Post Session Doc

This Document is meant to cover all the information needed to Build the Bot , Understand the Code and Debugging any Other Problems you could encounter during the process (Electronic or Software)

Contents

Theory*

1. Bluetooth Module (HC05)
2. Arduino
3. L293D motor driver IC - pins and internal working.
4. Power solutions for any project
5. Mobile application used to connect to bluetooth module

* - Lot of the Theory has been Taken from the Slides that was presented to you and links for the Document has also been attached in the Resources Section

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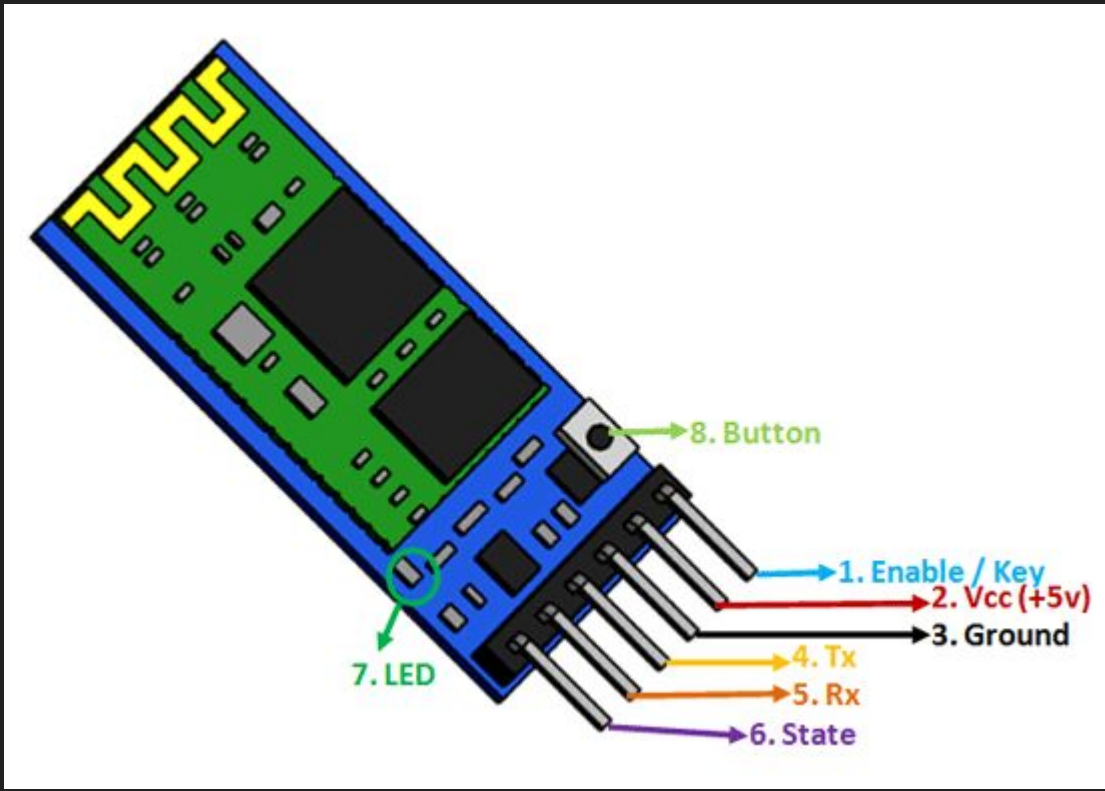
Bluetooth Module (HC-05)



RPA Summer 2020

Pin Description

PIN 1- ENABLE / KEY
Used to toggle between Data Mode (set low) and AT Command mode (set High).
Default- Data mode

PIN 2 - VCC
Powers the module. Supply Voltage- +3.3V to +5V

PIN 3- GROUND
Ground pin of module.

PIN 4- TX TRANSMITTER
Transmits Serial Data. received via Bluetooth

PIN 5- RX RECEIVER
Receives Serial Data. Data received by this pin is broadcasted via Bluetooth

PIN 6- STATE
This pin is connected to on board LED. Can be used as a feedback tp check proper working of Bluetooth..

