

Design Goals

Proceeding the project from the point reached by the previous team:

- New string potentiometers are needed to withstand the weight applied and be durable. 10k Ohms string potentiometers with a 12.5" length of string are suitable for this device. As new potentiometers are going to be used, the circuitry to the power supply and computer needs to be set up differently and the software interface created last year needs to be reprogrammed. BNC cables to go from the string potentiometers to the computer recording data have to be used in order for the interface to acquire data directly from the string potentiometers.
- New timing belt and pulleys are to be replaced for the bottom potentiometer. The current set-up of the potentiometer at turntable has a 1:1 gear ratio however, in order to have the turntable function as needed, the set-up has to have a higher gear ratio. For this to be achieved, the pulley attached to the potentiometer as well as the timing belt attached to have to be changed and the code has to be revised to increase gear ratio.
- The wiring of power supply seems to be done incorrectly therefore, the power supply has to be rewired correctly to the computer and all sensors. The best way to understand how the electrical aspects of the Twister work would be to unplug and disconnect all of the wires then to reconnect them the correct way to know the reasoning for each wiring. Then, the wires used and the methods of wiring could be modified as needed.
- The current neck bar has only one universal joint and as a result, the subject's neck has to bend along with the movement of the neck bar. To allow movement while the subject's neck is still perpendicular to the ground, two universal joints are to be installed so that one cancels the bending angle of the other. Moreover, the universal joint being used currently by the Twister has some slip in it therefore, a new universal joint with zero slip has to be ordered.
- A second harness holder that attaches to the harness has to be machined at machine shop as only one harness holder is available.
- Improve the flat spring that connects to the harness holder and allows for natural movement. The current springs have low durability and low life, so new durable ones have to be found.
- Torque sensors need to be reconnected correctly to the power supply then, the sensor has to be reprogrammed to the software interface created last year.
- The current attachment bar system is not practical and can hardly be placed accurately. Therefore, a roller system is going to be added to the lateral bars so that the bars remain horizontal and can be slid up and down easily. And that can be achieved by adding wheels to the system and cut the bar attachment into two parts with a spring in between to push both parts onto the vertical bars.

- Build a second lateral bar attachment. The bar attachment that holds the subject stationary broke last year therefore, a new attachment has to be built to prevent less bending.
- The DC motor has to be connected to the circuit and be programmed with the software interface to achieve the higher, settled on gear ratio.
- An emergency stop is to be added to the system for safety. The E-stop has to stop the turntable from moving but without a sudden stop that may hurt the subject.
- The current system does not have a physical safety stop when the platform rotates. Therefore, a physical stop is to be added to the system to have the platform stops at a certain degree while still achieving maximum rotation required.
- Test torque sensors to obtain the correct data needed from them. When the torque sensors were tested using an oscilloscope, there was so much noise in the data shown therefore, the torque sensors had to be tested with the computer in Dr.Cohen's lab or our computers to see if the same results are being acquired as the issue might be with the oscilloscope. Otherwise, an amplifier might be used to reduce the noise.
- Improve the code and interface. The code works fine for the drive system at turntable however, the bending mode is not working and needs to be improved and completed. Moreover, the code needs to be more user-friendly by adding extensive comments so that if the people working on the device in the future need to change something in the code it will be easy and clear.
- The stability of the apparatus needs to be improved by adding supports and modifying the design as needed.
- Move the Twister to Dr.Cohen's lab for testing, acquiring, researching data.