

COLORSORTBOT

Autonomous Robotic Arm for Object Manipulation and Sorting based on Color

➤ WHAT MATERIALS WOULD WE NEED :

First of all, in order to put the robotic arm together, we'll need :

- 1 – **An Arduino Uno** : The brain of the robotic arm



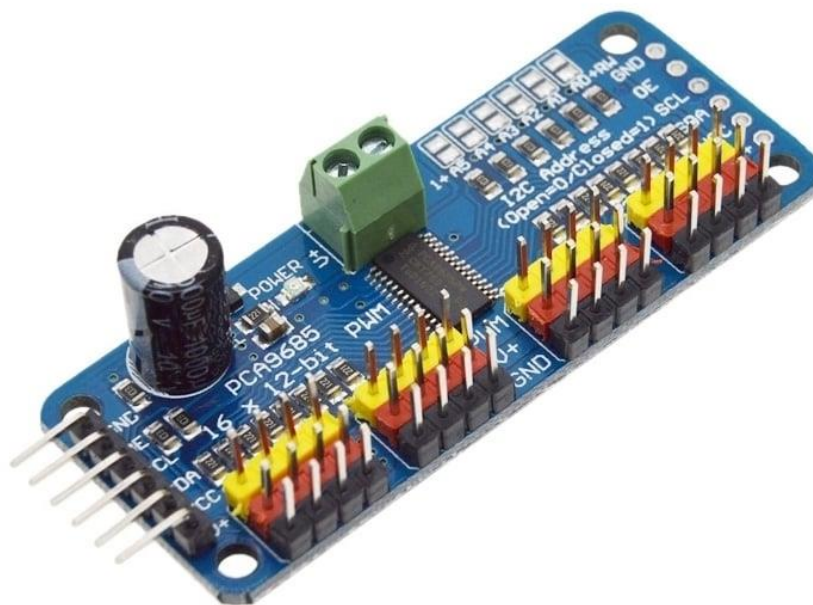
- 2 – **Servo Motor** x 6 (MG996R) : Will be used as joints for the robotic arm



- 3 – **Stepper Motor** (NEMA 17) :



4 – **Servo Driver** (PCA9685) : Given that the Robotic Arm is ideally a series of motors coordinating together, we can theoretically attach several motors that can be all powered by the Arduino. In this project, we'll be using the PCA9685 Servo Driver to power the MG966R Servo.



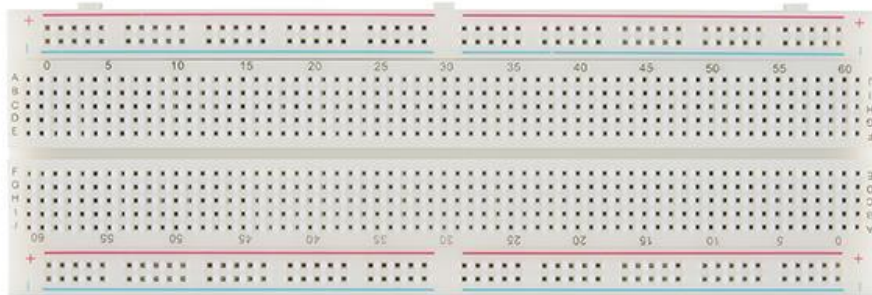
5 – **Servo Battery** (2400 mAh , 4.8V) :



6 – **Jumper Wires** :



7 – Breadboard :



