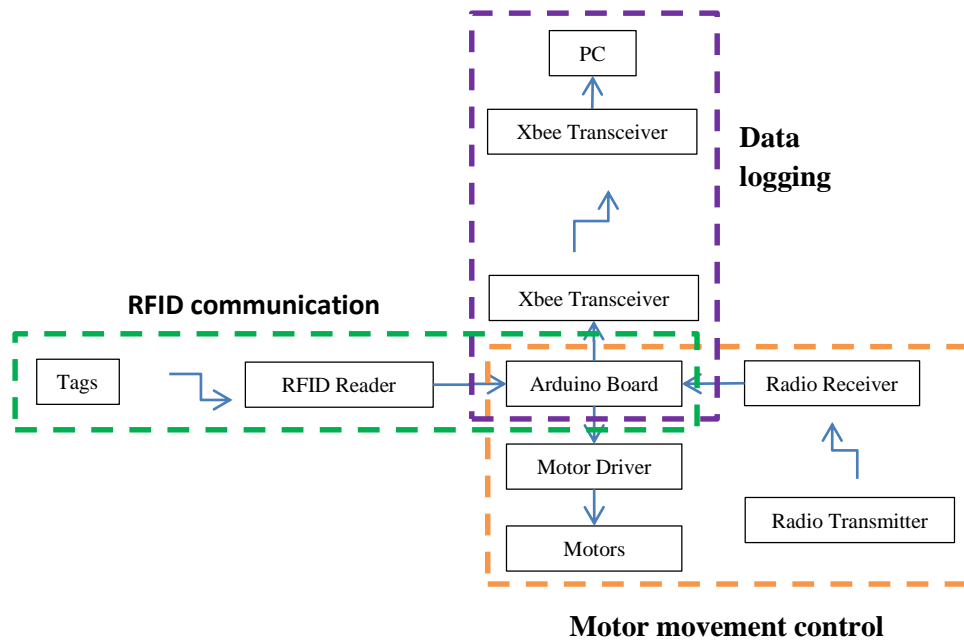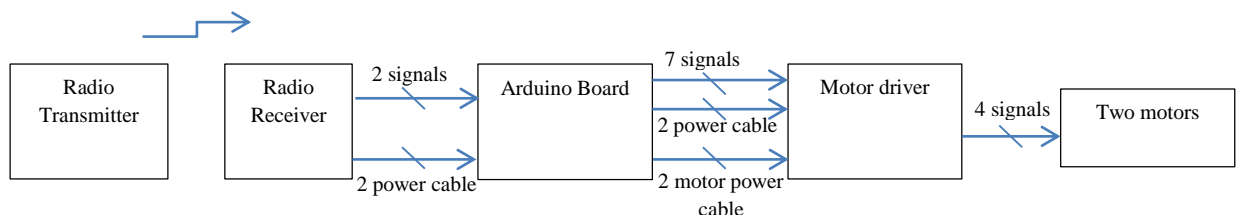# Overview

Arduino board is very popular with students and hobbyists due to its huge library of ready-to-use code and ability to make rapid prototyping. With the ease of using Arduino board and programming, a simple robot can be built in short time. There are 3 segments involved in the project; motor movement control, RFID communication and data logging. Those segments can be done separately without affecting the others. Those 3 segments can be translated into actions by sending left and right movement signals from RC transmitter to the receiver when user moves the stick on the transmitter. And then Arduino should be able to decode the received signal and sends to motor driver as direction and speed control. In next section, the tag should be scanned successfully when the robot approaches to the tags. Finally, the correct tag ID should be sent out to PC for data logging and live recording.

Required Items

1. 1 x Arduino board (Arduino Pro Mini 5V, 16MHz w/ ATmega328)
2. 1 x Motor Driver (1A Dual TB6612FNG)
3. 2 x Micro Metal Gear motor
4. 2 x Gear motor bracket
5. 2 x Wheel
6. 1 x Caster Ball
7. 1 x Radio Receiver
8. 1 x Radio Transmitter/Controller
9. 1 x Lipo Battery
10. 1 x 5V Regulator
11. 1 x ID-20LA RF receiver with RFID breakout board
12. 1 x Xbee transceiver with Xbee breakout board
13. 1 x Xbee transceiver with USB Dongle
14. Others (JST male battery connector, female crimp connector, standoffs, wires, screws, PCB board, etc...)