LED
Blinks to indicates the status of Module

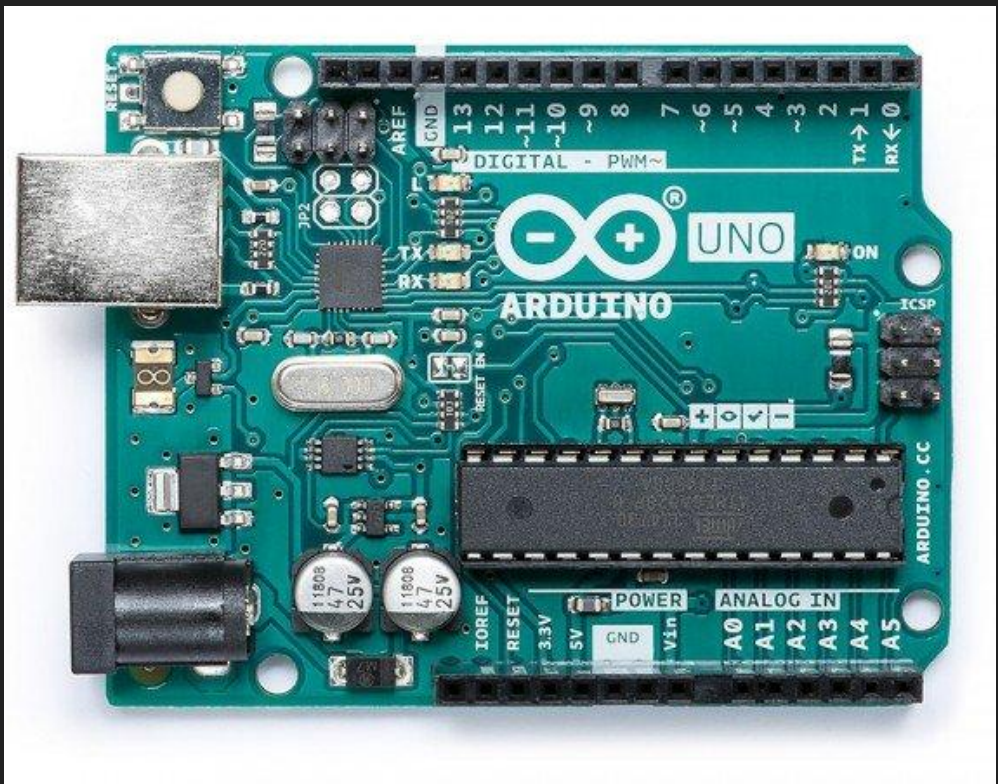
BUTTON
Used to control Key/Enable pin to toggle between Data and Command mode

Arduino

Arduino is Single-board microcontroller,intended to make the application application of interactive interactive objects objects or environments more accessible.

Designed to make the process of using electronics multidisciplinary projects more accessible.

(Whatever Project you do in your future , there’s a good (great) amount of probability you’ll be using Arduino for it, Mainly Because it is Open Source and the Arduino Online Community was and is always Developing and Active)



