Proton Therapy Device Manager
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Spring Midterm 2 Presentation
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Team 14
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Outline

- Background
- Project Motive
- Needs Statement
- Project Scope
- Design Concept
- Electrical Design
- Gantt Chart and Budget
- Summary
- Questions

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- Manufacturer of radiation therapy products
- Based in Sanford, Florida
- Established in 1986
- Helped over 50,000 patients

Proton Therapy

- Newest form of radiation treatment
    - Protons instead of x-rays
- Technician manually loads apertures
- Walk through reinforced hallways between dosages.
- Process takes about 4 minutes per aperture

Nozzle

Project Motive

- Reduce patient treatment time
- Reduce physical effort of technician
- Increase patients treated per day
- Improve the patient's proton therapy experience

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Needs Statement

Develop an automated device that safely loads and unloads apertures from the nozzle of the Mevion S250 proton therapy system.

Project Scope

Provide proof of concept by designing and building a 1:4 scale model of our automated system.
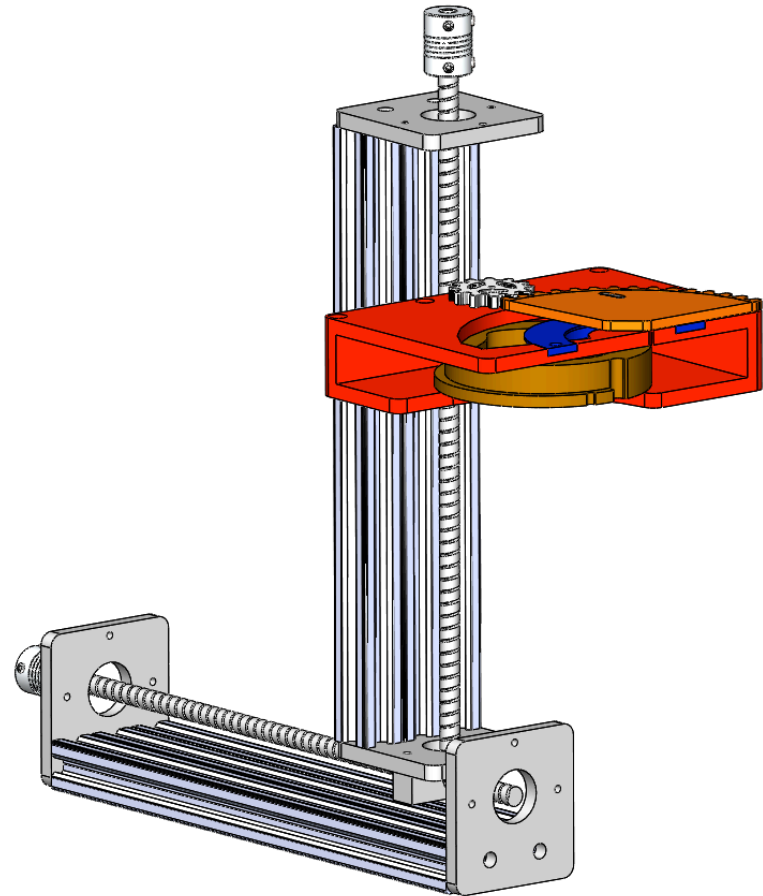
Apertures

