

Redevelopment of Photogrammetry as a Technique to Measure Strain in Balloon Film

By: Katherine Taylor



About Me

- Rising Junior at University of Maryland College Park
- Aerospace Engineering Major



About My Project

- Wallops Flight Facility
- Balloon Research and Development Lab
- Photogrammetry
 - What is it?
 - Why is it important?



Project Goals

- Take simultaneous photos of a marked target
- Triangulate marked positions from photos in PhotoModeler Image Processing Software
- Interpret marked point coordinates to calculate distance between points along surface of target
- Calculate Strain using progressive distances

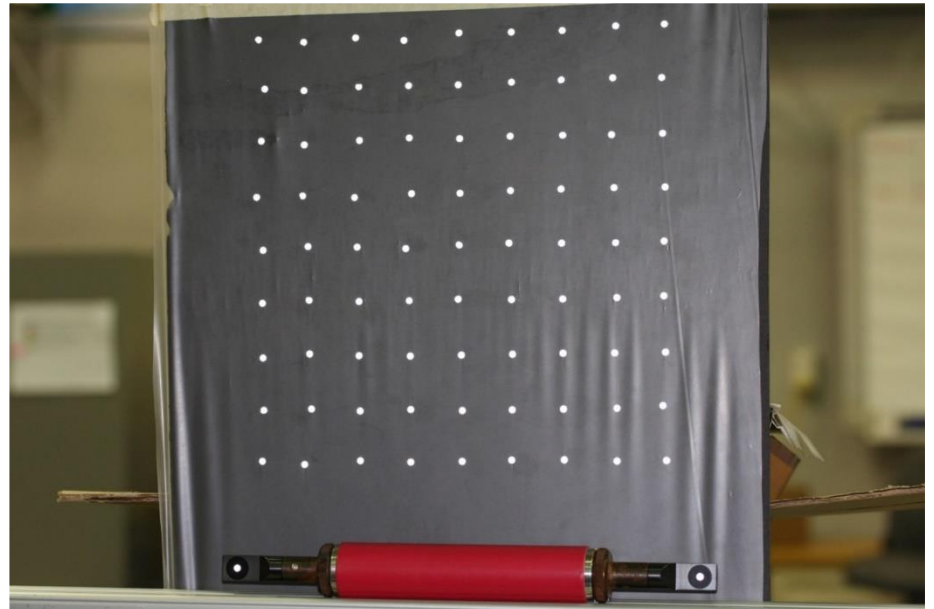
Step 1

- MultiMax Radio Transceivers
- Determined Most Efficient Positioning



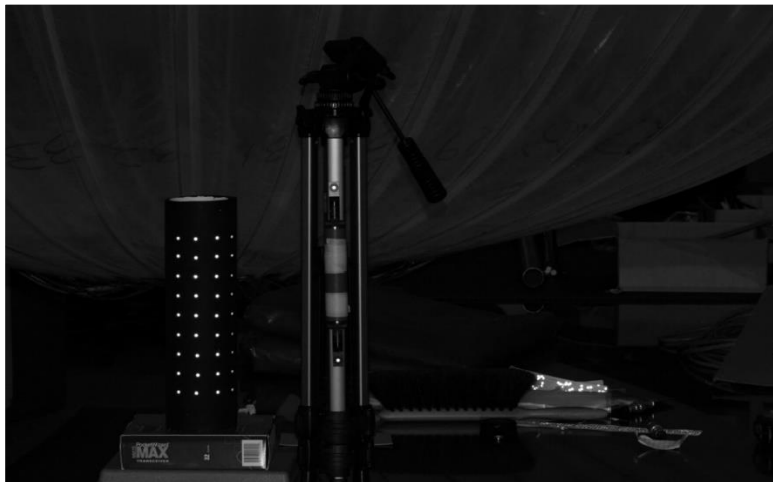
Step 2

- Uniaxial Testing
- Incorporated a Scale Bar



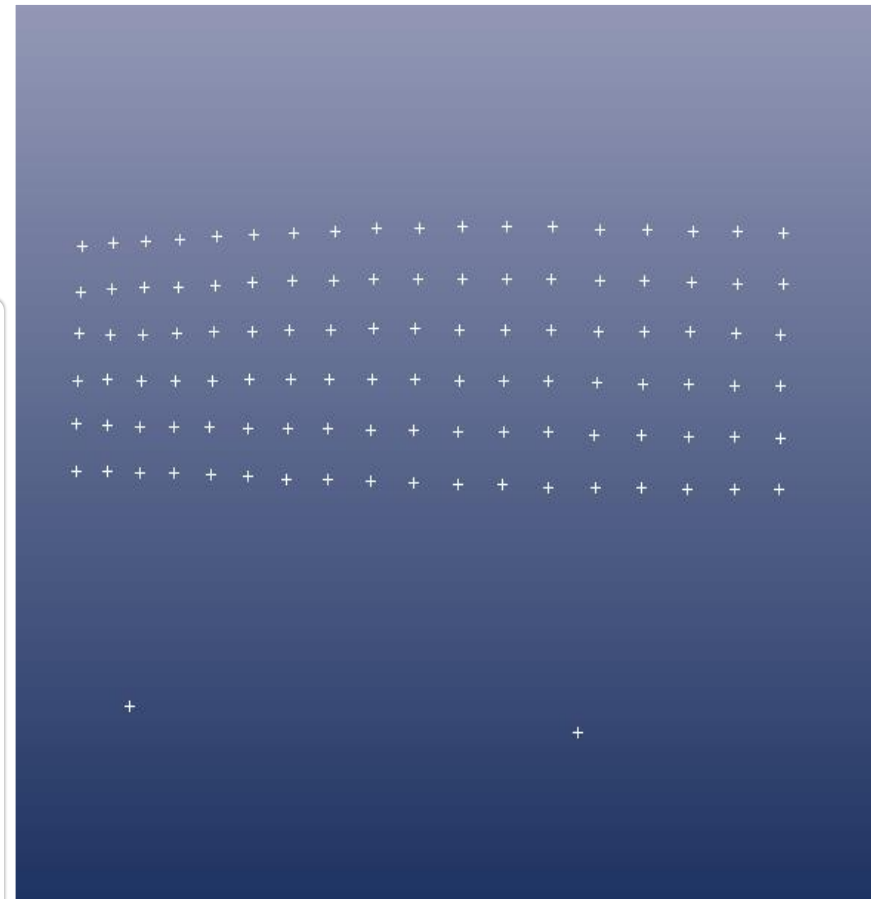
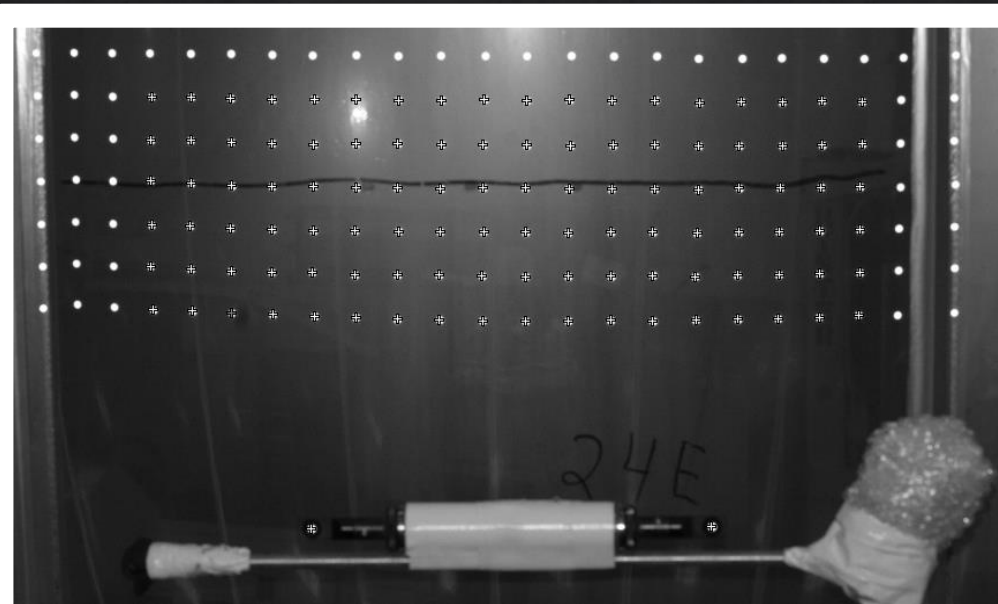
Step 3

- Cylinder Testing
 - Singly Curved Surface Test
 - Less than 0.5% Error
- Lab Balloon Testing
 - Doubly Curved Surface Test
 - Bivariate Surface Fit
 - Establish Set Up
- Island Balloon Testing
 - Doubly Curved Surface Test
 - Establish Need for Mobile Set Up