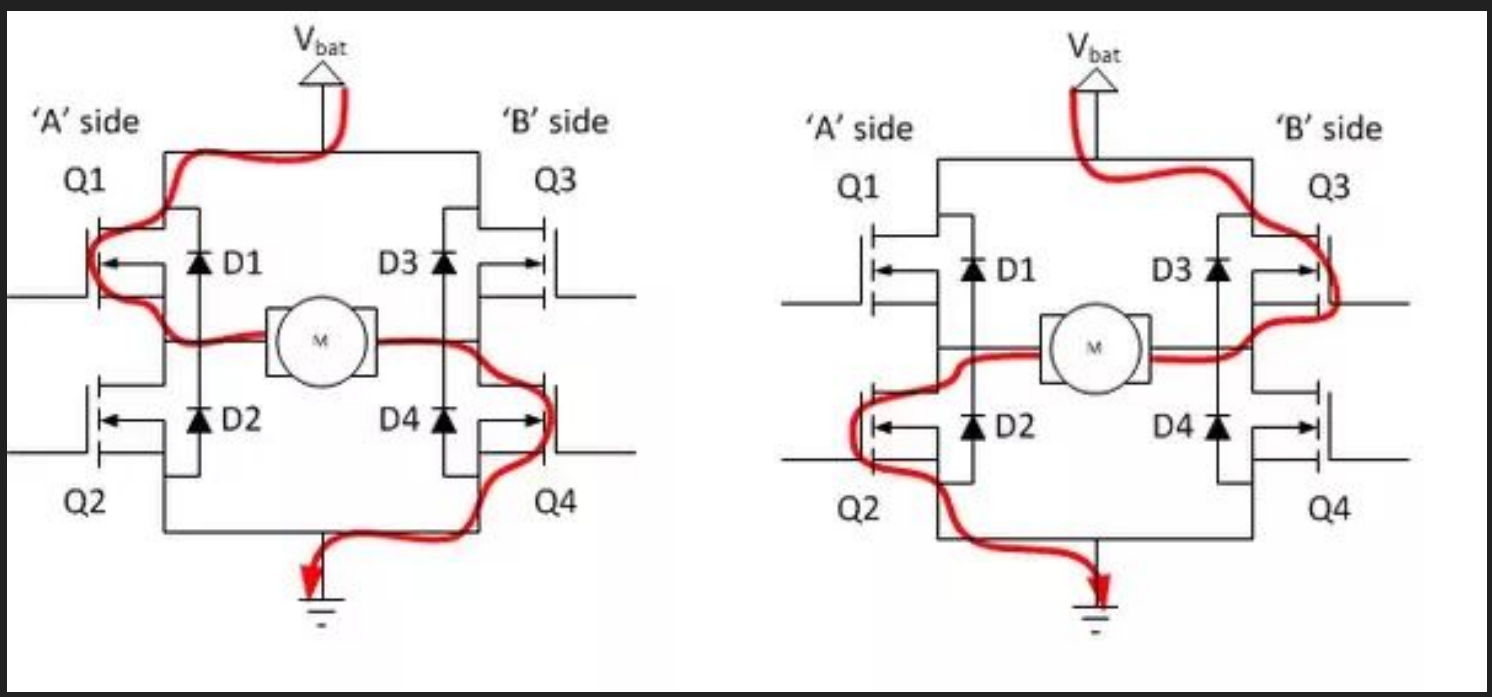
Motor Driver / L293D

What Is a Motor Driver and Why ?

Motor drivers acts as an interface between the motors and the control circuits. Motor require high amount of current whereas the controller circuit works on low current signals. So the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor.

How Does it work ?

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction to create forward / backward rotation.



Optional :
Wait what ? 4 Connections (Q1 , Q2 , Q3 , Q4) for controlling one motor ? Didn't we use four for controlling 2 motors in the session ??

Power Solutions

- 9V Battery
- Power Banks
- SMPS (AC Adapter - Basically your Phone/ Laptop Charger)
- LiPo Batteries (Used in Phones / Drones)

Our Applications has Motors Involved which means the Current Draw is High.

Optional :

Remember how terribly most of the 9V batteries Performed but the Few Who tested it using Duracell Batteries / Power banks Performed Better ? (Google Why)

Hint : Ever Broken RC Toy Cars bought from a store ? If Yes , You could have found Capacitors soldered across terminals of Motors in those.

How did power banks manage to perform well ?? (Google for batteries used in Drones and why)

and Do you think it'll affect the Life Power bank ? (and Why ?)

Still don't get it ?? See this :
https://www.youtube.com/watch?v=27ZEgrV6ODo

Robo Remo (The Android App Thingy you used in the session)

Bluetooth is a Full-Duplex Communication Protocol and we will be sending datas to it using the App.

WTH does Full-Duplex Mean ? It Can Send and Receive Messages at the Same Time.

Analog (Not so great Analogy)

Video Call -> Full-Duplex

Sitting in a Movie -> Half-Duplex (One-Side Communication)

Communication Protocol ? (In telecommunication, a communication protocol is a system of rules that allow two or more entities of a communications system to transmit information via any kind of variation of a physical quantity.)

This App is customizable so that when you define the up key to be “f” then once you click the up key , it sends “f” to the Arduino and moves your bot front.