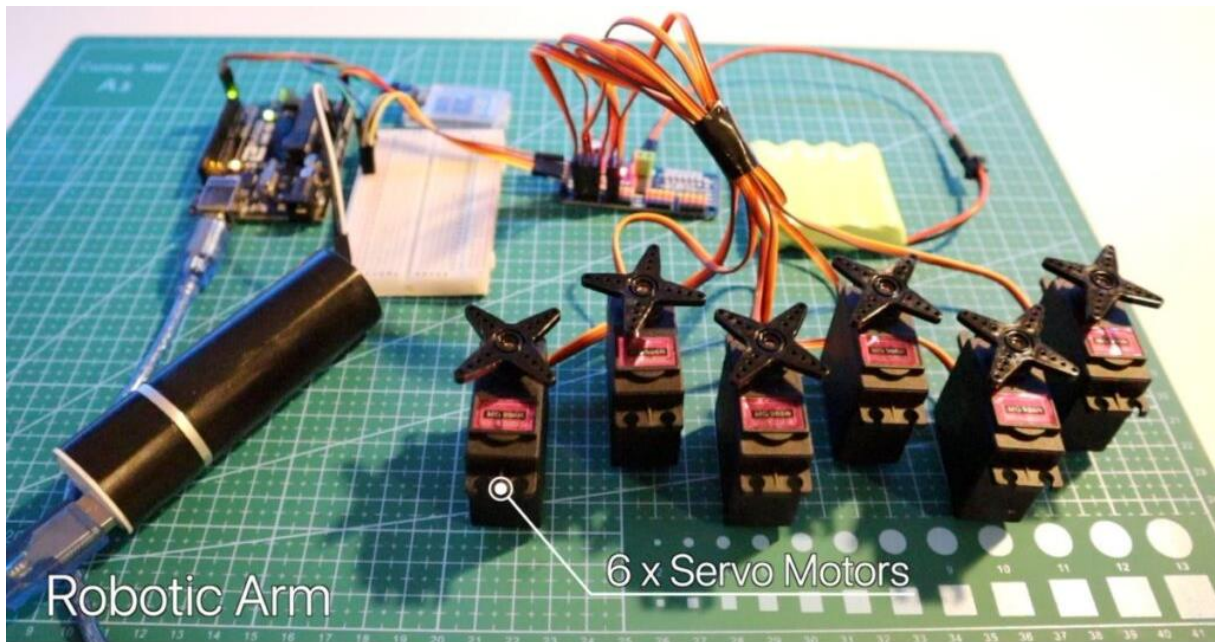
8 – Then there's the 3D printed robotic arm. In my case I'll use wooden sticks.

➤ HOW DOES IT WORK :

We can think of a Robotic Arm as a series of servo motors coordinating and all working together to complete a task *like moving an object*

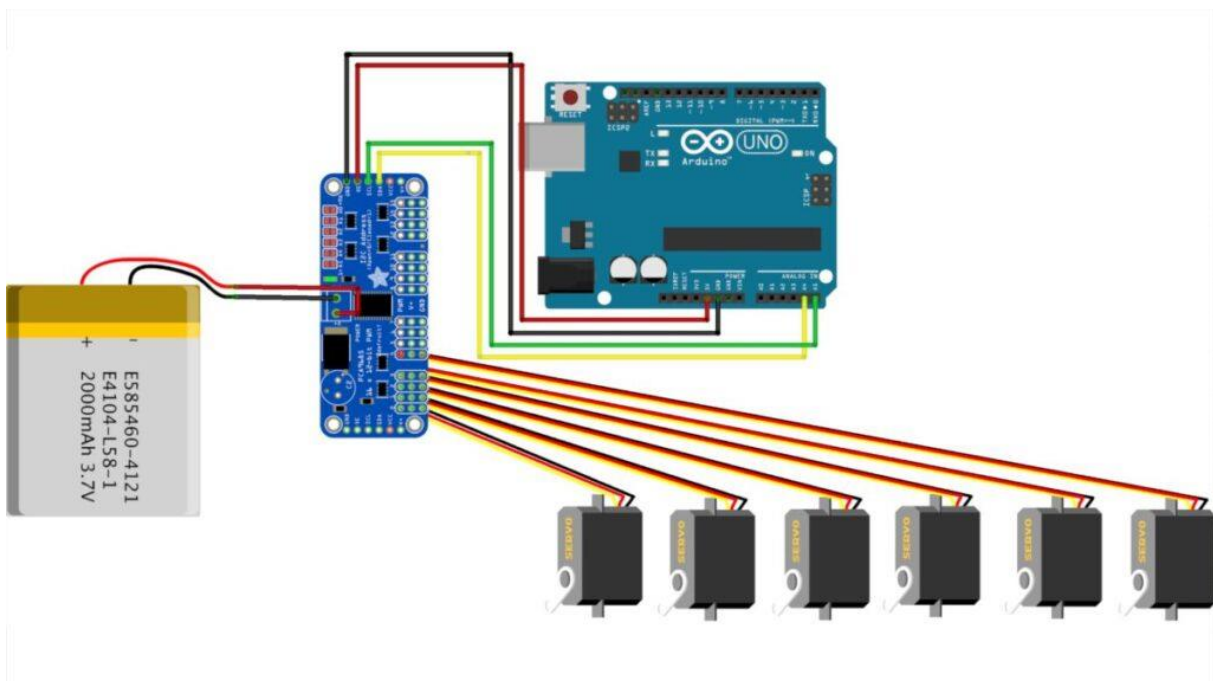
- We're using the **Arduino** to control the **Servo Motors**
- To drive them all we'll be using a **Servo Driver**
- Each **Servo Motor** will be programmed to move together to perform a task *like picking an object*





