# Basic Home Automation

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*Abstract*—**Innovations in Home automation and IoT is one of the focused topic of the engineers and being developed; this paper focused on the basic application of home automation and IoT it only uses Door Lock system, Smart outlet plug, smart LED and temperature sensor and is being monitored and controlled just by using a computer or a mobile device wirelessly or wired-connection.**

*Keywords—IOT, Smart Home, Home Automation, Basic Home Automation, Arduino UNO Microcontroller*

## I. INTRODUCTION

Home Automation sometimes called a smart home or smart house is an automated central control of the systems found in your home this involves basic devices and systems like lighting, heating, etc.; Home automation gives you control over your devices at home from your mobile devices or computer just by using Internet but in order for the device to be controlled it must be programmed or design to be controlled by a user [1]. A smart house is a dream for every engineer since it provides easy access to the house devices and systems, and easy monitoring and controlling.
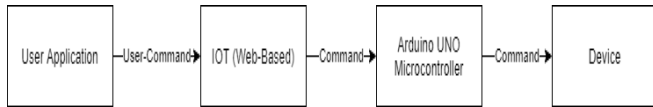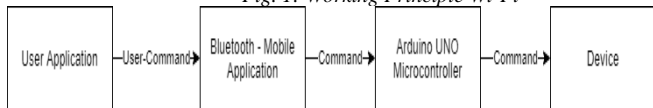


*Fig. 1: Working Principle Wi-Fi*



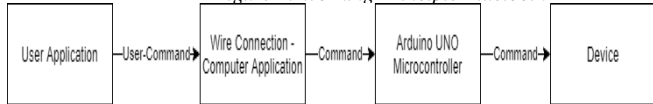*Figure 2: Working Principle Bluetooth*



*Figure 3: Working Principle Wire-Connection*

## II. DESIGN

### A. Design requirements

Automation system is required to provide convenience to the user, used to save energy and can be used easily [2].

### B. Design Parts

This parts are required in order for the system to work properly.

- **User-Application** – the system needs an application that is easy to use for the user. This is where the user can control devices just by clicking on the application.

- **IOT(Web-based)** – The application and the Microcontroller is connected to the server in order to the user command to be sent.

- **Arduino UNO** – this is the microcontroller that controls the devices connected to it, but it needs commands from the user for it to work.

- **Device** – this is the device that is being controlled by the user and the microcontroller.

- **Bluetooth Module** – this is where the mobile device can connect to the Arduino and the application [3].

- **Wire-Connection** – this is where the computer can connect to the Arduino and the application.

### C. Bluetooth Based connection through Mobile Devices

The application in your mobile phone can be connected using Bluetooth to the system.

- **HC-05 module** – is an Arduino UNO Bluetooth module and communicates to the Arduino via Serial Communication [4].
- **NRF24L01+ 2.4Ghz** – is an Arduino UNO Wi-Fi module that can give the Arduino access to you Wi-Fi network [5].

## III. SYSTEM FLOWCHART

This is the flow of the device where it checks if it is a Bluetooth, Wi-Fi, or Wired connection; it then connects to the main application where the user can control the devices that is connection to the system.
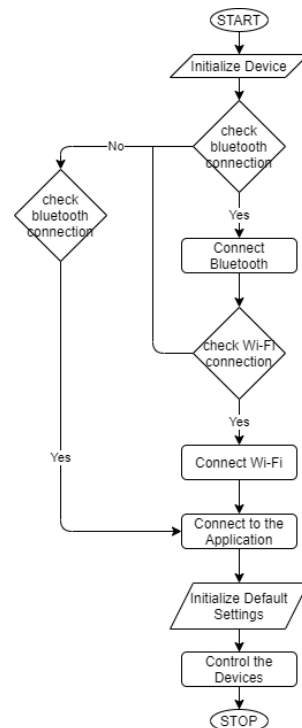


*Figure 4: Flowchart of the system*

## IV. COMPONENTS

This are the list of the components like microcontroller, modules, basic circuit parts used in the system.