Alignment notches

25 cm

16 kg Aperture

18 cm
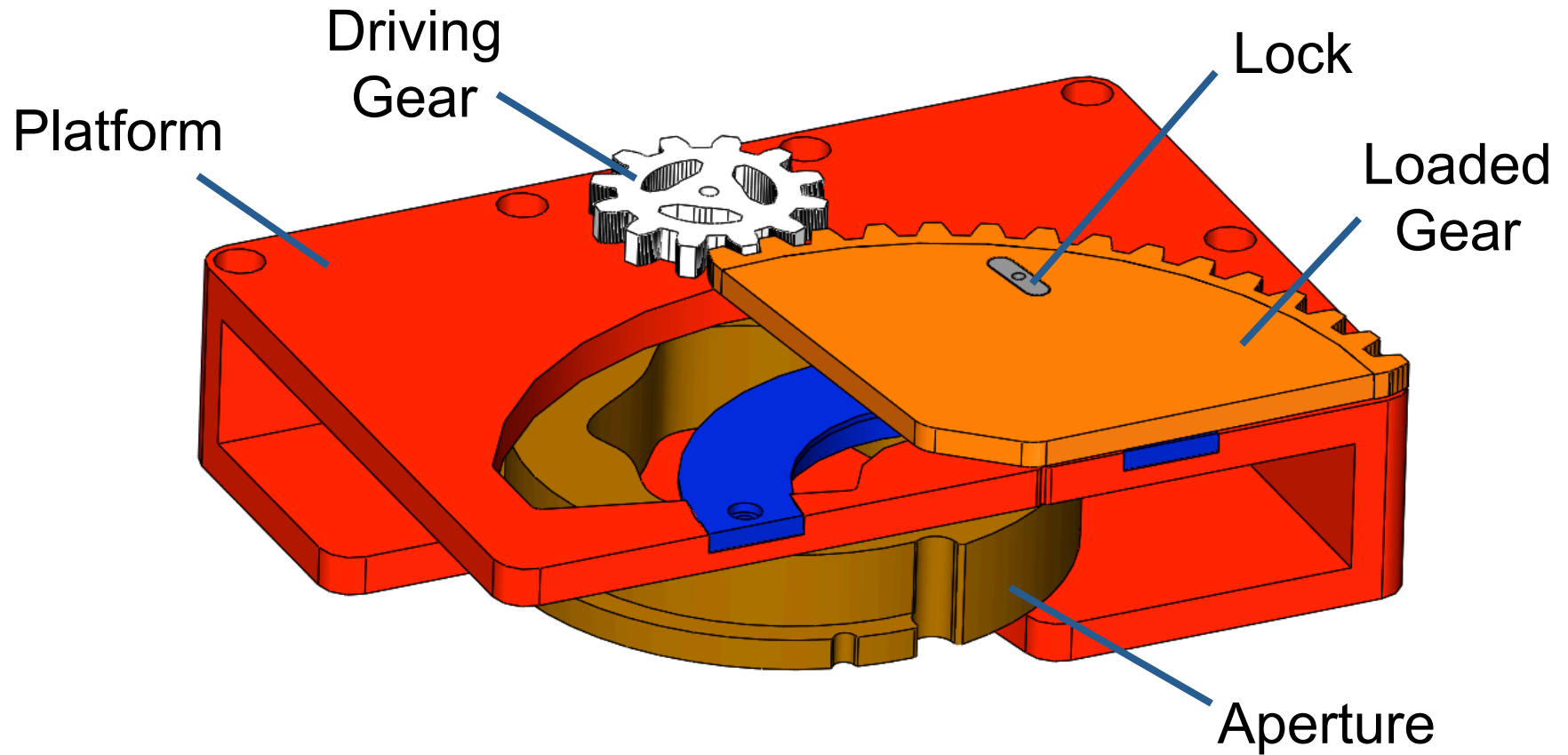
6 kg Aperture

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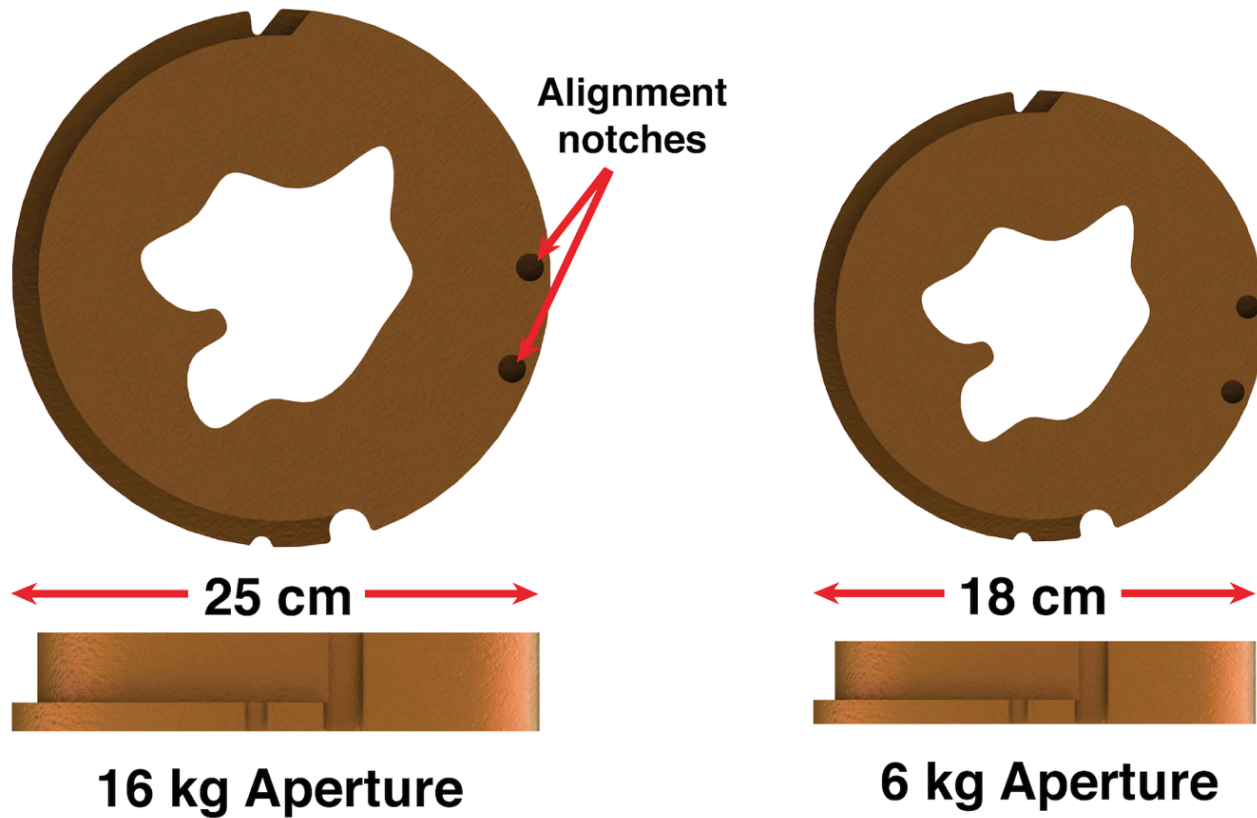
Design Concept
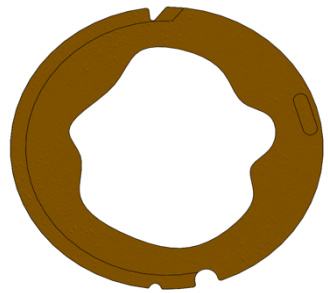
Nozzle

Design Concept

- Linear rail system