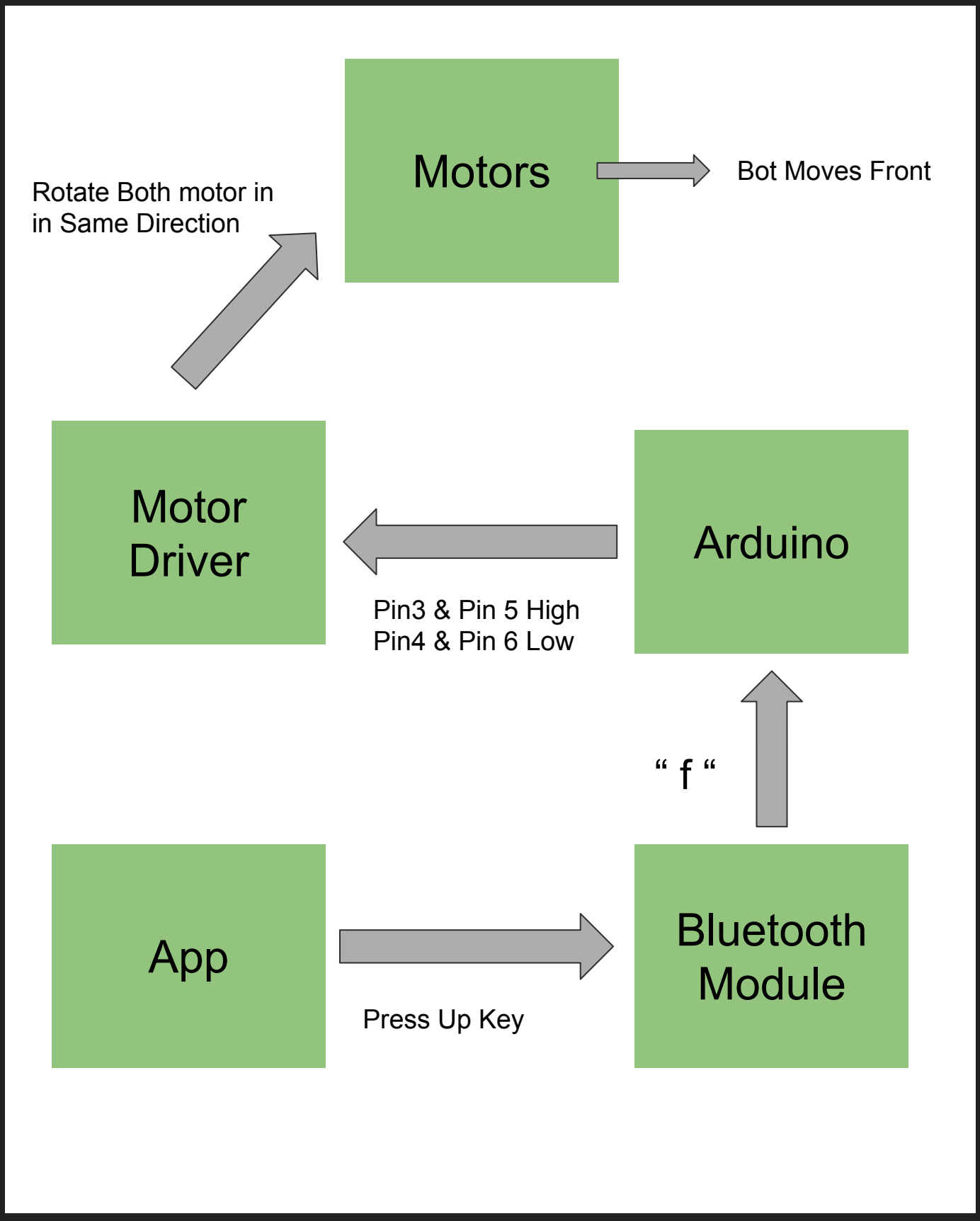
Optional :

Interested to know in Detail about How Bluetooth Works :

https://raghav1900.github.io/pages/visualising_rf_spectrum.html

Don’t worry if you don’t completely understand it , even i don’t , i thought the visualization was cool and gives an rough idea of how bluetooth transmits bits .

Now It All Makes Sense rite? 😮😳



Understanding the Code

Prerequisites : English

Congrats , You've Completed the Boring Part of the document, The Upcoming parts are going to be interesting.

Imagine You are the best programmer of a Billion Dollar Company and your boss brings his kid with a bot and tells you are gonna get a week off and A Salary Bonus to Fix his bot. Now you Analyze all the Components it has for a Few Seconds and Find out it's very Similar to Previous Slide, and the missing part is a good code , so You Start Writing Code , How could you Go about it ??