- **Arduino UNO** – is a microcontroller based on ATmega328p [6].



*Figure 5: Arduino UNO*

- **DHT11 Sensor –** is a device that measures the temperature and humidity.



*Figure 6: DHT11*

- **Servo Motor** – is a device that rotate or push parts of a machine with great precision [8].
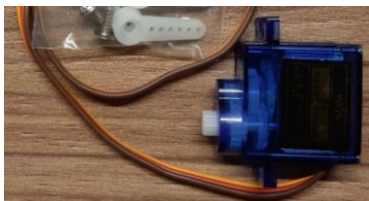


*Figure 7: Servo Motor 9G*

- **RFID Reader** – is a device that uses frequency waves to transmit signals that activate the tag [9].



*Figure 8: RFID Reader*

- **Photo Sensor** – are sensors of light and that it detects the presence of visible light.



*Figure 9: Photosensor*

- **LED** – a device that emits light.



*Figure 10: LED*

- 2-Relay Module – is an electrical switch that is operated by electromagnet.



*Figure 11: 2-Relay Module*

## V. PROCESS

### A. Software Development

Visual Studio was used to create the windows application of the system and was programmed to control the Arduino UNO using Serial communication.

In this part I needed to research and study on how to communicate the application (windows forms) and the Arduino UNO, upon researching I found a way the application can communicate to the Arduino UNO using Serial Communication.

Before I programmed the application, I first practiced with a 2 simple potentiometer and the objective is that the application must read the data that is being printed by the Arduino to the serial.
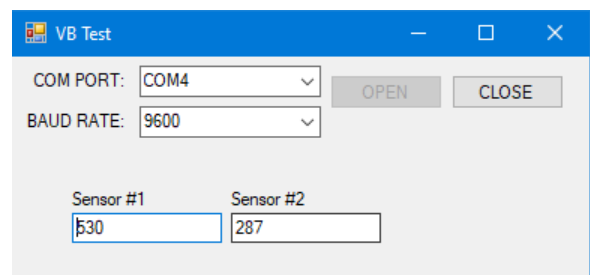


*Figure 12: Practiced Application*

By Using serialport function I was able to communicate with the Serial but you need to know what Com port the Arduino is Connected and also the Baud Rate; I was able to use my knowledge that I learned from my past programming subjects and I was able to create a Windows Application for the system.

I used the serialread function for the application to read what the Arduino is printing in the Serial then in the Arduino

code I used index method to print the sensors value in just one line, and for the application to read the data array I used the indexing method to separate the value of each sensors and used it to get value of each sensors.
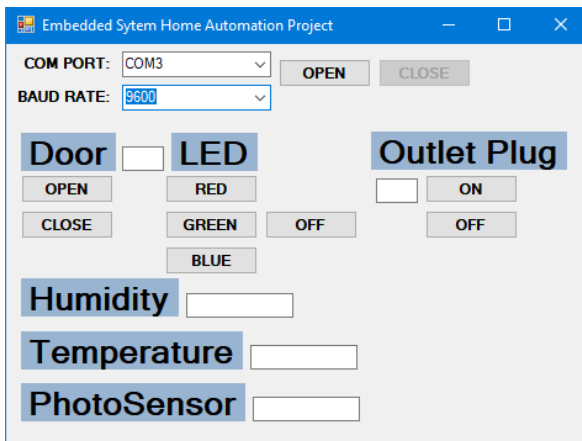


