

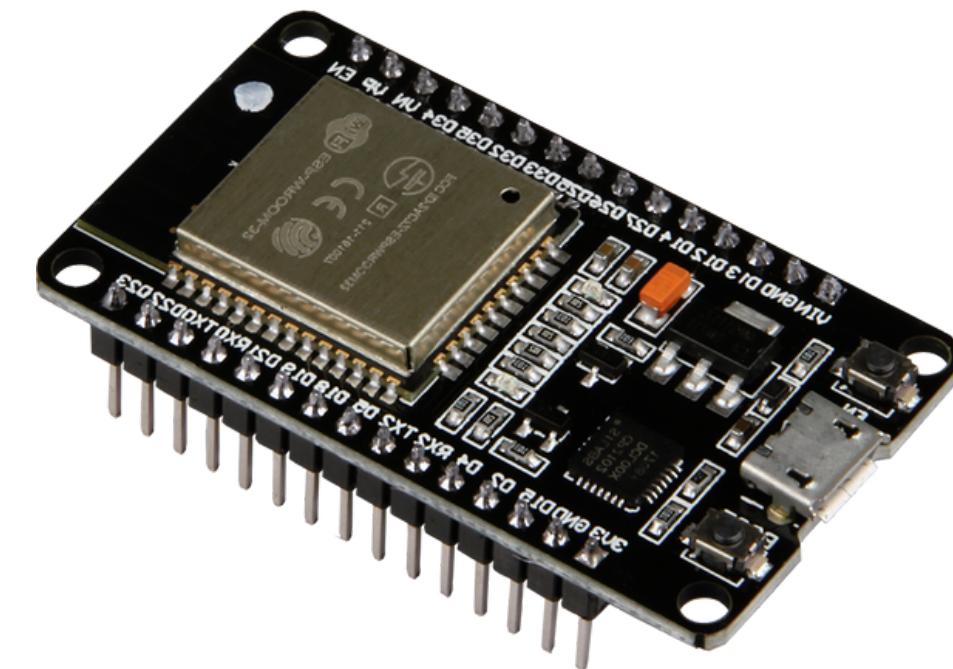
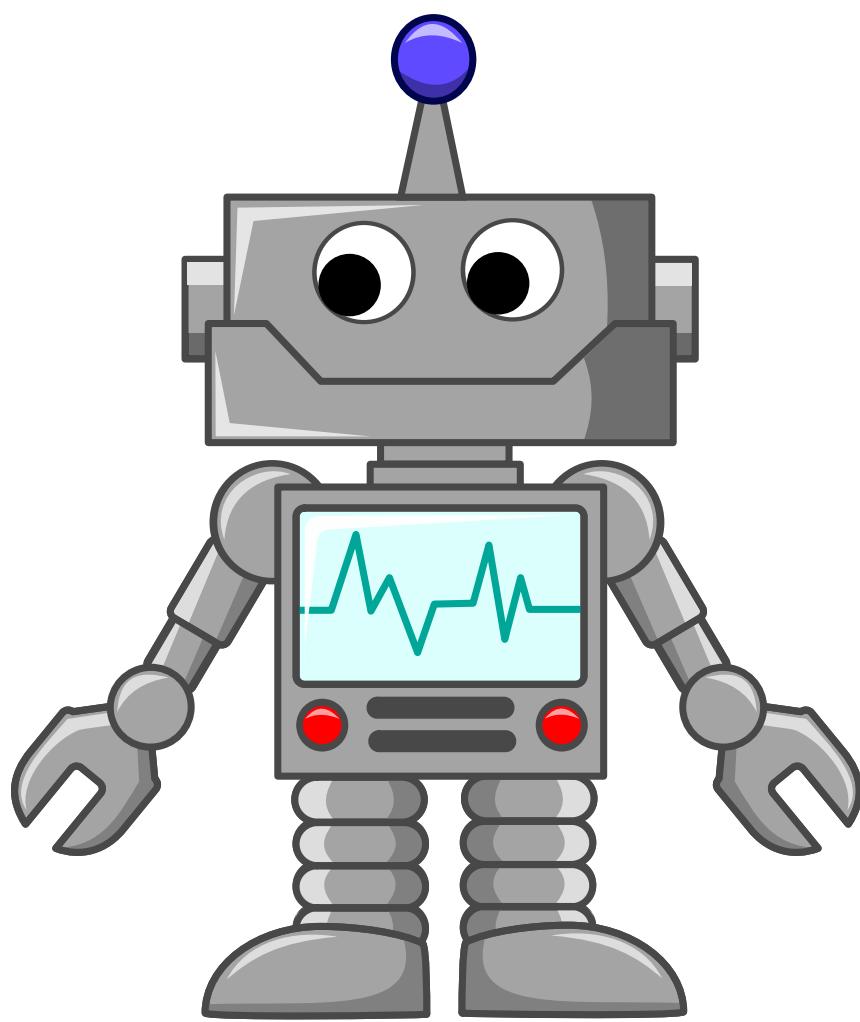


