Proton Therapy Device Manager

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Midterm 2 Presentation
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Advisor: Dr. Clark

Team 14
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Morgan O'Rorke
Sarah Sweat

Outline

- Background
- Project Motive
- Needs Statement
- Project Scope
- Design Concept
- Further Implementation
- Risk Mitigation
- 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

Project Motive

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

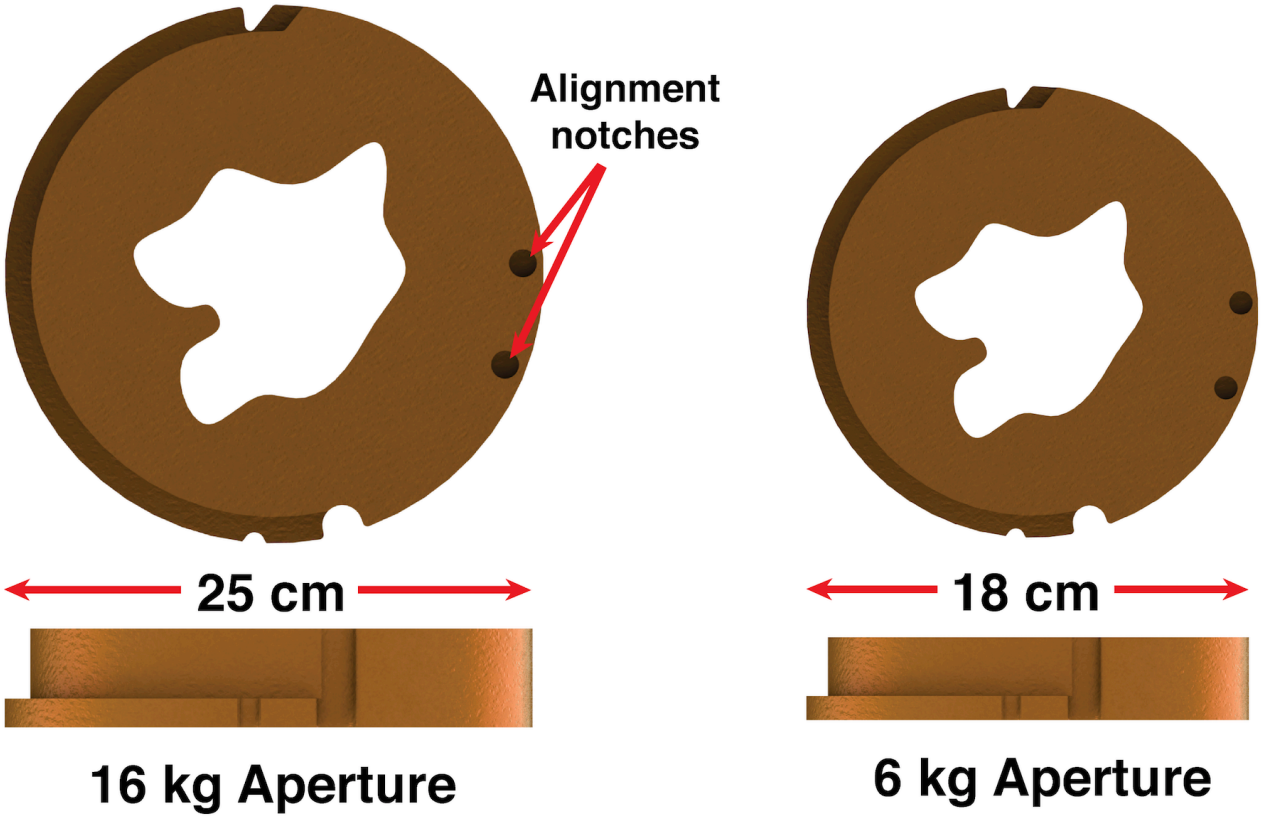
Needs Statement

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 and provide a cost estimate for the full scale system.