*Figure 13: Windows Form*

## B. Hardware Development

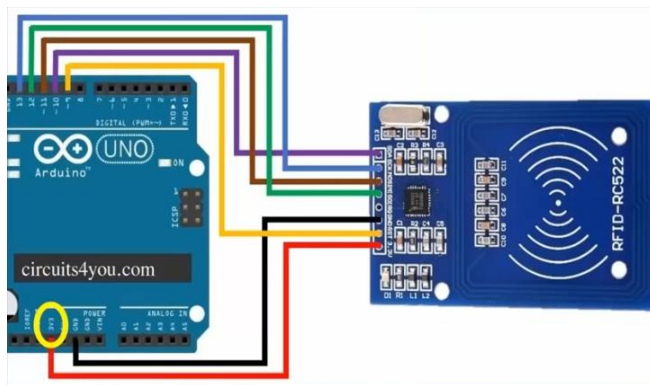I was able to gather the parts and connect them to their specific ports in the Arduino



*Figure 14: RFID Module Connection*

For the other components the connections are:

- DHT11 – pin 3
- Relay Module – pin 2
- Servo Motor Signal – 5
- LED Red – 4
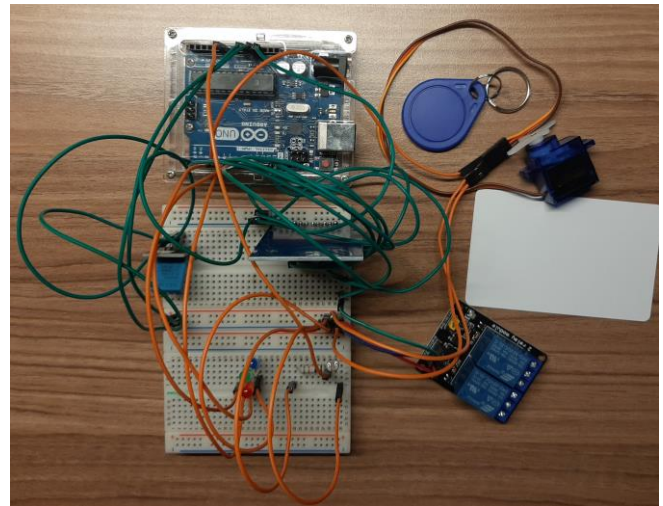- LED Green – 6
- LED Blue – 7
- Photosensor – A0



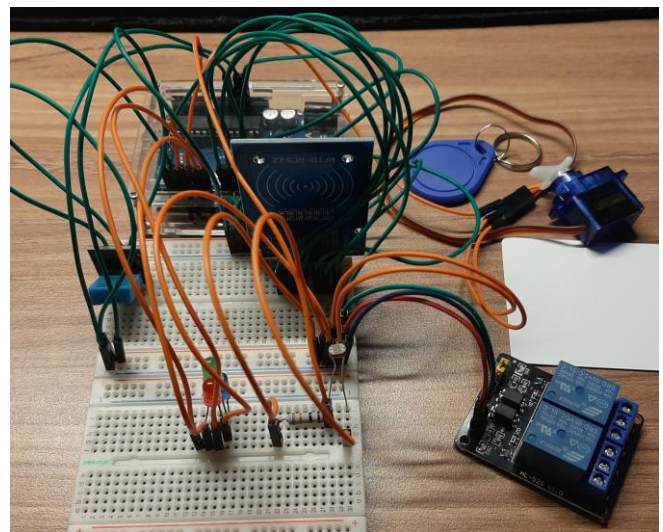Figure 15: Actual Picture of the System #1



