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Smart Home Control Using Arduino

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ABSTRACT: This report presents implementation of cost effective of Smart Home Control using Arduino. This framework is intended to help and give help to satisfy the needs of the elderly and the handicapped at houses. Additionally, the idea of home automation system will improve the normal living status at houses. The fundamental control system uses a wireless Bluetooth device gives a wireless access to smart phones.

KEYWORDS: Microcontroller, Relays Modules, Arduino Uno, Bluetooth, Android Phone.

I. INTRODUCTION

In this paper Smart lighting is a lighting technology designed for energy efficiency. This may include high efficiency fixtures and automated controls that adjust based on conditions such as occupancy or daylight availability. Lighting is the deliberate application of light to achieve some aesthetic or practical effect. It includes task lighting, accent lighting, and general lighting.

"Smart Home" is the term commonly used to define a residence that has appliances, lighting, heating, air conditioning, TVs, computers, entertainment audio & video systems, security, and camera systems that are capable of communicating with one another and can be controlled remotely by a time schedule, from any room.

Smart Home Foundations Prior to 1797, the washing machine was little more than a rock against which laundry was beaten. In that year, the washing board was invented, making the process of cleaning one's laundry astronomically easier. More than a century later in 1908 cleaning one's clothes took another quantum leap forward with the advent of the electric washing machine.

[1].Nowadays, everyone cannot be separated from their smart phones. A number of five thousand individuals from USA, UK, South Korea, India, China, South Africa, Indonesia and Brazil took a survey regarding which was done by Time magazine. The result proved most of them is inseparable from their smartphones, eighty four percent allegedly claimed that survive without their smart phones.

[2].Home automation is computerization of the home, housework or household action. Home automation may incorporate a control unit for controlling of lighting, HVAC (warming, ventilation and aerating and cooling), machines, and different frameworks, to give enhanced accommodation, solace, better energy saving, productivity and security. The idea of home Automation has been around for quite a while and items have been available for a considerable number of years, however nobody's arrangement has gotten through to the standard yet. Home computerization for the elderly and debilitated can give expanded personal satisfaction to persons who may generally need parental figures or institutional consideration. It can likewise give a remote interface to home apparatuses or the automation system itself, through phone line, remote transmission or the web, to give control and observe and monitor by means of a smart phone or a web explorer program.

Home Automation System

[3].A home automation system means to grant the end-users. Bluetooth based home automation system manage and handle the electric appliances. In case of using cell phones: different home automation systems over time, they have In Bluetooth based home automation system the home always tried to provide efficient, convenient, and safe appliances are connected to the Arduino BT board at input ways for home inhabitants to access

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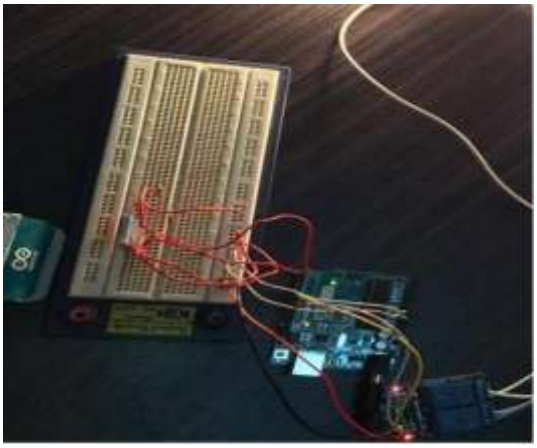
their homes, output ports using relay. The program of Arduino BT Regardless of the change in user's hope, growing board is based on high level interactive C language of technology, or change of time, the appearance of a home microcontrollers; the connection is made via Bluetooth. Automation system has remained the same. The password protection is provided so only authorized user is allowed to access the appliances. The Bluetooth Many existing, well-established home automation systems connection is established between Arduino BT boards and are based on wired communication such as Arduino based phone for wireless communication.

