The servo motor is an assembly of four things: The dc motor is connected with a gear mechanism that provides feedback to a position sensor which is mostly a potentiometer. From the gearbox, the output of the motor is delivered via servo spline to the servo arm. Difference between a dc motor, a servo motor, and a stepper motor.

Selecting between a dc motor, a servo motor, and a stepper motor can be quite a task, including the balancing of numerous design factors, namely cost, speed, torque, acceleration, and also drive circuitry all play an essential role in choosing the best electric motor for your application.

A servo motor works on the principle of Lorentz's force law, i.e., an electric motor in an electrical machine that converts electrical energy into mechanical energy. Electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of a torque applied on the motor's shaft. Electric motors can be powered by direct current (dc) sources, such as from batteries, or rectifiers.

In principle, with a rotary encoder, we have two square wave outputs. The figure shown above describes how the phases (a, b, and c) relate to each other when the encoder is turned clockwise (→) or counter clockwise (←). By monitoring the outputs with a microcontroller it is possible to determine the direction (→) and how far it has turned (→). We connect the 5v and ground from the mega2560 to the sensor. As a precaution, use a breadboard power supply to power the stepper motor since it can use more power and we don't want to damage the power supply of the mega2560. Electric motors are used to control the movement of objects. They are often used in robotics, automation, and machine learning to perform tasks that require precise control.

The basic principle behind the working of an ultrasonic sensor is to emit sound waves into the environment and measure the time taken for the wave to return. If the distance is less than the sensor's range, the sensor will detect the obstacle and return the measured distance. The basic formula for calculating the distance is:

\[ \text{Distance} = \frac{\text{Speed of sound}}{2} \times \text{Time} \]

Define pins for the input of the stepper motor driver module. Let's start with the basics!