ENGR 4421:Robotics II

Servo Motors

09/15/2022

Outline

- What is A Servo Motor
- How does A Servo Motor Work
- Motor Driver Board
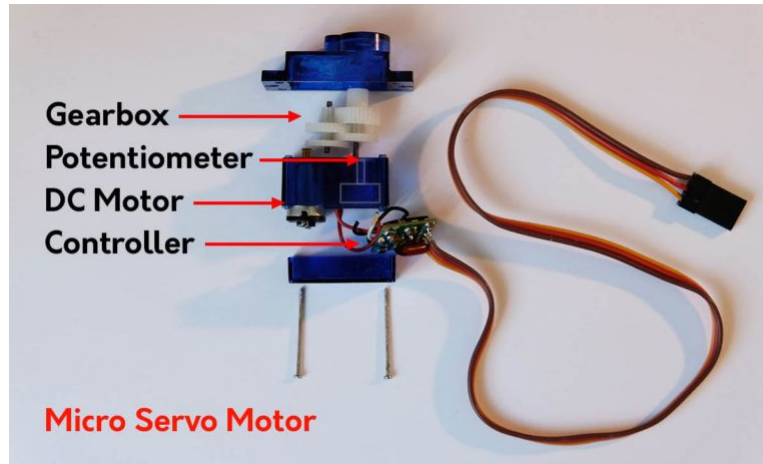
What is A Servo Motor

- Is a type of motor whose shaft position can be precisely controlled.
- Uses an internal "servomechanism" to provide positional feedback.
- Some servo motors use alternating current, others use direct current.
- Are widely used in industrial and hobbyist applications (robots, RC cars, etc.).
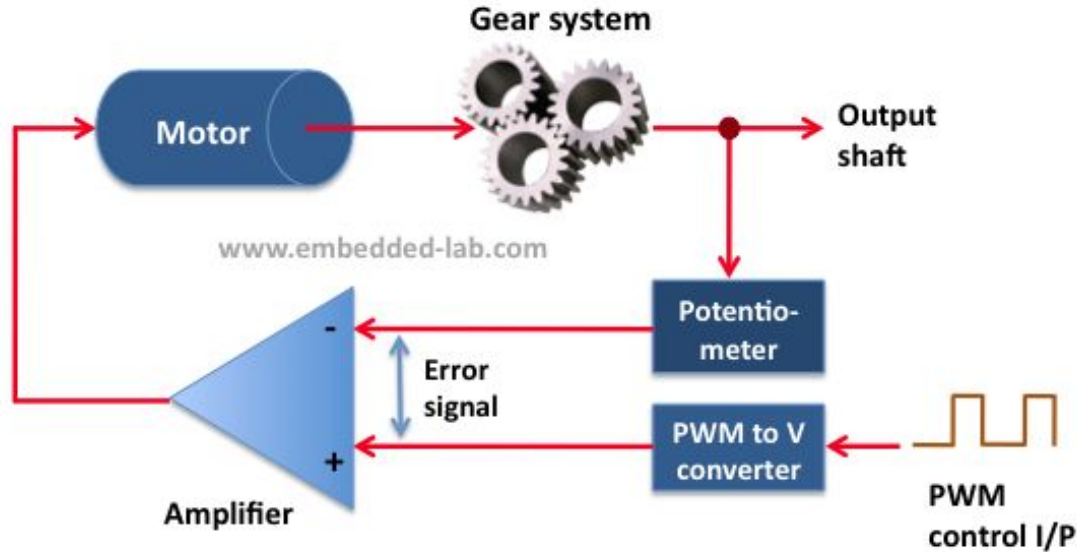
Facts

- Hobbyist servo motor uses a dc motor to spin its shaft.
- A potentiometer is used to provide positional feedback.
- A built-in H-bridge is used to drive the dc motor.
- Position control is achieved using Pulse Width Modulation control.
- We use MG966R

Gearbox
Potentiometer
DC Motor
Controller

Micro Servo Motor

How does A Servo Motor Work

MG966R Specifications

- Operating Voltage is +5V typically
- Current: 2.5A (6V)
- Stall Torque: 9.4 kg-cm (at 4.8V)
- Maximum Stall Torque: 11 kg-cm (6V)
- Operating speed is 0.17 s/60°
- Gear Type: Metal
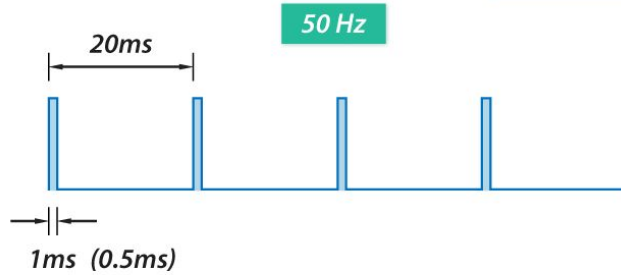- Rotation : 0°-180°
- Weight of motor : 55gm

20 kg-cm Servo Example
0.5 cm 1.0 cm 2.0 cm
RC Helicopter Fun.com
40 kg 20 kg 10 kg

MG966R Wiring

Wire Colour	Description
Brown	Ground
Red	Powers the motor typically +5V is used
Orange	PWM signal

Control

50 Hz

20ms

1ms (0.5ms)

0 Degrees

1.5ms

90 Degrees

2ms (2.5ms)

