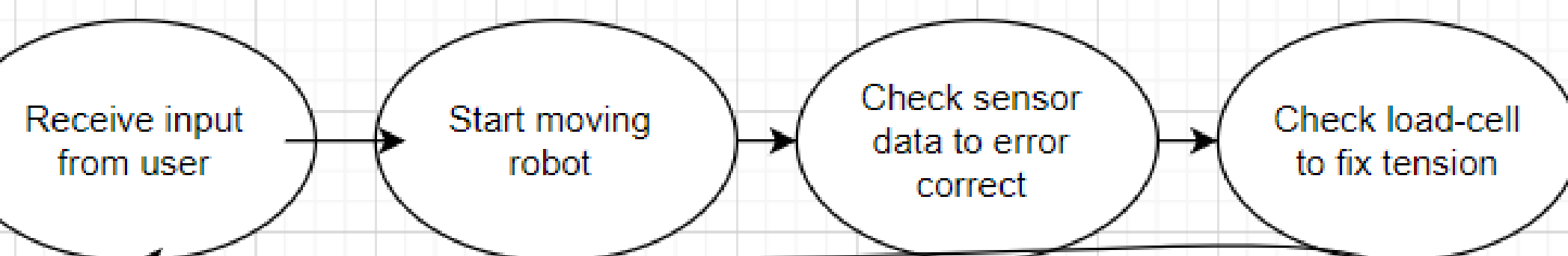


Viability of Magnets and Robotics On Medical Surgeries

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Research question: Exploring the viability of magnets and robotics in order to design techniques for minimally invasive surgeries with a greater sense of precision.

Methods



Upon receiving user input stating the desired change of displacement and angle, the program determines the starting movement of the robot and then checks FBGS and rotary encoders to provide feedback depending on the resistance of the material (gel) involved. After the displacement and orientation is confirmed, the loop is opened back up to accept another command from the user.

Obstacles

As a focus of the project is to gauge the viability and the respective accuracy of the system, the obstacles involved surround that focus:

- Calibrating FBGS, load cell, and other various sensors
- Interfacing with Arduino
- Interfacing with UR16e cobot
- Data collection of FBGS (TCP/IP)
- Code development/debugging

