جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

كلية العلوم

قسم الانظمة الطبية الذكية

Intelligent Medical Systems Department

Lecture: (7)

Arduino Wireless Control

Subject: Embedded System

Class: Third

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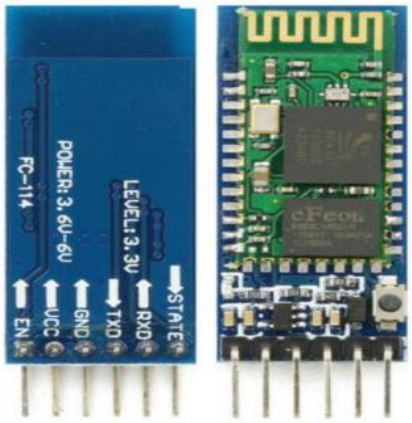
Arduino Wireless Control

Wireless control is much more convenient especially on a significant distance. Where provides more flexibility in remote control. Arduino board can be controlled wirelessly in different ways including Bluetooth and Wi-Fi and others.

Bluetooth

Is a communications technology in the band of short radio waves designed to transmit data over short distances from one meter to one hundred meters using Serial Communication protocol and consumption of small amounts of energy. Uses this technology is very much in the transfer data between mobile devices and other peripherals. Can also uses a Bluetooth for remote control of Arduino using the Bluetooth module HC-05.

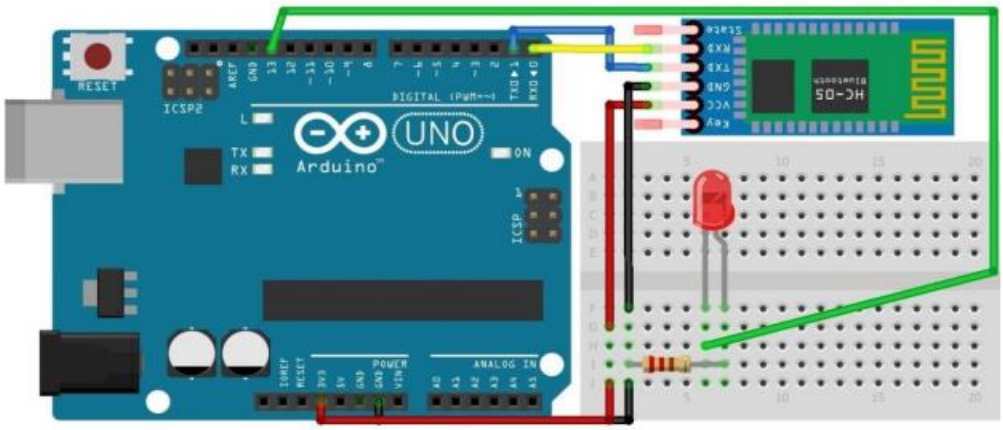


Example:

(Control the LED light through Bluetooth)

Requirements: Arduino, BreadBoard, Led, HC-05, Resistors, wires.

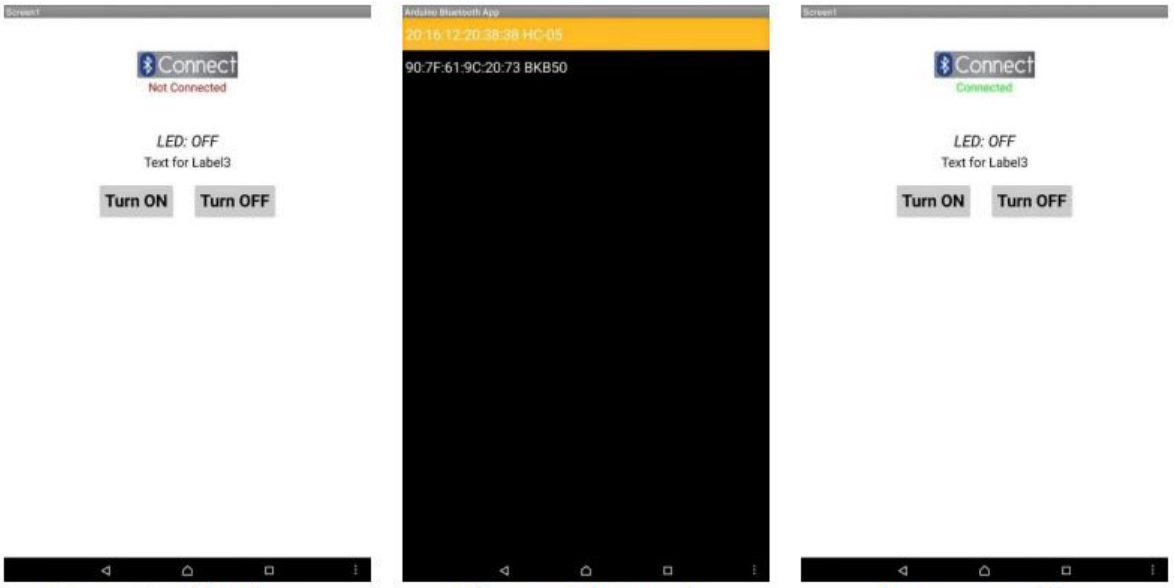
Connection map:



