

Home Automation Controller with Security System

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Abstract: The smart control system of electrical appliances in the home can generally give a very positive impact to the users. This is because they no longer bother to use a lot of their energy to do their daily activities such as turning on and off electrical appliances switches. A good system is closely available to the safety of an individual, especially when they are in the place where they live. The Arduino-based system can increase the progress of the existing system and facilitate users as well as increase the level of readiness. The purpose of this project is to create a prototype of an electrical control system at home with an Arduino system. The system offered Bluetooth technology in the development of advanced systems for controlling electrical appliances at home. The system can be controlled by a remote control or a smartphone connected via Bluetooth. The Arduino Uno R3 is the heart of the control system to receive the program that is set. For the smart home, the electrical appliances can be controlled by using the remote control or smartphone for controlling the ON/OFF switches by pressing the keypad or button. For the security systems, the use of 4X4 keypad as a means of access to the door knob by moving the servo motor. The user must enter the correct password into the system in order to enter. This low-cost innovation is intended to raise the standard of living in most home owners. Additional safety measures, such as cameras and motion detection sensors, can be readily added to the system.

Keywords: Arduino, IR Remote Control, Bluetooth

1. Introduction

The Internet of Things (IoT) may be characterized as linking commonplace objects like smartphones, Internet connections, sensors and drives to the Internet in which items are smartly linked and new ways of communicating and interact. Now anyone can be connected to anything anytime and anywhere, and these connections are expected to extend and create a totally advanced dynamic IoT

network [1]. Furthermore, this technology can actually help and support children, elderly and handicapped people in their home countries. A major research on home security and automation systems based on technology. There is an Arduino BT board main control in the system and a Bluetooth set. It has the advantages of using Bluetooth technology and password protection to create a low-cost and safe home automation system [2]. Smart Home System is a residential building that integrates a communication network that connects and provides remote control, monitoring or access to electrical devices and services. Intelligent Home is the common term used to define a house which integrates home-networking technology and services to increase power efficiency and improve living quality [3].

The Arduino is known as microcontroller, will function as to controls this system concepts. The function of the c+ language is for instructional execution for the programmers. This provides the use of an integrated Microweb-Server with the Internet Protocol (IP) connectivity for accessing and controlling devices and devices over remotely using the Android smartphone app to provide a low cost efficient, flexible home control and monitoring system [4]. Home automation refers to the use of micro-controllers or computer technologies to manage and control home appliances. Automation is already popular for days because it makes it easy, safe and efficient [5].

When a person is away from home, the main goal of a home automation and security system is to operate house appliances using various approaches such as android applications, web pages, and GSM. [7]. Our work focuses on the security aspect of the existing home automation system and points out its flaws. It shows how the concept of security and meaning of the word “intruder” has changed in modern homes. In today's society, automation is extremely significant, and this project provides an automated manner of regulating household appliances through human contact as well as system self-control [9]. The upgrade of the system with add the security home with control of keypad. Moreover, the use of a wireless Bluetooth connection in the control board simplifies system installation. The control board is situated next to the electrical switches, and the relay controls the switching connection. [10]. Besides, all of the research actually is related to this home automation controller with security system. It's became real and people out there will use this system in their routine life especially when do some activities at home or office. It also will give a lot of benefits to those who use this system.

2. Materials and Methods

This project uses remote control system access where for Home Automation Controller is controlled in two ways, namely through a smartphone and IR-Remote using Bluetooth network. While for Security System, it only use keypad to access the opened of the door. Circuit theory is also used to connect the appliances found in the Home Automation Controller and Security System. In addition, this project uses wire connection theory and mechanism theory to perform circuit connection.

The Arduino Nano is a small, complete and easy-to-use ATmega328P board. The Arduino Uno comes with 30 male I/O headers in a dip 30 configuration that can be scheduled via the integrated development environment of Arduino Software, common to all Arduino boards, both online and offline. The Arduino Uno R3 has a number of computers, Arduino or other microcontroller communications. The Arduino programme includes a serial monitor that can be sent to and from the Arduino board by simply textual data. A library of Software Serial enables serial communication with any of the digital pins in Uno. The Arduino software comes with a Wire library that makes using the I2C bus.

The HC-05 is a wireless a module that allows you to add wifi duplex functions in two directions. This module communicates Bluetooth-enabled device, such as a phone or laptop between two microcontrollers like Arduino. The HC-05 may operate in two modes which are data mode and which data from other Bluetooth devices can be sent and received, and one is AT Command mode, in which default device settings can be modified. Simply power the 5V module and plug the module's Rx pin into the MCU Tx and MCU's Tx pin.

