HOME AUTOMATION BASED ON ANDROID DEVICE.

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Abstract: The main objective of this project is to develop a home automation system usingan Arduino board with Bluetooth being remotely controlled by any Android OS smart phone. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user togo near them to operate. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled home automation system provides a most modern solution with smart phones.

I. INTRODUCTION

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives really easy. Have you ever wondered about home automation which would give the facility of controlling tube lights, fans and other electrical appliances at home using a remote control? Off-course, Yes! But, are the available options cost-effective? If the answer is No, we have found a solution to it. We have come up with a new system called Arduino based home automation using Bluetooth. This system is super-cost effective and can give the user, the ability to control any electronic device without even spending for a remote control. This project helps the user to control all the electronic devices using his/her smartphone.You can turn on/off your home appliances within the range of Bluetooth.

II. SYSTEM DESIGN AND ARCHITECTURE
2.1 Bluetooth Module

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.
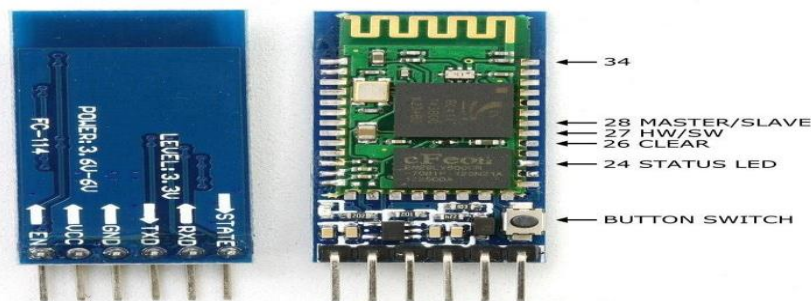

Figure 2.1 HC-05 Bluetooth

HC-05 is a Bluetooth device used for wireless communication with Bluetoothenabled devices (like smartphone).
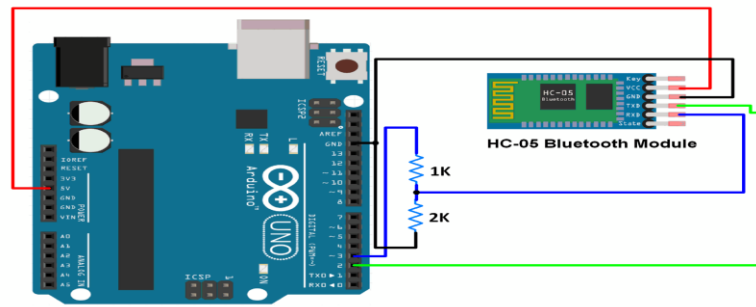
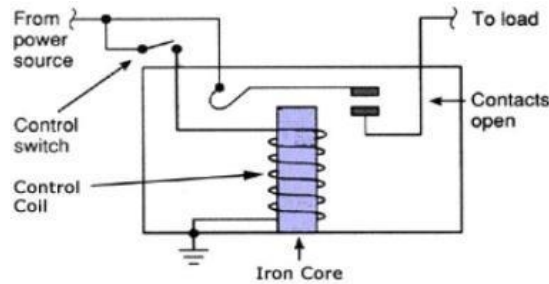**Figure 2.1.1 Bluetooth Module Interfacing with Arduino UNO**

2.2 Relay Board

Figure 2.2 Relay

Arelayisanelectricalswitchthatusesanelectromagnettomovetheswitchfromtheofftoonpositioninstead ofapersonmovingtheswitch.Ittakesarelativelysmallamountofpowertoturnonarelaybuttherelaycan controlsomethingthatdrawsmuchmorepower.

2.3 Microcontroller

Figure 2.3 ATMEGA 328P-PU

A microcontroller is an entire computer manufactured on a single chip. Microcontrollers are usually dedicated device embedded within an application. For example, microcontrollers are used as engine controllers in automobiles and as exposure and focuscontrollers in cameras. In order to serve these applications, they have a high concentration of on-chip facilities such as serial ports, parallel input/output ports, timers, counters; interrupt control, analog-to-digital converters, random access memory, read only memory, etc. The I/O, memory, and on-chip peripherals of a microcontroller are selected depending on the specifics of the target application. The degree of control and programmability they provide significantly enhances the effectiveness of the application.

2.4 Hardware Requirement

The list of components mentioned here are specifically for controlling 4 differentloads.
- Arduino Uno with Atmega 328P microcontroller
- HC – 05 Bluetooth Module
- 10 KΩ Resistor
- 1 KΩ Resistor X 4
- BC547 NPN Transistor X 4
- 1N4007 Diode X 4
- 5 V Relay X 4
- Prototyping board (Bread board)
- Connecting wires
- 9 V Power supply
- Smartphone or tablet (Bluetooth enabled)

2.5 Software Requirement

☐ Arduino 1.6.9 compiler

☐ Proteus 7

☐ Android application

2.6 Description of Hardware Required

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 crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to- serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to- serial converter.

