Snowflake Sensing System

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Outline

1. Introduction
2. Summary of Previous Work
3. Design Constraints
4. Design Objectives
5. Testing
6. Conclusion

Introduction

Project Goal:

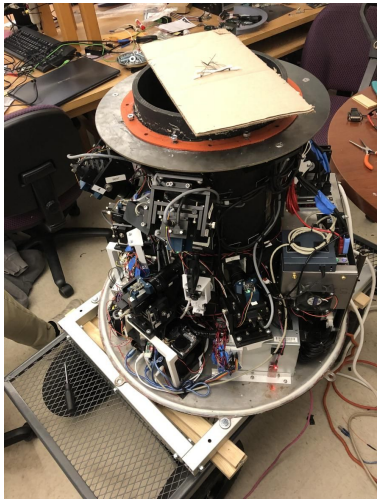
- Take images of snowflakes for research, 3D reconstruction, classification, fall speed calculations

Snowflake Measurement and Analysis System (SMAS):

- 7 cameras at different angles
- Laser triggering system (cross planes)
- CANBUS system
- IPX5 waterproof and weatherproof
- Wifi enabled

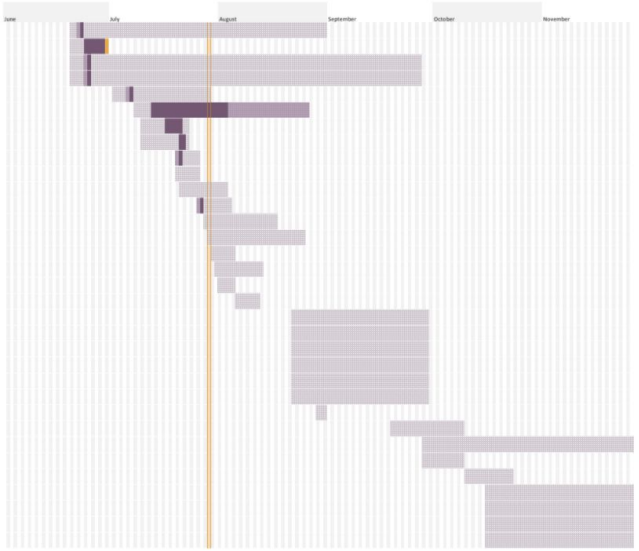
Summary of Previous Work

- This project began in 2015
- The device was lacking in robustness
- Almost every component has gone through multiple iterations
- Code required analyzation and revision



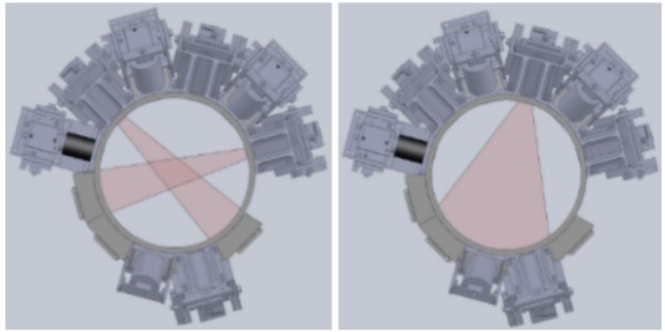
Design Constraints

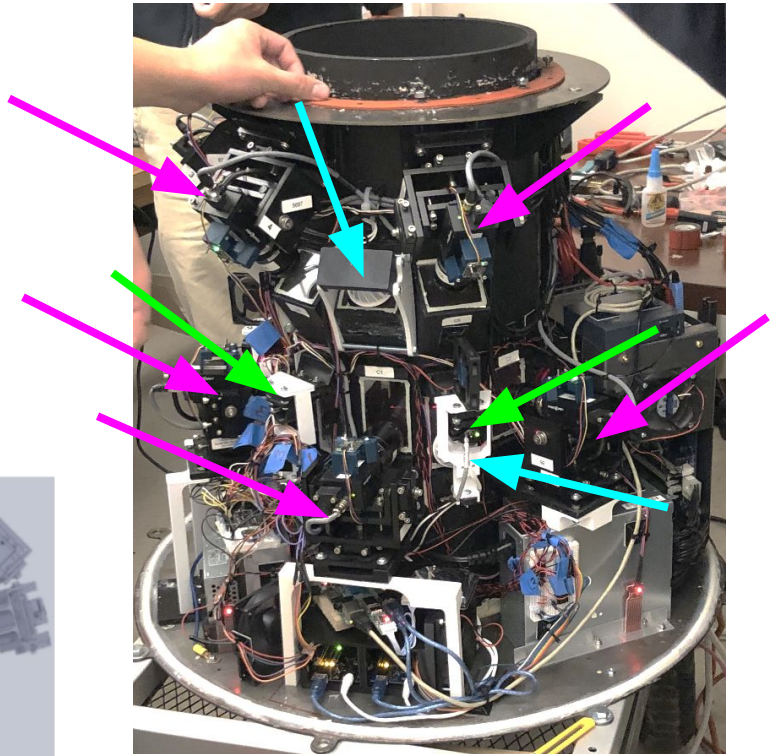
- Size - 3ft x 3ft x 3ft
- Money - Under given budget
- Time - November 8th shipping deadline
- Energy - Must be able to support all systems