The TSOP 1738 is a member of IR remote control receiver series. If IR waves from a source occur at a center frequency of 38 kHz, the output is low. Sunlight, fluorescent lighting, and other, can lead to disturbances and unwanted output even if the source does not transmit IR-signals. When photodiode PIN receives signals, a signal is generated. An automatic gain control receives this entry signal. In order to adapt the gain to the appropriate level, the output for a variety of inputs is returned to AGC. The AGC signal is passed on to the unwanted filter in a band-pass filter. Pin 3 of the TSOP module provides the collector output of the transistor.

IR-Remote control Handheld, wireless device that uses light signals in the infrarouge (IR) field for the operation of audio, video and other electronic appliances within a room. Infrared light needs a view to the destination. Low-end remote controls have to be targeted directly on the device using only one transmitter at the end of the unit. Three or four powerful IR transmitters in high quality Remote systems set in different angles to give signals to the room.

The servo motors belong to a closed-loop system consisting of several components, namely a control circuit, a servo motor, a shaft, a potentiometer, an encoder and an amplifier. A servo motor is a self-contained, highly efficient and precise electric device that rotates machine parts. A particular angle, position and speed that a regular motor does not have can be moved to the output shaft of this motor. The Servo Motor makes use of a regular motor for position feedback and combines it with a sensor. The controller is the main component of the Servo Motor specifically designed and used for that. The motor is controlled by an analogue or digital electric signal to determine the movement quantity of the wave's final control position.

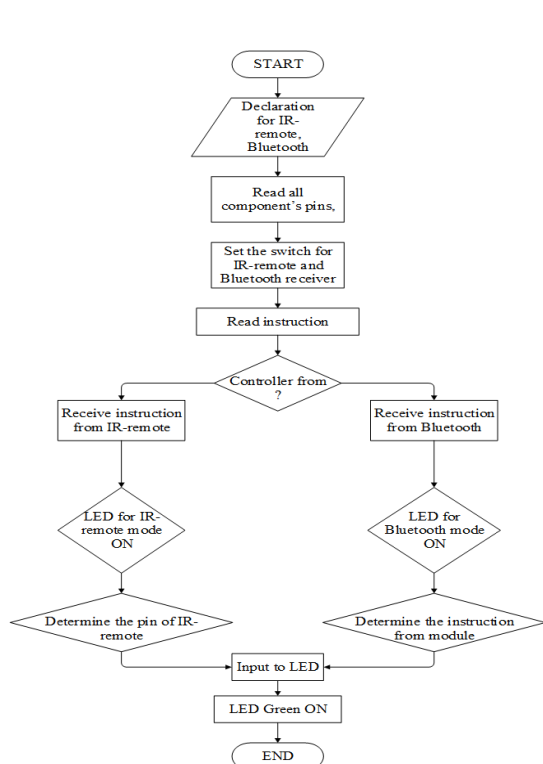


Figure 1: Home Automation Controller

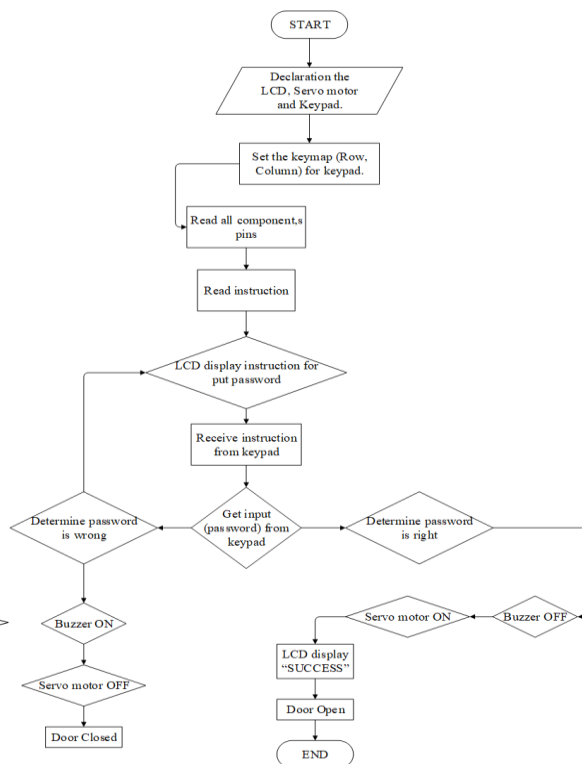


Figure 2: Security System

A keypad matrix is the type of keypad that can be seen on microwave ovens, gas pumps and computers. For prototypes and inventions in which things like codes, times or other values must be entered is a matrix keypad that you can connect to a breadboard. This 4x4 matrix keypad features 16 built-in row and column line pushbutton contacts. These lines can be scanned in a button-pressed state by a microcontroller. The Propeller defines the entire column lines to be entered in the keypad library

and all line lines to be entered. The microcontroller, if it's high, knows which line and which column it is setting high, the one that was detected high when checked.

