BLUETOOTH BASED HOME AUTOMATION USING ARDUINO

12.05.2016

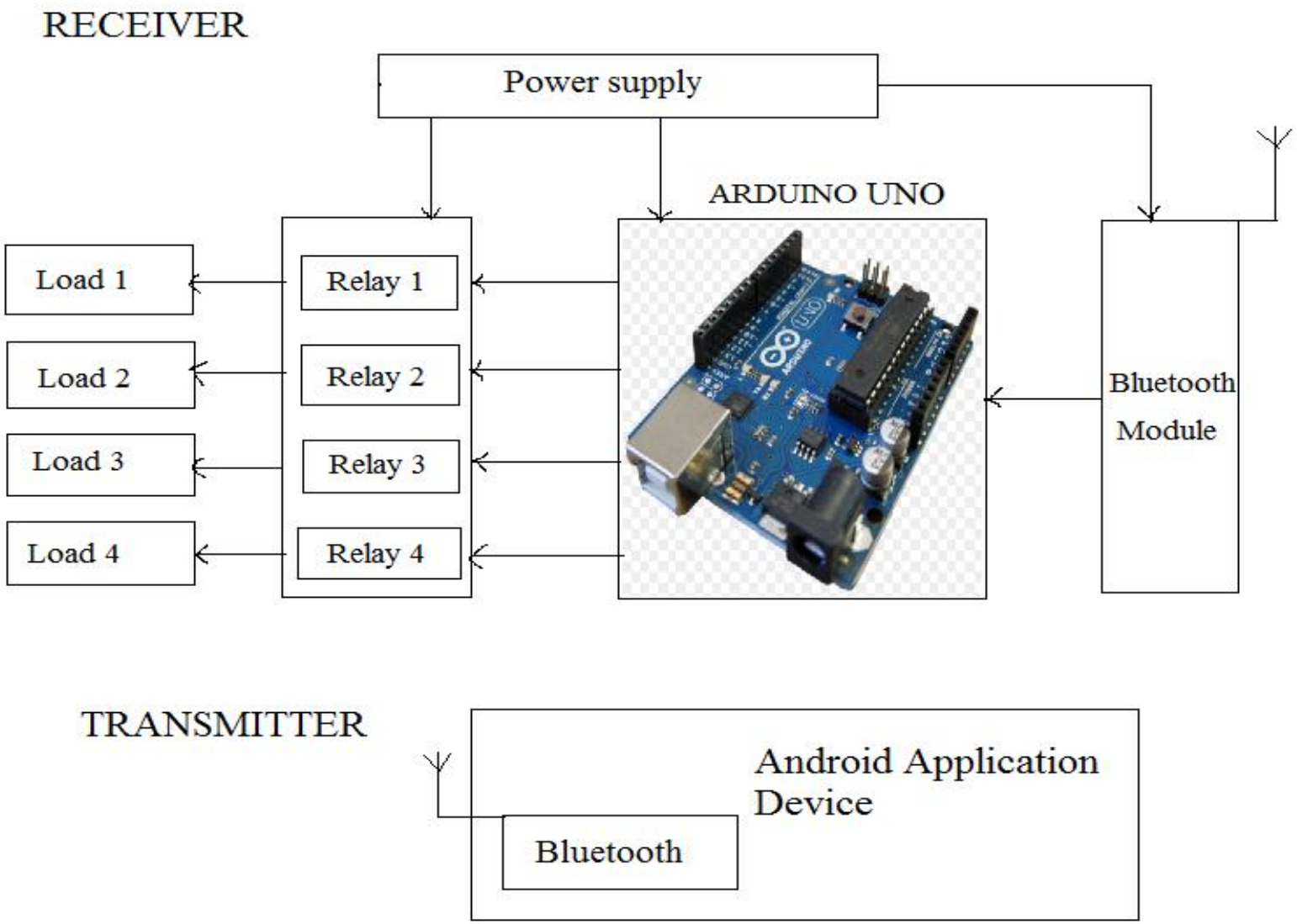
Overview

- Introduction
- Block Diagram
- Hardware Requirements
- Software used
- Advantages
- Disadvantages
- References

