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A Contemporary Approach to Devise Whip-Smart Environs

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ABSTRACT: Technology is a never ending process. To be able to design a product using the current technology that will be beneficial to the lives of others is a huge contribution to the community. In the past few years, technology has in a grown at high speed. Also human lives have become much more dependent on electronic devices and appliances. In today's world automation has played a key role in developing human's life and enhancing safety and security protocol. Mobile phones nowadays are very common to all people. This paper put forwards the implementation of home automation and security system using Arduino microprocessor and Android Smartphone. Bluetooth has been used as the most reliable and efficient technology for short range communication. This paper provided a novel approach to enhance automation in household works which eliminates the traditional method of switching.

KEYWORDS: ArduinoUNO, Android Mobile, Bluetooth, Home automation system, Relay.

I. INTRODUCTION

Today most home uses the electronic appliances such as fans, light, air conditioner etc. As the mobile phones are very common to all people nowadays using mobile as the key for controlling the home appliances will enhance the affordability and simplicity of the Home automation system (HAS).

Mobile phones with android based operating system are regarded as smart phone. This smart phone has the capability of connecting to most electronics equipment. The android application needed for the operation of HAS is designed in Android platform. To increase the security feature of the android application password protection has been implemented.

Arduino has been used as a microcontroller. Bluetooth has been used for the short range efficient connections [1]. The main wireless technologies used in home automation are GSM, Internet, Cloud and Bluetooth. Each technology has its own advantages and disadvantages. But Bluetooth based home automation systems have way more advantages. Devices can be connected from a range of 10m to 100m and this range can be increased by using piconet architecture. The frequency used for Bluetooth is 2.4GHz, which is globally available.

The speed that can be fetched for Bluetooth services is up to 3Mbps. These basic advantages that have driven us to the idea of developing a Bluetooth based home automation system [2].

II. RELATED WORK

Various methods have been proposed for development of home automation systems. Reference [1] is a home automation system which describes the approach to control various home appliances with ARM7 processor. Another proposed model based on IoT [2] uses Bluetooth and voice command is primarily concerned with the home

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automation system which uses Bluetooth for interaction between the android mobile application and the appliances under the control of the system.

In another paper that tells about Bluetooth based home automation [3], which focuses on the design and implementation of a low cost, flexible and wireless solution to the home automation. Another Bluetooth based work [4] was to outline the design and implementation of an embedded system which can easily interface with the existing home appliances and communicate with a smart phone via Bluetooth using serial interfacing. Another work based on Bluetooth [5] takes care of addressed control of device using Bluetooth and internet/wired.

In this paper [6], based on all the systems surveyed and their advantages and drawbacks, it presents the features to be possessed by an ideal system for home automation with remote access. This paper [7] points out the shortcomings of existing home automation systems in identifying and preventing sophisticated intruders in a home environment. Another system [8] has also been proposed by making use of Android application. This system mainly focuses on the Smart Living, more specifically the home lighting control system using Bluetooth technology.

In this paper [9] a security interface and home automation system is presented using an Android mobile device. This paper based on real time home automation [10] points out how system is designed at low cost and is used to improve the standard of living in home. This paper [11] points out at Bluetooth Remote Home Automation System Using Android Application.

This paper [12] gives basic idea of how to control various home appliances and provide a security using Android phone/tab. This work is based on Android and Arduino platform both of which are FOSS (Free Open Source Software). This home automation project [13] is made using atmega328 microcontroller and android application. This paper [14] have proposed a smart home automation system which is operated with the help of android smart phone by using Bluetooth Technology and home appliances will be controlled through FPGA using relays. This paper [15] focuses on the design and implementation of the Smart Home Automation Controller using Bluetooth and GSM for Android mobile phone. The purpose of this is to use mobile phone's inbuilt Bluetooth, SMS facility and Bluetooth serial module and GSM Modem for automation of Home Appliances.

III. PROPOSED WORK

This paper aims to develop a Bluetooth based home automation system with Arduino UNO Board and an Android application. Remote controlled home automation system provides a simpler solution with Android application technology. Remote operation is achieved by any smart- phone/Tablet etc., with Android OS, upon a GUI (Graphical User Interface) based touch screen operation.