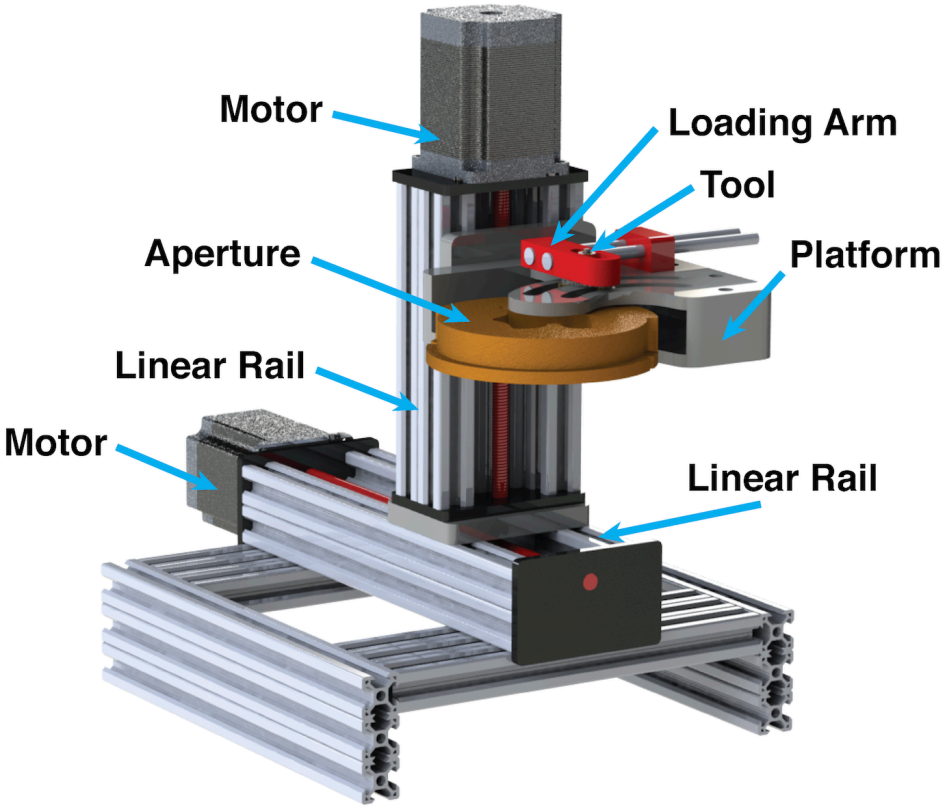
Apertures



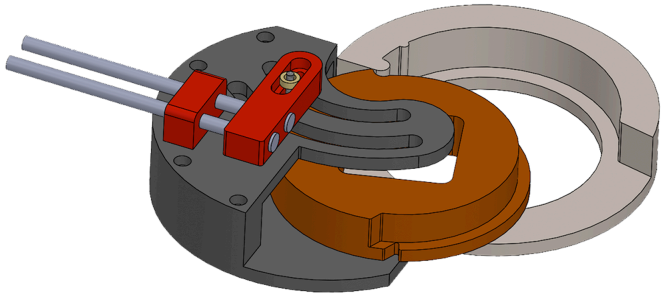
Design Concept

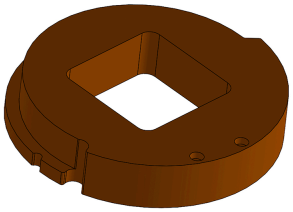
Design Concept

- The machine will use a linear rail system to dock the platform next to the nozzle. A loading arm will guide the aperture along a slot mechanism into the nozzle.

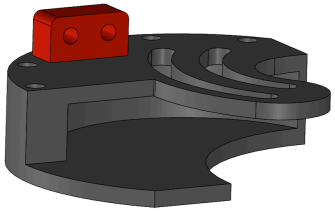


Assembly



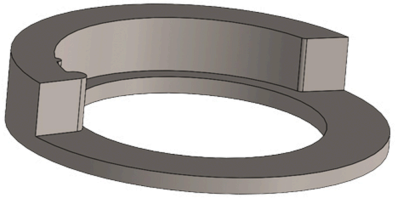


Aperture

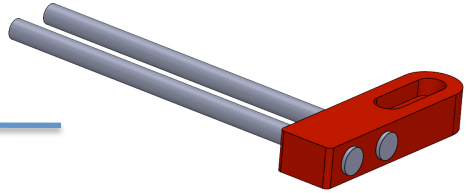


Platform

Tool



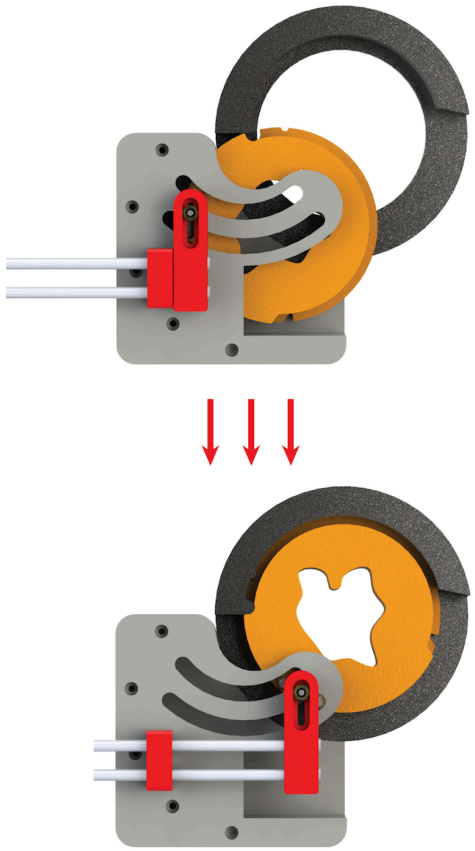
Section of Nozzle



Loading Arm

Loading Process

- Step 1
  - The platform will be guided along a linear rail system and next to the nozzle.
- Step 2
  - A motor will activate the loading arm to guide the aperture into position, and then unlock from the arm and lock into the nozzle.



