Dominica Sim, Farrukh Zia

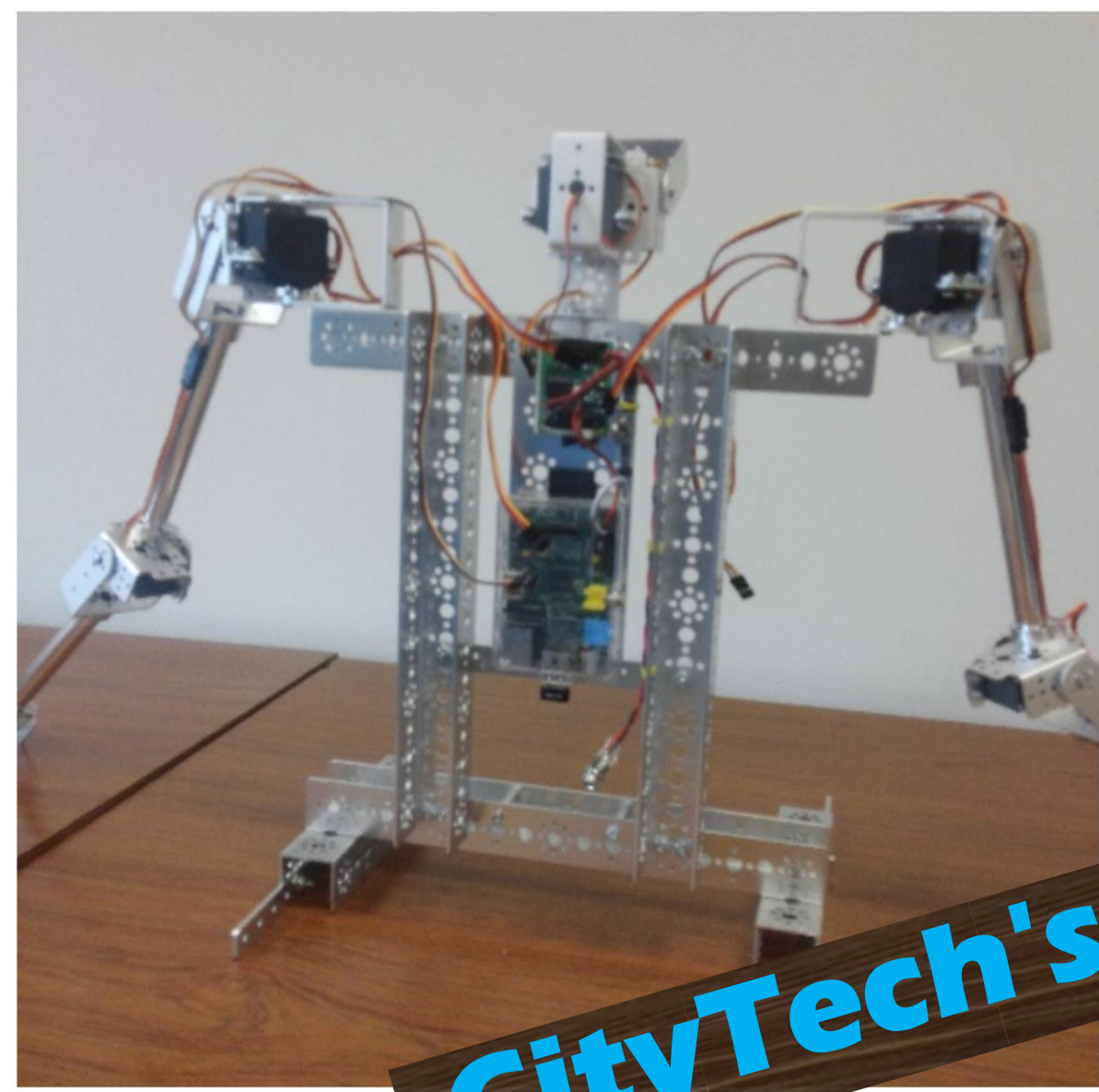**Department of Computer Engineering Technology**

How did I meet the Roboqueen?

