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App Based Device Controlling System

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Abstract: This project aims at controlling electrical appliances with the help of Arduino Uno using an android app. This is mainly designed keeping in mind the advantages it will offer in the university. It will help reduce wastage of electricity in the university and the expenditure towards paying the electricity bills. The app which has been installed on the smart phone helps us to remotely access devices and thus implement wireless technology. The design involves the use of Arduino Uno board and the appliances are connected using jumper wires and a breadboard. The communication between phone and Arduino Uno is wireless. Also, authentication token generation will ensure that only authorized users access or control the appliances in the university. This project will help automate electrical appliances and this will make the classrooms or cabins as smart classrooms or smart cabins. This IoT system designed will help control electrical appliances from anywhere in the university.

K***eywords:*** IOT,Arduino, devices, app, android, automation

1. INTRODUCTION

Internet of Things or IOT refers to collection of things having identities that are unique and also having connection with the internet.IOT is a new and a very revolutionizing concept and the progress in competencies in mobile devices and networking and cloud technologies drives this concept. Taking into consideration the large number of benefits that IoT offers, the project aims at controlling devices in our university with the help of an application in an android phone. Today's era is such where automation plays a vital role in human life. This not only reduces human efforts but also makes their life simpler and easier to live.Class automation or cabin automation will allow the students as well as the teachers to control electrical appliances like fan,light, projector, etc.The project aims at controlling electrical appliances using an app-based interface. The three main features of the project include controlling the intensity ofthe LED wirelessly and adjusting its brightness with the help of a mobile application, and controlling the speed of a fan based on the temperature of the room. Firstly, this ensures that users are not required to manually switch off the appliance, and secondly, it allows control of appliances from the main switch board. The main purpose of the project is to avoid the wastage of electricity in VIT University. The system can be implemented in our university for controlling electrical appliances in classrooms. It can also be used by the teachers to control the devices in their cabins and prevent wastage of power during their lecture hours.This can prevent high expenditure on electricity and make our campus more environment friendly and energy efficient. The basic architecture involves Arduino Uno, which is connected to the DC motor and the LED with the help of jumper wires.

Phone-based control and display is done through the mobile interface Blynk, which is connected to the setup through WiFi. Blynk is downloadable software that provides a user-friendly platform for end users to control devices and receive output. The application has an inbuilt cloud server where data is stored. It can be configured and connected to the Arduino so that the user can control the devices from anywhere. Authentication of Blynk users is done through an authentication code sent to their emails at the time of configuration. This code may then be shared with other users to authorize access.

2. RELATED WORK

M Tazil and R.Piyare in [1] made use of cell phone, Arduino and remote control, Bluetooth for home automation. The design of this system is not very cost efficient because of the us

Al-Ali and Al-Rousan [2] designed a Java based automation system that can monitor and control home appliance via the World Wide Web but it does not consider that case when server is down.

Alkar, Ali Ziya, and UmitBuhur [3] have presented proposal and execution of a low cost but flexible and secure internet based home automation system. The communication is wireless.The protocol between the units in the design is made such that it is suitable foremost of the appliances.

For all disabled and elderly people Thoraya Obaid et al in [5] designed a smart system for home which is controlled by voice commands. Voice system and wireless system are the two key features of this system. They have made use of a

software called Lab View for incorporating voice element and ZigBee module for incorporating wireless system. The user can control appliances by sending data to the wireless system. The use of ZigBee makes it system consuming low power and also low cost.This Home automation system incorporates GSM, Internet and voice. The system implemented microprocessor and GSM SMS control method by a GSM modem. It is considered as low cost on the other hand the cost of GSM modem and microcontroller is not considered. Also, long term cost by the GSM is not fully accepted by every user.

In [6], VikasVatsand and Upendra Kumar discuss the implementation of smart temperature-based fan control using P.L.C software RS Logix 500 and a temperature sensor. This system can be implemented on a large scale to create energy-efficient appliances that save electricity.