180 Degrees

HowTo
MECHATRONICS
www.HowToMechatronics.com
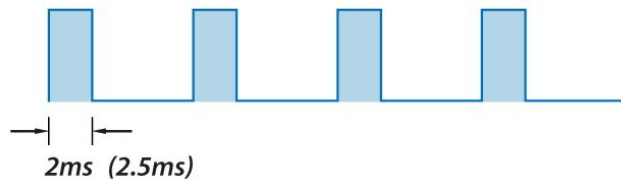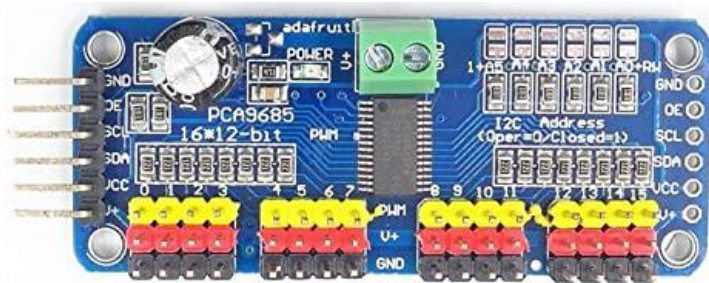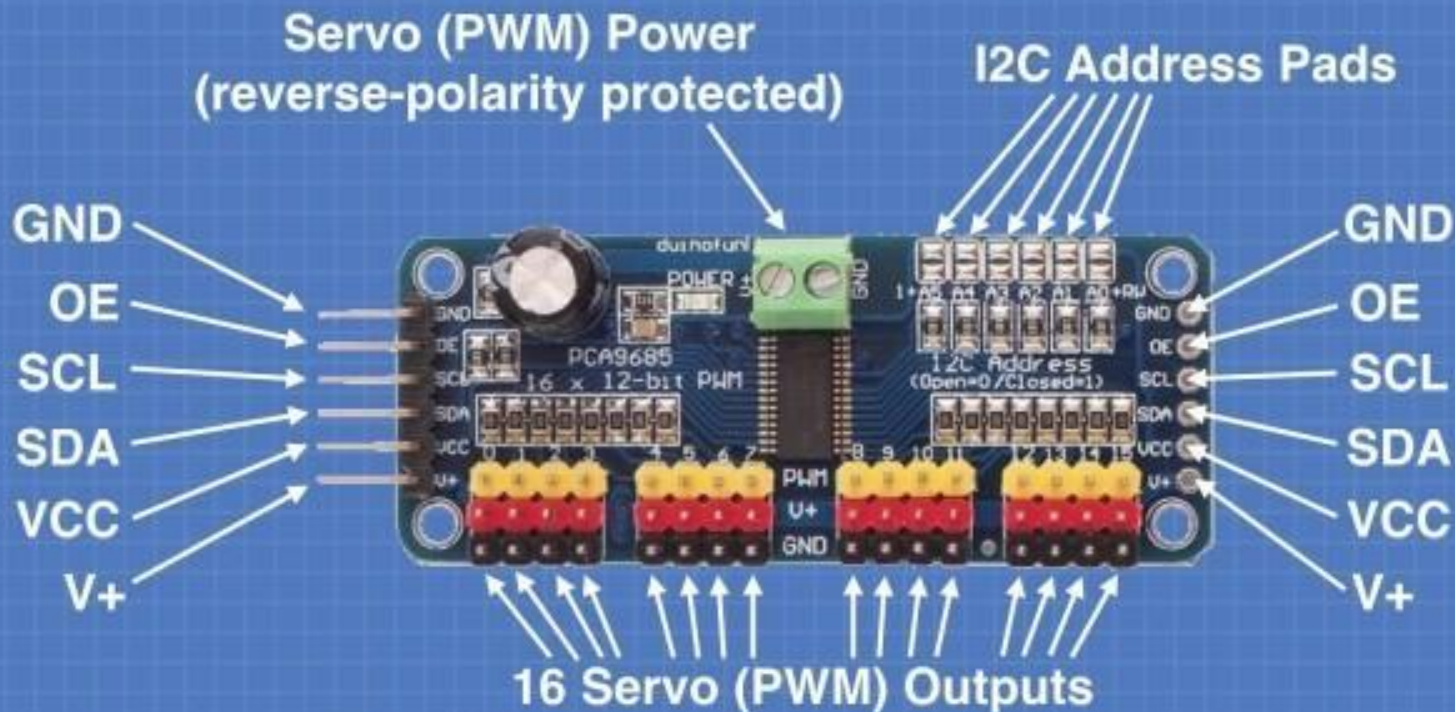
PCA9685 Features

- Has 16 channels of PWM ports.
- Uses I2C bus to communicate, can stack up to 62 boards and control 900+ motors.
- A built-in H-bridge is used to drive the dc motor.
- Position control is achieved using Pulse Width Modulation control.
- Duty-cycle is independently programmable for each of the 16 channels.
- Has 4096 steps (12-bit PWM) of control signal resolution.
- PWM signal frequency is adjustable from about 24 Hz to 1526 Hz.

PCA9685

Servo (PWM) Power
(reverse-polarity protected)

I2C Address Pads

GND
OE
SCL
SDA
VCC
V+

GND
OE
SCL
SDA
VCC
V+

16 Servo (PWM) Outputs

https://dronebotworkshop.com

Circuit-Python Driving

```python
from board import SCL, SDA
import busio
from adafruit_pca9685 import PCA9685
from adafruit_servokit import ServoKit
from time import sleep

# Create the I2C bus interface.
i2c_bus = busio.I2C(SCL, SDA)
# Create a simple PCA9685 class instance.
pca = PCA9685(i2c_bus)
# Set the PWM frequency to 60hz.
pca.frequency = 50
# Set Servo
kit = ServoKit(channels=16)

kit.servo[0].angle = 180
sleep(1)
kit.servo[0].angle = 0
sleep(1)
kit.servo[0].angle = 90
sleep(1)
```