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AKURDI PUNE

EMBEDDED SYSTEM DESIGN PRACTICAL - 2

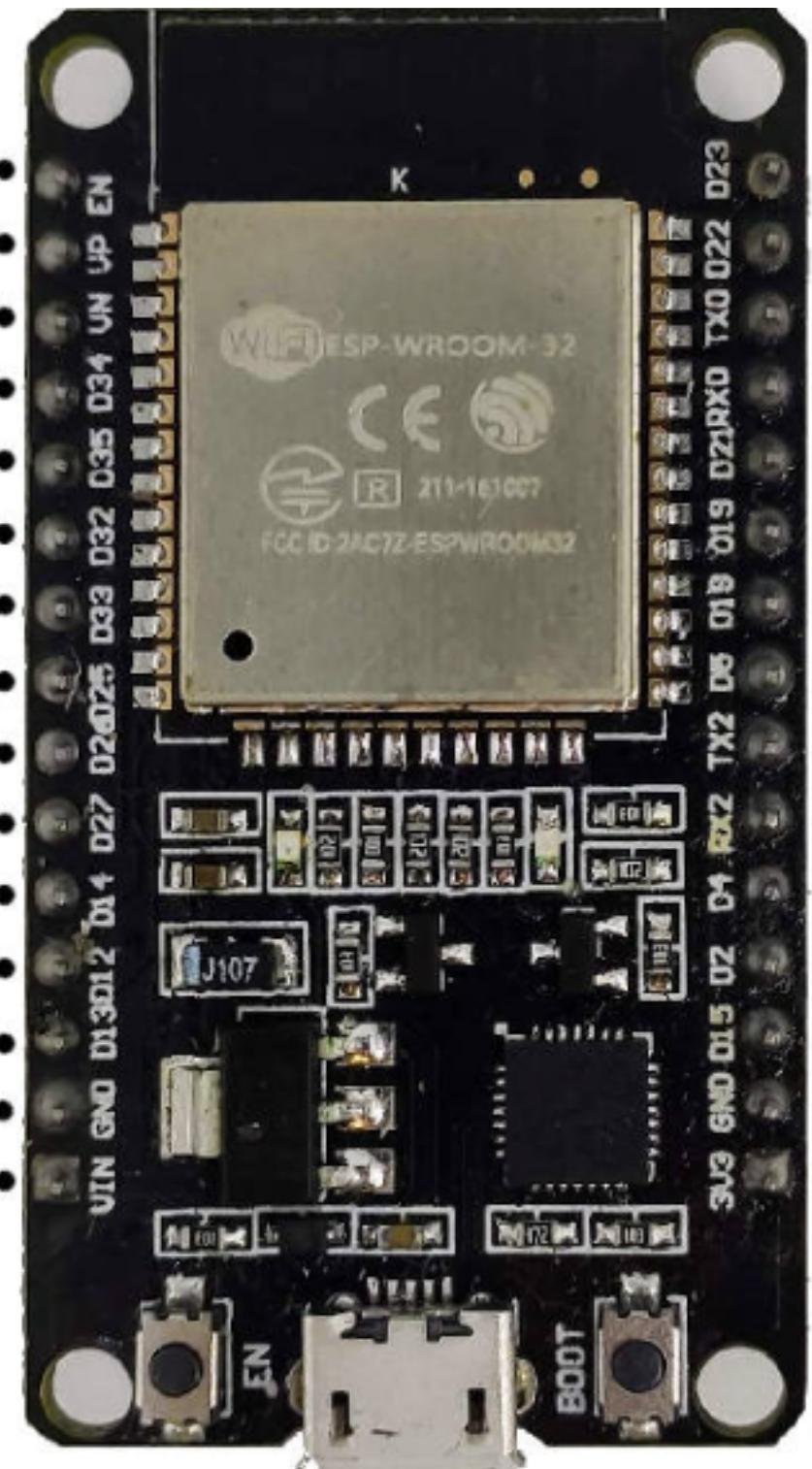
SERVO MOTOR

By Divesh Jadhwanı



ESP32 PINOUT

Input only	RTC GPIO0	SensVP	ADC1_0	GPIO36	5
Input only	RTC GPIO3	SensVN	ADC1_3	GPIO39	8
Input only	RTC GPIO4	ADC1_6	GPIO34	10	
Input only	RTC GPIO5	ADC1_7	GPIO35	11	
RTC GPIO9	Xtal32P	Touch9	ADC1_4	GPIO32	12
RTC GPIO8	Xtal32N	Touch8	ADC1_5	GPIO33	13
DAC 1	RTC GPIO6	ADC2_8	GPIO25	14	
DAC 2	RTC GPIO7	ADC2_9	GPIO26	15	
RTC GPIO17	Touch7	ADC2_7	GPIO27	16	
RTC GPIO16	Touch6	HSPI_CLK	ADC2_6	GPIO14	17
RTC GPIO15	Touch5	HSPI_Q	ADC2_5	GPIO12	18
RTC GPIO14	Touch4	HSPI_ID	ADC2_4	GPIO13	20
			GND		
			VIN		



36	GPIO23	V_SPI_D	MOSI
39	GPIO22	V_SPI_WP	SCL
41	GPIO1	TXD 0	CLK3
40	GPIO3	RXD 0	CLK2
42	GPIO21	VSPI_HD	SDA
38	GPIO19	V_SPI_Q	MISO
35	GPIO18	V_SPI_CLK	SCK
34	GPIO5	V_SPI_CS0	SS
27	GPIO17	TXD 2	
25	GPIO16	RXD 2	
24	GPIO4	ADC2_0	HSPI_HD
22	GPIO2	ADC2_2	HSPI_WP0
21	GPIO15	ADC2_3	HSPI_CS0
		GND	Touch3
		3.3v	RTC GPIO13

