I. Project Description

Current mechanical testing for materials used in impact mitigation neglects the effect of rotational acceleration, a common factor in concussions. The objective is to build a test apparatus capable of spinning elastomeric foam samples at variable speeds up to 3000 RPM based on the experimentalist command while capturing digital images of the deformed surfaces. Ex-situ digital image correlation will be used to quantify the in-plane strain components, assessing the effects of rotational acceleration on the foam efficacy.

II. Team Members

Nicholas Agtual
Electronics and Team Lead

Kyle Mesch
Rotational Assembly Lead

Derek Nunotani
Drivetrain Lead

Dylan Lawrence
Structure Lead

Madison Anderson
Sample Holder and Safety Lead

III. CAD Models

Figure 1: Test Apparatus CAD Model
Figure 2: Rotation Subassembly Exploded View

IV. Electronics and Software

Figure 3: Custom Arduino Shield
Figure 4: Software Logic

V. Experimentalist Command

Test Apparatus
- Target RPM
- Target Acceleration
- Run Time
- Original Sample
- Footage of Sample
- Angular Velocity Data
- Deformed Sample

Figure 5: System Inputs and Outputs
Figure 6: Motor Controller Graphical User Interface

VI. Manufacturing

Figure 7: Water jetting Components
Figure 8: Turning Shaft and Pulley on Lathe
Figure 9: Cutting Polycarbonate Panels to Size with Wall Saw

VII. Acknowledgements

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