A similar system is proposed in [7], where MdMozasserRahman, MohdFahrulRadzi Bin Zakariaand ShahrulNa'imSidek propose the construction of a smart table fan using LM35, PIR sensor and Arduino Mega. The smart table fan so designed is capable not only of changing speed with respect to temperature, but also of detecting the presence of humans and facing them by altering the angle of oscillations about its vertical axis.

In [8], the concept of intelligent household cooling appliances is further extended to the domain of fire safety and mitigation. In addition to temperature-based fan control, the circuit is equipped with fire detectors and alarms. This system is aimed at making the lives of senior citizens and differently abled individuals easier.

Blynk is a commonly used platform of cell phone-based control of Arduino-connected devices. The application allows remote monitoring, controlling as well as cloud-based storage and analytics. [9] Discusses the use of the platform in various IoT systems that implement home automation using Arduino Mega. The devices are connected to the internet via ESP8266 Wi-Fi Module, and may be controlled remotely using the Blynk interface, or using the TFT LCD Screen.

The use of Blynk API is further elaborated in [10], where the author explains the use of the interface with a Raspberry Pi to control household appliances and for security purposes. This system aims at creating and completely automated smart home, equipped with sensors, intelligent devices and security cameras. This project seeks to improve the quality of life of elderly and differently abled individuals, for whom manual operation of devices is difficult, and whose safety is a major concern.

Paper [11] elucidates the applications of IoT in making smart buildings. In the current day, many organizations strive to make their buildings such that higher requirements of performance are met by them. This paper analyses the factors that must be given importance in management of energy efficiently. IoT based system architectures are increasingly being used in making buildings of such institutions efficient by providing automatic remote controlled access to certain authenticated admins in the building. This prevents unnecessary expenditure of energy.

Use of IoT applications has increased with the rapid development of technology. Paper [12] speaks about use of IoT in home automation techniques. Smart homes are becoming increasingly popular as they provide features that are necessary in safeguarding the resident's security as well as leisure and comfort. For a central controller an Arduino microcontroller is used and as a user interface an application of Android is used.Under particular conditions programming the events can reduce the overall energy consumption by different electrical appliances.

Paper [13] discusses the procedures involved in controlling an Arduino board with smart phone and blynk via internet. Blynk can be used to create applications and acts as an intermediary human interface. Blynk has several widgets and tools which can be dragged and dropped from the toolbar. The project involves a simple Arduino board without an internet shield. The PC provides an interface to enter the authentication code to proceed with the application. The PC also ensures connectivity to the Arduino board and the app, to upload the code.

Temperature controlled fans are vital in Smart Energy efficient IoT systems. In paper [14], Gabriel Eng, discusses the mechanics behind the functioning of smart fans. The various components involved have also been discussed in great detail along with the connections involved. A detailed structured, circuit diagram has also been provided to provide clarity about the connections. The TMP36GT9Z temperature sensor has also been discussed in detail.

Paper[15] speaks about the applications of IoT on an industrial scale. The paper discusses the various devices in the industry which can be controlled using Arduino Uno and an IoT system architecture. It also discusses how various industrially vital parameters such as temperature, load current; moisture measurement etc. can be analysed using IoT based applications. Overall, the paper speaks about the large scope for automation using IoT technology.

3. PROPOSED WORK

A. Architecture

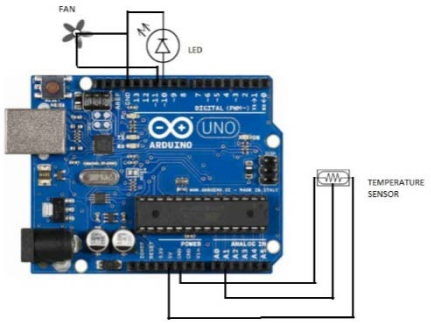

Figure1. Schematic Diagram of Various Modules

Figure 1 represents the connections of Arduino Uno with the LED,LM-35 and a DC motor.

B. Various Modules

1) *Arduino Uno* –It is a microcontroller board based on the ATmega328P.It has 14 digital input/output pins(out of which 6 can be used as PMW outputs),6 analog inputs, a 16MHz quartz crystal,a USB connection, a power jack,an ICSP header and a reset button [16].It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable to get started [17].