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 smart-phone/Tablet etc., with Android OS, upon a GUI (Graphical User Interface) based touch screen operation

Block Diagram



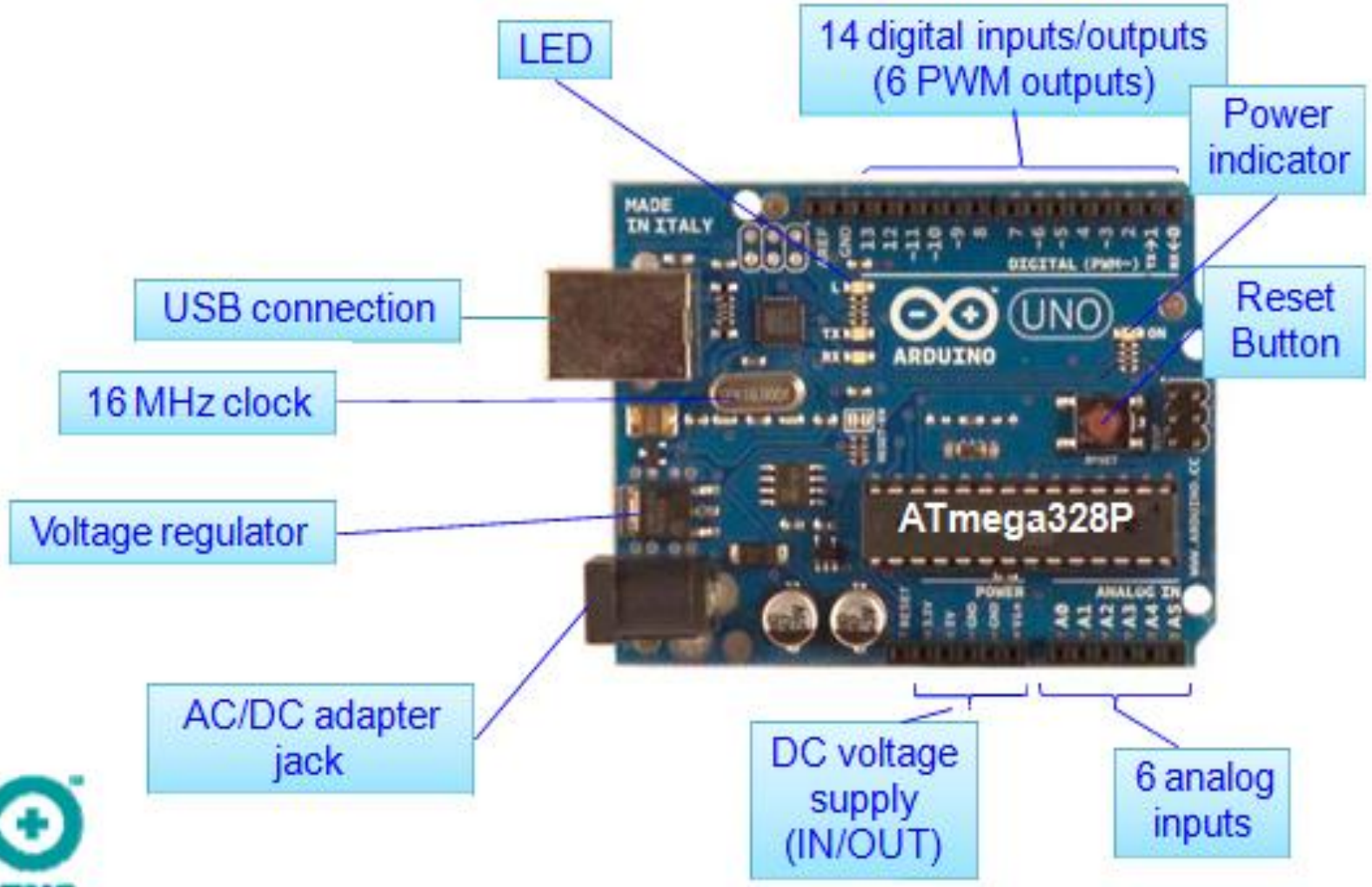
Hardware requirements

- 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...