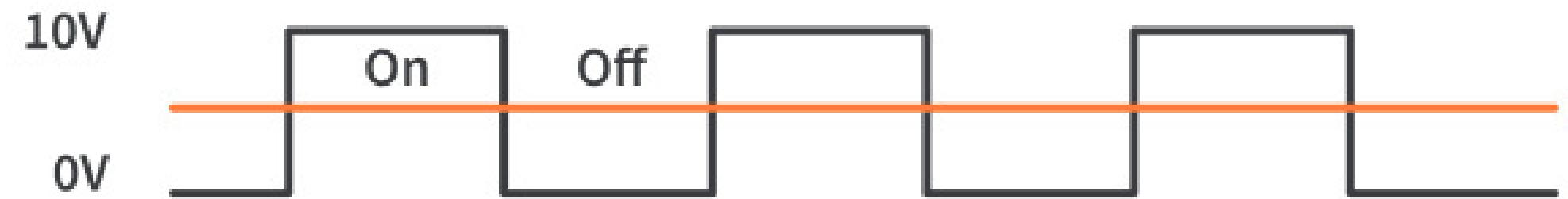
**240 MHZ (DUAL CORE
PROCESS
4MB FLASH MEMORY
520 KB RAM**

ESP32 PINOUT

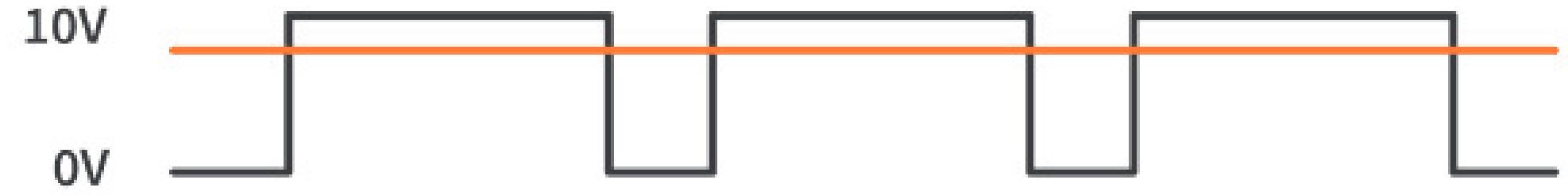
- 34 PROGRAMMABLE GPIOS
- 18 12-BIT ADC CHANNELS
- 2 8-BIT DAC CHANNELS
- 16 PWM CHANNELS - INTENSITY
- 3 UART INTERFACES - ADD
- 3 SPI INTERFACES - MEMORY
- 2 I2C INTERFACES - SDA AND SCL
- 10 CAPACITIVE TOUCH SENSING GPIOS
- 16 RTC GPIOS - DATE AND TIME

PWM

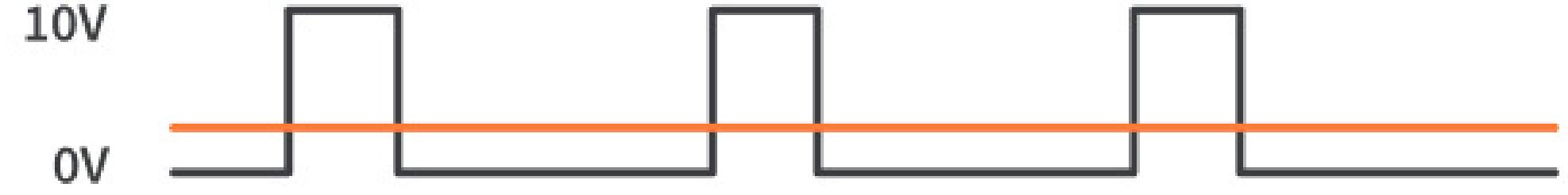
50% Duty Cycle - 5V



75% Duty Cycle - 7.5V



25% Duty Cycle - 2.5V



Average Voltage



Volts (V)

10V

0V

-5V

Analog Signal

Time (t)

Volts (V)

5V

0V

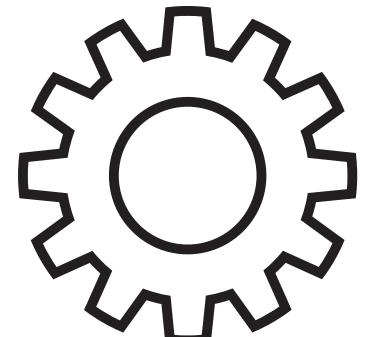
Digital Signal

Time (t)



