

piRover Builds with K2

P03 - Servo Extension

Rev 1.2

Goal:

The goal of Project 03, the final project, is to complete the course by implementing your own version of this smartphone controller. Part 2 of the project adds the buzzer and servo functionality to the drive functionality created in part 1. This document contains the details on servo use along with required code to implement the required left, center, and right servo functions. You will create a `piRover_servo` module and integrate this module and functionality into your P03 project.

Prerequisites:

This is an extension to the P03 project. Drive and buzzer functionality should be complete.

- P03 keyboard implementation

Performance Outcomes:

1. Create a module to support servo operation
2. Interface with Bluetooth to enable remote servo actions.

Resources:

1. See prerequisite lessons

Materials:

1. piRover
2. `keyboard_drive.py`
3. `piRover_buzzer.py`
4. `piRover_drive.py`

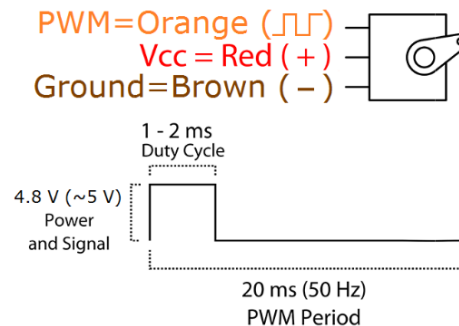
Part 1 – Set Up

1. Prepare your workspace for this project extension.
 - a. Connect to your piRover using VNC. Access your project folder and launch VS Code.
 - b. Create a new **`piRover_servo.py`** file in the project folder.

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Part 2 – Servo Investigation

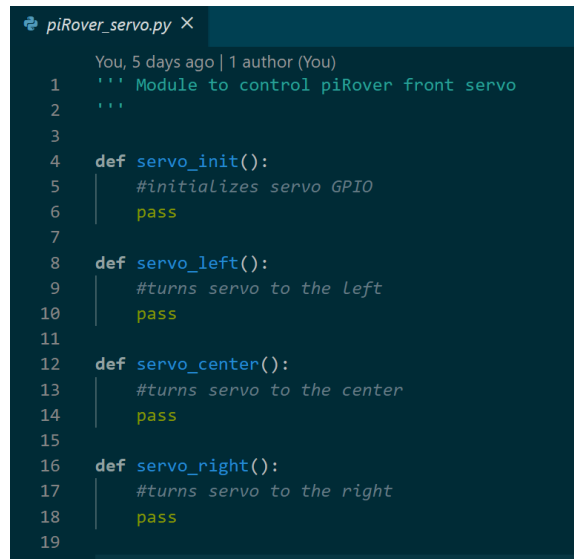
1. Begin by viewing a data sheet for the [SG90 Micro Servo](#). This small, inexpensive servo is common in many small robotics and drone projects. The code and output signal required to drive this servo is the same as larger servo devices.
2. Review the timing diagram for the servo signal to determine the duty cycle for the left, center, and right positions.



Position "0" (1.5 ms pulse) is middle, "90" (~2 ms pulse) is all the way to the right, "-90" (~1 ms pulse) is all the way to the left.

3. To control the front servo on your piRover the left, mid, and right actions will be used. You'll need to create a PWM port on the required GPIO pin to enable the servo motion.
4. Review the documentation in the [Yahboom Expansion Board Manual](#) to determine the GPIO pin used to control the front servo.
5. The piRover_servo module interface is shown on page 3. You'll need to create the PWM port on the appropriate pin and then control the servo position using the following duty cycle values. The servo should be centered during your initialization process.
 - a. Left: $1\text{ms}/20\text{ms} = 5\%$
 - b. Mid: $1.5\text{ms}/20\text{ms} = 7.5\%$
 - c. Right: $2\text{ms}/20\text{ms} = 10\%$

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```
piRover_servo.py X
You, 5 days ago | 1 author (You)
1 ''' Module to control piRover front servo
2 '''
3
4 def servo_init():
5     #initializes servo GPIO
6     pass
7
8 def servo_left():
9     #turns servo to the left
10    pass
11
12 def servo_center():
13     #turns servo to the center
14     pass
15
16 def servo_right():
17     #turns servo to the right
18     pass
19
```

Figure 1 - piRover Servo Module Interface

6. Open the piRover_servo.py file created during set up. Create the module including the functions shown above.
7. Integrate the piRover_servo.py module into the Keyboard Drive solution so that your keystrokes control the front servo position.
8. Submit this work with the final PO3 project submission.