Note: I'm using an external power supply when powering each Motor. The Arduino cannot supply enough power to control all motors. In this project, a 5V, a 2200 mAh RC Battery was used.

The Arduino diagram wiring should look as below:



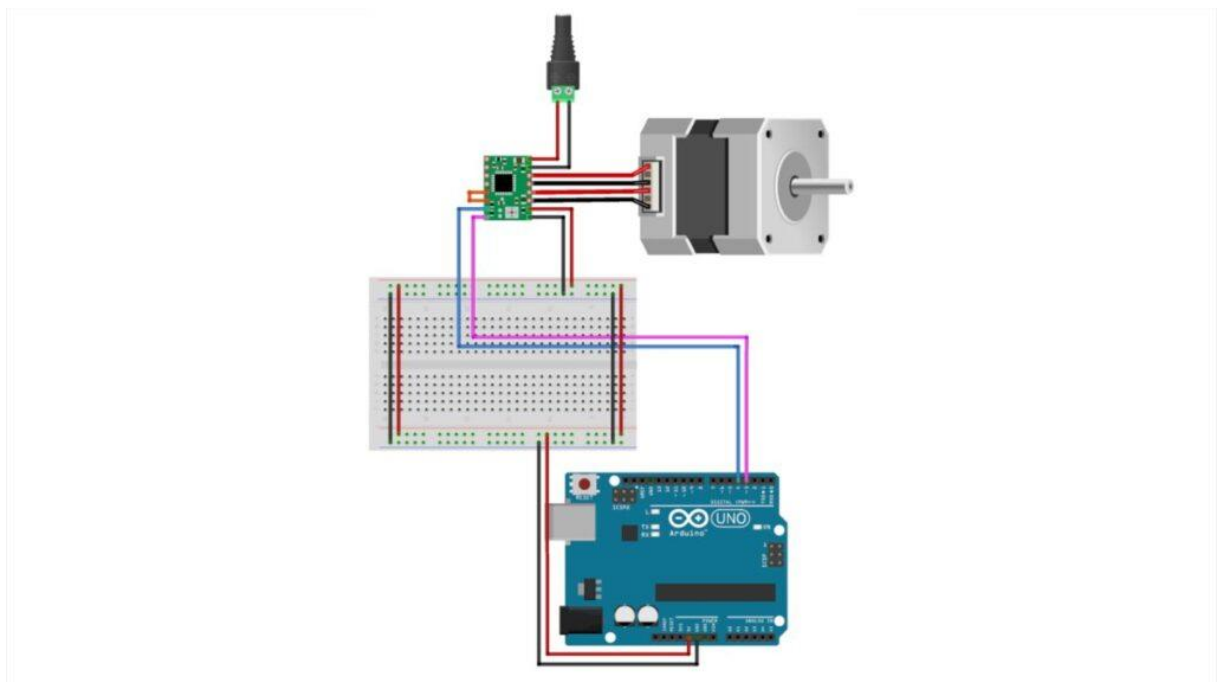
NEMA-17 for base rotation

Since the Robotic was starting to gain a bit of weight, and the MG966R servo motor was not powerful enough to rotate