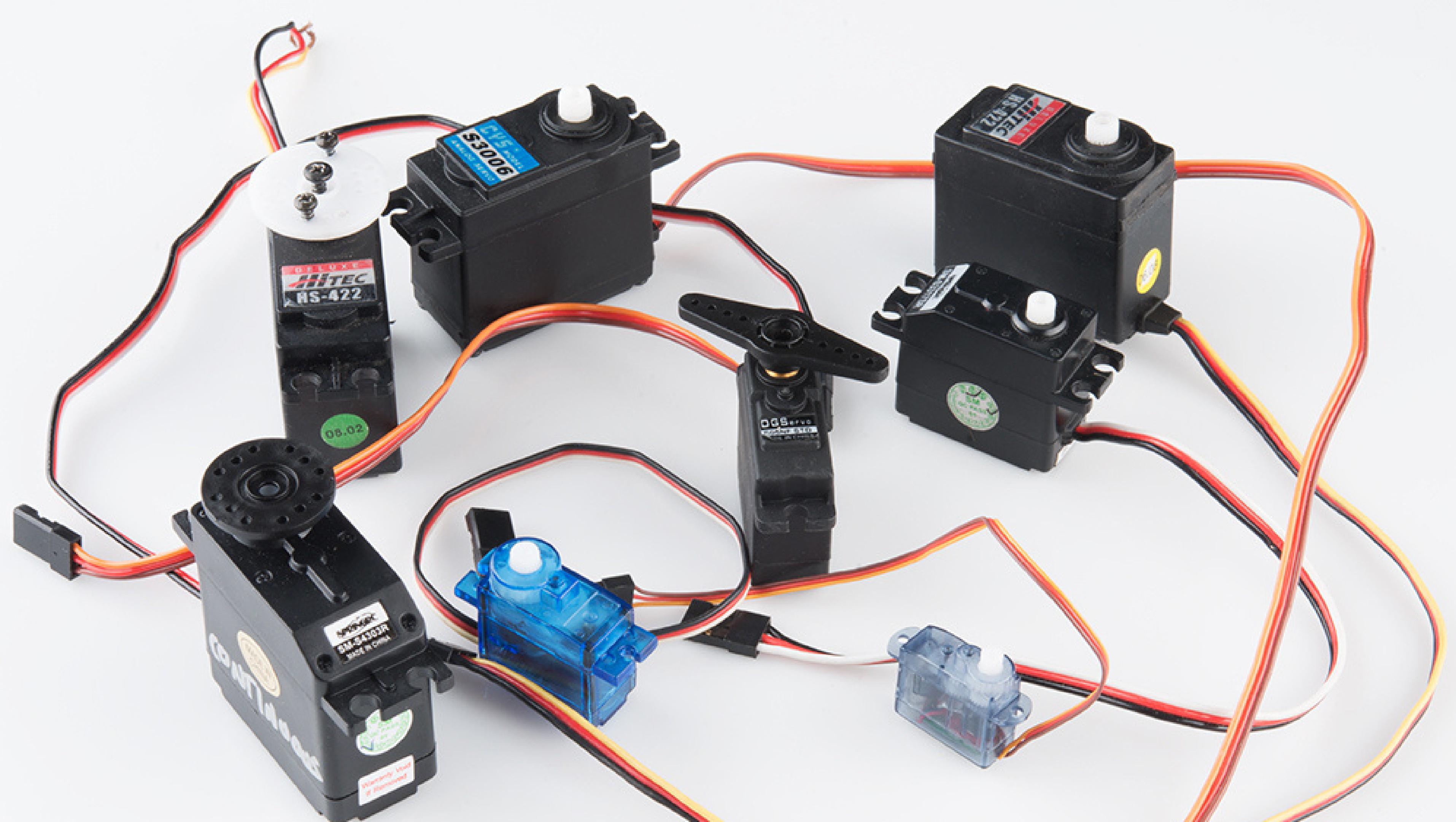
DC MOTOR AND SERVO MOTOR

DC(DIRECT CURRENT) MOTOR JUST CONTINUOUSLY ROTATES GIVEN A VOLTAGE



SERVO MOTOR ACCEPTS A SIGNAL AND THEN ROTATES IN A CERTAIN DEGREE SPECIFIED BY US





Servo Horn



Gear Train