In most built-in project's LCD modules are widely used, due to the low price, the availability and the easy programming process. 16 LCDs are so named as far as 16 columns and 2 rows. The combinations of 8 kg, 8 kg, 8 kg, 10 kg, 16 kg, etc. There are 40 pixels in each character and 1280 pixels for 32 letters in each character. Instructions on the Pixel position should also be provided to the LCD. It is therefore an aggressive task to manage all with the MCU, and therefore uses an interface IC such as HD 44780 on the back of the LCD module itself.

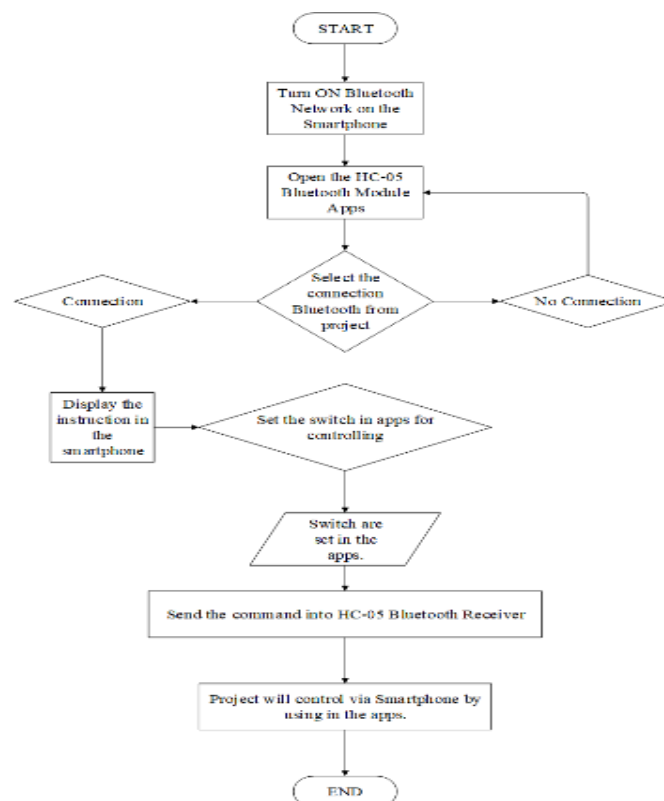


Figure 3: HC-05 Bluetooth Module Application

Figure 1 show the work process for the Home Automation Controller, Figure 2 show the work process for the Security System and Figure 3 show the work process of Bluetooth Module Application. This automatic home control and equipped security system is designed based on Arduino control. The project was developed through a control process through the concepts of Arduino Uno, Arduino Uno R3, IR-remote and Bluetooth. The system contains 2 ways to control, namely the use of a remote control (IR remote) and a smartphone connected via Bluetooth. The project also has a security system that only allows unauthorized users access with passwords. The system has the feature to change the password at any time by the user because it is authorized as needed. This proposed system provides an easy-to-use security system for businesses and homes. The system is password based and only allows authorized people to access it with a password. Through this project, there is no limited to household appliances and it also can applied to others appliances. For door security, its also working as the idea that planned. Beside that, the circuit of home automation control and home security must to be combined together as the main planned, but its need to separate to two circuits because of some technical problems.

3. Results and Discussion

It is started by using Tinker Cad application to make schematic drawings before project installation. Next, proceeded towards the connection of the circuit. It will start by identifying the wires that will be

connected from the Arduino Uno R3 to each component. Then begin for the coding part. Coding will be uploaded into the Arduino Uno R3 and then, the power supply is connected to the circuit to obtain the power source. Arduino Uno R3 needs to be connected to Bluetooth to connect the Arduino Uno R3 to the smartphone and also the IR remote. First attempt is done by pressing keypad 1 on the IR remote as well as the smartphone. The experiment is successful if the lamp to be controlled will lit up according to what has been set in the coding and the Arduino Uno R3. Second attempt is done by entering the correct password. The experiment is successful if the servo motor was function. The second attempt we did by entering the wrong password which is not as we have set. The experiment will be successful if the buzzer sounds when entering that keyword.

