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MEEN 402 - 500

**Prototyping Approaches**

1. *Parallel prototypes*

Our team is using parallel prototyping in the form of having two different solutions for each of our deliverables. We will be testing these solutions simultaneously this semester and determine what the best alternative is for each deliverable.

1. *Subsystem prototype(s)*

We are incorporating subsystem prototyping by testing our solutions for position and torque separately, and then installing both of them into the final valve-actuator assembly. Theoretically, the position and torque solutions, no matter which options we select, will not interfere with each other, so we will test and develop them as separate subsystems before placing them both together for final testing.

1. *Proof of concept*

Our team will utilize proof of concept testing by observing valve position data as we operate the valve by hand, separate from the actuator, to verify that the measurement is repeatable and accurate to Bray’s specified tolerance. After trying the hand-operated valve method, and getting the position sensor into a good enough state to get accurate data, this will be enough evidence that it will work in the fully assembled system. So we will test the fully assembled system after proving that the position solution works in a slightly different manner of operation before final assembly.

1. *Experimental*

An experimental aspect of our prototyping process is that we are not yet certain which one of the solutions for position and torque will make it through to the final concept. We have two ideas for each deliverable that we have the budget and testing planned out for, but we will experiment with all four solutions in different conditions to determine which is best, and getting data from all options will allow us to get a better read on which product should be finalized and given to Bray.

1. *"Wizard of Oz"*

Testing our selected sensors while *not* installed into the valve or actuator system. We can then manually rotate the potentiometer or strike the force sensors, then perform calculations on the collected data using a Raspberry Pi to confirm the validation system is functional before creating the final prototype.

1. *Alpha prototype*

The initial implementation of sensors into the valves and actuators would be alpha prototyping. We will be using the FEDC workspace to create our alpha prototypes and continuously verify with Bray that the requirements are being met. While the prototype will be regularly updated, our first physical model will be considered the alpha.

1. *Beta prototype*

The goal of our team project is to provide Bray with data and unique solutions that they can implement into their products. Once we have the solutions for the two deliverables we have, we will then send the information and data to Bray who will then develop the “Beta” prototype. If we had the equipment that Bray has in Houston, we would be able to build a full “Beta” prototype, but we don’t.

1. *User experience prototype*

One of the focuses of our project is to make it easier for the user (Bray customer) to see into their systems. By implementing the sensors, we can test if this focus is accomplished by possibly having Bray customers verify that our prototype is working so that it is easy for them to use. We can take feedback from the user and make changes/adjustments that way.