Potentiometer



Control Unit



DC Motor

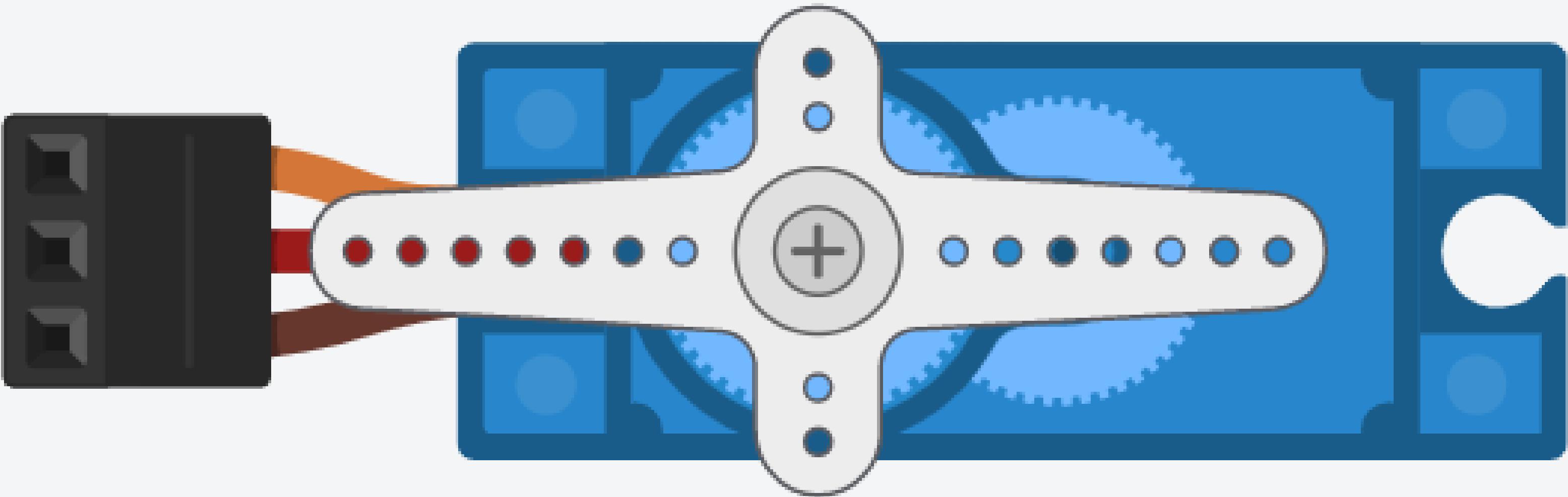


SERVO MOTOR PINOUT

Signal

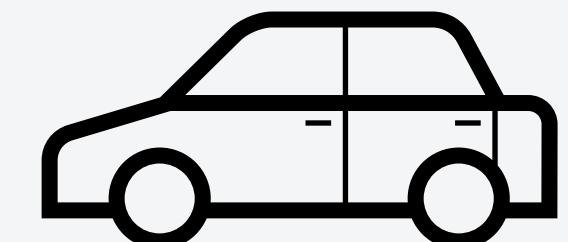
Vcc

Gnd



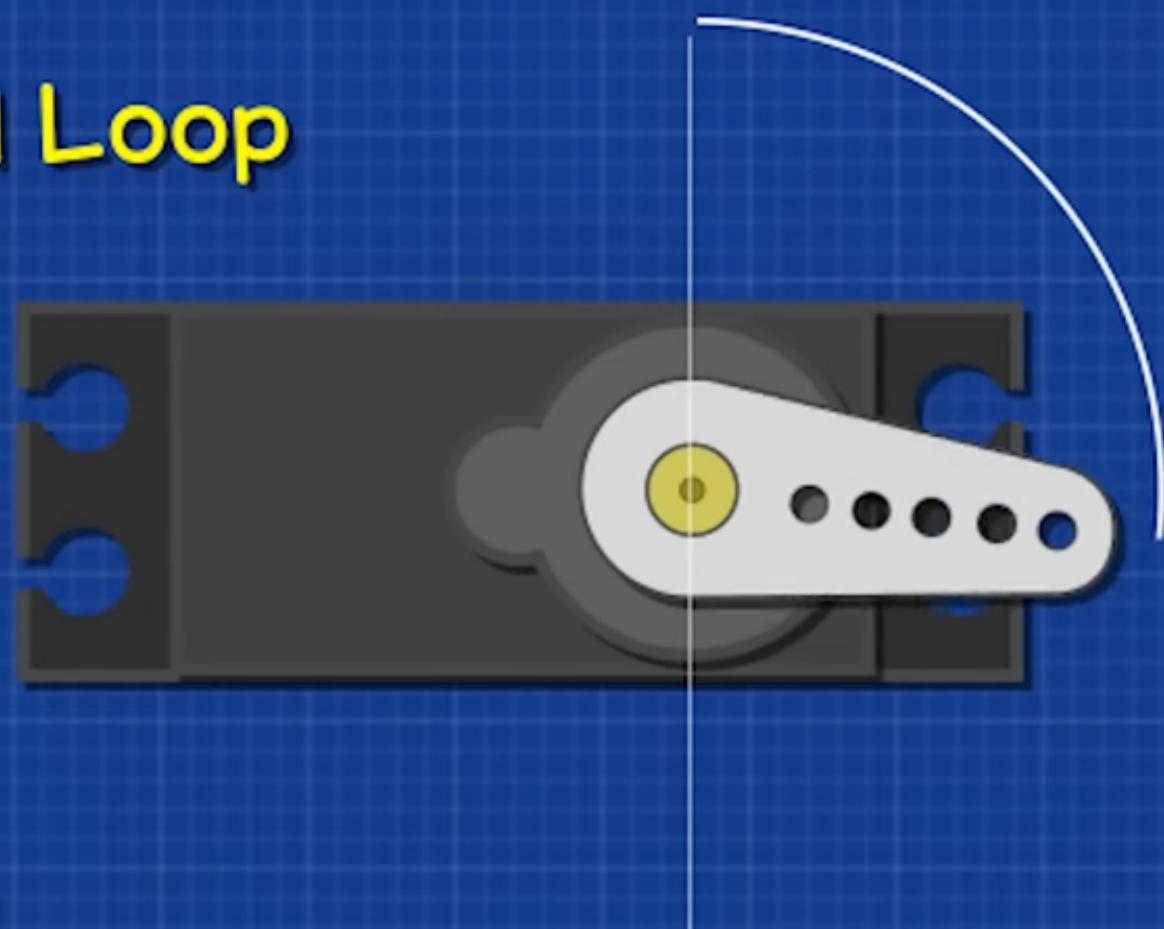
**SERVO MOTOR CONVERTS
ELECTRICAL ENERGY INTO
