Basic Idea:

- The robot uses 6 brushless motors. One ESC (electronic speed controller) controls one motor.
- The left joystick controls left and right turns. The right joystick controls forward and backward

ESC & Brushless Motor Ranges

- **REST:** Each ESC has its own rest servo value (the pulse width that the ESC send to the motor to stop it). Basically ESC in rest position means that the motor doesn't spin. this is usually near the servo range of 90.
- **MAX:** Each ESC has its max range. this is usually a servo value of 180. I have noticed that the motor RPM stays the same after a certain servo value. So the max range for my motors are from 91->180
- **MIN:** I have noticed later that all my motors do not run from a servo value of 0-15. so for these ESC, the reverse range is from 89->15

Controller Joystick Calibration

- Will need to calibrate the joysticks ranges to the specific ESC values (some ESC have different rest values, others have different max values, will need to calibrate the joystick for each ESC).
- Will then limit the speed of each motor using a speed controller.

Get the raw joystick values

Analog Read Range

Output Range: 0-512-1023

Function: readRawJoystickValues()

Variables: Variables for x and y components

left_x right_x

left_y right_y

Turn raw joystick values to servos values

Analog to Servo Range

New Output Range: 0-90-180

Function: turn_sticks_to_servo()

Variables: Resetted the old variables

left_x right_x

left_y right_y

Calibrate the joystick at rest value to ESC neutral position value

Servo Rest Value to ESC Neutral/Rest Value

New Output Range: 0-ESC neutral-180

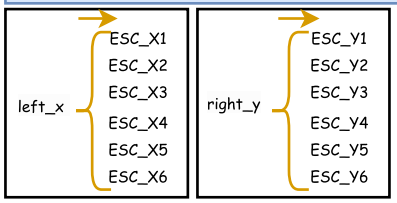
Function: calibrate_sticks_to_ESCs()

Variables: left_x and right_y branches out to 6 other variables

left_x → ESC_X1 to X6

right_y → ESC_Y1 to Y6

left_y and right_x aren't used to control ESC



Limit the range of the newly calibrated joystick using a potentiometer (SpeedPot)

Let the Speed Potentiometer set Max and Min Speed Ranges

New Output Range: SpeedPot low-ESC neutral-SpeedPot high

Function: limitESCs_to_SpeedPot();

Variables: The 12 ESC values are resetted to the maximun and minimum ranges that the speed potentiometer allows.

Description: Assuming the motors can run 100% forward (servo=180) and 100% backward(servo=0), then the potentiometer turned to a value of 100 will be 180 degree forward and 0 degrees backward (100% speed).
If 90 is the ESC neutral position (the servo value where the motors do not run), then the potentiometer turned to a value of 0 will be 90 degree forward and 90 degrees backward (0% speed, motor will not run).