[4]. In this system and raspberry pi-based home automation systems. This python script is used and it can install on any of the does not pose a problem until the system is planned well in Symbian OS environment, it is portable. One circuit is advance and installed during the physical construction of designed and implemented for receiving the feedback from the building. But for already existing buildings the phone, which indicate the status of the device, implementation cost goes very high. In contrast, wireless systems can be of great help for automation systems.

[5]. Automation is the key to the current trends (system) being followed to transform them into a better, faster and reliable technological solutions or systems. Automation refers to technique of making systems control themselves with a view to reduce human effort. With this principle came the idea of our project "Home Automation System". The proposed project controls electrical appliances and components at home to be automatically or remotely controlled by the system or by the user respectively. The backbone of this system is the ArduinoUNO microcontroller and Wireless Ethernet shield which provides the interface between the user and the appliances. Internet (webpage) user can access or operate any connected device from anywhere and system also checks for any device left switched on by user to switch it off. With the use of various sensors (Infrared sensors, temperature sensors) and actuators entire connection is established between Ethernet shield and the device.

II. BLUETOOTH AND ARDUINO USED IN SMART HOME



Bluetooth is a standard utilized as a part of connections of radio of short extension, bound to substitute connections which use wires between electronic gadgets like personal digital assistants (PDA), cell phones, personal computers (PC), Laptops, and numerous different gadgets.

Arduino-Uno Structure

Bluetooth technology can be utilized at homes, offices, schools, hospitals and in cars. Users can get instantaneous connections with several kinds of devices through this technology continuously.

Bluetooth technology has been one of the critical innovations to home automation system or Smart Living. It is a remote technology created to take the place of wired devices to wireless one which links gadget like cell phones and PCs (Laptops/desktops). Albeit "link substitution" could make a point-to-point connection, Bluetooth permits remote gadgets to have the ability to connect with one another inside reach. The system of a set of Bluetooth gadgets is called "piconet", which is an ideal technology to system a brilliant advanced home.

The Arduino Uno is a microcontroller board based on the ATmega328. It has a 16 MHz ceramic resonator, 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a USB connection, a power jack, an ICSP header, and a reset button. This board is very simple and can be easily used, everything we need to support

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the microcontroller is in this board, just plug it in a computer via USB cable and power using an AC to DC adapter or battery to get started.
The difference seen in the Arduino Uno is that it does not use the FTDI USB-to-serial driver chip but, it has the ATmega16U2 (ATmega8U2 up to version R2) programmed as a USB-to-serial converter.

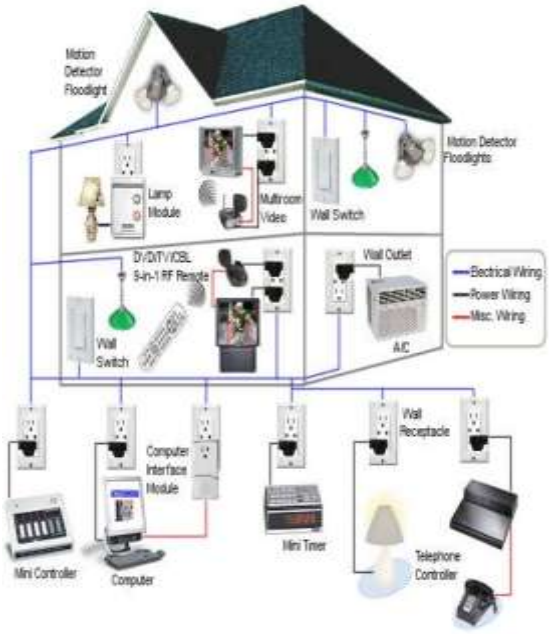
Arduino board/Bluetooth module Connection 30

III. EXPERIMENTATION

After everything is set and ready (android phone is connected to the Arduino) connecting the Arduino to the home appliances is needed. Using wires and connector blocks connect the positive end of the home appliance (e.g. Portable fan) to the normally open (in this project we want to make the output active high) port in the relay module and the negative end of the appliance to a power source. Then connect the IN port of the same relay module to the wanted Arduino-Uno port. 31 Apply the same for the other appliances only use different relays and different Arduino Uno Ports. Connect the android phone with the Bluetooth module and now all the connected appliances can control wirelessly using the android device.