Some Technical Specifications of Arduino UNO are:

1.	Microcontroller	ATmega328P
2.	Operating Voltage	5 V
3.	Input Voltage (recommended)	7-12V
4.	Input Voltage (limits)	6-20V
5.	Digital I/O Pins	14
6.	Analog Input Pins	6
7.	DC Current per I/O Pins	40mA
8.	DC Current for 3.3V Pin	50mA
9.	Flash memory	32 KB of which 0.5 KB used by Bootloader
10.	SRAM	2 KB
11.	EEPROM	1 KB
12.	Clock Speed	16 MHz

Android Studio

Android is a software stack for mobile devices that includes an operating system and key applications. Android applications provide access to a wide range of useful libraries and tools that can be used to build rich applications. Android also includes a full set of tools that provides developers with high productivity and deep insight into their applications. The data received by the Bluetooth module from Android smart phone is fed as input to the controller. Thereby, the controller acts accordingly on the DC motors to move in the entire robot in all the four directions using the Android phone.

An Android smartphone will act as remote controlled device for movement of the robot. An Android application will be developed for the same. The application will support only the 4.0 and above versions of Android Operating System will.This system will be using HC-05 Bluetooth module for the system, which can be used as either master or slave. Generally our master will be smartphone and slave will be Bluetooth module. Bluetooth module will give the commands given by smartphone to the microcontroller.
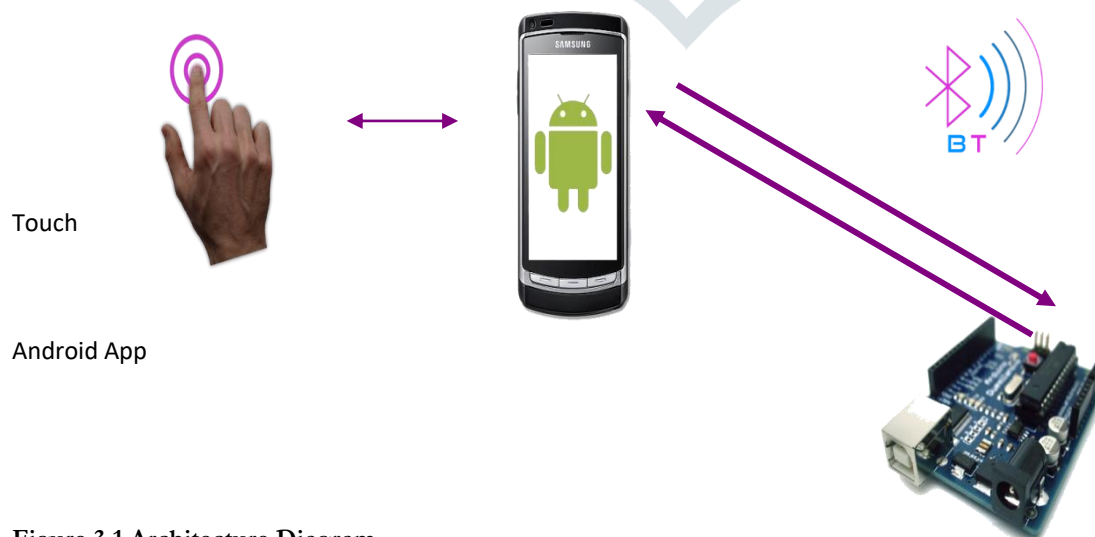

Touch

Android App

Figure 3.1 Architecture Diagram

This is the architecture diagram of our project in which the android smartphone is acting as remote to control the home appliances. The android app provides touch interface to operate the working of the appliances.

4. Software Implementation
4.1   Android Studio

Android Studio is the official IDE for Android app development, based on IntelliJ. Android Studio provides graphical tools for creating and managing Android projects, which contain everything that define your Android apps, from app source code to build configurations and test code. Each project contains one or more different types of modules, such as application modules, library modules, and test modules. On top of the capabilities you expect from IntelliJ, Android Studio offers:

Flexible Gradle-based build system

Build variants and multiple APK file generation

Code templates to help you build common app features

Rich layout editor with support for drag and drop theme editing

Lint tools to catch performance, usability, version compatibility, and other problemsCode shrinking with ProGuardBuilt-in support for Google Cloud Platform, making it easy to integrate Google Cloud Messaging and App Engine
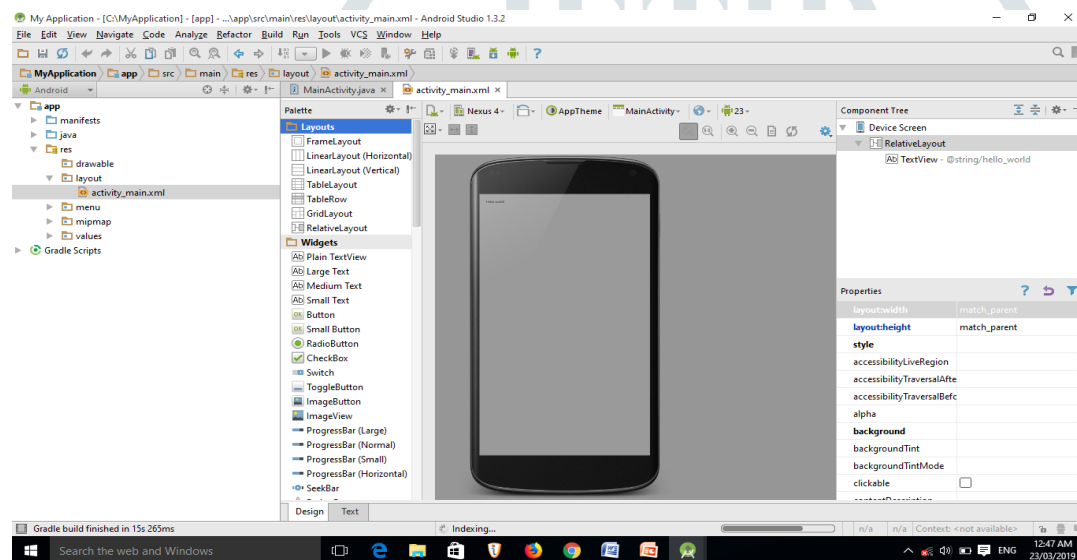
Android is very popular now, especially ADK (Android Open Accessory Development Kit), which allows external 0pen source hardware to connect with Android system by USB and interact with an Android-powered device in a special "accessory" mode.With the Google providing source files. To make the communication between Android and Arduino easy, we would like show you a new way that android interact with Arduino.

4.2 Why we used Android in our Project?

Android is very popular now, especially ADK (Android Open Accessory Development Kit), which allows external 0pen source hardware to connect with Android system by USB and interact with an Android-powered device in a special "accessory" mode.We keep working on it for weeks, and try to assemble some bata prototype and make a library for the communication between Android and Arduino by bluetooth and Freaduinofor ADK.

With the Google providing source files to make the communication between Android and Arduino easy, we would like show you a new way that android interact with Arduino.
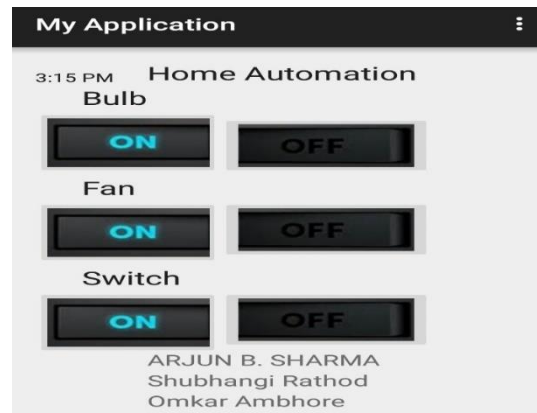
4.3 Application of Home Automation

Figure 4.1: Application of Home Automation

This is our Android application which is support to minimum android version 4.0.1 and above. This application contains 5 buttons such as forward, backward, right, left, stop which is used control movements of robot.

5. APPLICATIONS

1.Using this project, we can turn on or off appliances remotely i.e. using a phone or tablet.

2.The project can be further expanded to a smart home automation system by including some sensors like light sensors, temperature sensors, safety sensors etc. and automatically adjust different parameters like room lighting, air conditioning (room temperature), door locks etc. and transmit the information to our phone.

3.Additionally, we can connect to internet and control the home from remote location over internet and monitor the safety.

6. FUTURE SCOPE

☐ Arduino based device control using Bluetooth on Smartphone project can be enhanced to control the speed of the fan or volume of the buzzer etc.

☐ Home automation and Device controlling can be done using Internet ofThings – IOT technology.

☐ We can replace Bluetooth by GSM modem so that we can achieve device controlling by sending SMS using GSM modem.

7. CONCLUSION

1. The home automation system has been experimentally proven to work satisfactorily by connecting sample appliances to it and the appliances were successfully controlled from a wireless mobile device.

2. We learned many skills such as soldering, wiring the circuit and other tools that we use for this project and was able to work together as a team during this project.

3. The Bluetooth client was successfully tested on a multitude of different mobile phones from different manufacturers, thus proving its portability and wide compatibility. Thus a low cost home automation system was successfully designed, implemented and tested

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