Code:

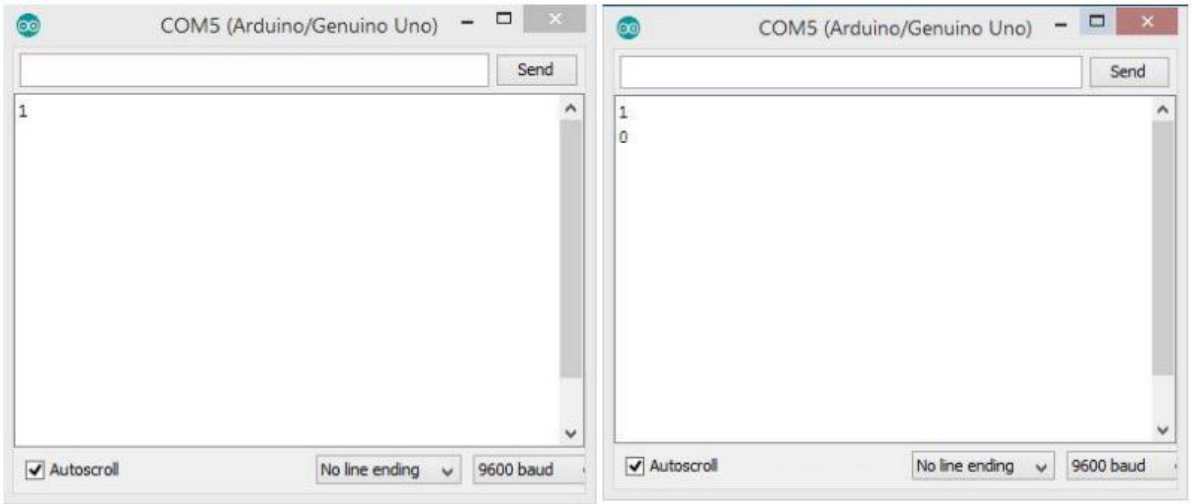
```
#include <SoftwareSerial.h>

int Rx = 0;
int Tx = 1;
SoftwareSerial bluetoothSerial(Tx, Rx);

void setup() {
  pinMode(13, OUTPUT);
  bluetoothSerial.begin(9600);
  Serial.begin(9600);
}

void loop() {
  if (bluetoothSerial.available()) {
    char c = bluetoothSerial.read();
    Serial.println(c);
    if (c == '1') {
      digitalWrite(13, HIGH);
    } else if (c == '0') {
      digitalWrite(13, LOW);
    }
  }
}
```

Arduino is controlled by Bluetooth connection. The Bluetooth segment connected to Arduino functions as a receiver for the signal and Bluetooth in the control device (here is the mobile device) as a signal transmitter. It is controlled by a specific application that sends commands to the Arduino for execution.



Open Application Choose Bluetooth Start controlling

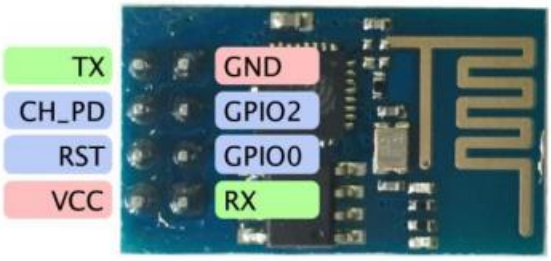
The result in serial monitor when sending commands from Application:



Wi-Fi

Wi-Fi Technology is a spectrum radio technology and OFDM radio technology for radio wireless networking of devices based on the IEEE 802.11 standards. To use Wi-Fi with Arduino can use deferent ways, where the most common of these ways is ESP8266 Wi-Fi module and Node MCU.

ESP8266 Wi-Fi module: The ESP8266 Wi-Fi module is basically a microcontroller developed by Espressif Systems which is a company based out of shanghaiing. This microcontroller has the ability to perform WIFI related activities hence it is widely used as a WIFI module with other microcontrollers and boards such as Arduino.