LED
14 digital inputs/outputs
(6 PWM outputs)
Power
indicator
USB connection
Reset
Button
16 MHz clock
Voltage regulator
ATmega328P
AC/DC adapter
jack
DC voltage
supply
(IN/OUT)
6 analog
inputs
ARDUINO

Specifications…

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

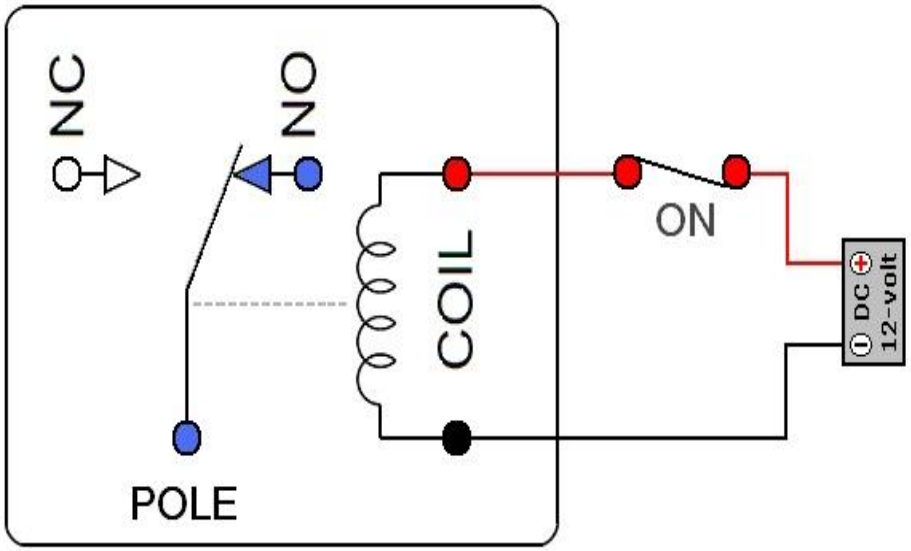
Bluetooth Module (HC-05)

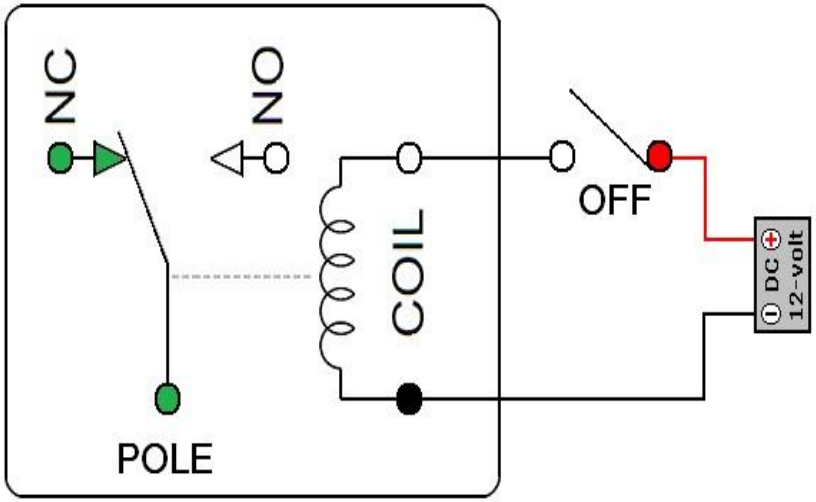
- For the communication between mobile phone and microcontroller Bluetooth module(HC-05) is used.
- HC-05 is low power 1.8V operation and is easy to use with Bluetooth SPP (serial port protocol).
- Serial port Bluetooth module have a Bluetooth 2.0+EDR (enhanced data rate), 3Mbps modulation with complete 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 an applying the voltage across its contacts.
- In this project used a 12V 4-channel relay.

