TENSILE TESTER CAMERA MOUNT

Material Science Research Lab

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BACKGROUND

DIGITAL IMAGING CORRELATION

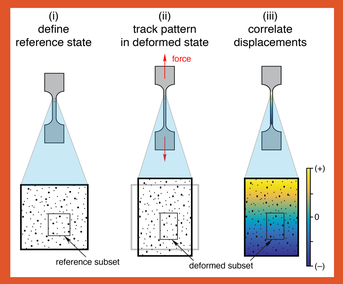


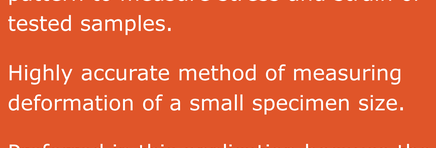
Figure 1: Image of Digital Imaging Correlation [1]

- Digital Imaging Correlation uses a series of cameras and a random speckled pattern to measure stress and strain of tested samples.
- Highly accurate method of measuring deformation of a small specimen size.
- Preferred in this application because the sample is too small to use an extensometer.

PREVIOUS MOUNTING DESIGN

Figure 2: Image of Original Camera Mounting System

- C-Clamps used to reduce vibrational effect but effectively eliminated mobility of mounting system.
- Difficult to place sample in tensile tester after the digital cameras have been calibrated.
- Maintains small amount of disturbance from vibrational effects.



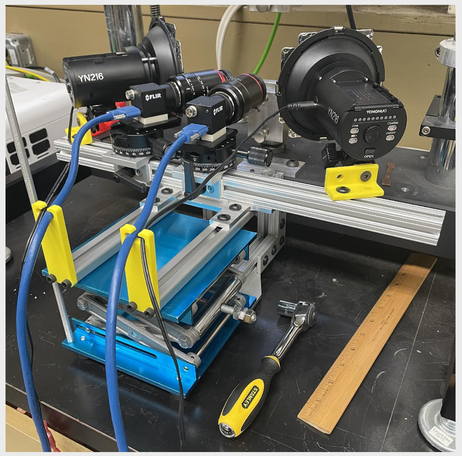


Figure 5: Side View of Final Design

FINAL DESIGN SIDE VIEW

- Fully adjustable twisting the scissor life knob, sliding the x axis rail, and the camera mounts.
- Configurable number of cameras and lights, which allows for different applications of mount.
- Rigid structure that dampens vibrations, which allows for greater mobility.
- Construction is light so that it can be removed from the tensile tester when not in use.
- Minimal time is required to remove the camera mounting system from in front of the sample during placement.

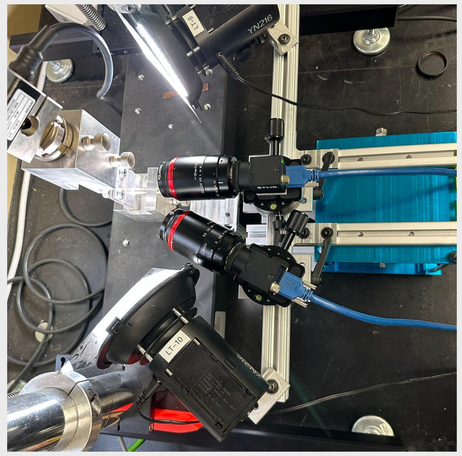


Figure 6: Top View of Final Design

FINAL DESIGN TOP VIEW

- Built in cable bundle management to protect fragile camera cables.
- Positional accuracy using a locking ring on the vertical aluminum rod. Allows for user to return to the same position after placement.
- Quick to perform operations. The table below specific operation time trials.

Trial Number	Time to Attach Mounting System (min)	Time to Detach Mounting System (min)	Time to Lower Camera for Sample Placement (min)
1	1.200	1.150	1.433
2	1.033	1.300	1.333
3	1.133	1.383	1.250
Average	1.122	1.278	1.339

BEFORE

AFTER

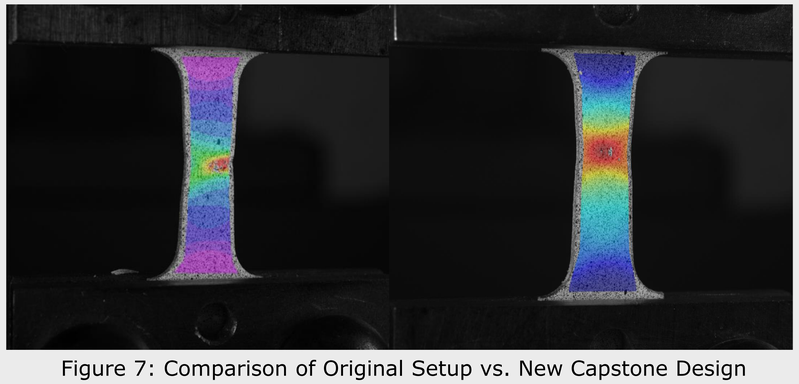


Figure 7: Comparison of Original Setup vs. New Capstone Design

COMPARISON

- Comparison between initial mounting system and new design.
- Major note for the project is that there is similar image quality between these two testing results.
- Increased functionality of the overall design without sacrificing any quality of testing results.

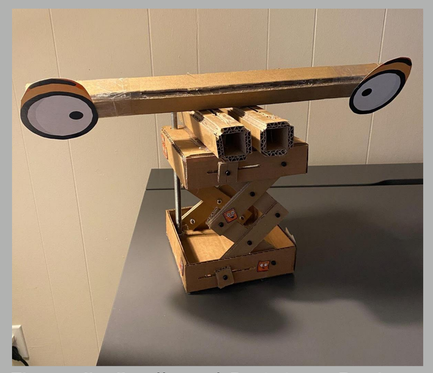


Figure 3: Cardboard Prototype Design

INITIAL PROTOTYPE

- A simple cardboard prototype that shows the dimensions of the final design.
- Allowed for basic understanding of the mechanisms being used in the design.

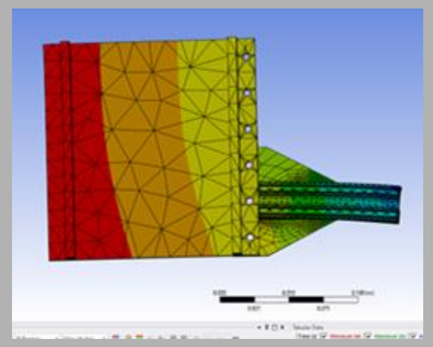


Figure 4: FEA Analysis of Design

FEA

- This is observing the displacements of the base plate of the scissor lift and one attachment to the tensile tester.
- The results were an overdesigned product that could withstand forces much larger than the design requirements had specified.

FUTURE WORK

- Research into increasing the stability of the scissor lift without decreasing the mobility of the design.
- Reduce the number of non-permanent connection (bolts) with fully secures methods (welding).
- Redesign light mounting brackets to be more adjustable.

REFERENCES

[1] “Digitalimagecorrelation.org,” digitalimagecorrelation.org. [Online]. Available: https://digitalimagecorrelation.org/. [Accessed: 26-Feb-2023].