PC

Xbee Transceiver

Data logging

RFID communication

Xbee Transceiver

Tags → RFID Reader → Arduino Board ← Radio Receiver

Motor Driver

Radio Transmitter

Motors

Motor movement control

Motor movement control

Radio Transmitter

Radio Receiver

2 signals
2 power cable

Arduino Board

7 signals
2 power cable
2 motor power cable

Motor driver

4 signals

Two motors

The left and right movement signal comes from the stick on the left side of the transmitter. Pairing or binding between receiver and transmitter can be done by pressing a button on the receiver while both are switched on. The binding is successful when a LED light on the receiver changes from red to green. Arduino code should read both channel 4 and 3 of the receiver and converts to speed and direction for the motor driver. The motor driver simply switches the motor direction and changes the speed based on the command of Arduino code.

Pin connection between Arduino and Radio Receiver

Arduino board	Radio Receiver	Note
5 V (Vcc)	5V (Vcc)	Power cable: Vcc (any middle pin of receiver)
GND	GND	Power cable: GND (any left side pin of receiver)
PIT	Channel 4	Signal : forward and backward movement (Pitch)
ROL	Channel 3	Signal : left and right movement (Roll)

Pin connection between Arduino and Motor driver

Arduino board	Motor Driver	Note
5 V (Vcc)	5V (Vcc)	Power cable: Vcc
GND	GND	Power cable: GND
AUX4	STBY	Signal : Motor standby pin
D11,D12,A2,A1	ANI1,ANI2,BIN1,BIN2	Signal : Motor direction control pin
D3, YAW	PWMA, PWMB	Signal: PWM signal: should use D3 and D9 pins on board
5 V (Vcc)	VM	Motor power cable : Vcc
GND	GND	Motor power cable : GND

Pin connection between Motors and Motor driver

Motor Driver	Motor	Note
A01, A02, B01, B02	2 wires for each motor	Signal : H-Bridge current flow

Quick Reference
http://www.ez-robot.com/Tutorials/Hardware.aspx?id=10

http://myrobotlab.net/how-to-read-rc-receiver-signal-with-arduino/
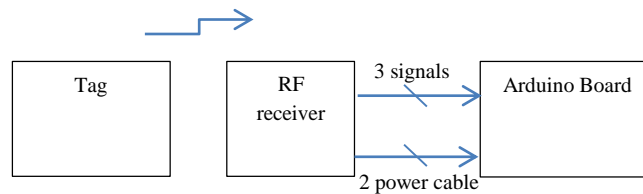
http://arduino.cc/en/Reference/pulseIn

RFID Communication

When a tag is near to RF receiver, 12 digit of hex code is scanned by RF receiver. The receiver sends out the hex code Arduino using serial connection.
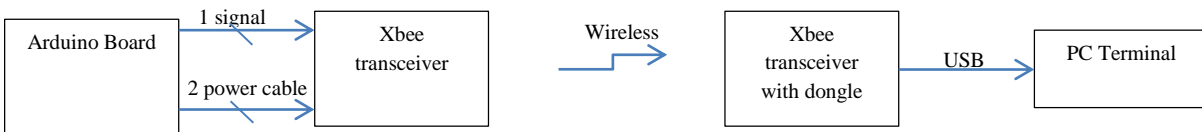
Pin connection between Arduino and RFID Receiver

Arduino board	RFID Receiver	Note
5 V (Vcc)	5V (Vcc)	Power cable: Vcc
GND	GND	Power cable: GND
Rx (UART0)	D0	Signal : UART transmission
A0	RST	Signal : Reset Pin
GND	FS	Signal: Format Selector, Connect to GND to transmit as ASCII code

Quick Reference

Data logging

Simple data logging can be achieved with Xbee transceiver. Make sure same baud rate is set in each pair of the connection. In order not to transmit message/signal across other groups, set different channel for each group. Both baud rate and channel can be set with XCTU application.