Design Objectives (Electrical)

- Subjects centered in frame
- Synchronized images
- Illuminated subject
- USB transfer bandwidth
- Sensor monitoring/CANBUS
- Power



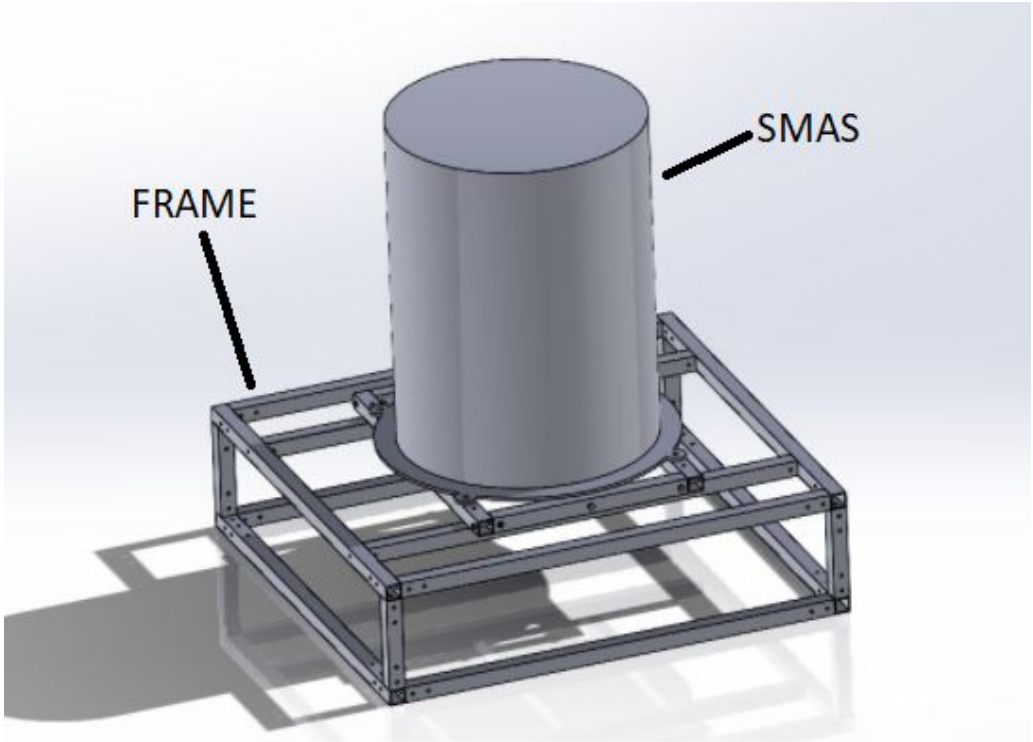


Design Objectives (Computing)

- Run system via a main Windows computer
- Host website for monitoring vitals
- Make sure the code will not stop when bugs/faults are encountered
- Manage onboard storage for saving images

Design Objectives (Mechanical)