Data

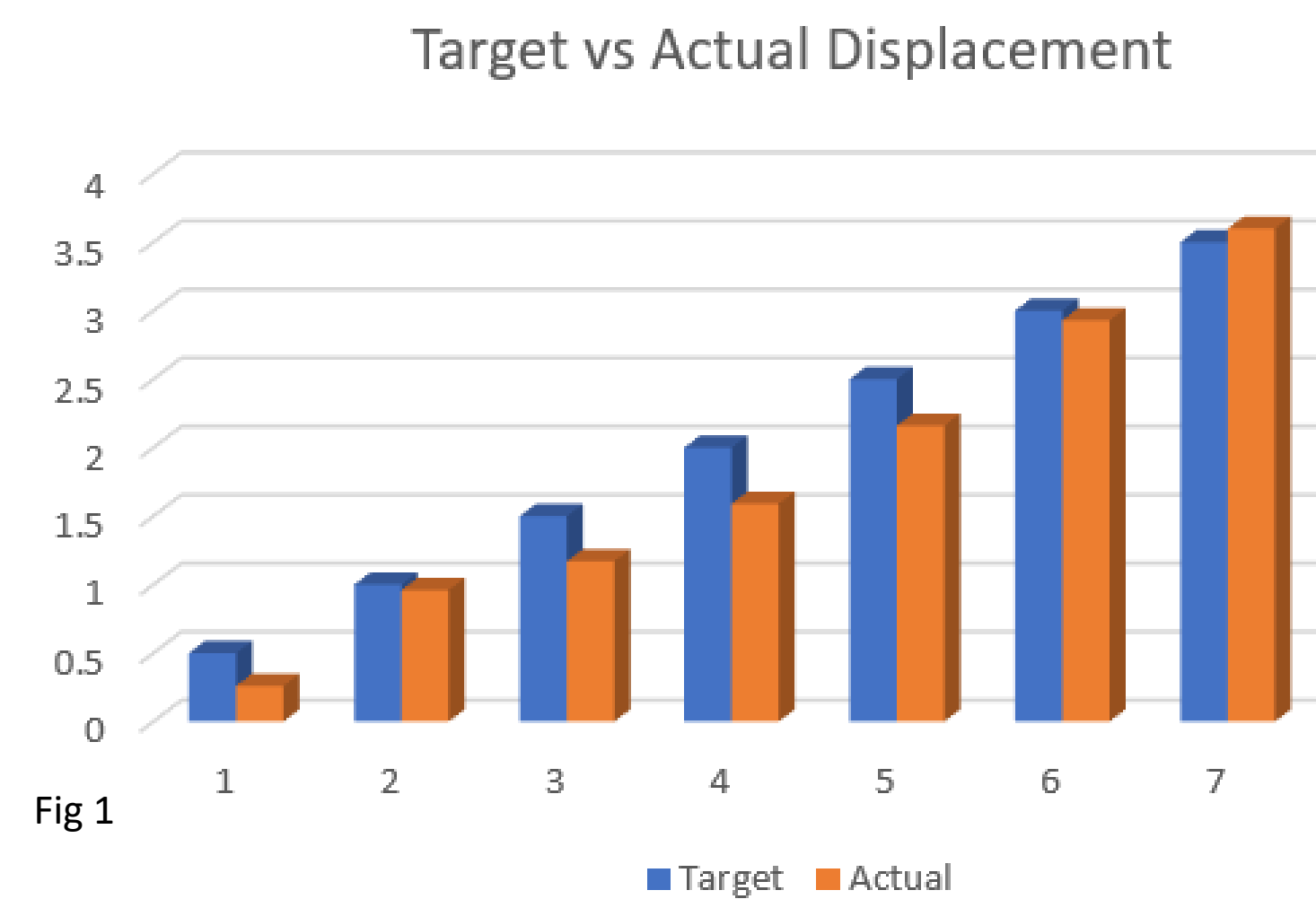


Fig 1

Figure 1 shows the change between the target and actual displacement of the needle through tissue-density gel.