MECHANICAL ENERGY**

**SERVO MOTOR IS OFTEN
CONTROLLED BY A
CONTROLLER
EG : REMOTE CONTROLLED CAR**



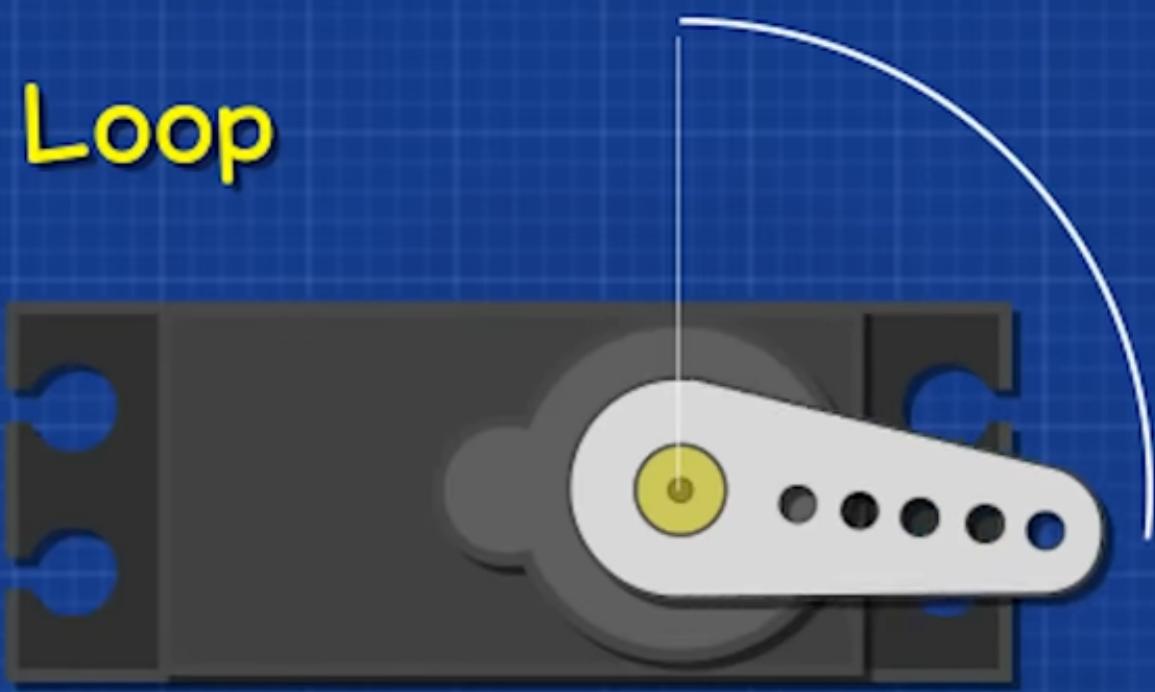
VARIATIONS

Closed Loop



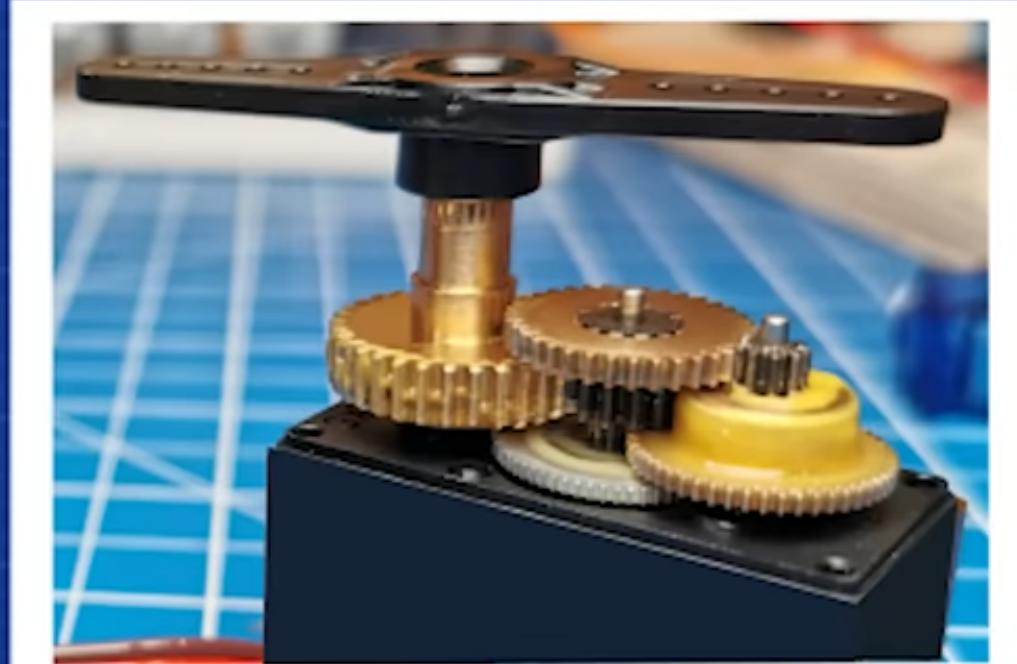
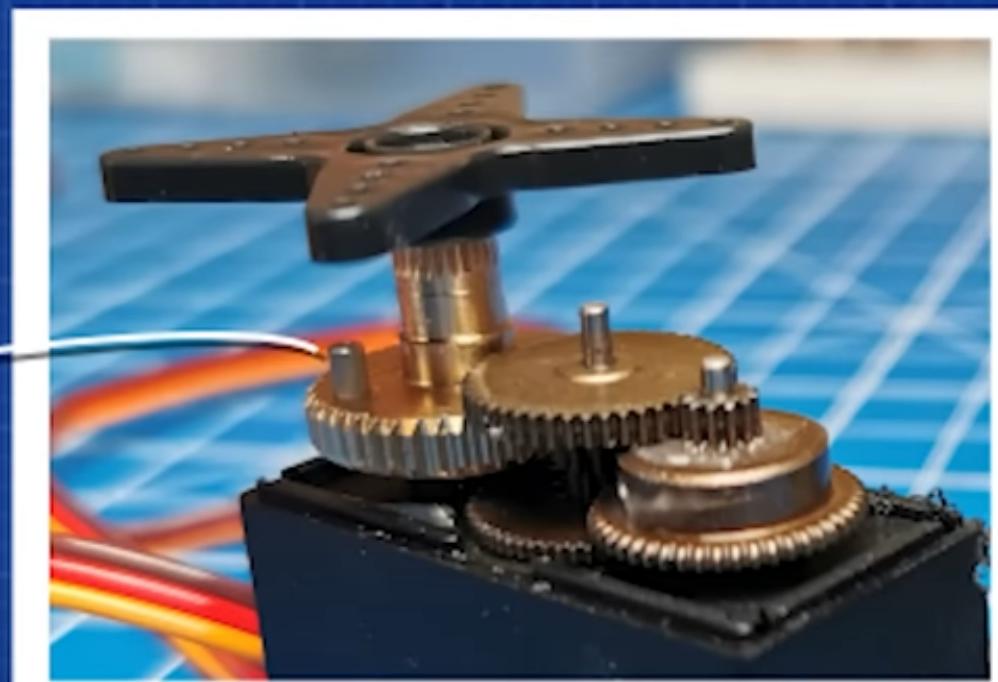
180°