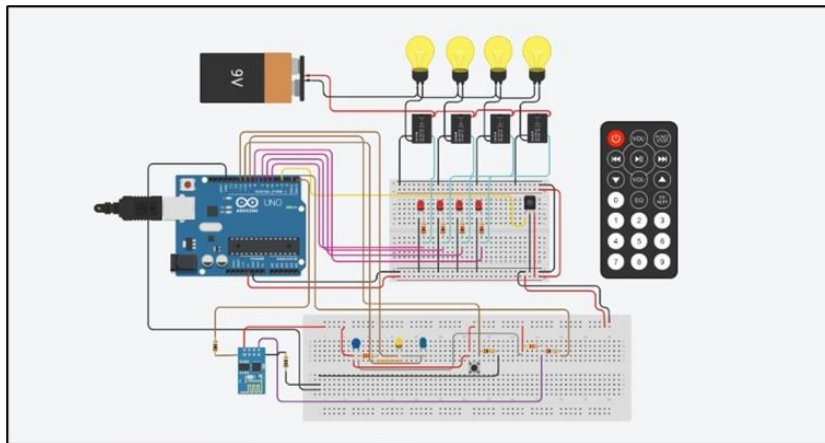


Figure 4: Home Automation Controller circuit

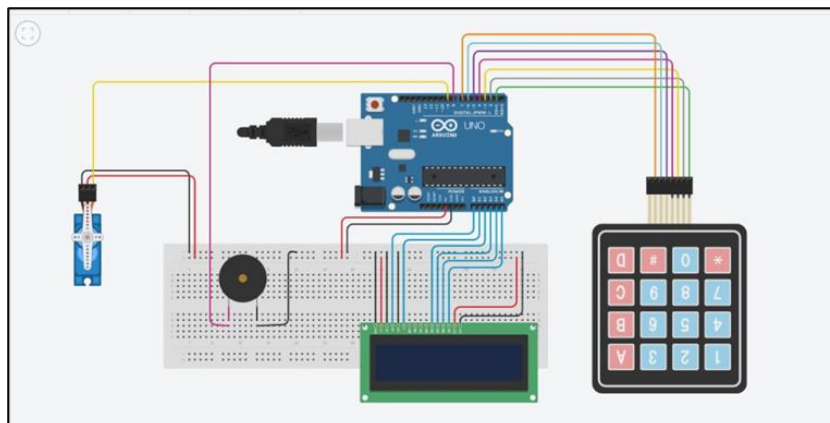


Figure 5: Security System circuit

Based on schematic drawing in Figure 4, it employs two control methods, that is IR remote and Bluetooth. By connecting a Bluetooth network, users can control the switch on their smartphone via the application. IR-remote can also be control the switch ON/OFF by sending a signal to the TSOP 1738 Infrared Receiver. For Figure 5, its show that the user must enter the password by pressing the keyboard. The LCD display will display correct or wrong password decisions. The buzzer sounded as an alarm if the password is wrong and the door was not opened.

Table 1: Controlling Electrical Appliances

NO.	IR-remote	BLUETOOTH
SWITCH	LED / BULB (ON and OFF)	LED / BULB (ON and OFF)

1.	Button 1	Green / Bulb 1	Switch 1	Green / Bulb 1
2.	Button 2	Blue / Bulb 2	Switch 2	Blue / Bulb 2
3.	Button 3	Red / Bulb 3	Switch 3	Red / Bulb 3
4.	Button 4	White / Bulb 4	Switch 4	White / Bulb 4

Table 1 shows the working path in controlling electrical appliances using two methods, namely IR remote and Bluetooth. For the use of IR remote, Button 1 is for Bulb 1, Button 2 for Bulb 2, Button 3 for Bulb 3 and Button 4 for Bulb 4. For Bluetooth control, Switch 1 for Bulb 1, Switch 2 for Bulb 2, Switch 3 for Bulb 3 and Switch 4 for Bulb 4. Meanwhile, Table 2 shows the working path for security system project control. For this system, it has only two options, the correct password and the wrong password. For the correct password, what will happen is that the door will open and the buzzer will not emit any sound while for the wrong password, the door will not open and the buzzer will sound.

Table 2: Security System Control

No	Password	Door	Buzzer
1	Correct Password	Open	Sound OFF
2	Wrong Password	Close	Sound ON

4. Conclusion

From the overall project, the prime objective of this project actually is to have the project that is more improvement compare that the existing project that have in this modern life. This project also created to securing the future by saving the precious energy, especially the old generation. It is because, this project actually not use a lot of energy to get the objective of the goals such as in this project is control the lamp or fan in the house by using the remote or mobile phone. From the observation, its does not have to spent a lot of energy to open the manual switch to open it. It is because its no need to walk forward the switch to open the lamp, but just open the lamp by just click by using finger. Additional safety measures, such as cameras and motion detection sensors, can be readily added to the system. The system can also be enhanced by adding an RFID scanner, allowing authorised individuals to carry only an RFID or NFC tag on their person. The RFID scanner will scan the tag wirelessly, and if the user is authorised to enter, the alarm system will be turned off for a short period of time to allow the user to enter.

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