When I first met with professor Zia to talk about his robot project, I was curious about where and how it would be used. When I was told that it would be used in New York City's store windows as fashion mannequin, it had already caught my attention. Having prior knowledge about window displays and product designs, I was interested in how it would turn out. My first impression of this project was the image on the left. After seeing what I had to work with, I immediately got to work on creating an actual human form for this robot. Researching mannequin materials, comparing the cost, and weights, the goal of this project was clear. We had to not only make a human form for this robot but we also had to make it cheaper than other materials that were used in other robotic mannequins. With all these conditions, we decided to make the form with cardboard. The next step was to figure out how to assemble it together to hold the garment's weights and allow movement. Professor Zia was planning to get the mannequin working with basic features, like head and arm movements and speech. I tried a variety of 3D software like 123D make, 3D max, Maya, 3D builder and Invertor, but I couldn't find an easy way to create organic shape figure and slice it to make planes for digital fabrication. I finally decided to use AutoCAD application because of my past experience, even though it would take tedious amounts of time.
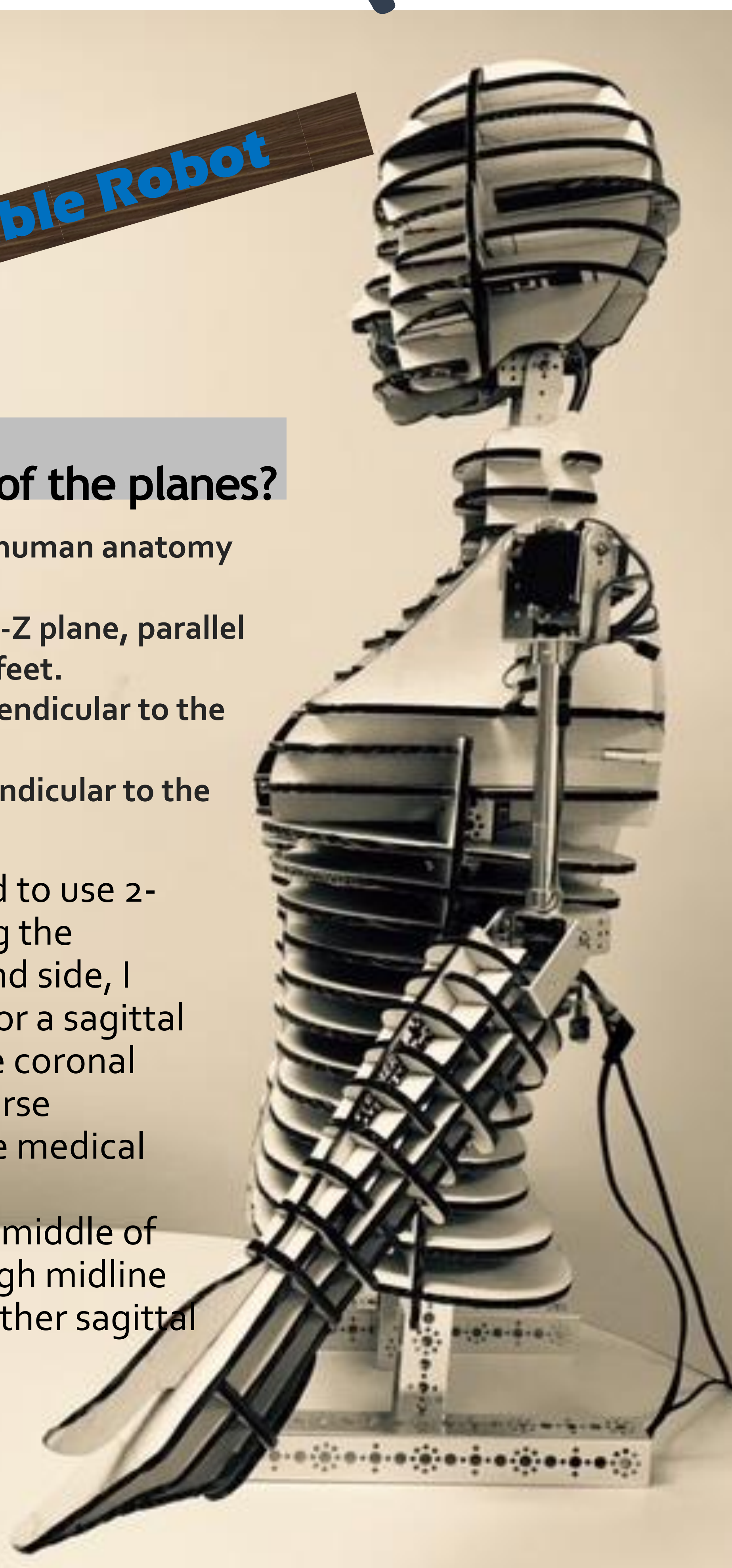
RoboQueen

CityTech's Fashionable Robot

To manufacture and assembling

I made schematic rough sketches of the robot's arm and upper body construction with measurements as shown on the right. Since we decided on the material to be cardboard, I needed to lay the slices out on a 2-dimensional plane. I also needed to adjust between the references of real female sizes and standard sizes for mannequins. I had to combine them to create a more realistic form. The next step was trying to combine the cardboard with the robotic structure. In order to build a 3-dimensional form we needed to create 3 axes where the cardboard slices would join and support each other. After getting all of the precise measurements, I started to draw an actual construction.

How did I get the shape of the planes?

