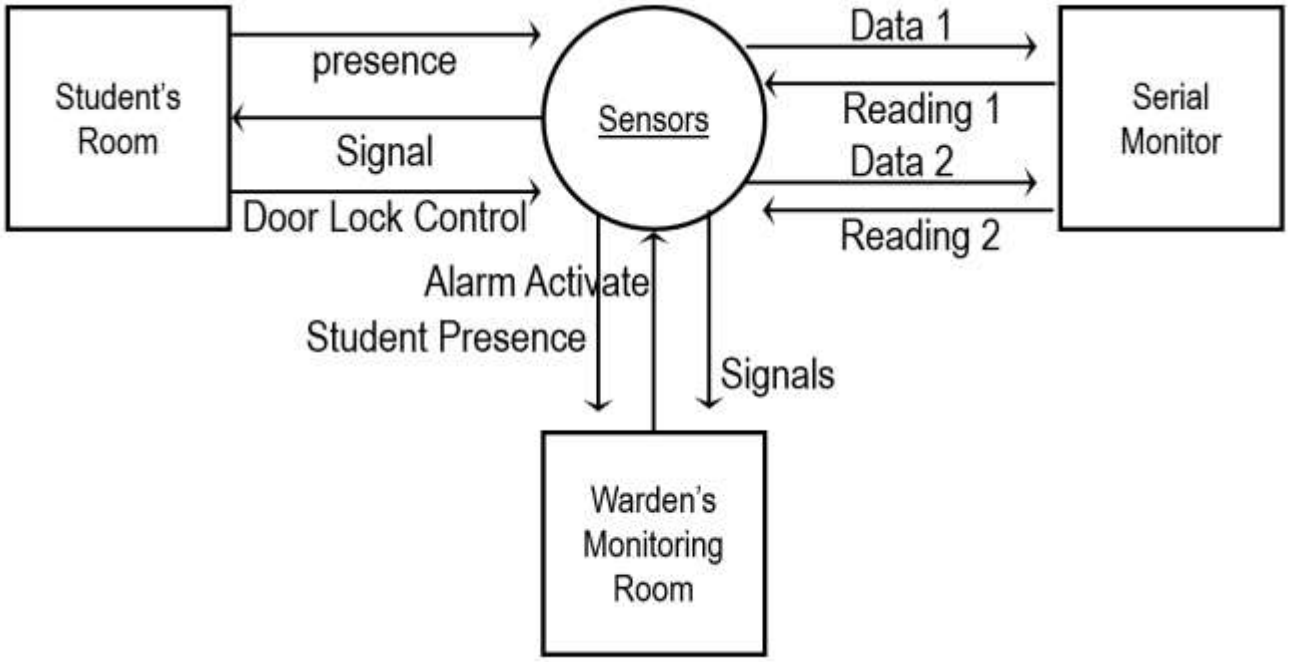

Fig 6.1 (DFD for Whole System)