*Figure 16: Actual Picture of the System #2*

## C. Testing and Debugging

I encountered an error when connecting to the port and a message box keeps popping up non-stop.
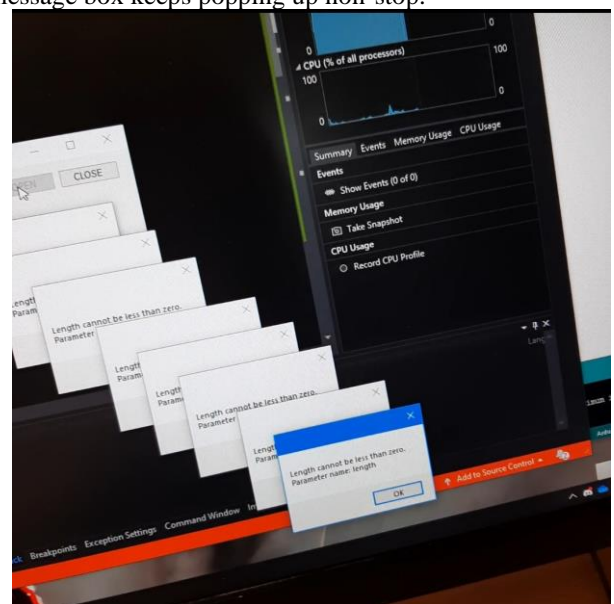


*Figure 17: Picture of the Error*

I fixed the error by changing the indexing [;] sign to letters [A, B, C, D] and the application runed with no error and problems.
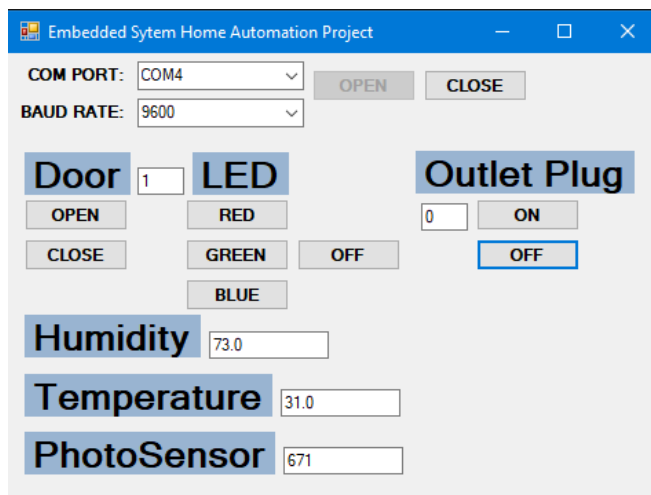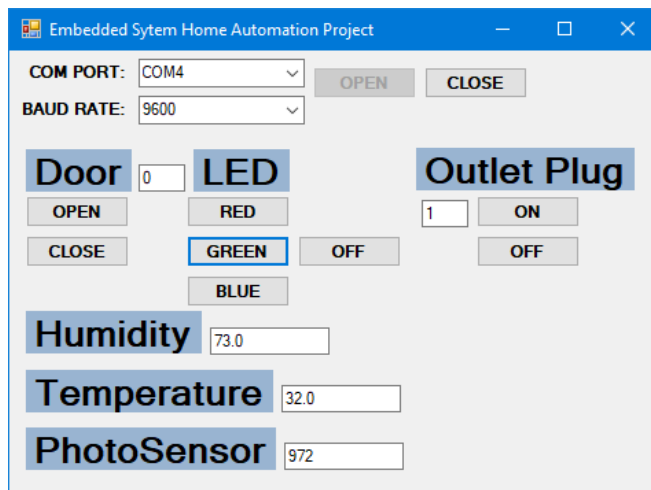


Figure 18: Test #1



Figure 19: Test #2

The demo of the system will be posted in the Blackboard link.

CONCLUSION

Home automation and IoT is really useful in our daily lives since it helps us control our devices with ease and can monitor it just by using a computer or a mobile device that is connected to the internet, Bluetooth or wired directly. Upon working on this project I gained knowledge on how to control the Arduino UNO by using a windows forms (application) with the help of the Serial connection but I only practice and worked on a wired connection method not on a wireless methods since I don't have any wireless modules for the Arduino UNO and I lacked time to study and knowledge on how to program with Android Studio and connecting the Arduino UNO wirelessly. I think using the indexing method and serial read function is very inefficient and slow and there are other methods that is better than the method used in this project. I want to continue this project to improve it and try other methods and give life to the user-interface (UI) of the application to be more appealing to the users and make it easy to use.

REFERENCES

The template will number citations consecutively within brackets [1].

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