# Introduction

We are living in 21st century where automation of any form i.e. home or industrial plays an important role in human life. When it comes to industrial automation, the concept is applied to large machines or robots which helps in increasing the efficiency in terms of production, energy and time.

Home automation on the other hand involves automating the household environment. This is possible because of the smartphones and internet that we are widely using. Home automation can be again divided in to just controlling the appliances using a smartphone from a remote location and another type filled with sensors and actuators which controls the lighting, temperature, door locks, electronic gadgets, electrical appliances etc. using a "Smart" system.

In this project, we designed a simple home automation project using simple components using which different electrical appliances can switched on or off. The project is based on Arduino and we have used Arduino UNO for the project.
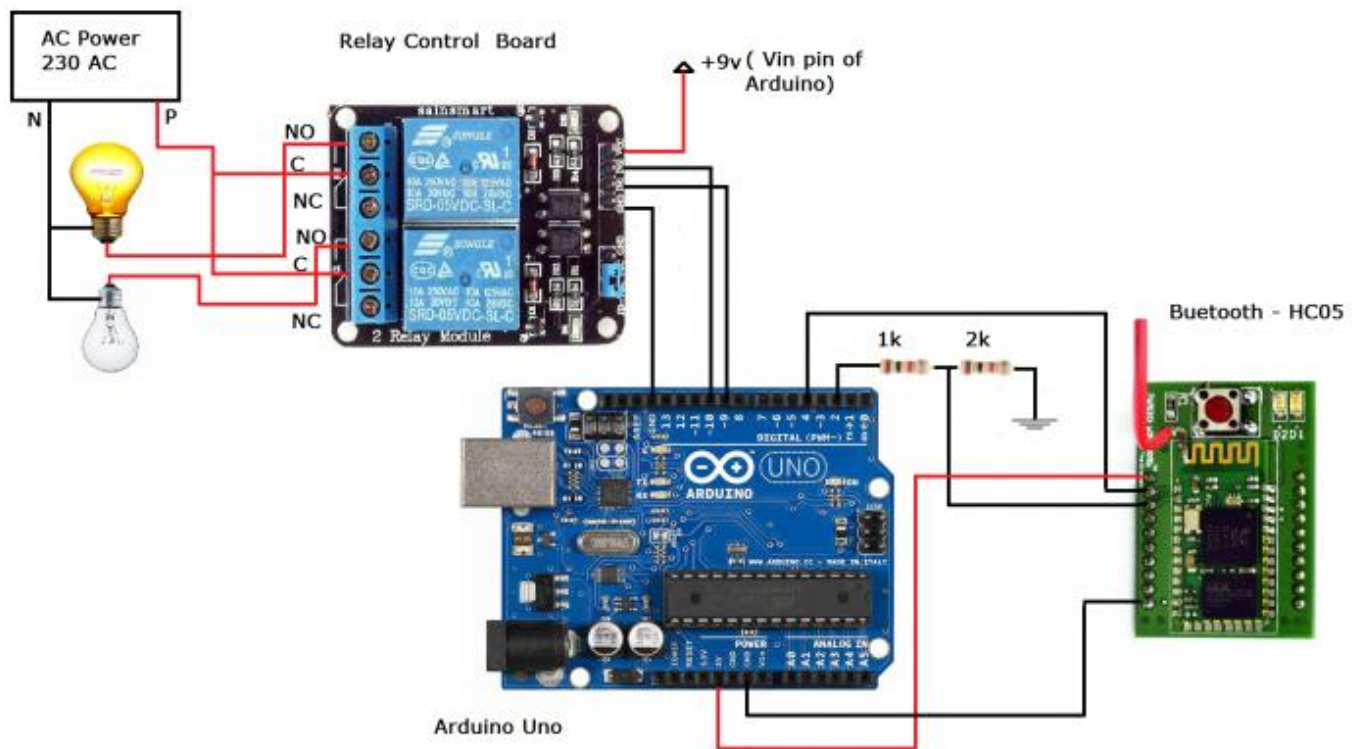
Hardware Requirement