- 8 mm pitch rod
- Nema 17 steppers
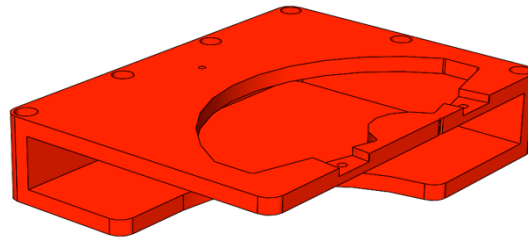- Accuracy: 40 microns
- 4.5:1 gear ratio
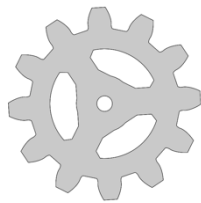- 1 minute loading time

Assembly

Platform
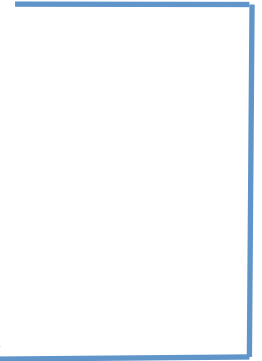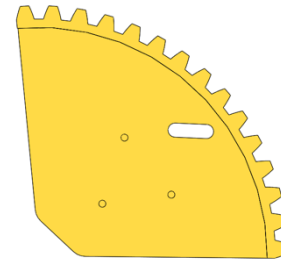
Driving Gear