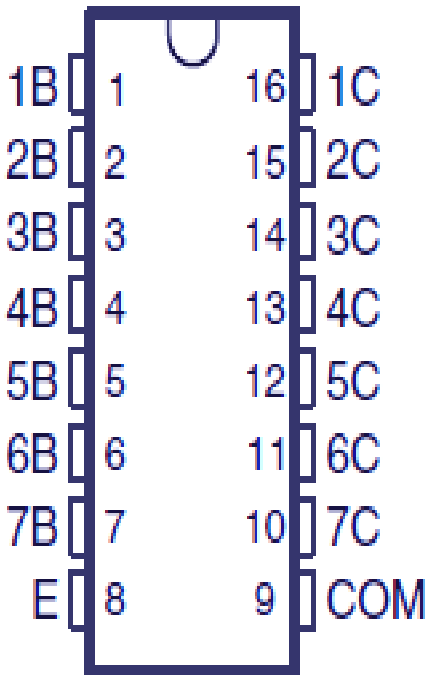
How Relay Works?

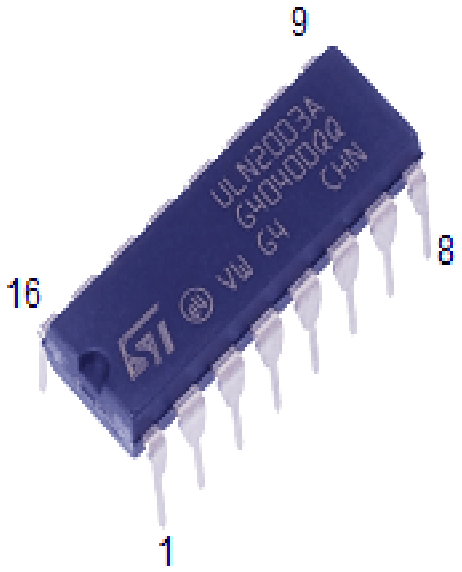




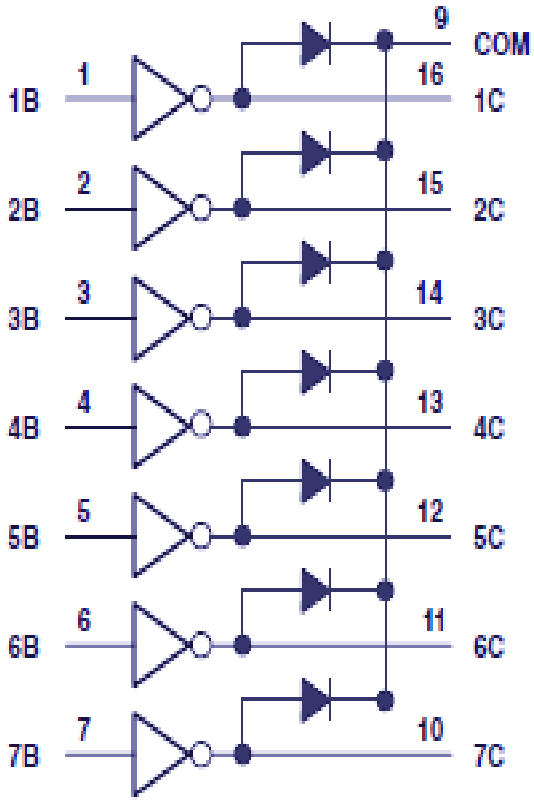
Relay Driver(ULN2003)

