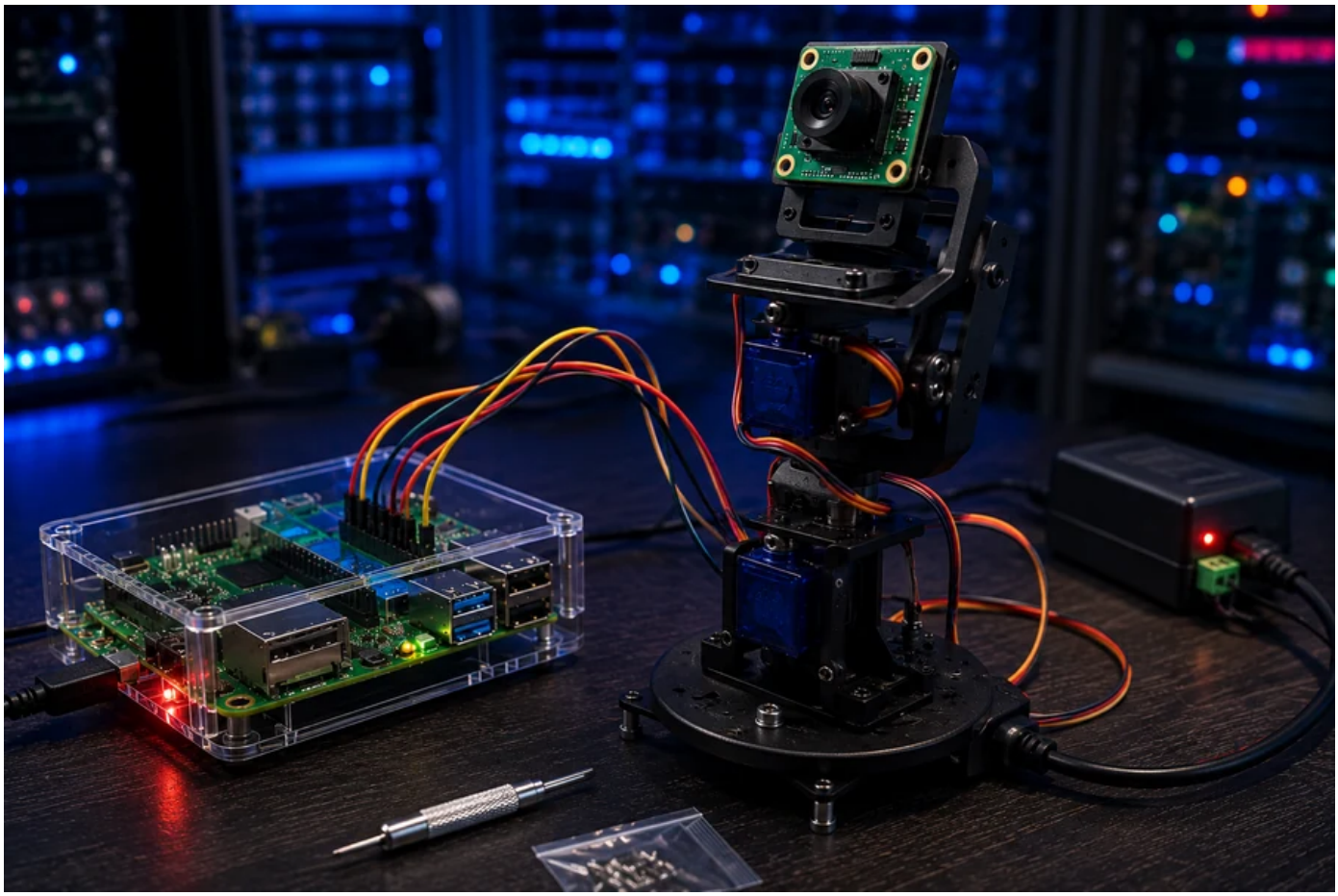
WolfieWeb Raspberry Pi Servo Pan-Tilt Camera Mount Lab Manual

Super detailed wiring, power safety, servo test code, angle tuning, and camera mount upgrade instructions.



What You Will Build

This project controls a two-axis pan-tilt mount using two SG90 servos. The Raspberry Pi sends low-current signal pulses while the servos draw power from a separate 5V supply. That separation matters because servos can pull more current than the Pi can safely provide.