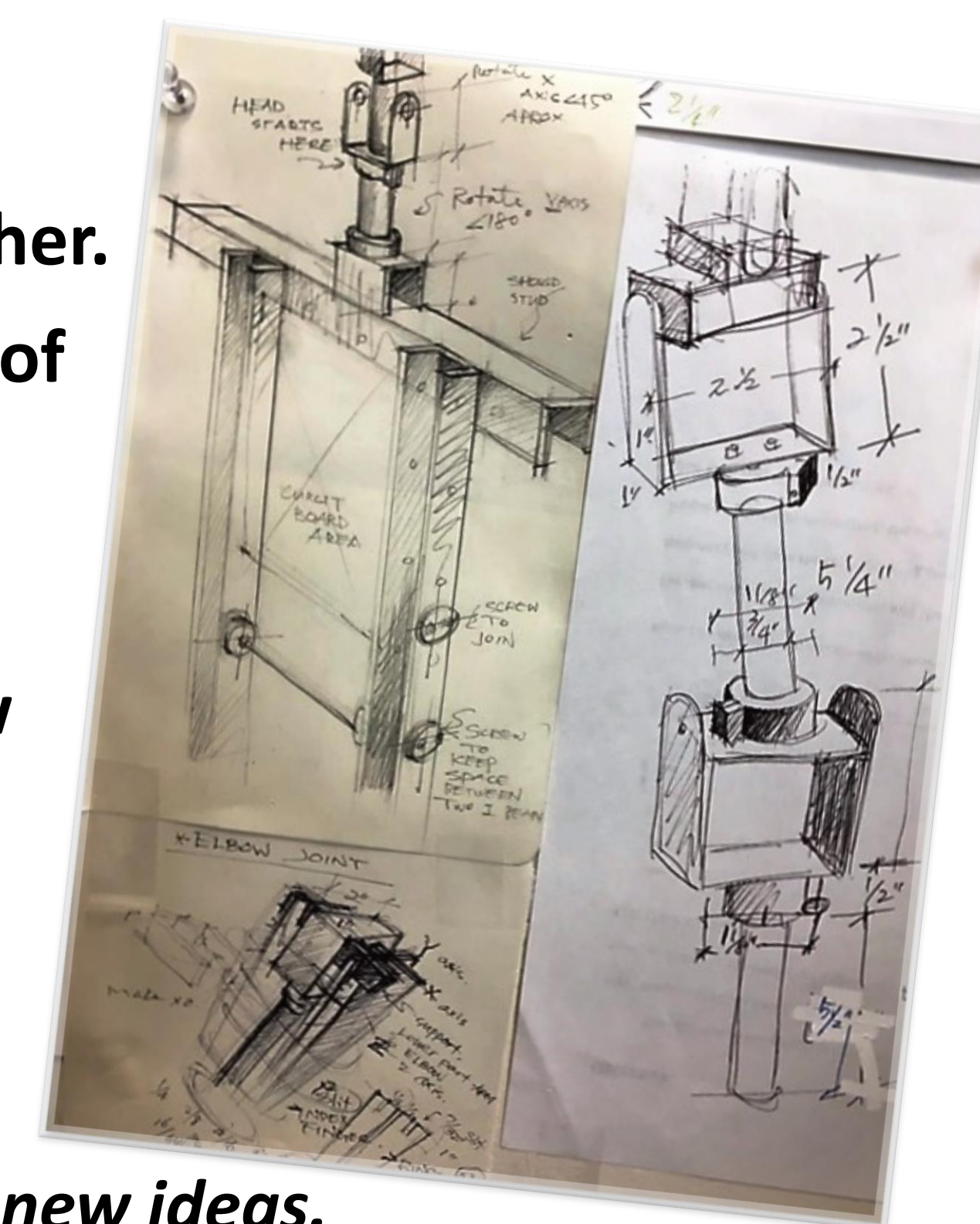Since 3-dimensional forms need 3 axes, I used the human anatomy sections which were;
•A transverse (also known as axial or horizontal) X-Z plane, parallel to the ground, which separates the head from the feet.
•A coronal (also known as frontal) X-Y plane, perpendicular to the ground, which separates the front from the back.
•A sagittal (also known as lateral) Y-Z plane, perpendicular to the ground, which separates left from right.

In order to create a 3-dimensional figure I had to use 2-dimensional planes to create a body. By using the reference picture of the female front, back and side, I was able to use the profile view of the body for a sagittal plan, and use the side view of the body as the coronal plan to get a silhouette. To get all the transverse horizontal plans I used a MRI picture from the medical field. The mid-sagittal plane was the specific sagittal plane that was exactly in the middle of the body. In other words, it would pass through midline structures such as the navel or spine and all other sagittal planes are parallel to it.

The digital fabrication by
NYCCTfab
NYC College of Technology

Various digital fabrication strategies, such as laser cutting, have altered our way to synthesize new ideas.
For this project, I used the Universal ILS 12-150D laser cutter which had a work area of 48x24 inches. It allowed a wide variety of paper, wood, plastic and fabric materials to be cut, stitch-cut, scored, etched, engraved and drilled. The format of the laser cutter used was accessible by Illustrator CS6, Rhino 5.0 and Auto CAD. The laser cutting settings that I used were; blue color mode set as a vector, input power set at 120 Watts, speed set at 10%, cutting power set at 60%, and PPI 500 for the vector. The red color mode was set at power 20%, speed 100%, and PPI 500. In order to prevent a burn in the material I had to make sure that every line was cut by a single stroke. All of the procedures were vital in the creation of the Roboqueen, and I probably would not have been able to create a body without all the tools I used. Finally, the 130 individual pieces were assembled into a 3D body like a jigsaw puzzle.