Pin configuration





Logic diagram



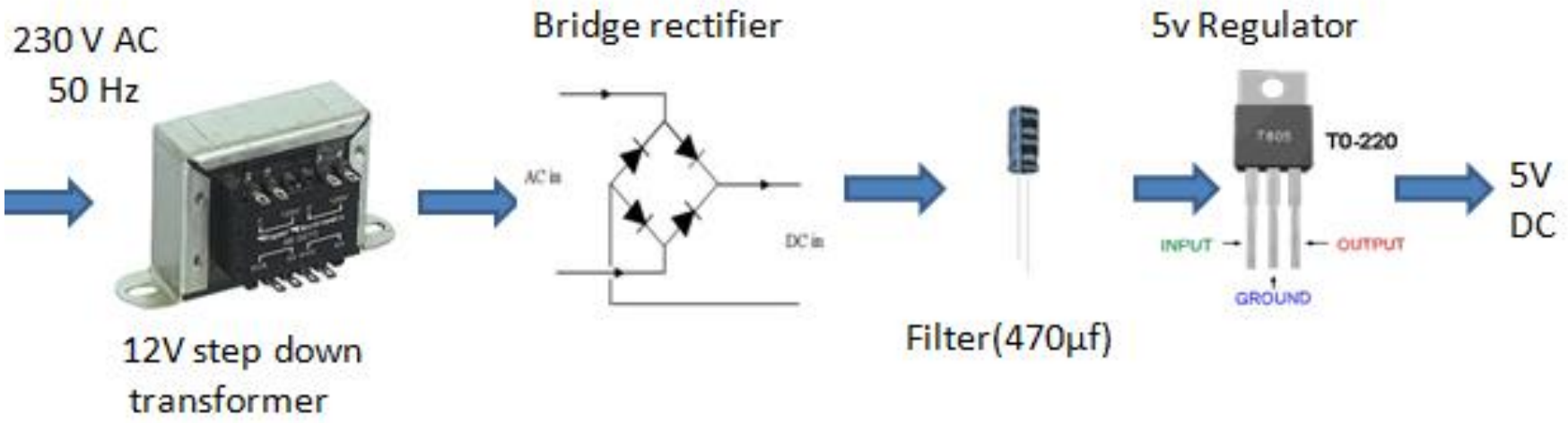
ULN2003A driver IC pin configuration and internal logic diagram

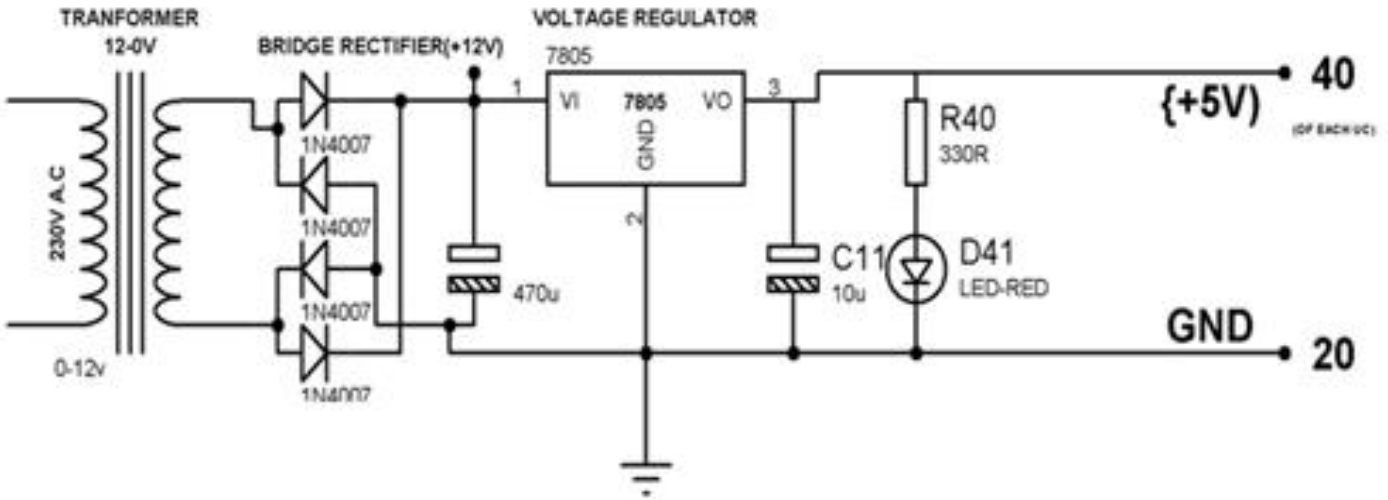
www.circuitstoday.com

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





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.