Pin connection between Arduino and Xbee

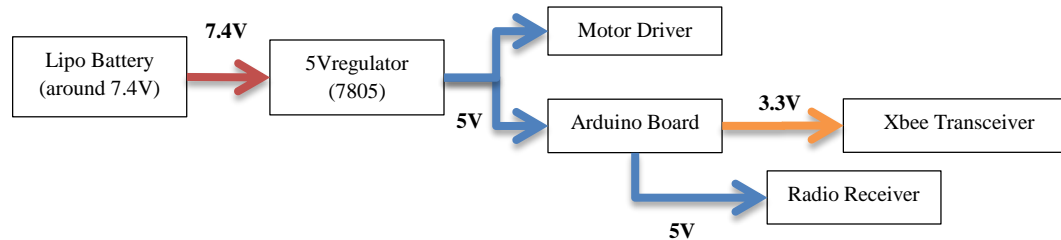| Arduino board	Xbee
3.3V (Vcc)	3.3V (Vcc)
GND	GND
Tx (UART0) (AX3)	DIN

Software

XCTU Application

Quick Reference

Power Supply

Power distribution can be implemented in following ways. Take not that there is 3.3V pin on Arduino board for Xbee transceiver.
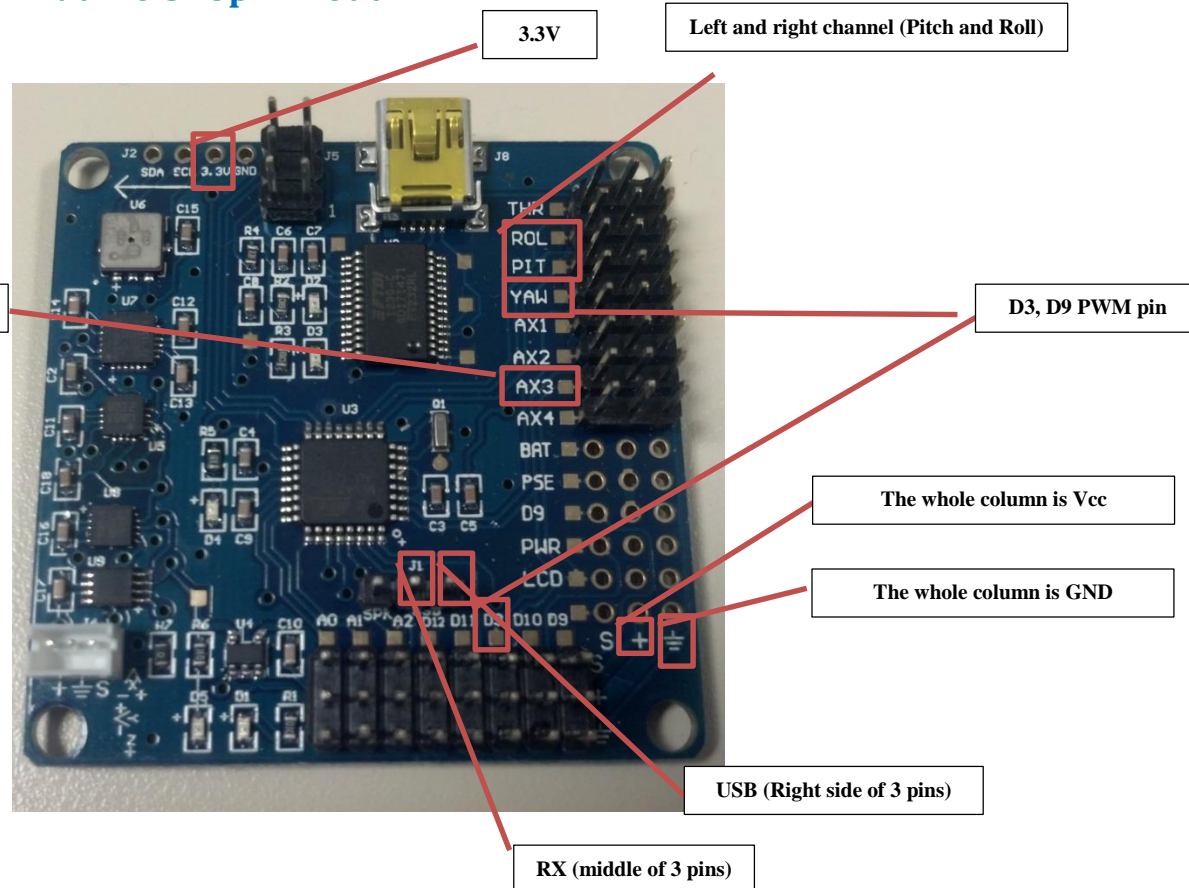

Structure

Simple structure can be built with PCB board or 3D printer. Symmetric and balanced structure should be built in order not to topple the robot while moving. 3D structure can be downloaded from here
https://github.com/aknay/GroundRobotWithMultiWii

Arduino 328p Pin out

Major pins are labeled on the picture. The RX and USB pin must be shorted with jumper for USB communication in order to download firmware.