the Robotic Arm at the base. To rotate the Robotic Arm, a more robust motor than a servo motor would need to be used



A Stepper Motor (NEMA-17) can be used due to its precision and high torque, helping the Robotic Arm rotate seamlessly to gesture controls.

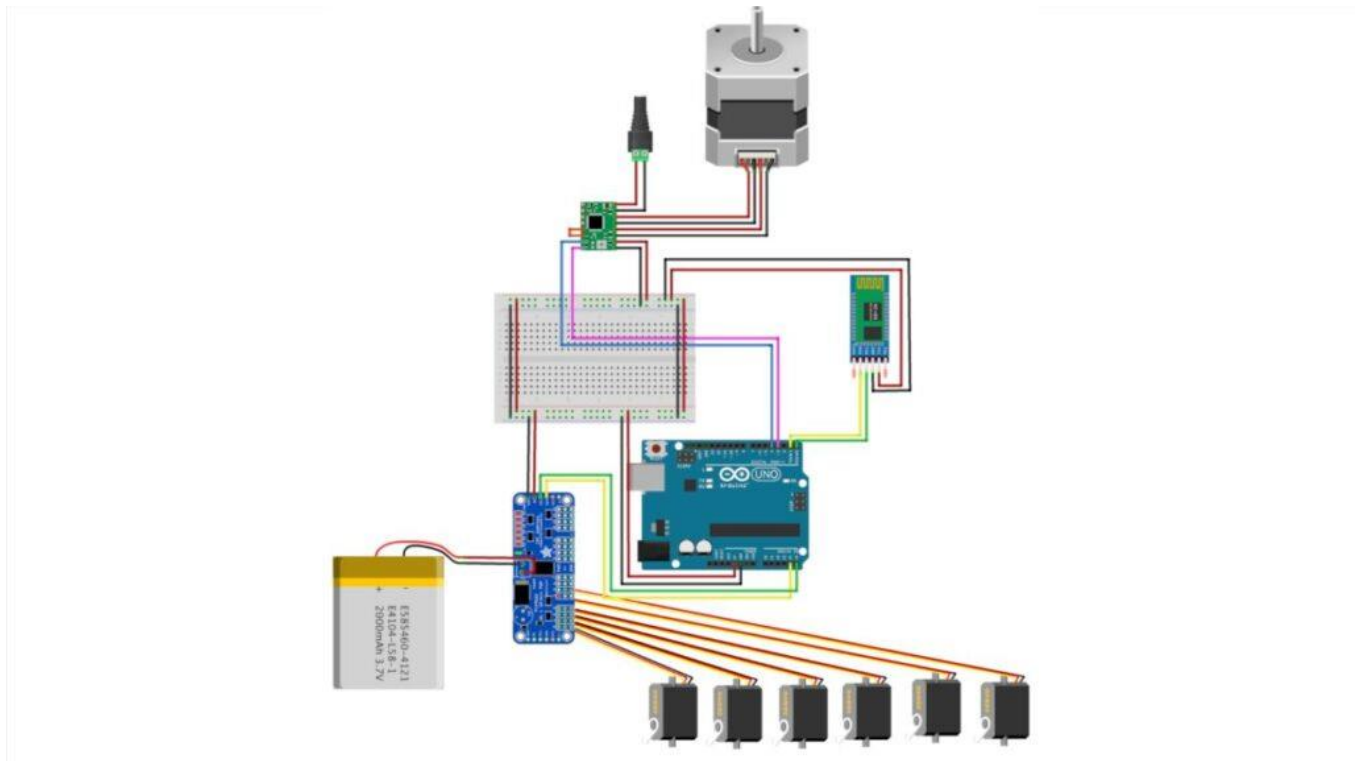
The NEMA-17 and the A4988 Driver si used to control the direction of the Motor, you can see from the diagram below:



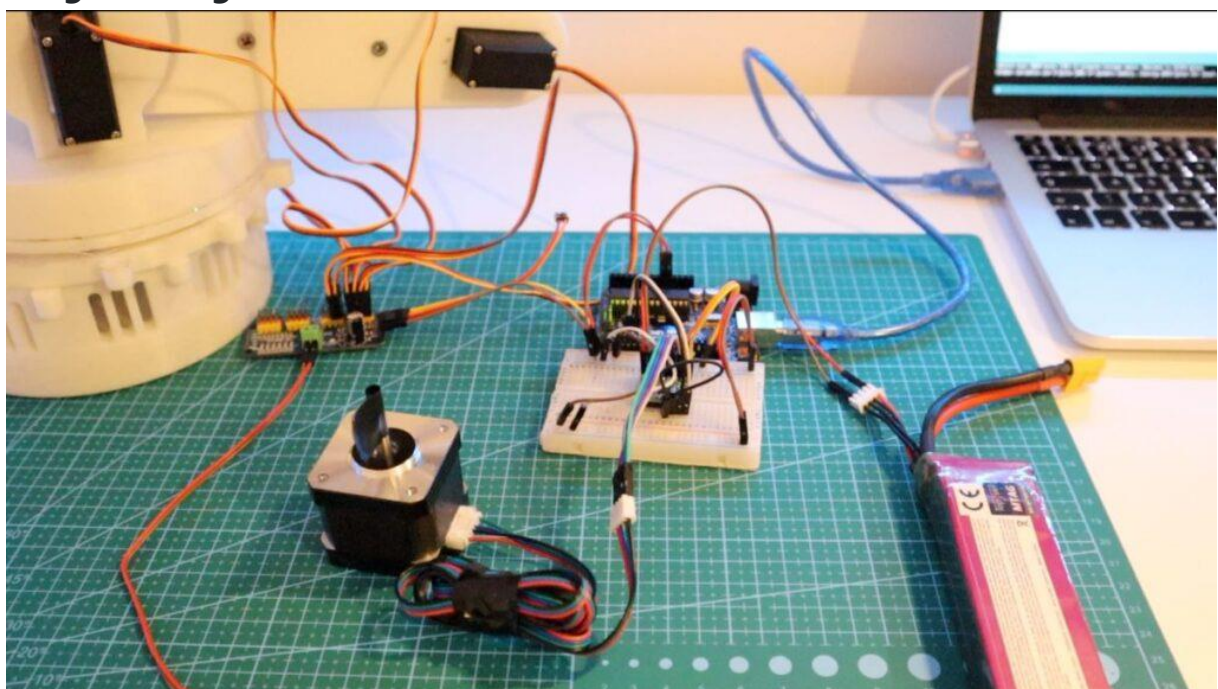
And finally, the following diagram shows the final wiring diagram assembly of the complete Robotic Arm.

Assembly of Circuitry

The below wiring diagram shows the final assembly of all electronic parts to create a Robotic arm, including the Bluetooth module. We'll cover the pairing process below.



Programming the Robotic Arm



The Robotic Arm code makes use of the HCPCA9685 Library (for the Servo Driver). This way, we can power multiple servo motors, all controlled by an Arduino. In the code, we can start by adding this library and declaring the servo variables.

The following variables are used to find the previous/increment and get the Servo's current position.