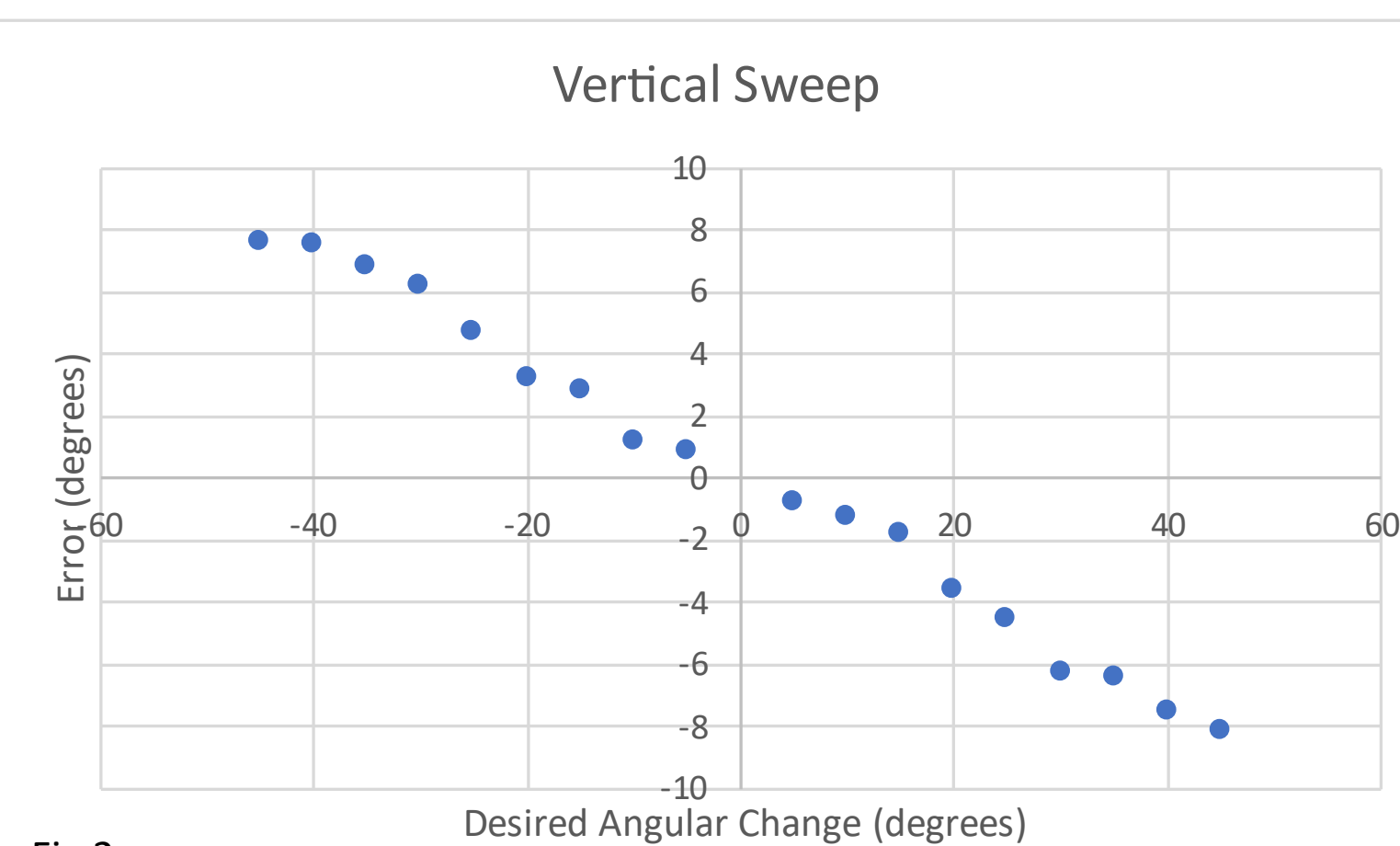


Fig 2

Figure 2 shows the change between the desired angle and the error without error-correction by simple movement of the robot about the horizontal axis.