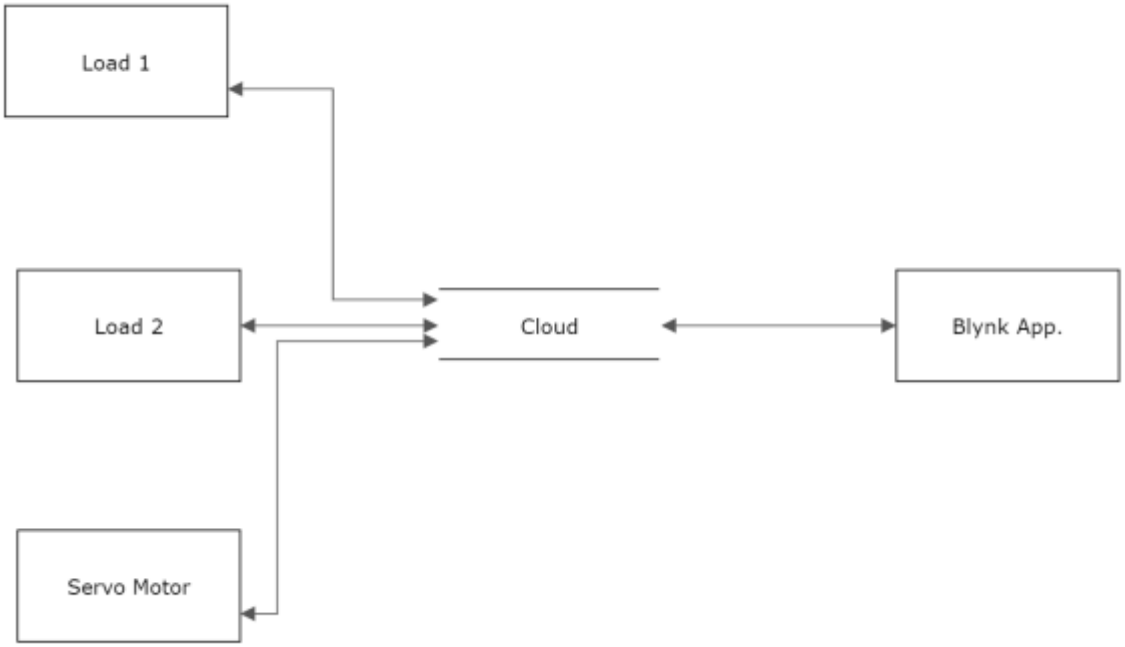

Fig 6.2 (DFD for Blynk App.)

Codes Related To Project

In Arduino UNO Board:

```
#include <dht11.h>
#define DHT11PIN 6

dht11 DHT11;
int trigPin = 9;
int echoPin = 10;
int led1 = 7;
int led2 = 12;


void setup() {
  Serial.begin(9600);
  pinMode(A0, INPUT);
  pinMode(4, OUTPUT);
  pinMode(3, OUTPUT);
pinMode(led1, OUTPUT);
pinMode(led2, OUTPUT);
   pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
}

void loop() {
int a=analogRead(A0);
if(a>300){
  digitalWrite(4, LOW);//buzzer
  digitalWrite(5, HIGH);//led
}
else{
  digitalWrite(4, HIGH);
  digitalWrite(5, LOW);
}
Serial.println("analog");
Serial.println(a);
int chk = DHT11.read(6);

  Serial.print("Humidity (%): ");
  Serial.println((float)DHT11.humidity, 2);

  Serial.print("Temperature (C): ");
  Serial.println((float)DHT11.temperature, 2);
```

```
  long duration, distance;
  digitalWrite(trigPin,HIGH);
  delayMicroseconds(1000);
  digitalWrite(trigPin, LOW);
  duration=pulseIn(echoPin, HIGH);
  distance =(duration/2)/29.1;
  Serial.print(distance);
  Serial.println("CM");
  delay(10);

 if((distance<=10))
  {
    digitalWrite(led1, HIGH);
    digitalWrite(led2, HIGH);
}
   else if(distance>10)
 {
     digitalWrite(led1, LOW);
     digitalWrite(led2, LOW);
   }
delay(500);
}
```

In Nodemcu Board:

```
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <Servo.h>

Servo servo;

char auth[] = "j0M9UF02mwjFAOmN4RkPanTok6gwMqKW"; //  your auth code
char ssid[] = "VenomZone";  // ssid name
char pass[] = "aman12346"; // ssid password

void setup()
{
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);

  servo.attach(2); // NodeMCU D4 pin

 }

void loop()
{
```

```
  Blynk.run();
  Blynk.run();
}
BLYNK_WRITE(V1)
{
   servo.write(param.asInt());
}
BLYNK_WRITE(V2)
{
   servo.write(param.asInt());
}
```

Images and Screenshots related to projects:

Fig: 8.1 (Project GUI)