A light dependent resistor works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the materials conductivity is increased when light is absorbed by the material. When light falls i.e. when the photons fall on the device, the electrons in the valence band of the semiconductor material are excited to the conduction band. These photons in the incident light should have energy greater than the band gap of the semiconductor material to make the electrons jump from the valence band to the conduction band. Hence when light having enough energy strikes on the device, more and more electrons are excited to the conduction band which results in large number of charge carriers.

The result of this process is more and more current starts flowing through the device when the circuit is closed and hence it is said that the resistance of the device has been decreased. This is the most common workingprinciple of LDR.



HomeAutomation System

In this Project and android phone is used as the remote control for the user alongside with an App Called Home Automation. Home Automation is a simple Android app that will make controlling the pins of Arduino-Uno from an Android phone wirelessly possible. Home Automation employs a simple Android user interface to control Arduino Uno's digital and PWM pins, send text commands to Arduino-Uno and receive data from Arduino over Bluetooth serial module. In this Project the Digital Pin Function is only required to make the system work, so the Arduino-Uno Board should be programmed to only support that feature.
After installing the app on the phone and connecting the Arduino-Uno board with the Bluetooth module a test to make sure that the phone is interacting with Arduino via the Bluetooth module is needed. Open the app in the android device.

- Search for Bluetooth devices via the app.
- Connect to the Bluetooth module.
- If the light in the Bluetooth module stopped blinking then everything is working fine
- Otherwise the wiring need to be checked.

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Final program code to be put in Arduino IDE and to compiled with Arduino Uno Board

```
#include <dht.h>
#define dht_apin A0
dht DHT;
char c = ' ';
int sensorPin = A1;
float sensorValue = 0;
void setup() {
pinMode(7, OUTPUT);
digitalWrite(7, LOW);
pinMode(8, OUTPUT);
digitalWrite(8, LOW);
Serial.begin(9600);
Serial.println("DHT11 Humidity & temperature Sensor\n\n");
delay(1000);
}
void loop()
{
  if (Serial.available())
  {
    c = Serial.read();
      if (c == 'C')
digitalWrite(8, HIGH);
    if (c == 'D')
digitalWrite(8, LOW);        Serial.print("Current humidity = ");
Serial.print(DHT.humidity);
Serial.print("% ");
Serial.print("temperature = ");
Serial.print(DHT.temperature);
Serial.print("°C ");
if((DHT.temperature)<30)

}
```

IV. OBESERVATIONS

Managed to successfully apply the HOME AUTOMATION SYSTEM USING ARDUINO and it was user friendly and cost effective. User friendly as in anyone can use just a click of a button on an android screen and everything works. And it is cost effective as in it will cost exactly as the project requires (optimum price).

Final Models

```
Serial.print("luminance = ");
Serial.print(sensorValue);
Serial.println("%");
delay(1000);
```

A light dependent resistor works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the materials conductivity is increased when light is absorbed by the material.

V. CONCLUSION

It can be concluded that HOME AUTOMATION SYSTEM USING ARDUINO was a success. This system consists of an Arduino-Uno board, a Bluetooth Module, an Android phone, power sockets, home appliances and an android Application (Home Automation). It is user friendly and it is cost effective.

Also, it can be concluded that the objectives of this project has been successfully met and they are as follows:

- Better to use relay modules and connect it directly than using normal relays with breadboard.
- Try to find a way to amplify the Bluetooth module signal to work in greater distance.
- Test each and every component before using them especially the relays for safety purposes.

SOME OF THE ADVANAGES FROM THE ABOVE RESULTS

- Constructed a wireless home automation system controlled by a smartphone specifically an android device.
- Designed and implement cost effective home automation system yet an efficient one.
- Designed a user friendly and a safe system to control home appliances especially aimed to aid the elders and handicapped.

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