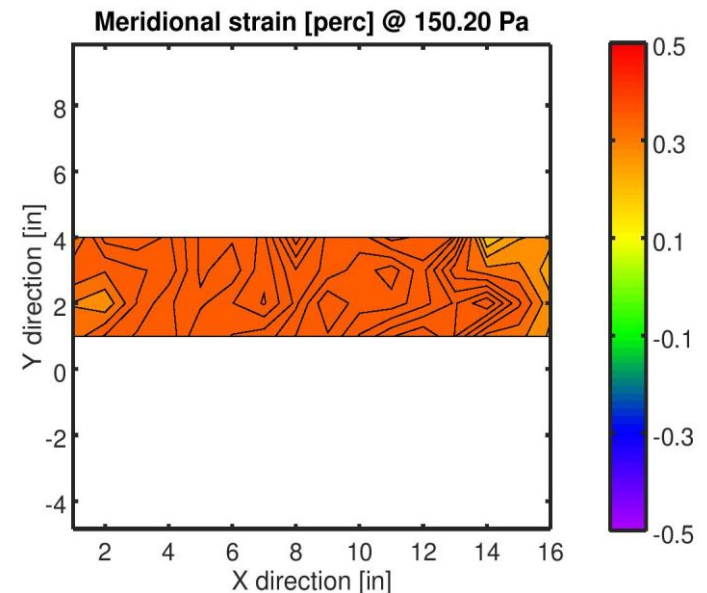
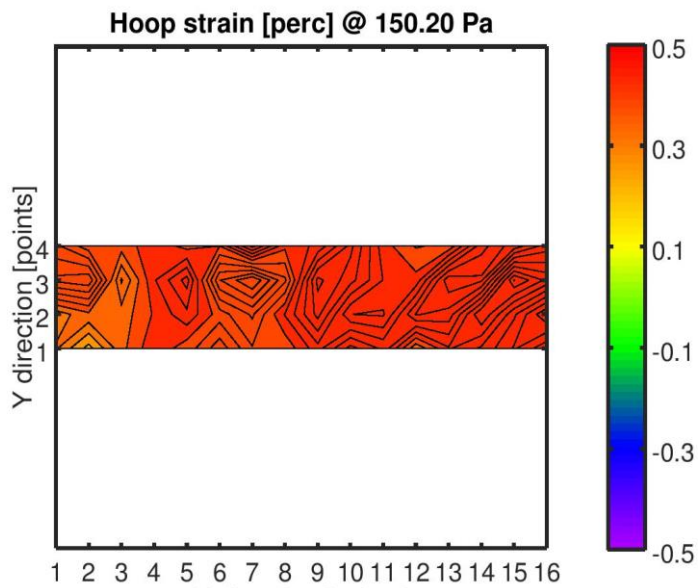
Step 4

- PhotoModeler Image Processing
- Neighborhood Processing
- Strain Measurements



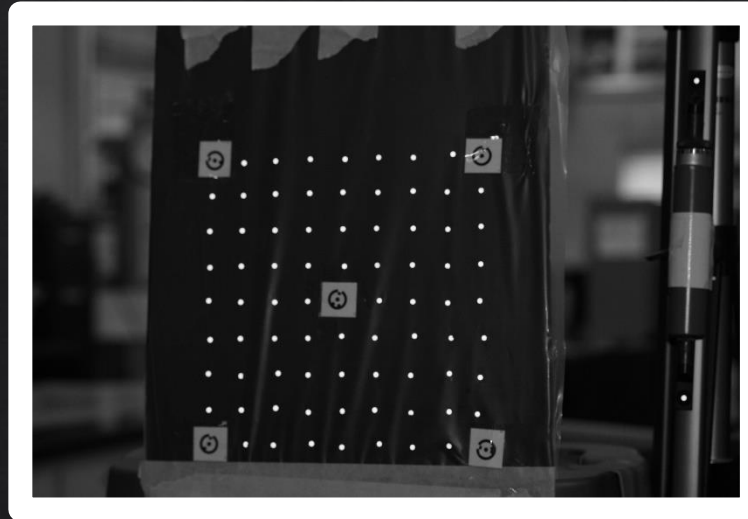
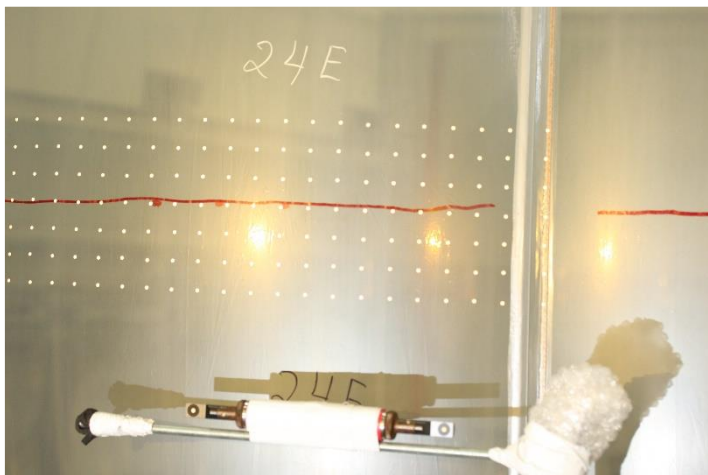
Results

- Found Strain as a function of balloon gas pressure
- Created Contour Plots
- Compared Data to Digital Image Correlation System (DIC)



Challenges

- Lighting
- Lenses
- Time Between Images
- Post Processing
- RAD Targets



Future Work

- Cold Temperature Testing
- Additional Room Temperature Testing
- Expand Processing Capability



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