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## DrawBot: Arduino Components

Arduino is a microcontroller that takes inputs from sensors and switches, and controls any variety of outputs through user coding. These outputs can range from lights to motors. Arduino has become a very popular choice of microcontroller because it is inexpensive and is very accessible. Its open-source and extensible software makes figuring out how to use and program an Arduino very simple. For this project, without an Arduino, nothing would be able to work. The code is uploaded through the Arduino which in turn allows everything to work and move properly, thus making the Arduino a very important and necessary component of our Drawbot.

The power supply provides the external power necessary for running the motor from the motor shield. Our stepper motor requires a 7V power source. Using a battery pack to provide the 7V and wiring it to the motor shield, the motor runs smoothly.

A motor shield helps to easily control the direction and speed of the stepper motors independently, in order to make incorporating a motor into the Drawbot very simple. The motor Shield requires an external power source to operate. The motor shield is able to power up to two stepper motors, DC motors or servos. The motor shield is also able to measure the motor current absorption. A motor shield is necessary in our Drawbot so that we have a platform for the motors to operate on.

A stepper motor is a motor that completes a full rotation using finely divided steps. The motors can uniquely control the direction and degree of rotation, thus making it a very usable

resource for this DrawBot project. A stepper motor can either be unipolar or bipolar – unipolar motors have five, six or eight wires, while bipolar motors have only four. In this project, a unipolar stepper motor will be used. There are two coils of wound wire in a unipolar stepper motor, each with a center tap. A magnetic field is produced by running current through a winding, which, in turn, attracts a permanent magnet rotor which causes the motor to rotate a step. To produce a continuous, smooth rotation of the motor, the winding is “deactivated” as the next winding is “activated” by streaming a current: the motor rotates in the direction of these activations. By controlling which windings are activated and in what order, the direction of the motor can be manipulated through a user interface.

This user interface is usually one of many open-source software programs. Using these programs, commands to control the direction and speed of the motors can be encoded and uploaded to the Arduino chip. In this way, the Arduino outputs can be directly manipulated to serve one’s needs.

The Arduino microcontroller is an extremely convenient tool for the DrawBot competition. By utilizing the Arduino’s motor capabilities, we will use two unipolar stepper motors to control the movements of a drawing utensil to trace out a predetermined shape.