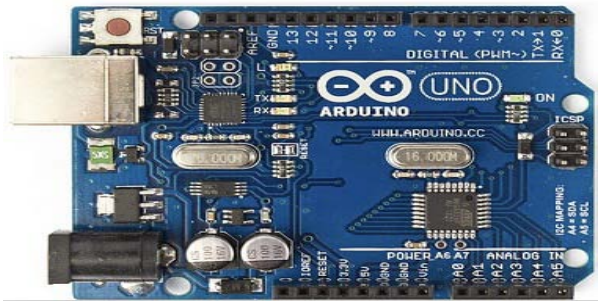

Figure 2. Arduino Uno Board

2) *Blynk App*–Blynk is the most user-friendly IoT platform for a reason.It is a smartphone application that allows us to create an interface that interacts with Internet-connected hardware. The interface can be freely downloaded into smartphones, and can be used for remote monitoring and control of IoT-controlled devices. To prevent misuse and unauthorized access, the application requires the user to enter an authentication code, which is sent to them via an email. Users may share this code with other individuals they wish to grant access to [18]. All data is stored on the Blynk Server, and can be exported by the user, in the form of a csv file. This data can then be used for further analysis.

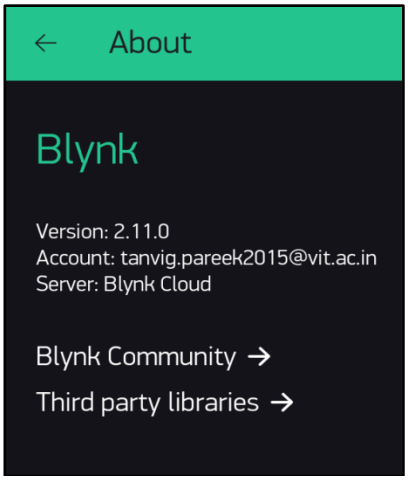

Figure3.Blynk App Account

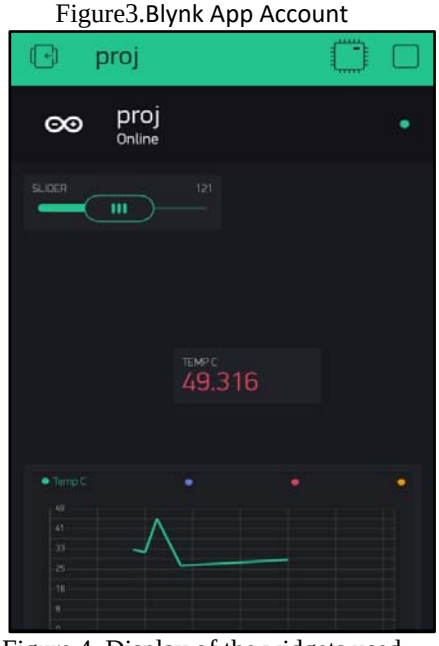

Figure 4. Display of the widgets used

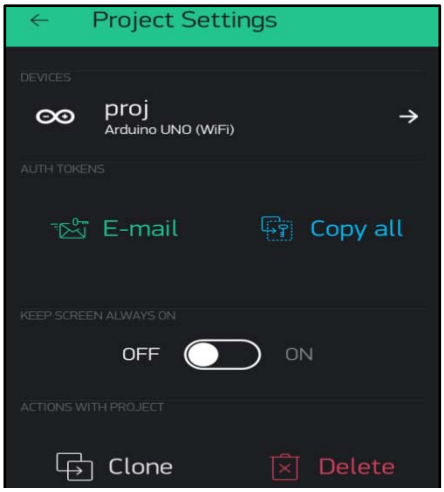

Figure5: Project Settings of Blynk App

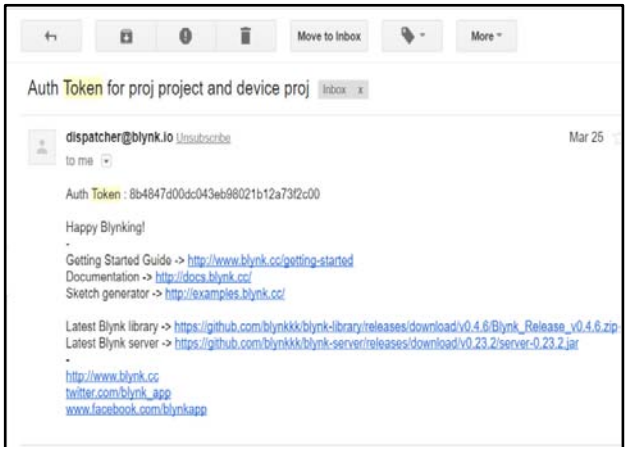

Figure 6. Authentication code for Blynk App

This is necessary for the purpose of security. This ensures that only authorized users can control the electrical appliances and others cannot misuse it.The authentication token generated in the project is emailed to the authorised user so that he/she can incorporate it in the arduino code and thus avail the benefit of this feature.