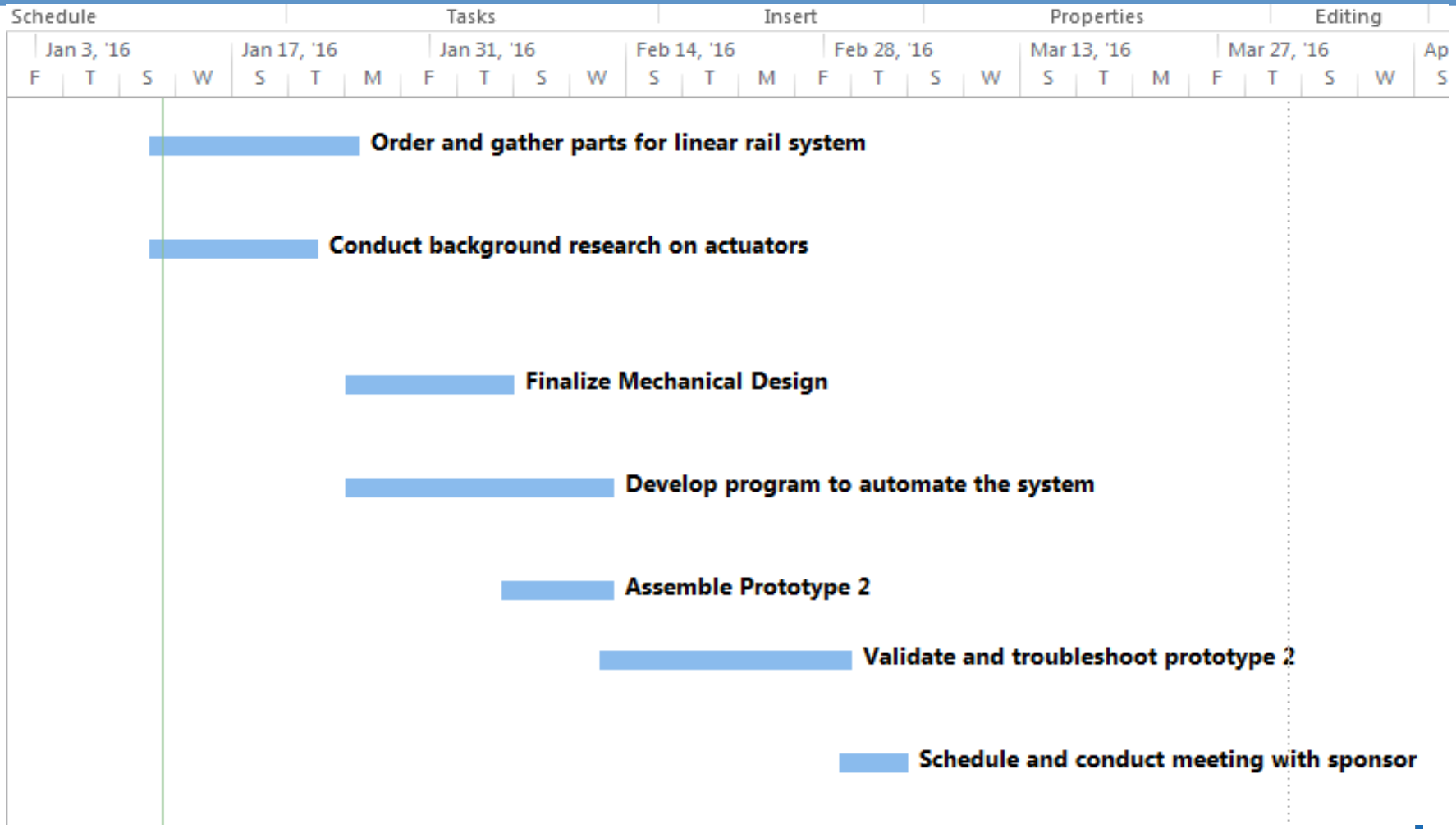
Further Implementation

- Mechanical
  - Linear railing system to move platform
  - Vertical adjustment system for platform
  - Rotational motion for platform
  - Mechanism to unlock safety latch on the nozzle
  - Optimize tool to handle applied forces
- Software
  - Barcode scanning system to identify products