Go to the Previous Slide and Think for a minute before you See the Solution

Steps:

This would probably be the steps that you would have followed :

- Get Input from the Android App using Bluetooth
  - The Possible Inputs are ‘f’ , ‘b’ , ‘l’ , ‘r’ meaning front , back , left and right.
- If f then move forward
- If b then move backward
- if l then move left
- If r then move right
- Wait for Next Input and Go to First Step

Now the Code that you’ve used is the implementation of the Same steps, Let’s Break it down in detail :

Got Three Minutes ? Go through this first :

https://www.circuito.io/blog/arduino-code/

Coming Back , Let’s start putting the code together

Getting Input : (Remember Bluetooth Uses Serial Communication)

```
if(Serial.available()) {                // If Any Input is Available
   char c = (char)Serial.read(); // Save the Input to variable c
```

Movements :

strcmp(a, b); Gives 0 as output if a=b

l1 , r1 , l2 , r2 are defined as 3,4,5,6 initially and are pins connected to Motor Drivers

Forward : (Move Both Motors Forward)

```
if(strcmp(cmd, "f")==0) {     // If ‘f’ is received then Do the following
  digitalWrite(l1, HIGH);
  digitalWrite(r1, HIGH);
  digitalWrite(l2, LOW);
  digitalWrite(r2, LOW);
 }
```

Backward : (Move Both Motors Backward)

```
if(strcmp(cmd, "b")==0) {
  digitalWrite(l1, LOW);
  digitalWrite(r1, LOW);
  digitalWrite(l2, HIGH);
  digitalWrite(r2, HIGH);
}
```

Left : (Move Right Motors Forward and Left one Backward)

```
if(strcmp(cmd, "l")==0) {
  digitalWrite(l1, LOW);
  digitalWrite(r1, HIGH);
  digitalWrite(l2, HIGH);
  digitalWrite(r2, LOW);
}
```

Right : (Move Left Motors Forward and Right one Backward)

```
if(strcmp(cmd, "r")==0) {
  digitalWrite(l1, HIGH);
  digitalWrite(r1, LOW);
  digitalWrite(l2, LOW);
  digitalWrite(r2, HIGH);
}
```

Wrapping up the Code !!

Great Now that you have the Basic Movement working with the code, You can upload the code to Arduino and Get a Weekend off with a bonus…

But Remember you are the Best Programmer of the Company , So you don’t stop there, Now that you are used to Writing Good Code , So You Put all the movements into a Function which will be called if there’s an Input and Set the Input Value to Zero after the bot have moved according to the input.

Congrats !! Now You’ve built the code code that you used in the Bot Session to Run your bot. Yep It’s really that simple…

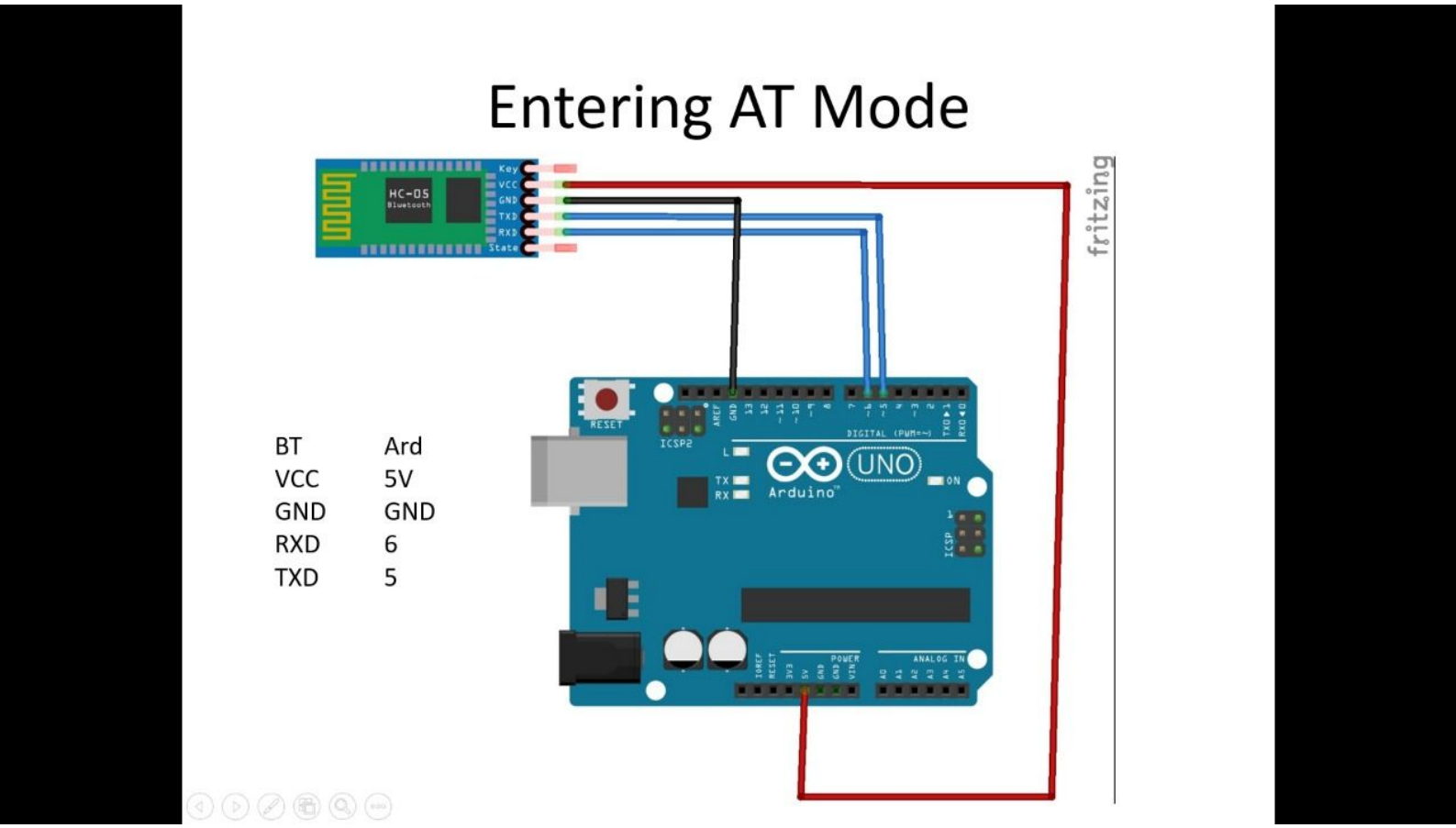
Don’t Believe me ? Here Take a look at the Full code →