3) *LED*- A two-lead semiconductor light source whose full form is Light Emitting Diode. It is a pn junction diode, which emits light when activated. Although the LED is used in this project for representational purposes, the system can be extended to include other forms of lighting in classrooms, academic buildings and hostels.

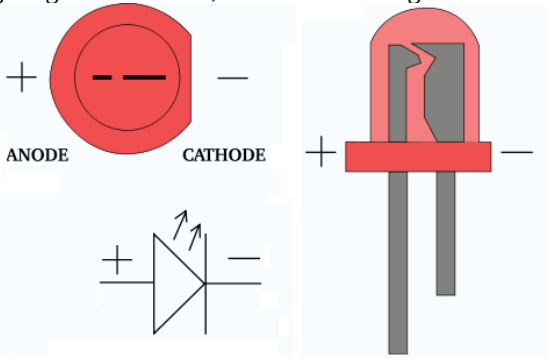

Figure 7. LED lights

4) *DC motor*- It is an electrical machine which converts electrical energy into mechanical energy.In this project, it is used for representation of cooling devices such

as fans and air conditioners, whose intensity of operation is varied on the basis of the atmospheric temperature.

Figure 8. DC Motor

5) *LM35*- It is a sensitive sensor that can be integrated with the circuit and used to measure temperature and produce an analog electrical output according to the temperature in Celsius. It has three input pins, namely ground and supply, which are attached to GND and %v pins of the Arduino. The output pin is connected to one of the Arduino's analog input pins to receive data from the sensor.

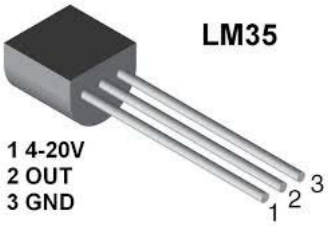

Figure9: Temperature sensor LM35

4. RESULTS

The results focus on three features:

1. Controlling the intensity of the LED via the slider on the app.
2. Controlling Speed of the fan depending on the room's temperature which is displayed on the app.
3. Storage of data onto Blynk Server, analysis of the results and representation in the form of a graph.