- Arduino Uno
- Bluetooth – HC05
- Relay Board
- Tungsten Bulb (2)
- Connecting Wires
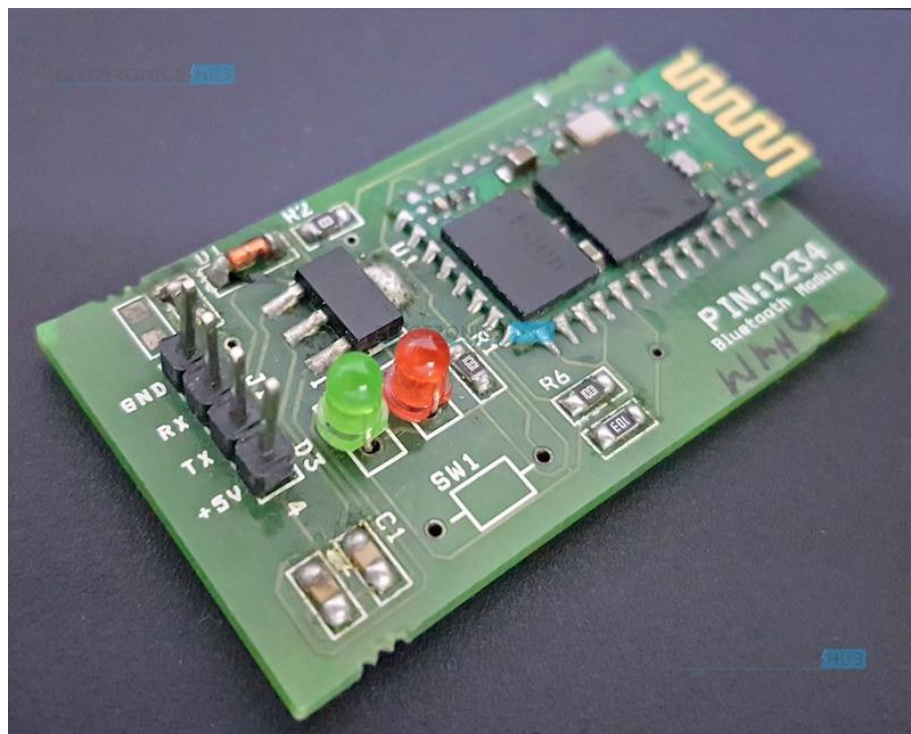- AC power supply(230v)

Software Requirement

- Arduino IDE

Overview of the Robot

Hardware Overview

Bluetooth Module:

The Bluetooth Module used in this project is HC- 05. As seen in the image below, this Bluetooth module has 4 – pins for VCC (5V), ground, TX and RX.

This Bluetooth can be used with Bluetooth enabled phone (or tablet or laptop) and the range of this module is approximately 10 meters.

Relay Board:

A 4 – channel relay board is used in this project to control four different loads. It has all the necessary components and connections like base current limiting resistor, flyback diode, LED indicators and header for connecting it to other devices.

*Caution*: We should be very careful when using a relay with AC mains.

Microcontroller: Arduino Uno

The Arduino Uno board is a microcontroller based on the ATmega328. It has 14 digital **input/output pins** in which 6 can be used as **PWM outputs**, a 16 MHz ceramic resonator, an ICSP header, a USB connection, 6 analog inputs, a power jack and a **reset** button.

The 8 – bit ATmega 328P microcontroller-based Arduino UNO is used in the project to control different components like Bluetooth module and relay network. This microcontroller is used for its ability to interface with hardware components and runs the system as per a pre-uploaded code.

Features of the Arduino UNO:

