WORKS COMPLETED:

This week, I’ve worked on ordering the MID connector for the motor and the LabVIEW program. The wires from the motor need to be connected to the stepper drive. However, in order for the wires to be connected to the stepper drive, they have to first be connected to an MID connector. There was no spare MID connector when the stepper drive was ordered, thus I contacted National Instruments in order to get a quote for the connector. In addition, I’ve talked to the client and he agreed that I should order the connector. Thus, I wrote up an order form and sent it over to Jacki to order the connector.

I’ve spent most of my time working on the LabVIEW program this week. First, I’ve designed the front panel. I wanted to design the front panel such that it is user friendly and straightforward. I decided that the front panel should contain a tab container with three tabs, each tab representing a different module of the program. In addition, I’ve also decided that the program should consist of three different modules: one module for the carriage positioning, one for the image setup, and one for the overall testing.

The function of the carriage positioning module is to adjust the position of the bending bar. The bending bar is attached to the linear actuator which is attached to the motor. Before testing, the position of the bending bar needs to be adjusted so that it is very close or at least touching the surface of the tissue without exerting any force on the tissue. By having a carriage positioning module, the user can move the motor, which in turn moves the bending bar so that the bending bar position can be set to wherever the user wants it to be.

The Virtual Instruments (VIs) used to construct the carriage positioning module so far are taken from the NI Motion library. Basically, there is a VI to initialize the motor. This VI is used to configure the motor to the default settings set in Measurement and Automation (MAX). Other VIs used for the module included the load velocity, load acceleration/deceleration, load position, and start motion. The load velocity VI take in, as inputs, the velocity set by the user in steps per second. This velocity determines the speed of the motor. The load acceleration/deceleration VI sets the acceleration/deceleration for the motor. The load position VI takes in, as inputs, the position for the motor to go to. The position VI works in conjunction with the velocity VI. For example, if the user input in 10 steps per second for the velocity and 500 steps for the position, then the motor will move to the 500 steps position in 50 seconds. Finally, there is a start motion VI. This VI tells the motor to start rotating according to the settings set by all the previous VIs. In addition, there is also a halt function. This halt function stops the motor whenever a certain Boolean is true. For instance, if the user presses
the stop motor button, then the Boolean output is true. This activates the halt function which stops the motor from rotating.

The image setup module is used to verify that the camera captures the image accurately. In addition, it is used to process the image such that the markers’ positions, bending/reference bars positions, and posts positions are separated from the background and tracked. The image setup module uses VIs from the NI IMAQx library. These VI includes the camera initialization VI, which initializes the camera to the settings set in MAX. It also includes a Grab Setup VI which is used to start the image acquisition process. This VI performs a continuous acquisition that provides access to the most recently acquired image. Furthermore, there is also a Grab Acquire VI which acquires an image from the Grab Acquisition.

The image setup module also needs several other VIS to process the raw image that is being captured by the camera. These VIs includes thresholding, remove small objects, remove border objects, and adjusting the brightness, contrast, and gamma of the image. These VIs function to separate what needs to be tracked from the background and all other unnecessary artifacts. Currently, we have no camera, so I cannot add these VIs into the main program just yet. This is because I do not know how to the camera functions and the image quality of the camera.

Finally, the testing module is where all the testing occurs. Once all the setups are completed and the user inputs in all the necessary inputs, the user then presses the start button on the testing module, and the program will control the motor and the camera to perform the flexural test. It will also output all the necessary data into a text file. This module will be the last module in the program and will be written last because it integrates all the other modules together.

Figure 1 below shows the current block diagram for the program. It consisted of the completed carriage positioning module. It also shows some VIs used for the image setup module. Figure 2 below shows the front panel for the carriage positioning module. As can be seen, the bending bar can be move back and forth, either toward the tissue or away from the tissue. There is also a stop motor button which, when pressed, stops the motor from moving. There is also a motor speed meter which inputs the velocity for the motor. Figure 3 below shows the image setup module. It consisted of a raw image display and a processed image display. The raw image display shows the raw image including the background and artifacts the camera is acquiring, and the processed image display shows the image of only the markers, bending/reference bars, and posts.

**FUTURE WORKS:**

Goals for next week: determine the inputs and outputs for the program, help think of design for mounting for the bending on the linear actuator. Goals for next 2 weeks: write codes for the image acquisition module, help write codes for calculations. Goals for the month: finish writing the codes for all the individual modules, start the integration process, start the debugging process.
Fig. 1 – Block diagram for main program

Fig. 2 – Front panel showing the carriage positioning module
Fig. 3 – Front panel showing the image setup module