Figure10. Screenshot of the Application

Figure 11: Screenshot of the Command Prompt for connecting with the Blynk server

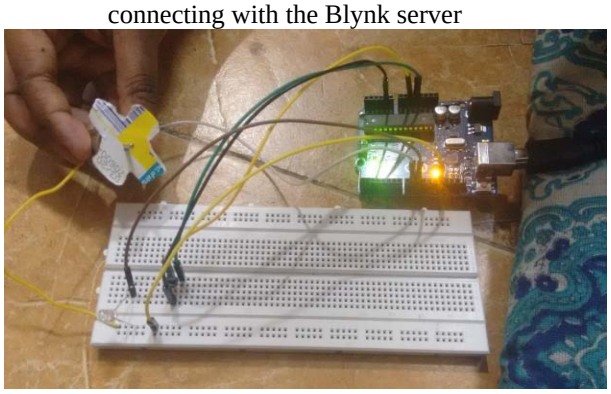

Figure 12

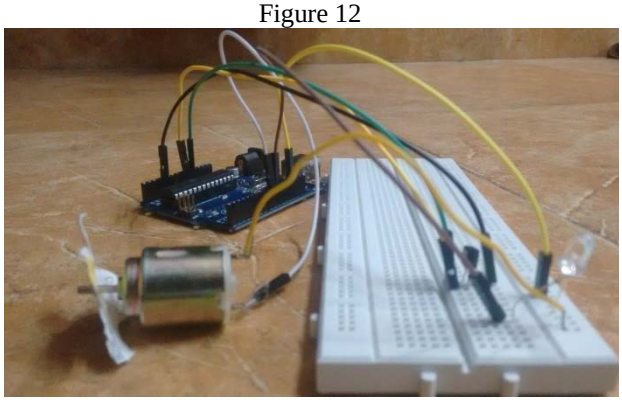

Figure 13

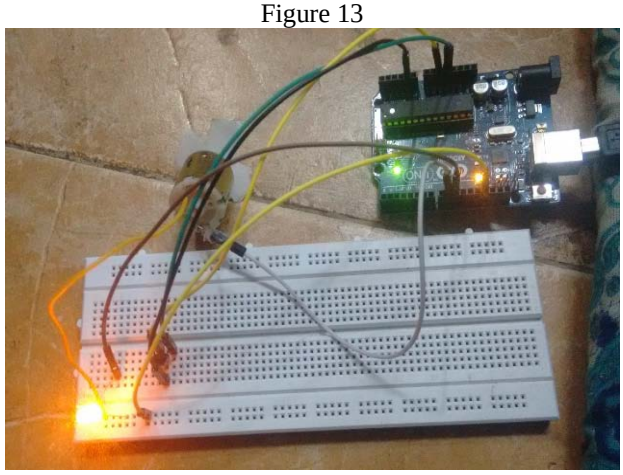

Figure 14

Figures 12, 13 and 14 depict the circuit. When the LED is switched on via the app and the fan rotates according to the temperature of the room. Here temperature is 27.83 hence fan rotates at a low speed.

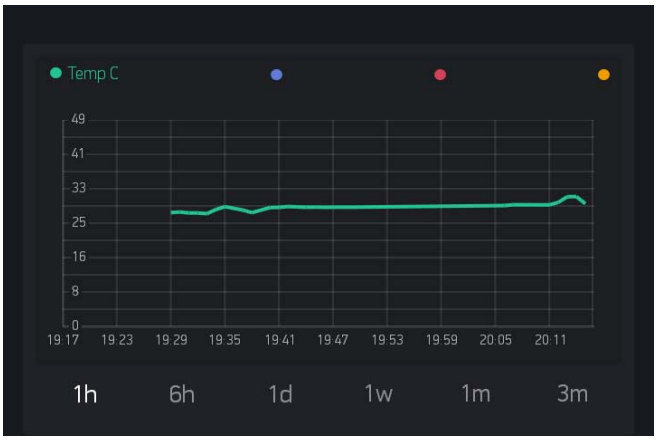

Figure 15.Representation of data with the help of a Graph

5. CONCLUSIONS

In conclusion, this app-based device controlling system is designed to reduce expenditure and make our lives easier.This can not only prevent high expenditure on electricity, but make our campus more environment friendly and energy efficient.
The connection via WiFi makes things much more beneficial as we can control the appliances from a great distance too.The wireless control by smart phone via the app makes sure that in case if a student or a faculty forgets to switch off the appliances while in a hurry,he/she won't have to go all the way back to the class or cabin respectively.This not only saves on time but also saves on energy consumption.Also, the automatic regulation of the speed of the fan depending on the temperature of the class or cabin ensures that the person doesn't have to get up and go all the way to the switch board to increase or reduce the speed.The switches on the app represent the real-time switches and therefore is very user friendly and can be used by everyone.

6. FUTUREWORK

For future work, we will try implementing app based device controlling system using voice and gesture technology.So, for voice control,voice commands can be communicated to the Arduino via smartphone App and thus according to the commands we will be able to switch on or off the appliances [19].For the gesture control, we could make use of accelerometer and then configure the three axes according to our needs and thus based on the gestures we give the appliances can be controlled.All the future work if implemented in a low cost and a proper way can help improvise the current system that we have proposed.

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