Improving Joystick Control for Driving

Introduction

This paper explains how to adjust the control system to maximize the useful travel on the pilot's joystick(s). The result will be increasing sensitivity, maneuverability and control. This method can be used for either dual joystick driving or single joystick driving.

The dual joystick (tank style) drive configuration can make significant improvements in the pilot's ability to precisely control the robot. Refer to the Application Note about increasing the number of joysticks if you need more than two joysticks.

Minimum Drive Power

Robots often require significant power to start moving. This minimum start power is a result of static friction in the drive train. The control system is designed for various motors and motor applications. Speed controllers have a typical minimum output of 10%. A robot may require 25 to 50% to begin movement. Due to this minimum power needed to begin movement, some of the joystick's travel (in forward and/or reverse) is wasted because too little power is output from the speed controller (see Figure 1). This wasted travel decreases the ability to maneuver the robot easily and accurately.

Figure 1: Example of speed controller output and wasted joystick travel (forward only shown)

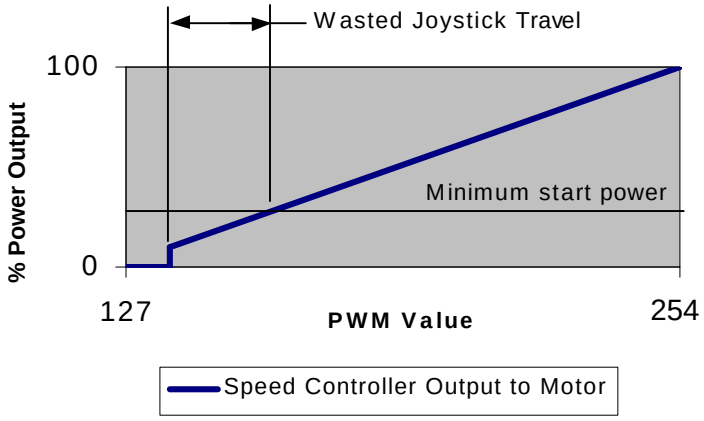
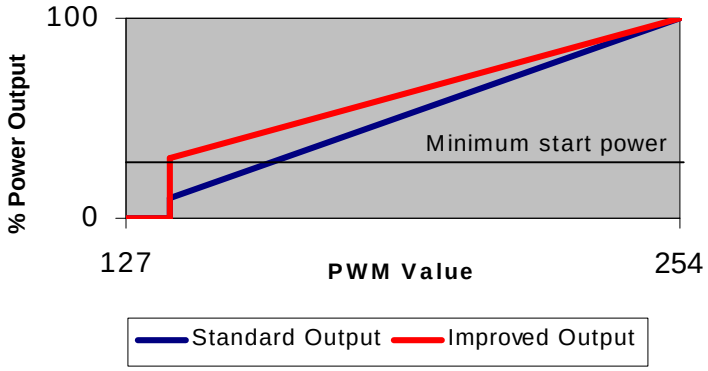


Figure 2: Example of improved output from speed controller (forward only shown)



Modifying Joystick Control

The following code will adjust the output of the control system to match your robots drive train minimum power requirements. This code adjusts both forward and reverse in the same manner. Refer to the FIRST manual and documentation for directions on modifying the Basic Stamp code in the FIRST receiver.

The value **30** (used three times) adds directly to the low throttle output. Adjust this value to match your robots needs. This value may be determined by:

1. Trying different values
2. using the debug feature (`Debug ?p1_y`) of stamp and moving the joystick in small increments until the robot moves
3. reprogramming the receiver to output a specific value until the robot moves
   `p1_y = 141` then `p1_y = 142`, etc

Basic Stamp Code Example

This example code modifies one joystick axis `p1_y` that is typically passed to PWM1. You will need to implement this code for both joystick inputs (assuming two wheel drive).

Add this line just before the "`OUTPUT DATA`" section of the default code:

```
Gosub alterp1_y
```

Add these lines at the end of the code, just before "`Stop`":

```
alterp1_y:
      if p1_y < 138 and p1_y > 116 then neutral
      if p1_y < 117 then doReverse

      p1_y = p1_y + 30 - ((p1_y-138)*30/116) max 254
      Return

      doReverse:
      p1_y = p1_y - (p1_y*30/117) min 0
      Return

      neutral:
      p1_y = 127
Return

Stop
```

Notes:

1. The adjustment value, **30** in this example, may be different for each drive wheel. This value will also change after the drive train is broke-in.
2. While in the neutral band (117 to 137) the output is fixed at 127.
3. The slowest forward value in this example is 138 + 30 = 168
4. Forward output in this example will be linear from 168 to 255
5. The slowest reverse value in this example is 116 - 30 = 86
6. Reverse output in this example will be linear from 86 to 0

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