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Servo actuators are designed to convert energy from various sources, such as electric currents, pneumatic pressure, or hydraulic fluid pressure, into motion. There are three main types of actuators: pneumatic, hydraulic, and servo actuators. Servo actuators use feedback signals to move or control mechanical systems in a highly efficient and safe manner.Servomotor: A Key Component in Precise Motion ControlA servomotor, also known as a servo motor or simply servo, is a rotary or linear actuator that enables precise control of angular or linear position, velocity, and acceleration in mechanical systems. It is an essential part of a servomechanism, consisting of a suitable motor coupled to a sensor for position feedback and a controller.###ARTICLEServomotors and their development in World War II have a rich history. Initially, simple servomotors were used with resistive potentiometers for position encoding, but these are now largely replaced by more precise encoders like rotary ones. Modern servomotors often come pre-packaged with the motor, driver, encoder, and associated electronics all in one unit, known as an integrated servomotor. Controllers may also be custom-developed using microcontrollers to reduce costs for large-scale applications.These motors can be made from various types, including brushed permanent magnet DC motors, small industrial servomotors typically use electronically commutated brushless motors, and larger ones often employ AC induction motors with variable frequency drives. Additionally, drive modules are standardized components that take a single direction and pulse count as input and may include features like over-temperature monitoring.Servomotors have various applications, including in direct-drive sim racing wheels, where precise control is crucial. Their development has been extensively documented in literature, with many sources providing detailed information on their design, functionality, and usage.The evolution of servomotors has seen a shift from simple resistive potentiometers to more complex systems like rotary encoders. This advancement has improved the precision and reliability of these motors, making them essential components in various industrial and technological applications.The concept of cooperative usage of multiple distance meters involves utilizing various measurement tools to achieve a common goal. A color detector and separator device can be used in conjunction with permanent magnet motor technology to improve efficiency.Servomotors, such as the TowerPro SG-90, play a crucial role in these applications. These motors operate at specific voltage ranges, typically between 4.8V and 6.5V, with +5V being the most common operating voltage. The torque output of the motor is directly related to the voltage used, with higher voltages resulting in greater torque.When selecting a servo motor for a project, it's essential to consider the motor's rotational range, gear type, and weight. Most hobby servo motors can only rotate between 0 and 180 due to their gear arrangement, but some models offer 360 rotation or can be modified to achieve this.The torque output of the motor is another critical factor to consider. The TowerPro SG-90, for example, features a metal gear design that provides higher torque output compared to plastic gears. This makes it suitable for applications requiring stronger and longer-running motors.To make this motor rotate, we need to power it with +5V using the Red and Brown wire and send PWM signals to the Orange colour wire. Therefore, we require something that can generate PWM signals to activate this motor, such as a 555 Timer or other Microcontroller platforms like Arduino, PIC, ARM, or even a microprocessor like Raspberry Pie.However, how do we control the direction of the motor? To understand this, let us examine the picture from the datasheet. From the image, we can infer that the PWM signal produced should have a frequency of 50Hz with a PWM period of 20ms. Consequently, the On-Time can vary between 1ms and 2ms. So when the on-time is 1ms, the motor will be at 0, whereas a 1.5ms duration will result in a 90 position, similar to 2ms for 180. Thus, by varying the on-time from 1ms to 2ms, we can control the motor between 0 and 180. For further learning, one may refer to the Basics of Servo Motor article.This SG90 Servo Motor is widely used as an actuator in various robots such as Biped Robot, Hexapod, robotic arm, etc.. It also serves for steering systems in RC toys Robots where position control is required without feedback. Furthermore, it has less weight, making it ideal for multi DOF robots like humanoid robots.

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