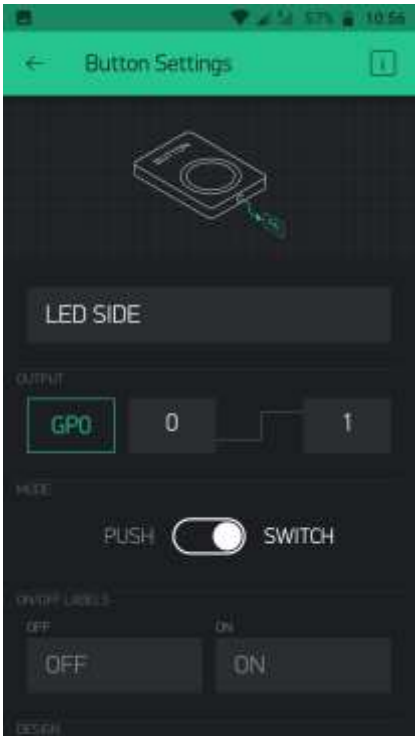

Fig: 8.2 (LED button Setting)

Fig: 8.3 (LED Button Setting)

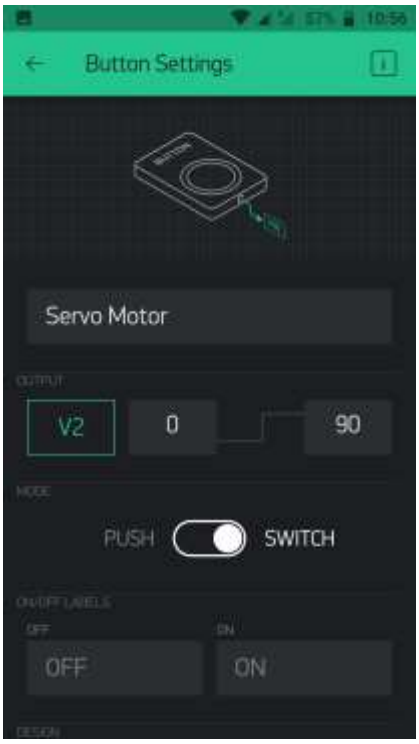

Fig: 8.4 (Servo Motor Setting)

Fig: 8.5 (Servo Slider Setting)

Fig: 8.6 (Project Front View)