https://github.com/aswinkumar1999/Elec_iBot_Session/blob/master/Bot.ino

Great Job , Now you are ready to Tweak the Code to Control the Bot in different ways !! (See you in the “ What’s Next” Section 😉)

AT Mode & Robo Remo App

Normally You Use Arduino to talk to the Bluetooth Module and Recieve Data and move the Bot , By default the name of the Bluetooth Module is “ HC-05 “ and Password being “0000” or “1234” which is open for anyone to connect. To Avoid this Problem we’ll be talking directly to the Bluetooth Module and Changing Its name and password.

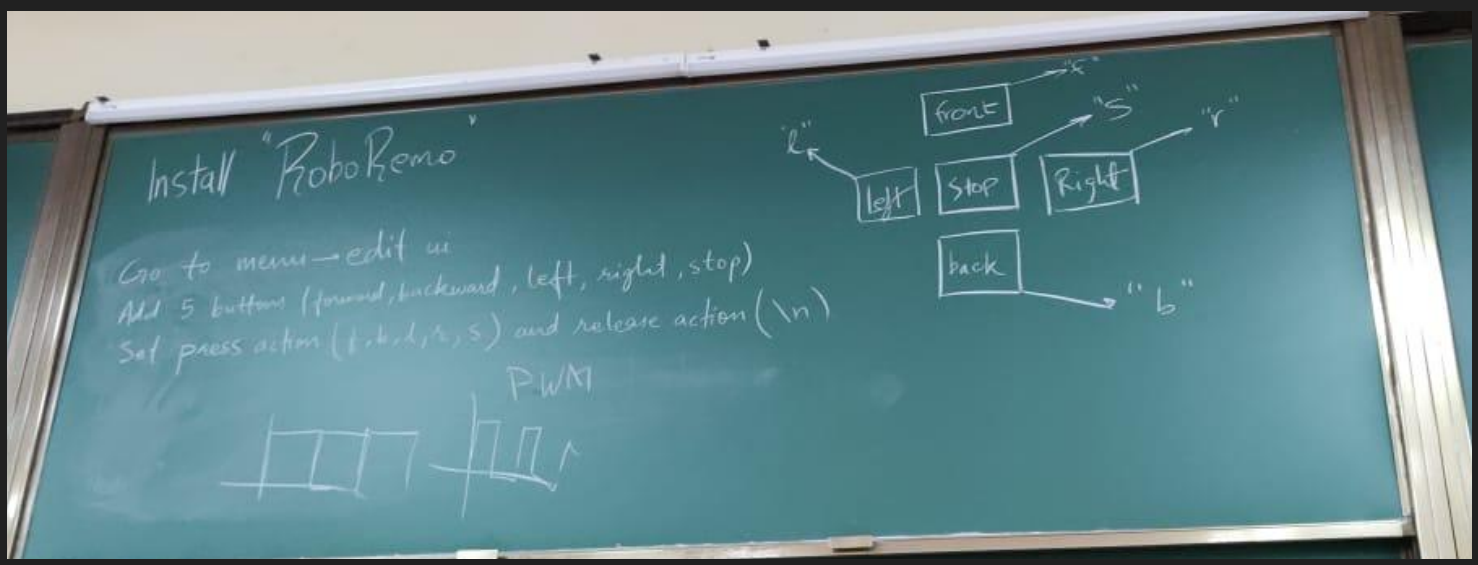