- Microcontroller: ATmega328.
- Operating Voltage: 5V.
- Input Voltage (recommended): 7-12V.
- Input Voltage (limits): 6-20V.
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6.
- DC Current per I/O Pin: 40 mA.
- DC Current for 3.3V Pin: 50 mA.
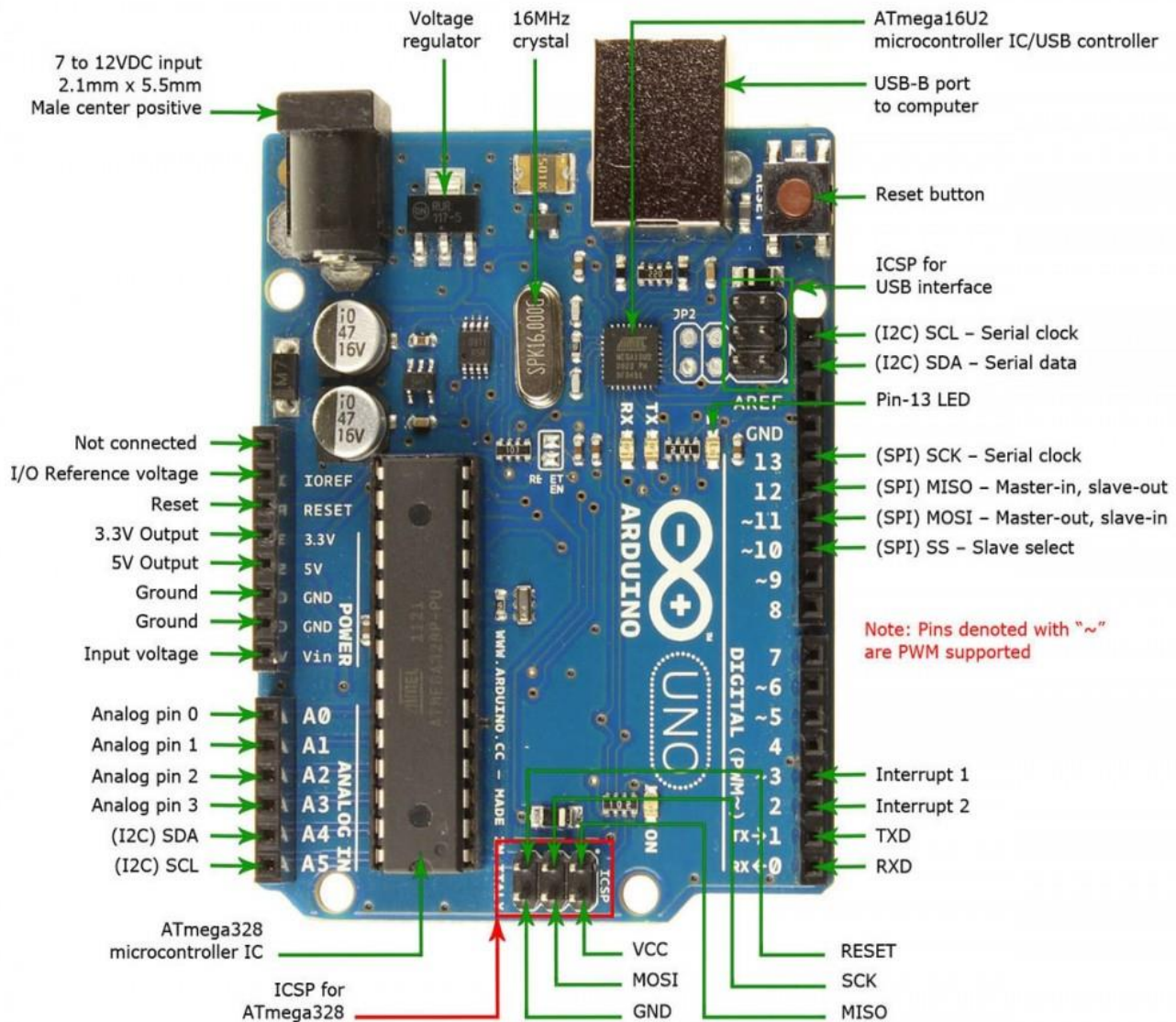
Software Overview

From a software standpoint, the only software used is the **Arduino IDE** which is used to code and upload the code into the Arduino.

The IDE provides an all-in-one software platform where one can code, compile, debug, print and also upload the code to the Arduino.

The basic overview of any Arduino code contains 2 mandatory functions: setup () and loop ()

setup ():
This function is the first function to be executed when the Arduino starts up and used to define pins and variable and perform the prerequisites.