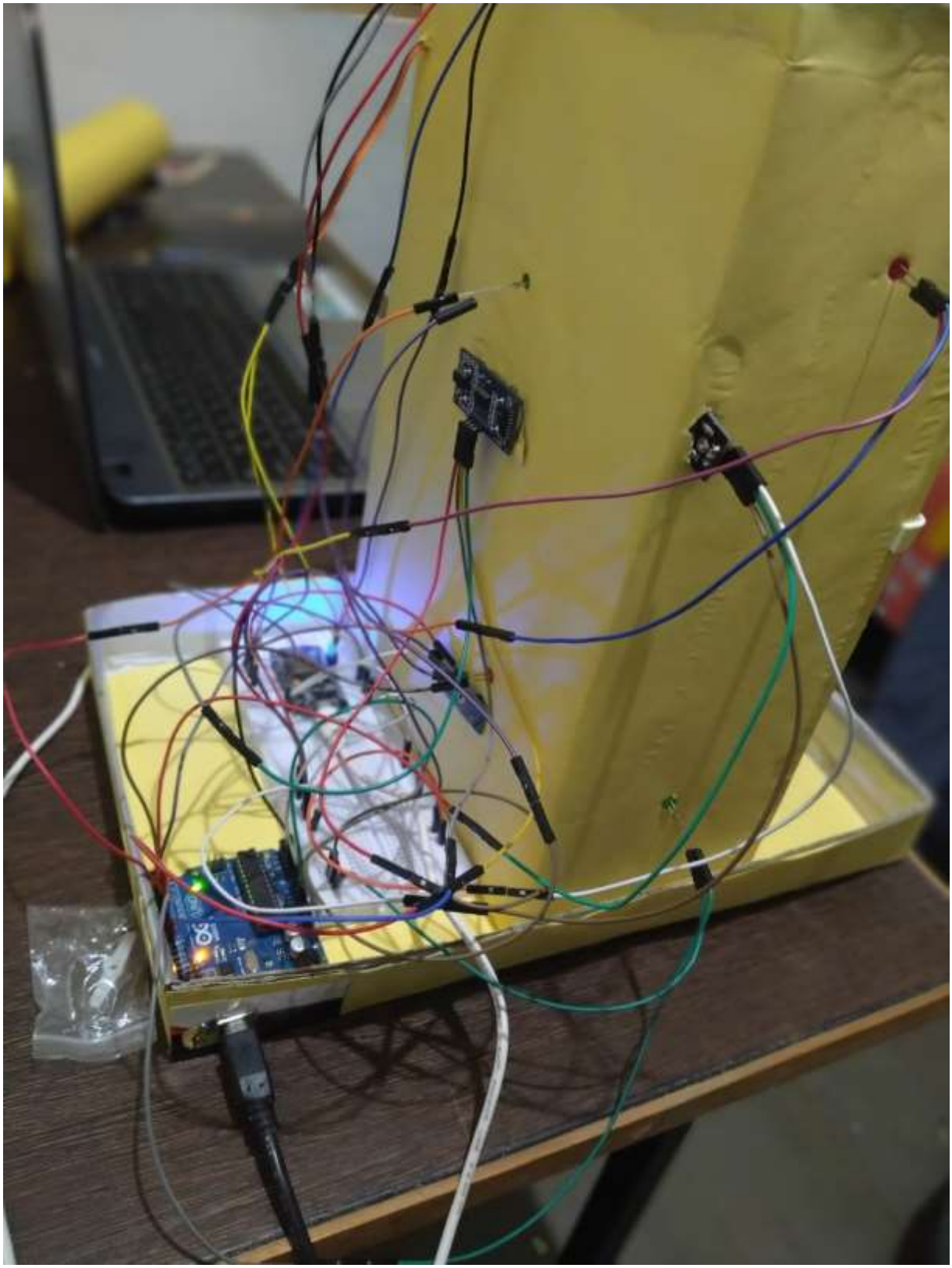

Fig: 8.7 (Circuit & Connections Images)