Pin Description of ESP8266 Module

VCC: It is the power pin through which 3.3V is supplied.

GND: It is the ground pin.

TX: This pin is used to transmit serial data to other devices.

RX: The RX pin is used to receive serial data from other devices.

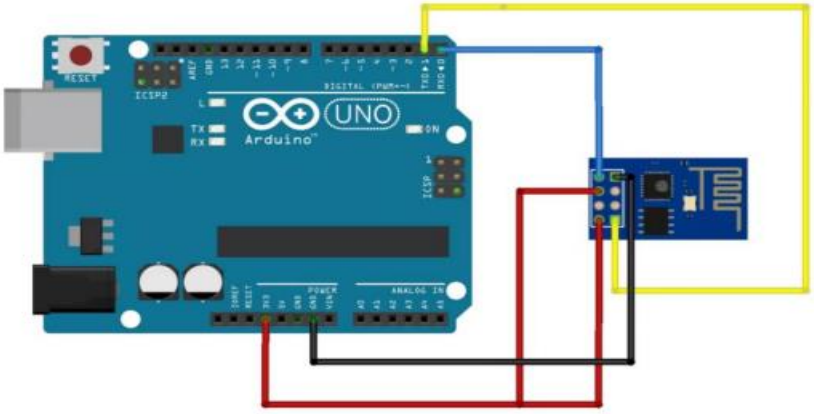
RST: It is the Reset Pin and it is an active LOW Pin. **(ESP8266 will reset if the RST pin receives LOW signal).**

CH_PD: This is the chip enable pin and it is an active HIGH Pin. It is usually connected to 3.3V.

GPIO0: The GPIO0 (**General Purpose I/O)** Pin has dual functions – one for normal GPIO Operation and other for enabling the Programming Mode of ESP8266.

GPIO2: This is GPIO Pin.

IMPORTANT NOTE: The ESP8266 is not compatible with 5V and the ESP-01 Module does not have any voltage regulators on-board. Make sure that the power supply to the ESP8266 is 3.3V, preferably from a dedicated power supply rather than taking it from the 3.3V Pin of the Arduino.



****(first must add (<ESP8266_Lib.h> , <BlynkSimpleShieldEsp8266.h>)libraries - can download it from github)**

Code

```
#define BLYNK_PRINT Serial
#include <SoftwareSerial.h>
#include <ESP8266_Lib.h>
#include <BlynkSimpleShieldEsp8266.h>

char auth[] = "yourAUTH";
char ssid[] = "yourSSID";
char pass[] = "yourpassword";

#define ESP8266_BAUD 115200

// Define a SoftwareSerial port for the ESP8266
SoftwareSerial EspSerial(2, 3);  // Rx, Tx
```

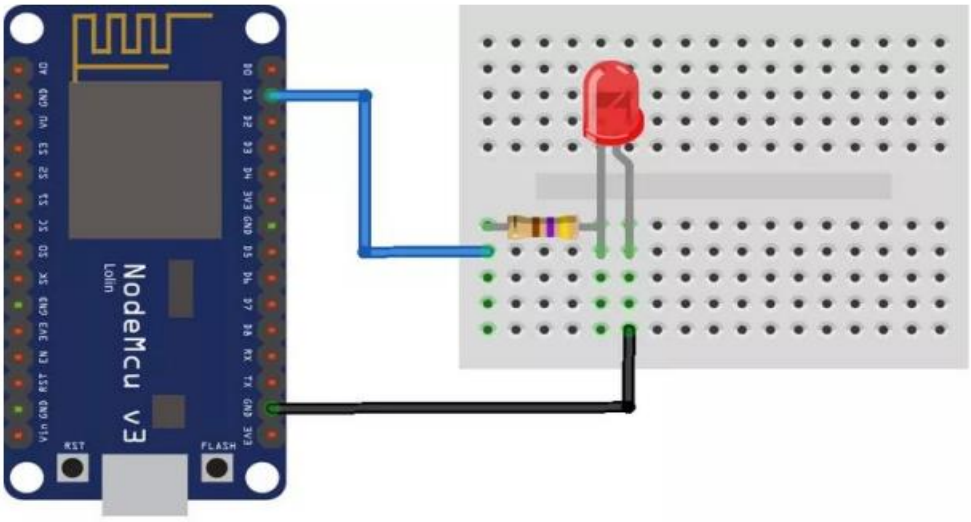
```
ESP8266 wifi(&EspSerial);

void setup() {
  // Start the serial connection for monitoring on Serial Monitor
  Serial.begin(9600);
  delay(10);

  // Start the serial connection for the ESP8266
  EspSerial.begin(ESP8266_BAUD);
  delay(10);

  // Start the connection to the Blynk platform
  Blynk.begin(auth, wifi, ssid, pass);
}

void loop() {
  Blynk.run();
}
```

Node MCU: is a Development Kit based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board. It is basically a System on Chip (SoC).It has Lua based firmware which is used to develop IoT based applications.