Critical Power Rule

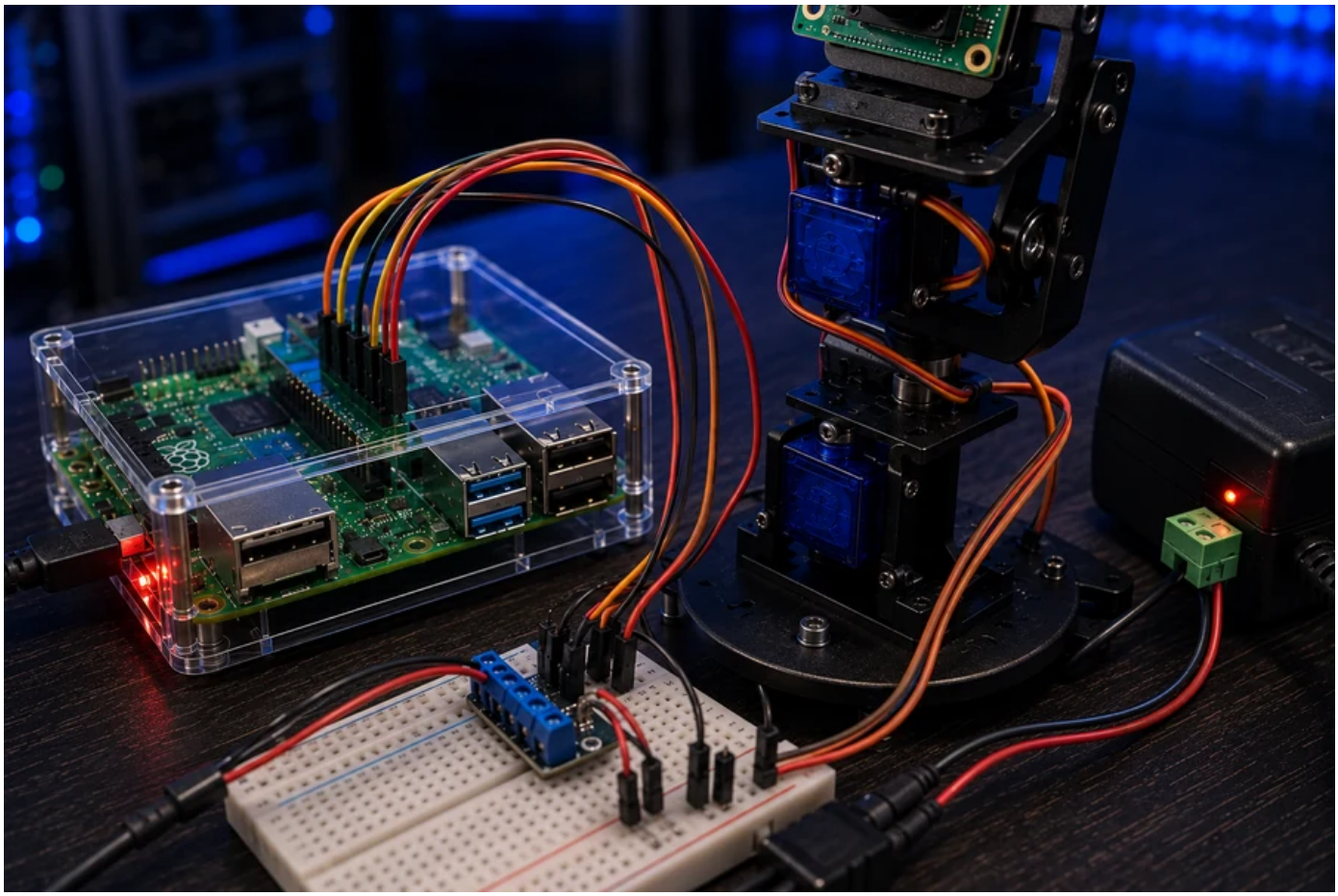
Do not power SG90 servos from GPIO pins. For a stable build, use an external 5V supply for the servo red wires and connect the external supply ground to a Raspberry Pi ground pin.

Parts Needed

Part	Purpose	Notes
Raspberry Pi 4 or 5	Runs the Python servo control script	Any Pi with GPIO works.
Two SG90 micro servos	Pan and tilt movement	One servo controls left/right, one controls up/down.

Pan-tilt bracket	Holds servos and camera	Assemble slowly; plastic brackets can crack.
External 5V power supply	Powers servos safely	Use enough current for both servos.
Jumper wires	Signal and ground connections	Keep wires short and tidy.
Optional Pi Camera	Camera payload	Add after servo movement is stable.

Safe Wiring Diagram



The ZIP also includes an editable SVG wiring guide: images/servo_pan_tilt_wiring_diagram.svg.

Connection	Wire To	Purpose
Pan servo signal	GPIO17	Controls left/right motion.
Tilt servo signal	GPIO18	Controls up/down motion.
Servo VCC/red wires	External 5V positive	Powers the motors.
Servo GND/brown wires	External 5V ground and Pi ground	Creates shared signal reference.

Install and Test

```
sudo apt update
pip3 install gpiozero pigpio
sudo systemctl enable --now pigpiod
```

Servo Test Script

```
from gpiozero import AngularServo
from time import sleep

pan = AngularServo(17, min_angle=-90, max_angle=90)
tilt = AngularServo(18, min_angle=-45, max_angle=45)

def move_safely(servo, angle):
    servo.angle = angle
    sleep(0.5)

move_safely(pan, 0)
move_safely(tilt, 0)

for angle in [-45, -20, 0, 20, 45]:
    move_safely(pan, angle)

for angle in [-25, 0, 25, 0]:
    move_safely(tilt, angle)

pan.detach()
tilt.detach()
```

Run the script with python3 servo_pan_tilt_test.py. The mount should center, sweep gently left and right, then tilt up and down.

Troubleshooting

Problem	Likely Cause	Fix
Servo jitters	Weak power or no shared ground	Use external 5V and connect grounds together.
Servo moves wrong direction	Bracket orientation reversed	Invert angle values in code.
Pi reboots	Servos pulling power from Pi	Move servo VCC to external supply.
Mount binds	Bracket screws too tight	Loosen and retest before powering.

Upgrade Path

After the servo mount moves reliably, connect it to the Flask dashboard for browser control, MQTT for remote commands, OpenCV for motion tracking, or SQLite for logging movement events.