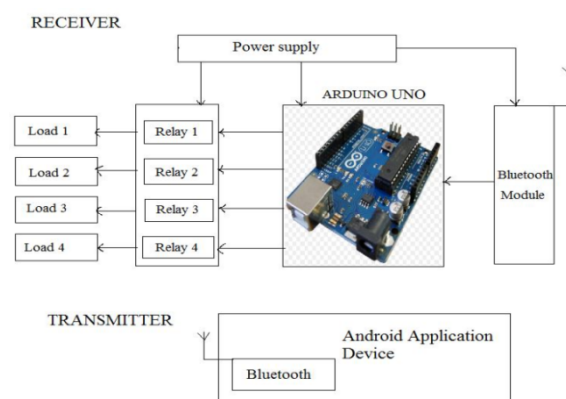


Fig 3.1: Block Diagram of Proposed Work

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The block diagram consists of Arduino as a brain of our network connected to corresponding relay circuit for controlling each switch. The Arduino is also connected to the Bluetooth module which in turn control all the devices connected to it. These types of devices are mostly used in smart home applications.

3.1 ARDUINO UNO:

The Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.



Fig 3.2: Arduino UNO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

3.2 BLUETOOTH MODULE (HC-05):

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle. Go shopping Serial Port Bluetooth Module (Master/Slave):HC-05 (IM120723009). Bluetooth serial module is used for converting serial port to Bluetooth. These modules have two modes: master and slaver device. The device named after even number is defined to be master or slaver when out of factory and can't be changed to the other mode.

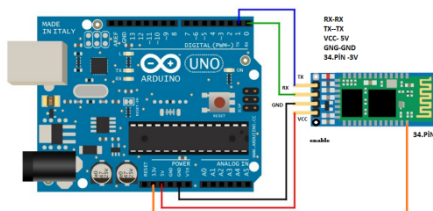


Fig 3.3: Arduino to Bluetooth Connection



Fig 3.4: HC-05 Bluetooth Module

An Android Smartphone, a **Bluetooth** transceiver, and an **Arduino** are connected in a network. HC 05/06 works on serial communication. The Android app is designed to send serial data to the **Arduino Bluetooth module** when a button is pressed on the application. You can open the serial monitor and watch the received data while connecting.

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3.3 RELAY:

A **relay** is an electrically operated **switch** of mains voltage. It **means** that it can be turned on or off, letting the current go through or not. Controlling a **relay** with the Arduino is as simple as controlling an output such as an LED. Relay is basically an electromagnetic switch which can be turn on and off by an applying the voltage across its contacts. In this project used a 12V 4-channel relay. The **relay module** is a separate hardware device used for remote device switching. With it you can remotely control devices over a network or the Internet. Devices can be remotely powered on or off with commands coming from Clock Watch Enterprise delivered over a local or wide area network.



Fig 3.5: Relay Driver

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.

3.4 ANDROID:

Android is an open – source operating system which means that any manufacturer can use it in their phones free of charge. It was built to be truly open. Android is built on the open Linux Kernel. Furthermore, it utilizes a custom JAVA virtual machine that was designed to optimize memory and hardware resources in a mobile environment. An android app is meant for phones with android based operating systems. They can be downloaded from the android app Market which is pre -loaded on every android phone. The Android platform includes support for the Bluetooth network stack, which allows a device to wirelessly exchange data with other Bluetooth devices. The application framework provides access to the Bluetooth functionality through the Android Bluetooth APIs.

IV. RESULTS AND APPLICATIONS

Download the android apps Arduino Bluetooth from the Google play store which is freely available. Install it to your phone. After then open Bluetooth in our mobile device and search for it in Bluetooth list you will get HC-05, select it and press in connect menu. After connection you will get something like as shown in picture below. When we press device 1 then the light connected in Arduino Uno pin 2 is in ON state and again presses in same device 1 the LED light is in OFF state. It will ON and OFF up to eight LED. It means it can control up to eight devices. By using the relay driver along with the Arduino Uno and Bluetooth module we can controlled eight home appliances at a time.

Arduino Bluetooth Control Device Application is to allow you to control various electrical devices up to eight devices and independently controlled. Use Android Bluetooth mobile device to remote control your device with Serial TTL Bluetooth Module and Arduino Board. It is used for Automation System, Smart Home Automation, light control etc.

The same type of work can be extended to any type of environment where the automatic control is needed. And so, not only in home automation but also in agriculture, medical field, mining, etc... this smart system can be effectively implemented. According to the place of implementation, this system can be implemented with Wi-Fi and cloud facility too.

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Fig 4.1: Device Control Switch



Fig 4.2: Bluetooth Arduino Control App

V. CONCLUSION AND FUTURE WORK

From these results, we conclude that the Arduino Uno with the Bluetooth module and relay driver works very well. It is easy to use in our home as a smart home automation system. It is very beneficial to the person who is physically disable and also used for aged person for controlling electrical appliance remotely with the help of Android mobile phone. Presently we are working to perform this automation by developing our own app creation. And so, in future we are planning to develop this system with our own app creation. Also, we planned to extend this implementation, to be used in anywhere else irrespective of time and distance.

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