Work Completed:

On Friday, Megan and I went to Walmart to purchase spray paint to test on our robotic arm. The client had requested that the arm be “Yankee’s Pinstripe Blue” The closest color that we could find to this was Navy Blue. The entire upper and lower arm, along with the gripping device will be painted this color.

Upon doing much research on the internet, the group was able to find that the best spray paint to use was by a company called Krylon. This company manufactures a specific model of spray paint that is intended for use on PVC. This model is called “Fusion.” It was manufactured in such a way that it creates and adhesive bond with all plastic that it is applied to. The paint requires no sanding or priming and is also good for all indoor and outdoor applications.

A major concern when using this paint is its ability to last. We know that the client is a child of only ten years old and will not be as careful with the device as an adult would be. Also, the child will be using this device in a classroom in which the arm will undergo much abuse and usage. I found a proper technique of application that will avoid the problem and concern of chipping or fading.

The ideal condition for this paint is when it is in a well ventilated area between 50 and 85 degrees with very low humidity. Before the paint is applied, all loose particles and debris should be removed from the surface of the PVC. The surface should also be dry and free of any moisture. Any dampness will not allow the paint to dry properly. For best results, if the surface has been unweathered (this is the case for our PVC), the surface should be wiped with a paint thinner prior to application since it will create a better adhesion for the surface.

Before applying the paint I should the can vigorously for two minutes. When spraying the paint on the surface if the PVC, I held the can approximately eight inches from the surface. I sprayed in an even sweeping motion while consciously keep the can at an even distance from the surface. This extremely important since when I placed the can at an uneven distance or too close, I could a differentiation in the texture of the surface. Since the paint being used was blue, this was extremely obvious. I began at one side of the pipe and equally passed to the other side. I applied one thin coat and then waited thirty seconds before applying a second. I kept applying thin coats to avoid dripping.

Once I applied the paint, I allowed the PVC tube to sit outside for an hour so that it would dry completely. The paint actually dries in fifteen minutes. I just wanted to be sure that I did not smudge the surface and that the paint was completely bonded. I think I applied the initial coat of paint much thicker than desirable. I did encounter some dripping. The instruction on the can said that the paint would dry in fifteen minutes but to wait an hour before handling. The color will need multiple coats, not only for protection
but also to achieve a shade of blue that is dark enough. The first coat appeared to be a bit light and bordered on being a more primary shade of blue.

In order to be sure that the paint will not chip at all, it is essential that a second coat be applied. This coat must be placed on the PVC either within the first twenty-four hours of the initial application or after seven days of the primary application. It is essential that this be followed so that the adhesion is as strong as possible. We will definitely follow this technique for future applications. The paint becomes completely chip resistant as seven days of the final application.

In order to finish this application process, the over spray needs to be covered with paint thinner. This solidifies that final layer and will make the pipe resistance to much abuse. In order to keep the paint fresh so that it does not settle, the can must be held upside down and sprayed until only a clear gas comes out once the painting is done. This helps to clear the nozzle of the bottle and removes and potential components that could lead to an oxidation or breakdown of the paint. If the nozzle were to become clogged at all, apply lacquer thinner to the nozzle. Never stick anything in the nozzle opening. This could greatly affect the uniformity of the paint application.

The group also brainstormed and found a new way to attach the grippers to the wrist portion of the arm. We decided that the original square panel that was created to house the gears and motor should be redesigned to bridge the attachment. This was done in the machine shop using the drill press, belt sander, and band saw. New PVC was found in the machine shop and was cut with the band saw and then demurred with the belt sander. New holes were made to attach the gears using the drill press and a 5/8 inch drill bit. The new panel can be seen below in Figure 1.

![Figure 1: New connection panel for gripper and wrist](image)

Once the new panel was created, we then need to attach it to the lower arm. Quarter inch holes were made into the side of the new panel, perpendicular to the gear holes, using the drill press. These holes are one inch apart. These holes were then threaded in the using a tapper. Quarter inch holes were then made into the lower arm that were of equal distance and size to the ones made on the panel. Spacers were also cut from a PVC rod that had a inner hole diameter of a quarter inch. These spacers will be used to keep the internal pulleys stationary. The new attachment can be seen in Figure 2.
**Project Review:**

This week, much change and redesign was made to our device. The original square was altered to the panel into the panel seen in Figure 2. We also determined that the motor that we are currently using is not desirable for our project. First, the motor we purchased is AC and the circuit constructed is for a DC motor. In order to convert the current from the AC motor we would need to purchase converters that are very expensive. The motor also requires 115V. This is more than a vacuum cleaner. Even a car battery would not power this motor. We do not want the client to have to be constricted so we do not want to have to use a power outlet. Due to this, we will need to find a new motor with high torque at a low cost.

**Future Work:**

This week we will need to find a new motor to purchase so that we can put our entire project together. We also need to find a way to create a revolving base. We will meet with Dr. Fox about this since he made one in his lab. We also need to purchase one more quarter inch screw so that we can assemble the pulley system. Finally, we need to decide if the length of the lower arm needs to be reduced. This will be determined by a trip to Hampton Elementary School.

**Total Number of Hours Worked:** 12 Hours