

Alex Novoselov

Henry Wang

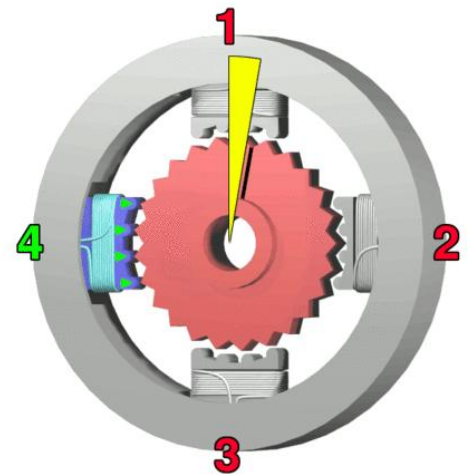
Kevin John

Matthew Lee

An Explanation of Major Components

The objective of the draw-bot competition is to use a mechanical system to trace a predefined shape in the fastest time. To accomplish this objective, we've decided to use a stepper motor which is controlled by an arduino.

Stepper motors are ideal for this purpose because they allow the user to finely control the direction, degrees, and speed of rotation. A stepper motor consists of 4 electromagnets surrounding a gear shaped rotor. By sending a voltage through the electromagnets, we change their magnetic polarity. Because the teeth of the rotor alternate in polarity, the inner gear is forced to rotate a small degree. These small increments of rotation are called 'steps' which is where the motor gets its name. By controlling the voltage – which electromagnet gets current and timing – we can control how fast the motor spins.



The voltage received by the stepper motor comes from a power source. In our drawbot, the power source is a 9 volt battery. The battery, if attached directly to the stepper motor, would only allow it to move the rotational distance equivalent to 1 step of the rotor. To allow for larger degrees of rotation, and variable speeds and directions, the 9-volt battery is instead connected to the motor shield.

The motor shield acts as the interface through which the arduino controls the voltage. It contains the entire infrastructure necessary to control the stepper motor. Additionally, it provides a neat and easy alternative to soldering wires and chips directly. One of the key components on the motor shield is the h-bridge. The h bridge is an integrated circuit with four switches. These switches, when opened and closed, allow the various wires leading to the stepper motor to get voltage. It is these h-bridges that are then connected to the arduino.

An arduino is a programmable microcontroller that is essentially the 'brain' of our draw-bot. Based on the inputted code, the arduino opens and closes the gates on the motor shield, allowing voltage to pass from the power source to the motor at different times. This arduino interface receives the code which tells it to open and close in a specified order. With the proper code the arduino will ultimately tell the stepper motor which direction to spin, how many degrees to go before turning around, and how fast to move.