Servos

A servo motor is a popular choice for positioning tasks in projects, combining a motor with control electronics for ease of use.

Common servos have a similar appearance, featuring a sawtooth shaft for accessory attachment and three wires: brown (ground), red (VCC), and orange (control signal). The control signal requires PWM with a period of 20 milliseconds (50 Hz) and a duty cycle of 5% to 10%, where:

- 1 ms corresponds to the 90° position,
- 1.5 ms represents the 0° position,
- 2 ms indicates the +90° position.

Servos can rotate up to 180°, facilitated by internal gears that reduce RPM from around 3,000 to approximately 50-100 RPM while increasing torque.

Inside the servo, there is a potentiometer that acts as a feedback mechanism by creating a voltage divider based on the motor shaft's position.

The control IC (KC5188) compares the current state voltage from the potentiometer with the target state from the PWM signal, adjusting motor rotation accordingly.

Torque and speed specifications are available in datasheets; upgraded servos like MG996R feature metal gears and enhanced motors for increased torque.

Using an Arduino pin (e.g., pin9), one can generate required signals through code utilizing the servo library. While Arduino can manage complete rotations, it may require adjustments beyond standard settings; typically needing between 0.5 ms to almost 2.5 ms for full rotation.

A simple circuit using a 555 timer IC can also create PWM signals without an Arduino, allowing flexibility in controlling servos.

To achieve continuous rotation like normal motors, one can remove mechanical end stops and replace feedback potentiometers with resistors to simulate constant zero-position feedback.