It is easy to work on this inexpensive SoC and make our device smart. It has analog and digital pins, which we can use to interface our sensors and can get the data over internet.

The device looks similar to an Arduino or Raspberry Pi Zero featuring a USB port for power or programming. Several firmwares are available (similar to an Operating System) for programming the device in Lua, C (with the Arduino IDE) or even MicroPython. Cursory reading showed the Lua firmware to support the most amount of modules/functionality including HTTP, MQTT and popular sensors such as the BME280.

The Node MCU programming model is similar to that of Node.js, only in Lua. It is asynchronous and event-driven. Many functions, therefore, have parameters for callback functions.



Program with Arduino C:

```
#define LED D1
void setup() {
pinMode(LED, OUTPUT);
}
void loop() {
digitalWrite(LED, HIGH);
delay(1000);
digitalWrite(LED, LOW);
delay(1000);
}
```

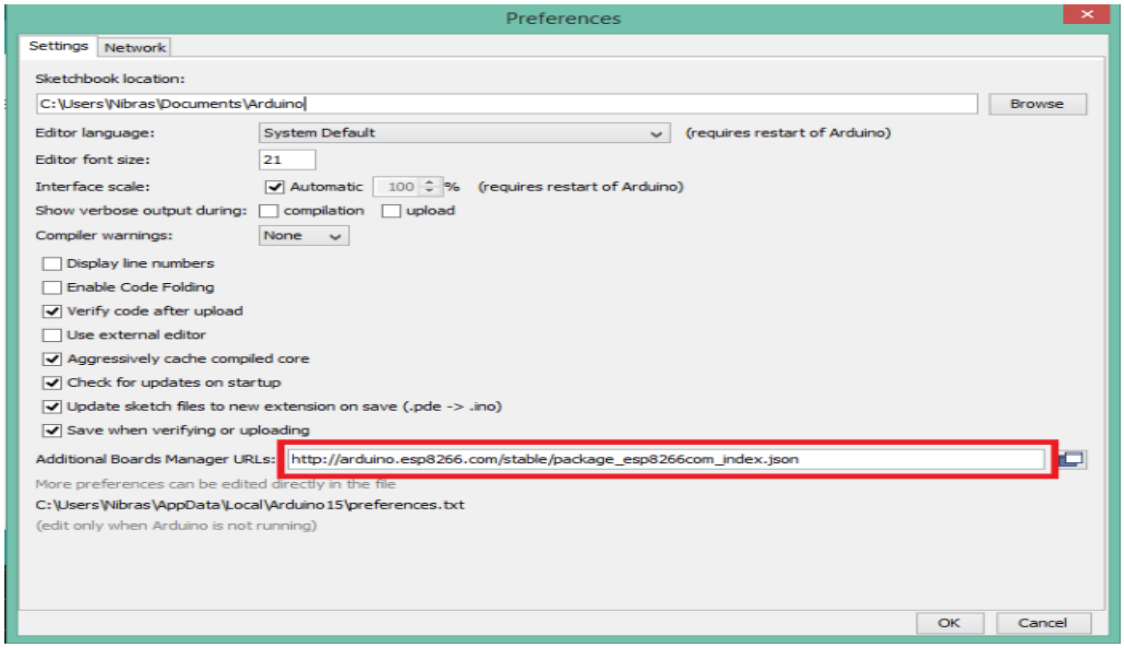
Program with Lua:

```
LED_PIN = 1
gpio.mode(LED_PIN, gpio.OUTPUT)
value = true
tmr.alarm(0, 500, 1, function ()
 gpio.write(LED_PIN, value and gpio.HIGH or gpio.LOW)
 value = not value
end)
```

Note:

In order to use ESP8266 Wi-Fi Module using Arduino IDE need to make a few changes to the Arduino IDE: First, go to File –> Preferences and in the Additional Boards Manager URLs Section, enter the following URL:

http://arduino.esp8266.com/stable/package_esp8266com_index.json



Second, go to Tools –> Board –> Boards Manager and search for ESP8266 in the search field. Select the ESP8266 by ESP8266 Community and click on Install.