Open Loop



360°

Limiting
Pin

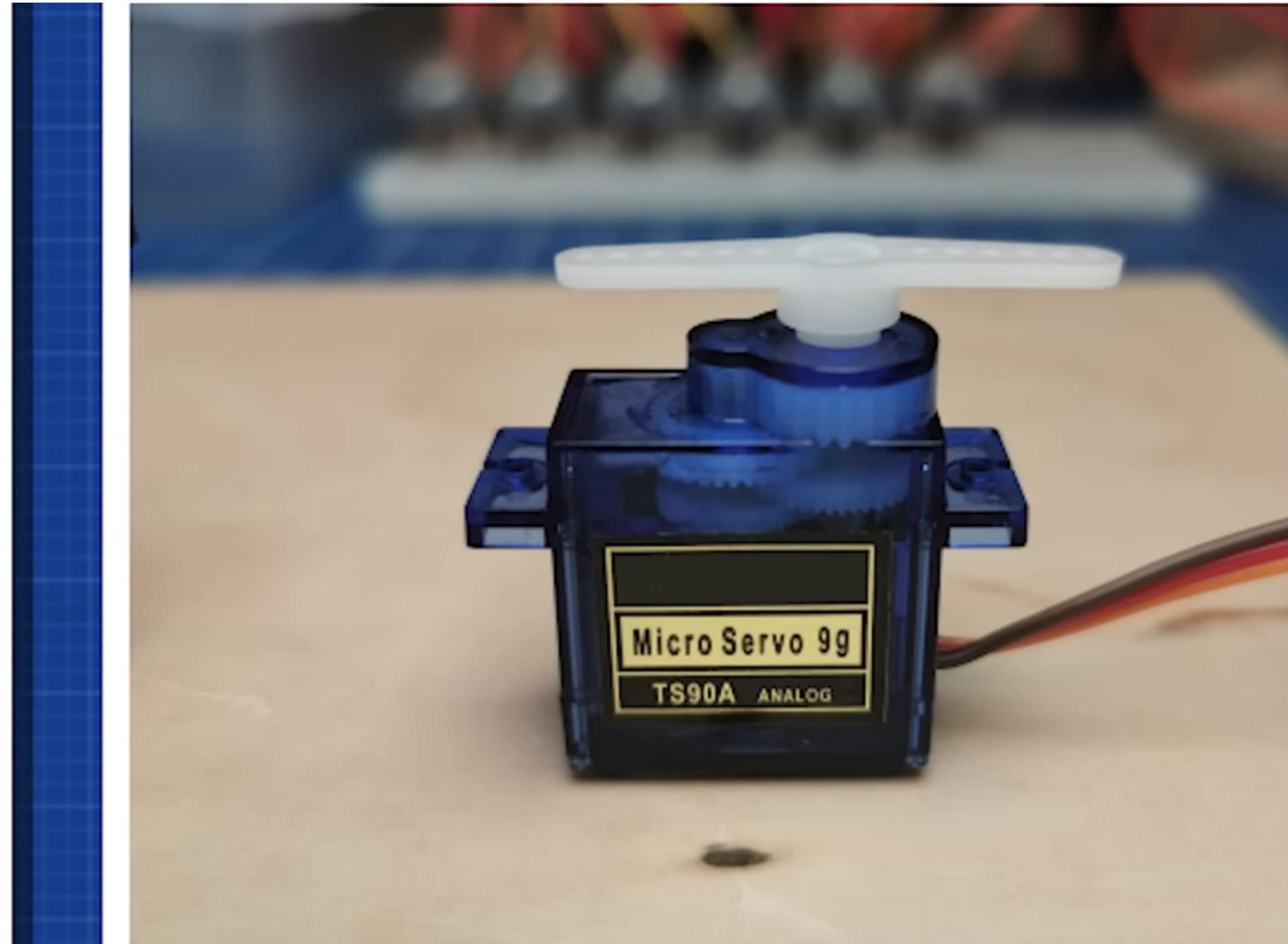


WEIGHTS

Weights determine how much force can be applied using a servo motor and not the actual weight of the motor