Now That you are Smart Enough to Understand Codes , Here’s the Code for AT-Mode (Take a Look at it and Google If you don’t understand any terms) →

Robo Remo app as you know is used to map ‘f’ to up key for the movements.

AT Mode of hc05

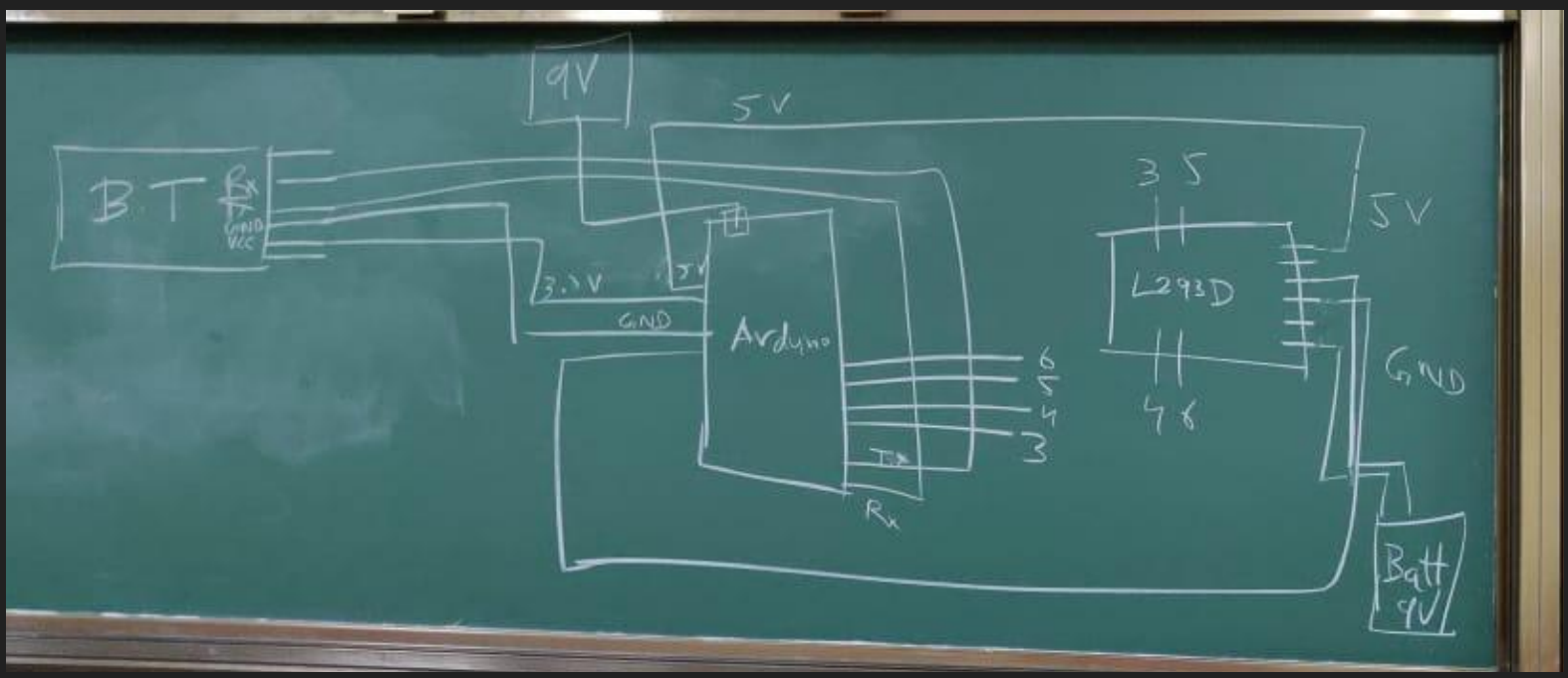
Upload the code "ATMode_2.ino" and disconnect the Arduino.
Make connections as per the circuit diagram
Keep the button on hc05 pressed and power the board
Go to serial monitor, set the baud rate to 9600 and 'both NL and CR' options
Enter these commands :- AT
AT+NAME=____
AT+PSWD="____"