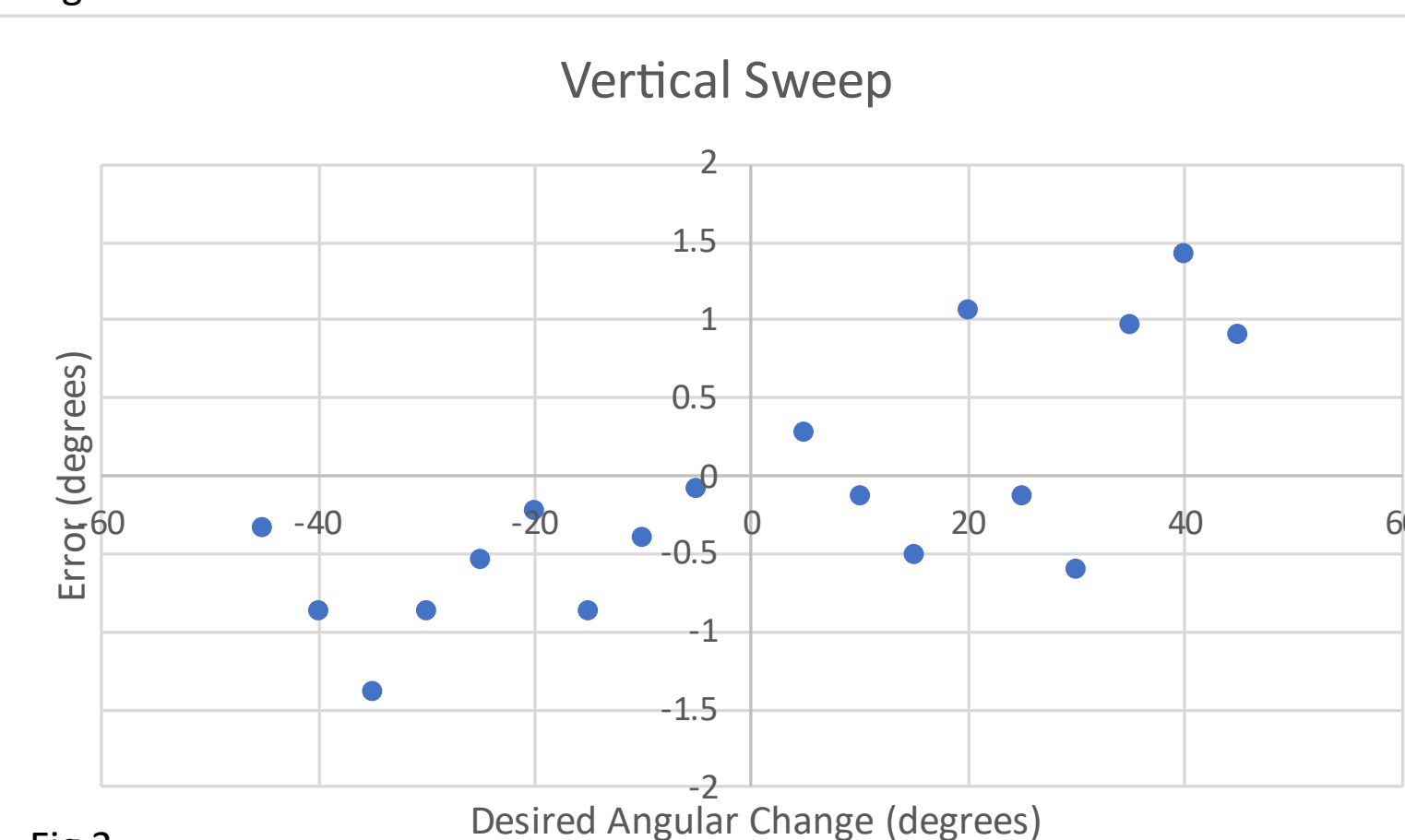
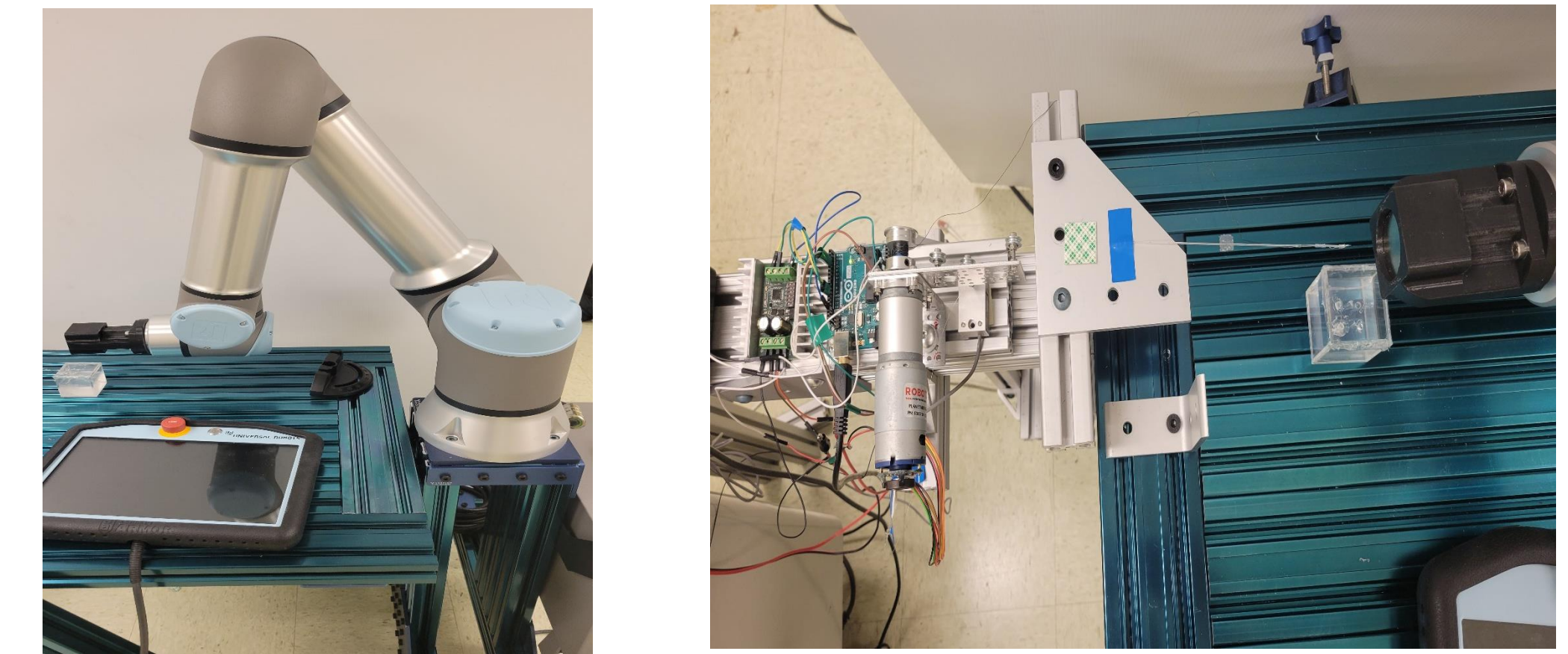


Fig 3

Figure 3 shows the change between the desired angle and the error with error-correction. The error is about $\frac{1}{4}$ as large as the error depicted above

Instrumentations



Going Forward

As the end user for this project is surgeons for their use in surgical procedures, it is imperative to list the following as later goals for the project:

- Develop GUI for ease of use
- Remap code in order to allow anyone—not just programmers—to run the code
- Increase accuracy and precision of system to within 0.5 degrees

Acknowledgements

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