Risk Mitigation

- Verify apertures are loaded into the correct position
  - Barcode scanning system
- Ensure no component failure during operation
  - Finite Element Analysis
  - Failure Mode Effects Analysis
- Implement aperture security safeguard
  - Utilize nozzle safety latch

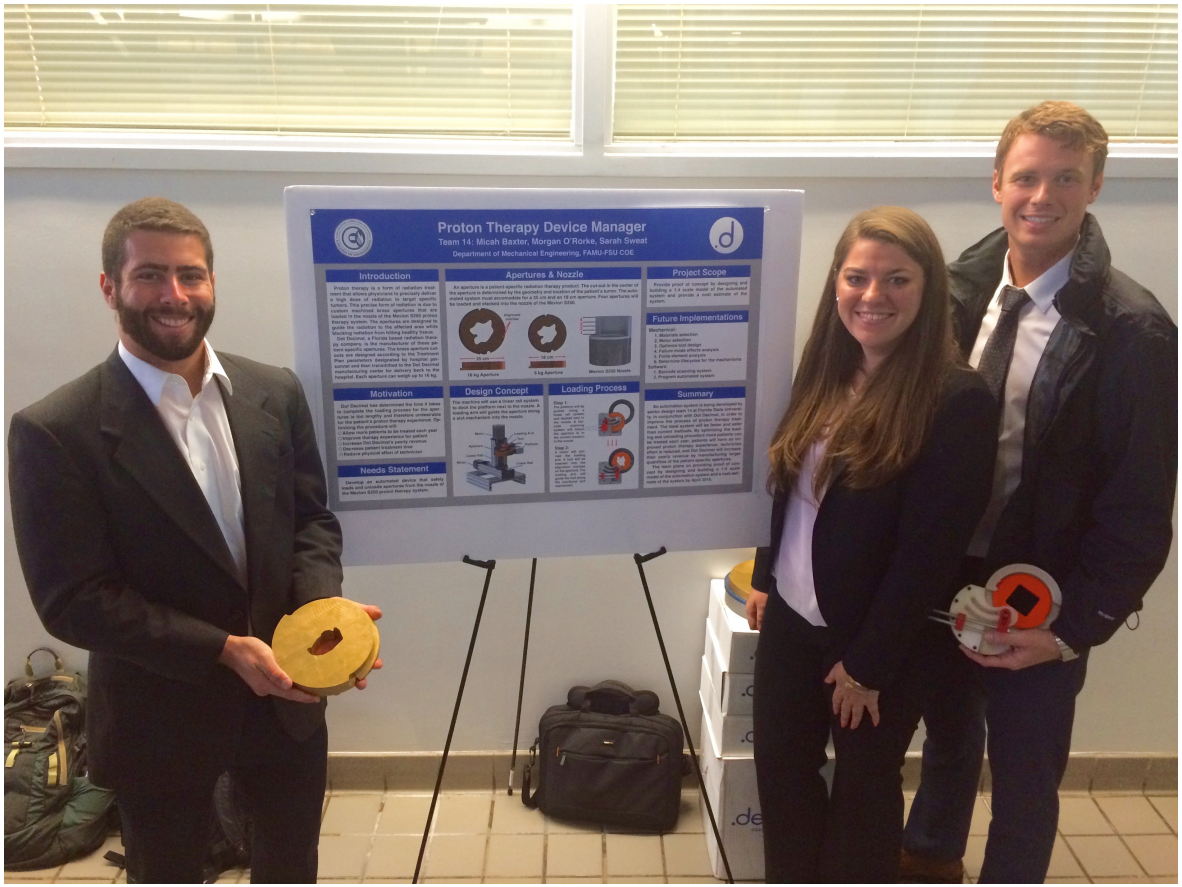
Gantt Chart


Schedule
Tasks
Insert
Properties
Editing
Jan 3, '16
Jan 17, '16
Jan 31, '16
Feb 14, '16
Feb 28, '16
Mar 13, '16
Mar 27, '16
F T S W S T M F T S W S T M F T S W S T M F T S W S
Order and gather parts for linear rail system
Conduct background research on actuators
Finalize Mechanical Design
Develop program to automate the system
Assemble Prototype 2
Validate and troubleshoot prototype 2
Schedule and conduct meeting with sponsor

Summary

- Dot decimal has requested an automated loading system
- Chosen design concept solves the loading/ unloading problems
- Future Implementations
  - Scanning
  - Safety Latch
  - 3 DOF motion system

Questions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Introduction
Apertures & Nozzle
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