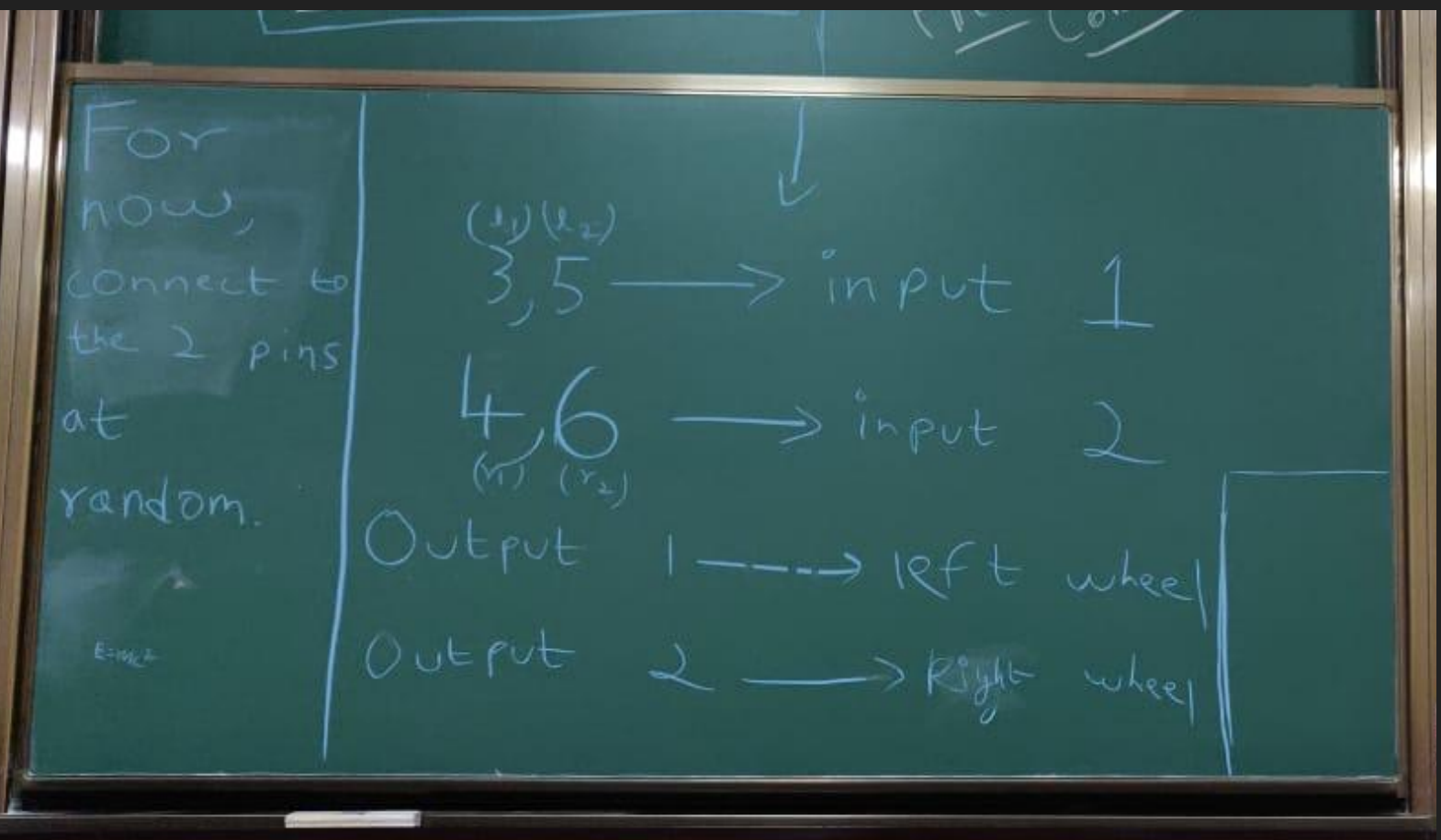


Bot

Time to wire things up. ;)

Yep , Clearer versions of the Pic will be in the resources folder





Rest of the Information have been uploaded Online we can constantly add changes to it. Use the link below to access it.

https://github.com/aswinkumar1999/Elec_iBot_Session