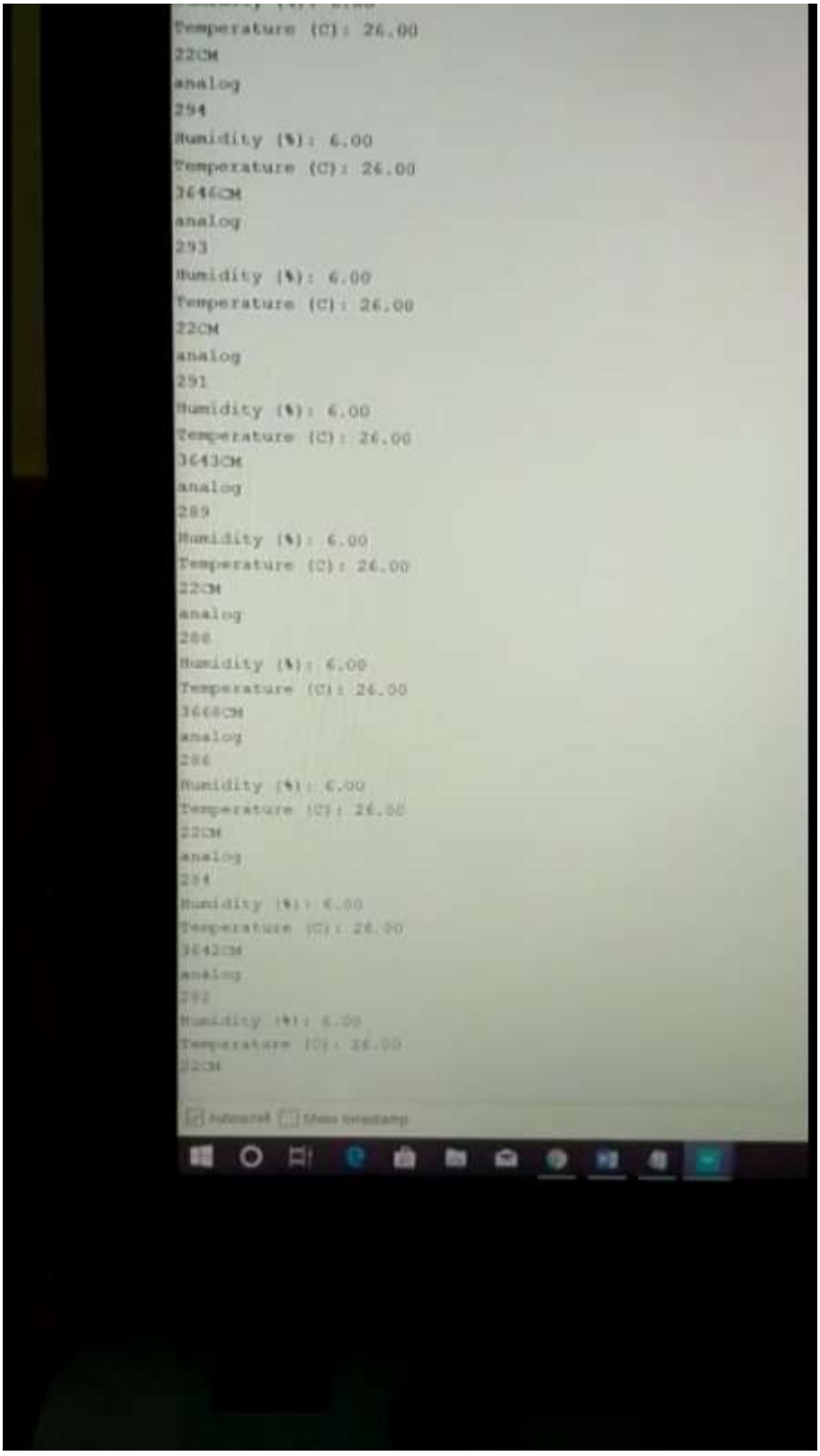

Fig: 8.8 (Serial Monitor)

Contribution summary

The team is doing a fantastic job for making this project. The credit of the work completed till now goes to each and every member of the team. Their commitment and devotion towards the work will definitely make this project a great one.

The work done by each member is as followed:

Animesh Raghuvanshi: is responsible for making all the necessary arrangements for this project. This include the work like making arrangement for all the apparatus like Node MCUs, wires, LEDs,Actuaors etc.

Aman Singh and Mayank Gupta: have made all the necessary connection for this project which includes like making a appropriate connections in Node MCUs, with the actuators and sensors and have checked they are working in a proper manner.

Kartik Agrawal: is responsible for all the programming aspects of the project which includes making changes in the code as per the conditions or situations provided to us. He is responsible for making the code related to Node MCU and Arduino UNO.

Work Completed:

Till now we have worked on the following aspects of the project which has been completed till date. This includes:

1. We have successfully made the module for avoiding wastage of electricity in the hostels using Ultrasonic Sensor and Blynk App.

2. The automatic door locking system has also been created successfully and is showing positive results with Servo motor used in the project.

3. Implementation of 3-D model of the project.
4. Used Buzzer with MQ-2 Sensor.
5. For checking the rise in temperature and humidity we have use DHT11 Sensor.
6. Inculcate the value of IoT among the students.

Applications

1. Reduce the excess wastage of electricity in hostels.
2. Increases the security of students from theft.
3. Save the hostel inmates from fire accidents.
4. Prevent students from smoking activities.

Future Perspective

Now we have implemented the project on a small basis but we can expand it on a large basis in which we can use multiple sensor to automate whole hostel. Such that if we have left tap open then it will automatically close it. We are using pyro electric on a small basis but it can be extended and can be used all over the hostel and mess which will convert pressure into electricity. This will lead us to generate power and help us to save money.

All the functionality can be extended in office, dispensary, gym, playgrounds, common room, class rooms etc. We will also see the maintenance in the addition of the above project and will add module with the same after new problems will come.

Seeing the development of the project in the future, we will try to add image processing as new emerging technology in our project and it will definitely add a boost-up to this idea.

References

1. https://www.geeksforgeeks.org/
2. https://www.researchgate.net/
3. Wikipedia
4. https://subscription.packtpub.com