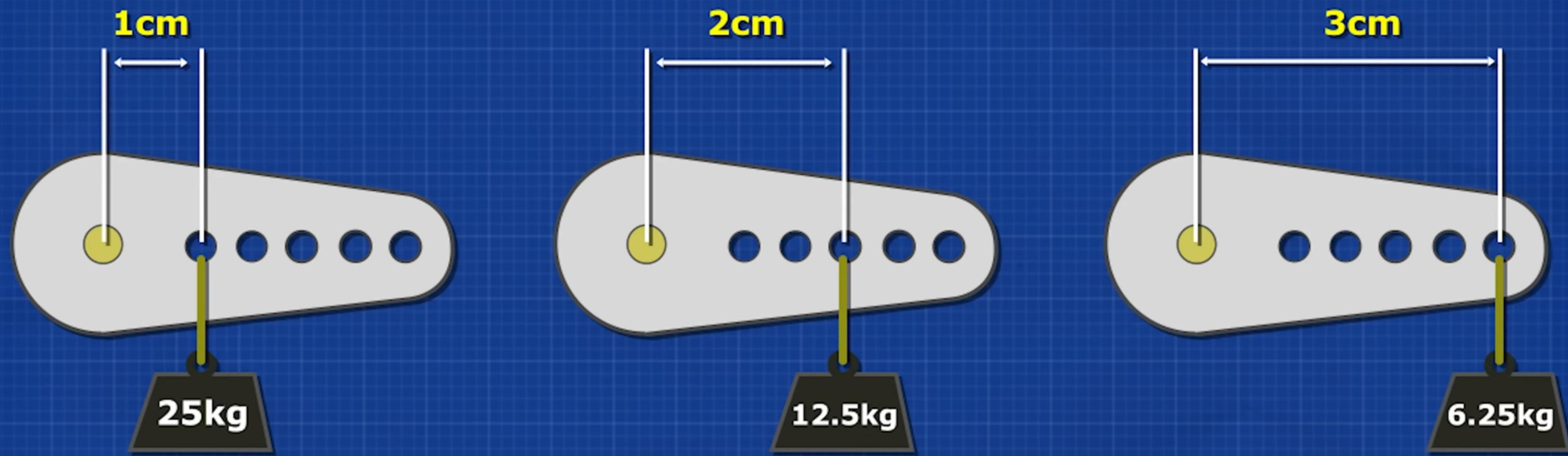


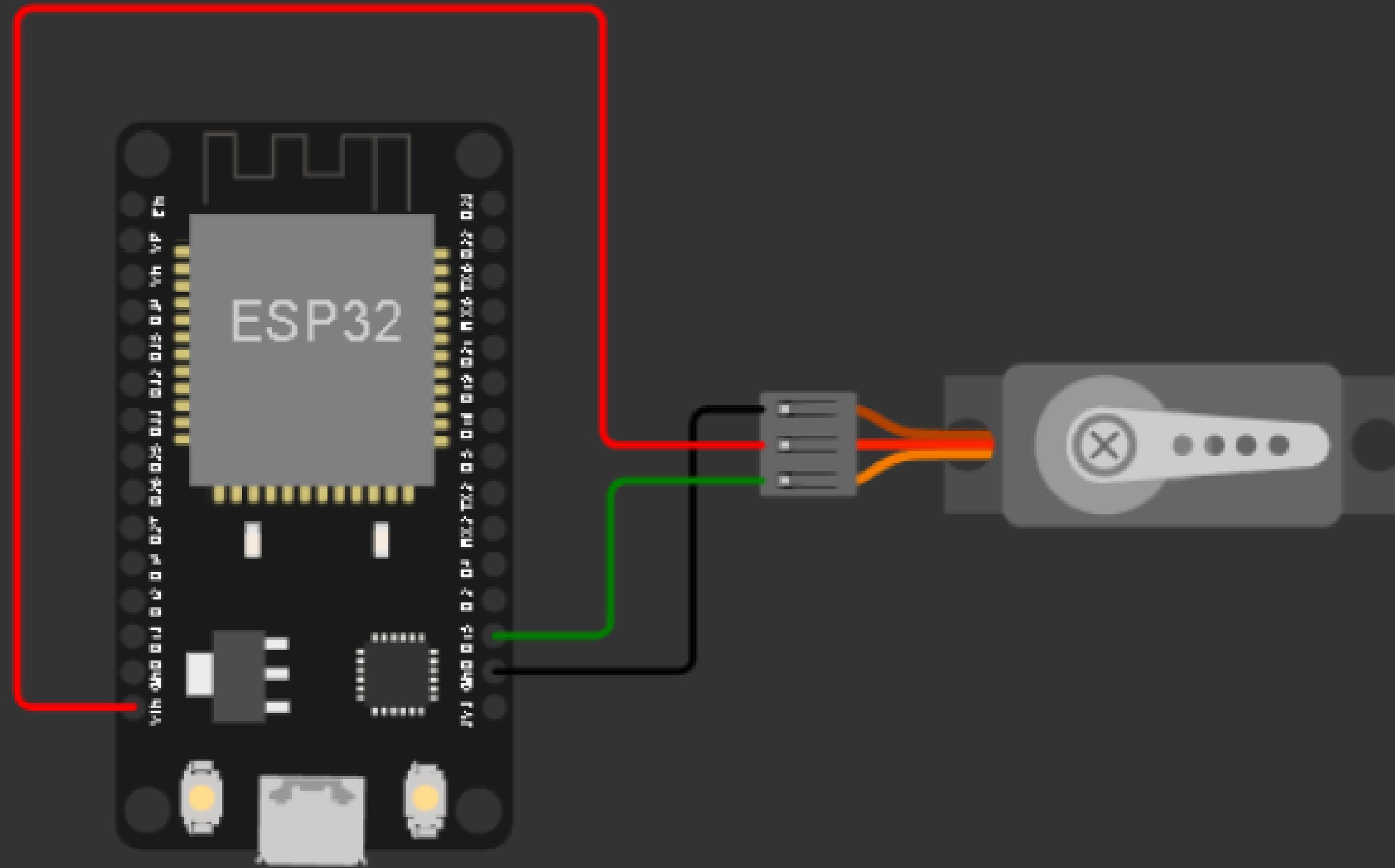
25 kg



9g (0.009 kg)

WEIGHTS - DIVISION





```
1 import machine
2 from machine import Pin , PWM
3 import time
4
5 servo = PWM(Pin(5) , 50)
6
7 while True:
8     servo.duty(26)
9     time.sleep(1)
10    servo.duty(123)
11    time.sleep(1)
```

THANK YOU

dypiu.ac.in