- Mounting frame

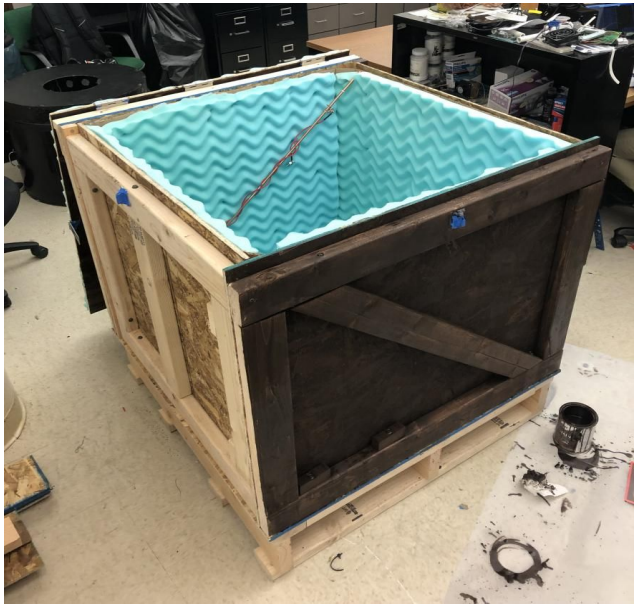


- Waterproofing

Design Objectives (Mechanical)

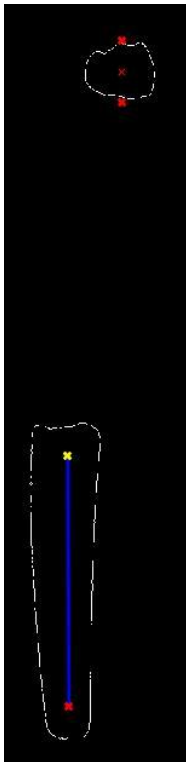
- Maintain optimal temperature

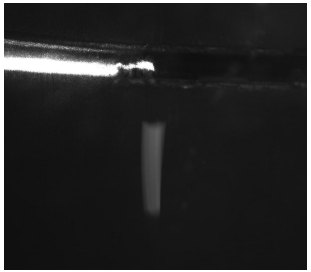
- Prepare for Transportation

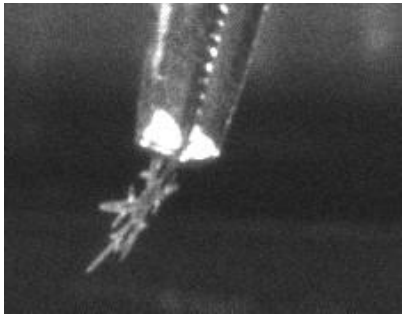


Testing (Software)

- Software stress
- Image focus
- Fall speed measurement



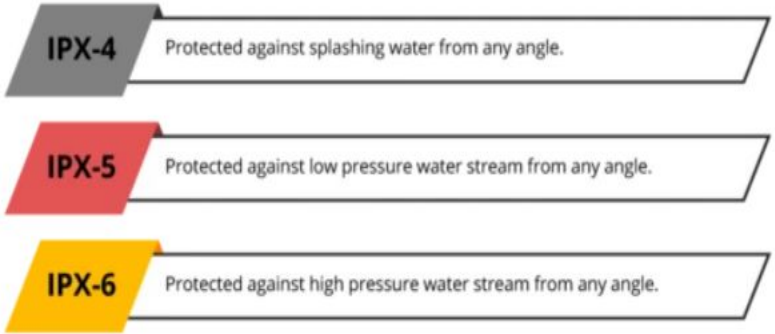


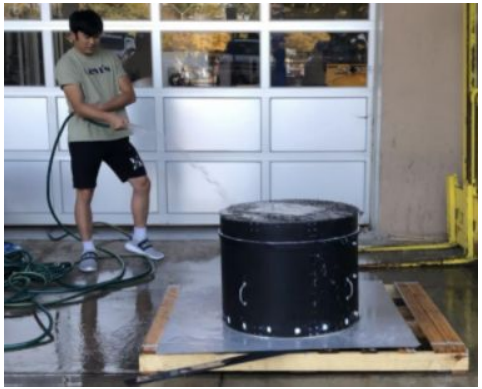


Testing (Mechanical)

- Temperature test with functioning device

- IPX5 standard





Conclusion/Future Work

- SMAS has been sent out to the NASA facility at Wallops Island, Virginia
- Preliminary design has begun on the next iteration of the project
- Exploration into snowflake image classification using machine learning has also begun

Thank you