Lock

Loaded Gear

Aperture

Parts

Aperture

Platform

Lock

Driving Gear

Loaded Gear

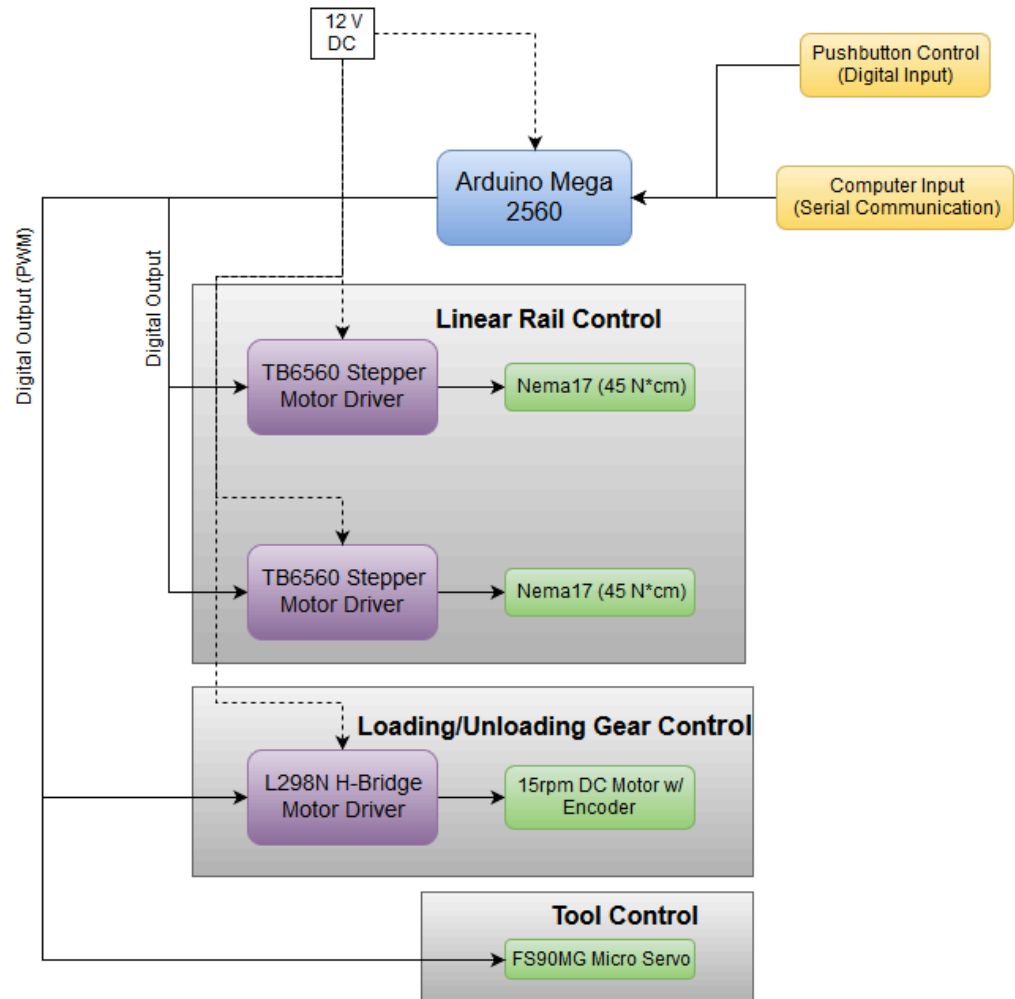Micah Baxter

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Loading Process

- Please see video.

System Overview

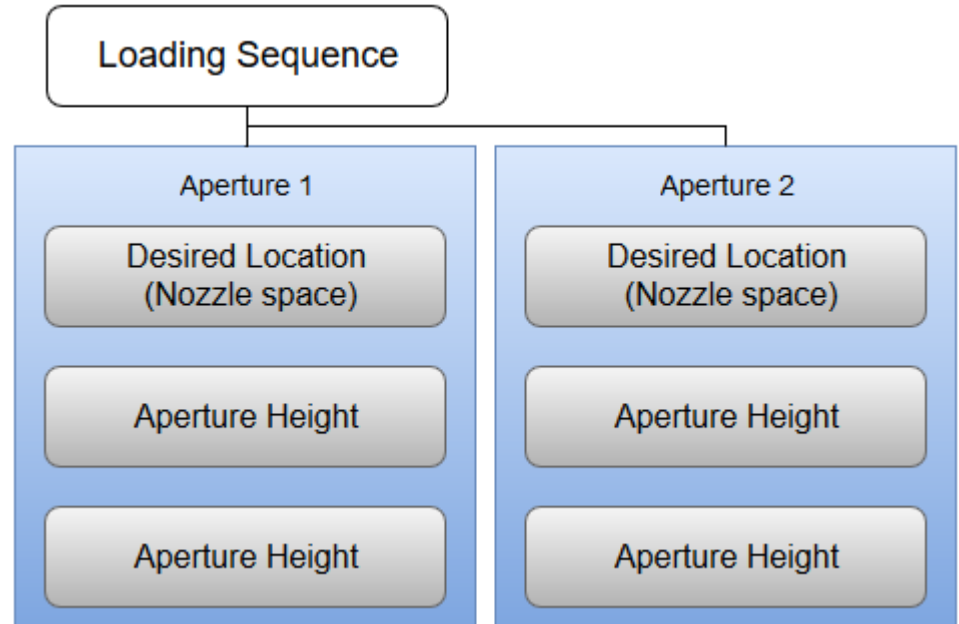## Microcontroller:

- ATmega2560

- 54 Digital I/O

- 16 Analog I/O

Implementation:

- Manual Operation

- Automatic Operation

Morgan O'Rorke

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Automatic Operation

1. **User selects which aperture(s) to load (loading instructions are sent to MCU)**

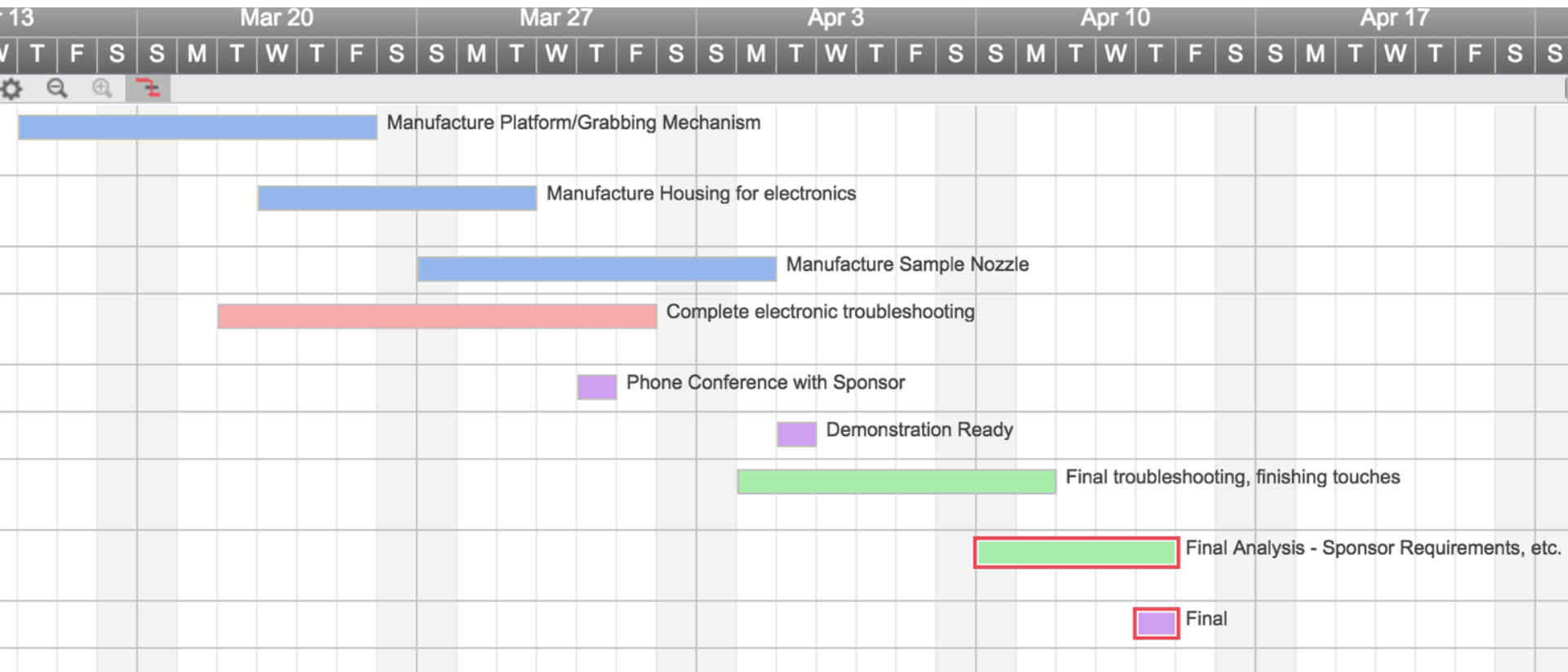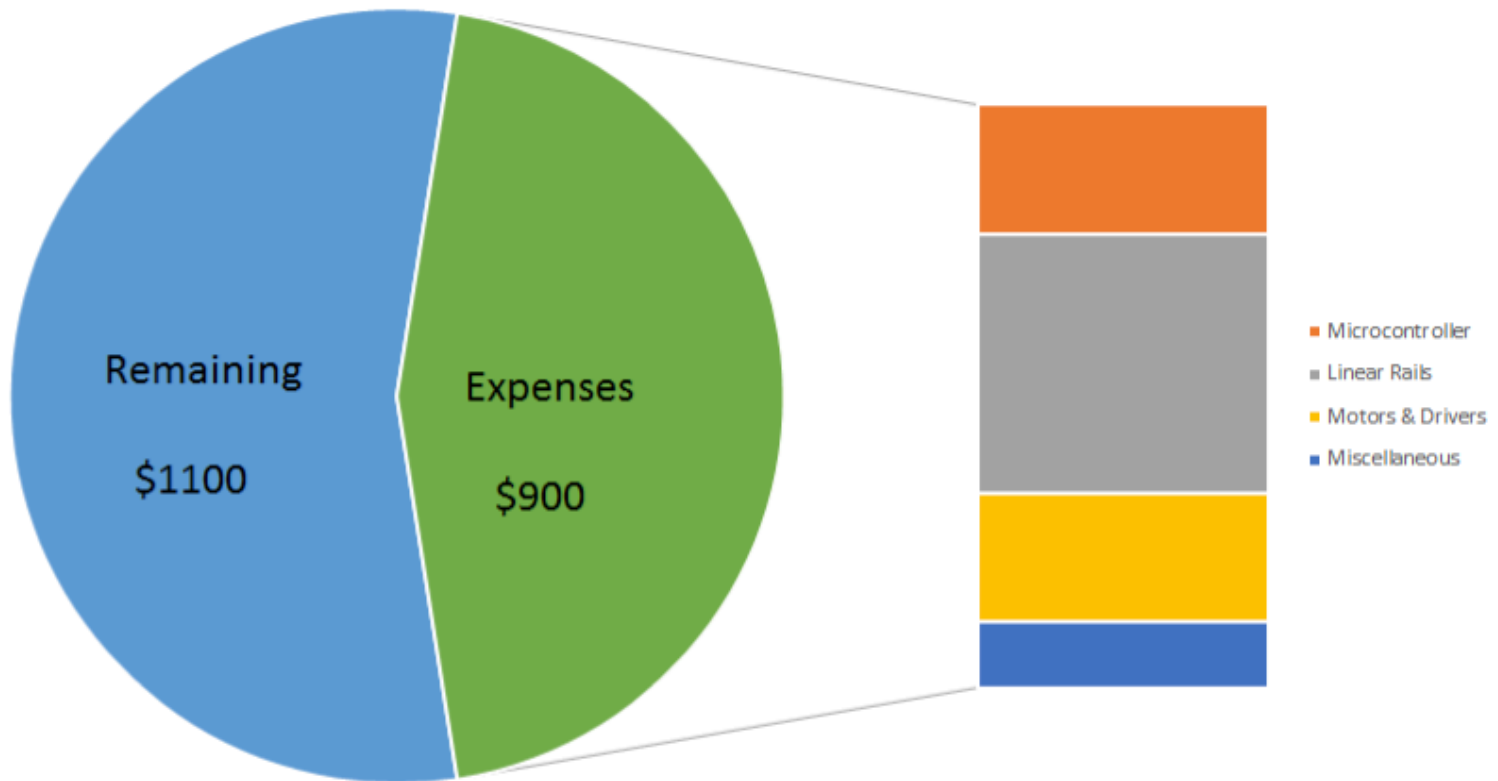2. **System unloads/loads apertures (signal is sent upon completion)**

Morgan O'Rorke   14

Power

Power Supply: 12V 30A DC (360W)

Component	Voltage	Current Draw	Power Consumption
Mega2560	12V	25mA	0.3W
Nema17(2x)	12V	1A	24W
15rpm DC motor	12V	750mA	9W
FS90MG Micro Servo	12V	500mA	6W
			39.3W

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Future Work

Budget

Summary

- Dot decimal has requested an automated loading system

- The chosen design concept solves the loading/ unloading problems

- Future Work

  - Manufacture platform and nozzle for testing

  - System assembly

  - Finalize program structure and MCU communication

Questions