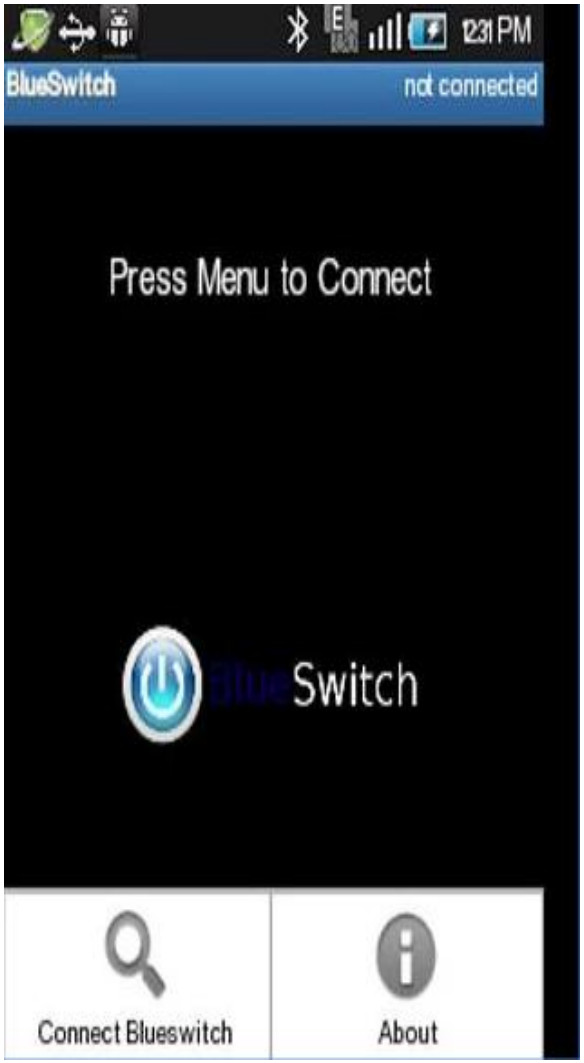
Android Application Operated Bluetooth

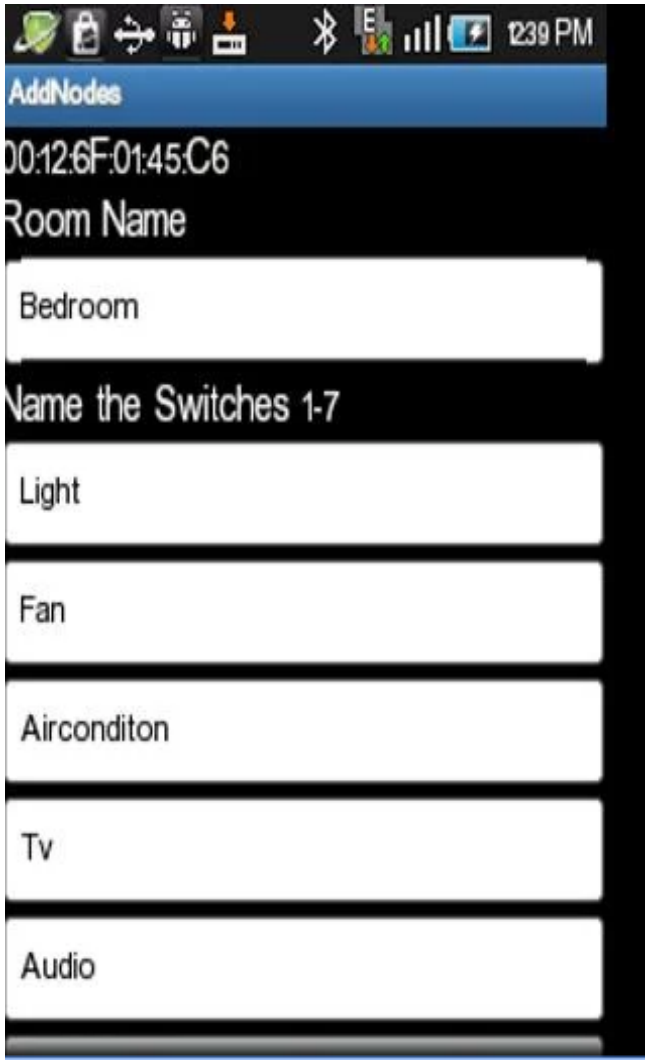
- The Android platform includes support for the Bluetooth network stack, which allows a device to wirelessly exchange data with other Bluetooth devices.
- The application framework provides access to the Bluetooth functionality through the Android Bluetooth APIs.

