Work Completed

Since the last report, we received the force sensitive resistors (FSR) from Tekscan. There were a few questions that needed to be answered, which I discovered after reading through the Tekscan and Interlink FSR manuals. I spoke with Mike Ozog from Tekscan’s technical support and obtained the answers to our questions.

I. What input voltage and resistor will be required to extend the 100 pound force limit to fit our needs (~330-350 lb force)?

   a. Due to variations in sensors during manufacturing and different interfaces, each sensor must be tested individually for the appropriate $V_{REF}$ (input voltage) and $R_G$ (reference resistor) to extend the pound limit. The following steps outline the testing procedure.

   1. Sensor must first be placed into the packaging or material in which it will be used (finished product, such as an insole)

   2. Attach the circuitry to ohmmeter or oscilloscope. Circuitry should have a voltage supply (start at -5V) and a variable resistor (potentiometer starts around 20kΩ).  

   ![Diagram of the testing procedure](image)
3. Place 10% above the maximum weight (10% above to allow for conditioning) onto the product and allow the readout to stabilize (which should be saturated due to being well over the allowed weight).

4. Gradually decrease the potentiometer and the input voltage (going in the more positive voltage direction). Adjust until the readout is no longer saturated and write down the resistance and voltage level.

5. Repeat for each FSR. Note: it should only require relatively small changes (toward zero) to reach 350 pound force, since the FSR can be adjusted up to 1000 pound force.

II. What type of actuator can be used to calibrate the FSRs?
   a. Can use an actuator (with appropriate ranges of pound force) or a set of weights.

III. What type of thin elastomer could be used to help absorb error from inconsistent force distribution?
   b. They use a medium durometer urethane, but neoprene should be fine. Make sure that there is an additional pad of elastomer on either side of the FSR ring that fits within the silver ring, as this is necessary to absorb the error without damaging the FSR or causing error.

I contacted Linx Technologies to find out if we can use the 433MHz antennas with the 418MHz transmitter/encoder and receiver/decoder, since we already have these parts. The e-mail response from technical support was that the 418MHz would see very high Voltage Standing Wave Ratio (VSWR) with most of the transmit power reflected back from the antenna. The transmitter could create a lot of undesired harmonics. This could also cause overheating of the device and damage to the transmitter. Therefore, we will use an antenna with the same frequency as the transmitter and receiver. Consequently we will need to order more parts. However, we recently learned that we will need two telemetry sets with different frequencies, one frequency for the B&L
Engineering insoles and a different frequency for the FSR insoles.

**Future Work**

We should begin connecting the devices and testing them, so we will begin building the LabVIEW program on Friday, October 6. We also need to create a program for the microprocessor, so we can test our circuitry set-up, once it’s completed. We need to order the additional telemetry parts.

We need to decide on the material for the FSR insoles and get that ordered. We need to make the FSR insoles so that we can determine the appropriate input voltages and reference resistance. Then we can begin calibrating the FSR insoles.

**Project Review**

We are continuing to make progress and should have some outputs in LabView from the B&L Engineering insoles in the next week. Unfortunately, the change in focus of our project, with the added telemetry technology, has slowed us down considerably in our building due to the research and learning required to understand and build this added technology. If we’d had the first semester of Sr. Design to research and plan for this part of the project, we would be further along. However, we will be able to overcome this set back.

**Hours Worked**

14 hours