BLUETOOTH BASED HOME AUTOMATION USING ARDUINO
Overview

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Introduction

• 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 smartphone/Tablet etc., with Android OS, upon a GUI (Graphical User Interface) based touch screen operation.
Hardware requirements

- Arduino UNO
- Bluetooth Module - HC-05
- 12V Relay
- Relay driver - ULN2003
- Power Supply
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.
The board...
### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microcontroller</td>
<td>ATmega328P</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>5V</td>
</tr>
<tr>
<td>Input Voltage (recommended)</td>
<td>7-12V</td>
</tr>
<tr>
<td>Input Voltage (limit)</td>
<td>6-20V</td>
</tr>
<tr>
<td>Digital I/O Pins</td>
<td>14 (of which 6 provide PWM output)</td>
</tr>
<tr>
<td>PWM Digital I/O Pins</td>
<td>6</td>
</tr>
<tr>
<td>Analog Input Pins</td>
<td>6</td>
</tr>
<tr>
<td>DC Current per I/O Pin</td>
<td>20 mA</td>
</tr>
<tr>
<td>DC Current for 3.3V Pin</td>
<td>50 mA</td>
</tr>
<tr>
<td>Flash Memory</td>
<td>32 KB (ATmega328P)</td>
</tr>
<tr>
<td></td>
<td>of which 0.5 KB used by bootloader</td>
</tr>
<tr>
<td>SRAM</td>
<td>2 KB (ATmega328P)</td>
</tr>
<tr>
<td>EEPROM</td>
<td>1 KB (ATmega328P)</td>
</tr>
<tr>
<td>Clock Speed</td>
<td>16 MHz</td>
</tr>
<tr>
<td>Length</td>
<td>68.6 mm</td>
</tr>
<tr>
<td>Width</td>
<td>53.4 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>25 g</td>
</tr>
</tbody>
</table>
Bluetooth Module (HC-05)

• For the communication between mobile phone and microcontroller Bluetooth module (HC-05) is used.
• HC-05 is low power 1.8V operation and is easy to use with Bluetooth SPP (serial port protocol).
• Serial port Bluetooth module have a Bluetooth 2.0+EDR (enhanced data rate), 3Mbps modulation with complete 2.4GHZ radio transceiver and baseband.
• Using Bluetooth profile and android platform architecture different type of Bluetooth applications can be developed.
Relay

- Relay is basically an electromagnetic switch which can be turn on and off by applying the voltage across its contacts.
- In this project used a 12V 4-channel relay.
How Relay Works?
Relay Driver (ULN2003)
Why Relay Driver?

- Relay safely driven by ULN2003 IC
- Protect microcontroller from relay kick back using integrated clamping diodes.
- Has 7 high current Darlington arrays each containing 7 open collector Darlington pairs with common emitters.
Power Supply

230 V AC
50 Hz

12V step down transformer

Bridge rectifier

Filter (470μf)

5v Regulator

5V DC

Diagram of a power supply system including a transformer, bridge rectifier, filter, and 5V regulator.
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.
Android Application on Mobile Phones

• An android app is meant for phones with an android based operating systems. They can be downloaded from the android app Market which is pre-loaded on every android phone.
• Blue control APP and Bluetooth Spp APP are some examples.
Android Application Operated Bluetooth

• 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.
Android Application for Home Automation

- Control home electrical system using smart phone with android application and Blue Switch Module.
- Blue Switch Module’s outputs to directly drive loads like bulbs, Lamps, Sockets, Television, Fans etc.
Contd...
Software Used..

• Arduino IDE
• Eclipse Android SDK (Software Development Kit)

Programming Languages Used..

• Embedded C/C++
• Java & XML
Advantages

• It is a robust and easy to use system.
• There is no need for extra training of that person who is using it.
• All the control would be in your hands by using this home automation system.
• This project can provide the facility of monitoring all the appliances with in the communication range through Bluetooth.
• The schematic of Arduino is open source, for the future enhancement of the project board can be extended to add more hardware features.
Disadvantages

• Bluetooth is used in this home automation system, which have a range of 10 to 20 meters so the control cannot be achieved from outside this range.

• Application is connected after disconnect of the Bluetooth.

• When the new users want to connect, first download application software and then configuration must be done.

• High power consumption because of bluetooth connectivity.
Future Work

- Memory can be used to store the appliance status during power failure.
- Appliance scheduler/timer can be implemented using RTC (Real Time Clock)
- Can be changes to an IoT device using WiFi connectivity.
References

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• www.arduino.org
• www.beyondlogic.org
• www.wikipedia.org
• www.elementzonline.com
• www.elementztechblog.wordpress.com
Questions????
THANK YOU