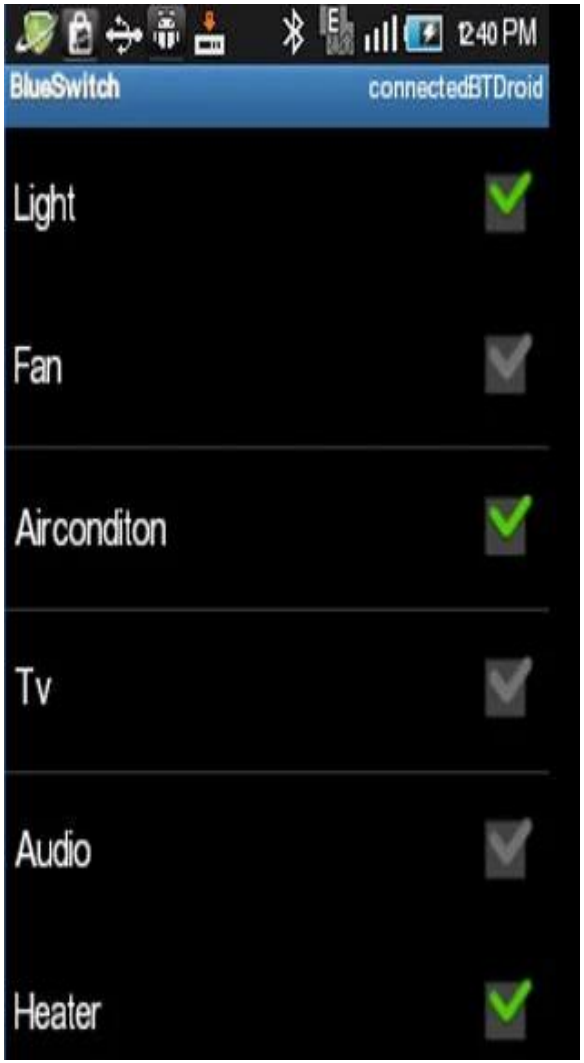
Android Application for Home Automation

- 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.
- For download and installation http://www.bleplug.com.

Contd…


1231 PM
BlueSwitch
not connected
Press Menu to Connect
BlueSwitch
Connect Blueswitch
About


1239 PM
AddNodes
00:12:6F:01:45:C6
Room Name
Bedroom
Name the Switches 1-7
Light
Fan
Airconditon
Tv
Audio


1240 PM
BlueSwitch
connectedBTDroid
Light
Fan
Airconditon
Tv
Audio
Heater

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

- www.atmel.com
- www.arduino.org
- www.beyondlogic.org
- www.wikipedia.org
- www.elementzonline.com
- www.elementztechblog.wordpress.com

Questions????

THANK YOU