loop ():
This function is the main driver of the Arduino code, this function is called over and over after its completion and never terminates. The code within this function runs again and again infinitely.
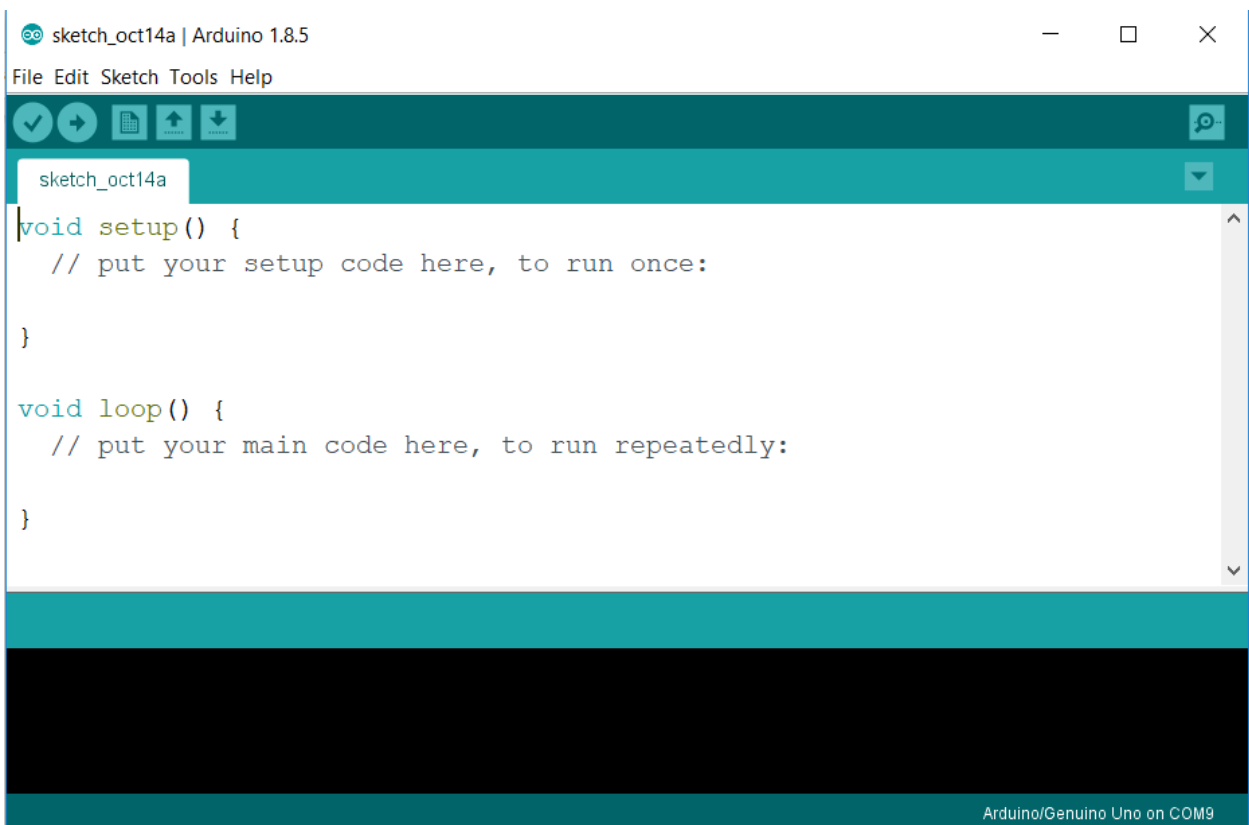
Circuit Construction

First make the circuit connection as shown in fig1.1. The 1st Pin (Vcc) of Bluetooth (HC05) is connect to +5v of Arduino Uno and 10th pin (GND) to Arduino Uno GND. The 2nd pin (Tx) and 3rd pin (Rx) of HC05 is connected to 4th and 2nd of Arduino Uno. Make sure that Rx pin of HC05 is connected to Arduino @nd pin through voltage divider contains 1k and 2k resistor, because Rx pin of HC05 is 3.3v compatible but Arduino GPIO output is 5v. So, we decreasing the voltage from 5v to 3.3v using voltage divider to make Arduino and Bluetooth compatible.

Then 9th and 10th pin of Arduino Uno is connected to R1 and R2 of relay board. Vcc and GND pin of relay board is connected to Vin(+9v) and GND pin of Arduino Uno. Another side of relay board three pin connector available, named NO (Normally open), C (common) and NC (Normally closed). Each relay contains separate connector. Phase(P) of 230v AC is connected to C (common) and one end of bulb is connected to NO (normally open). Another end of bulb is connected to Neutral(N) of AC supply.

Working

After making circuit connection as per the fig 1.1 compile the Arduino program given below in Arduino IDE and upload program to your Arduino Uno using USB B type data cable. Power up your Arduino using 9v DC adapter. After power up your circuit the lrd on Bluetooth start to blink very fast, it means the Bluetooth device waiting to be pair. Now connect your mobile to HC05 using **Bluetooth Controller** app. After connecting your mobile to HC05 turn ON and OFF the lights using respective keys.

Download **Bluetooth Controller** app from google play store.