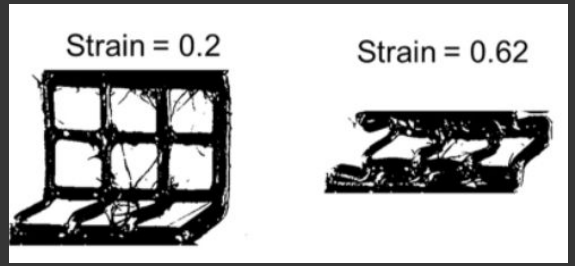
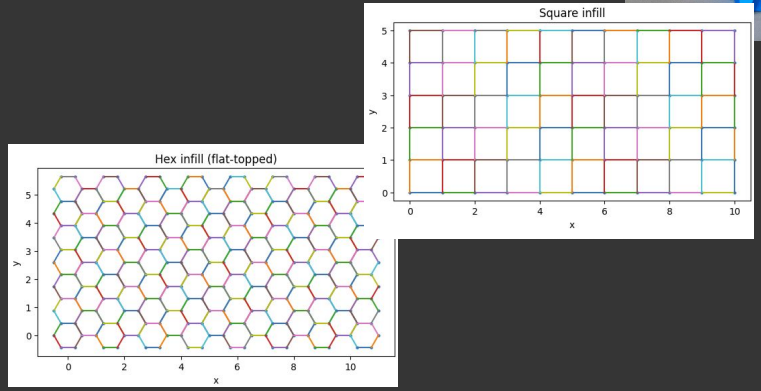
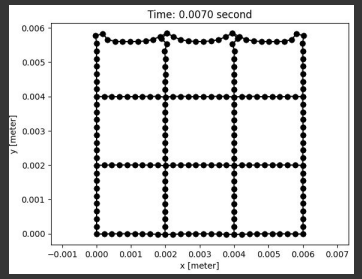
Modeling FDM-Printed TPU Energy Absorption for Impact-Resistant Armor in Combat Robotics

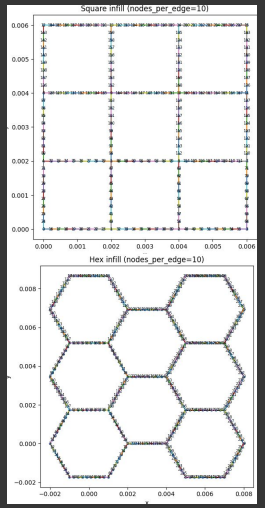
Problem Statement & Motivation

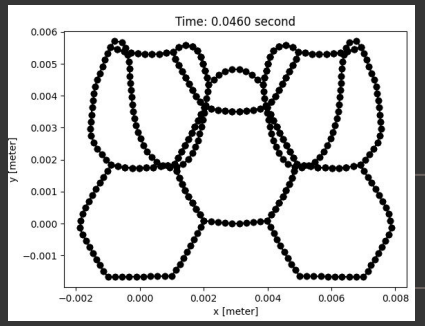
- Develop a spring network simulation to visualize FDM-printed TPU component infill topology (grid & hex) for impact-resistant combat-robot armor
- Quantify the energy absorption capabilities of various TPU geometries and print configurations to guide design choices in combat robotics.









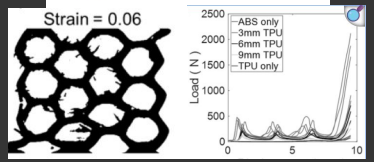


Current Progress & Findings

- Grid and hex node setup
- Loading & empirical material values
- Initial collision & nonlinear springs

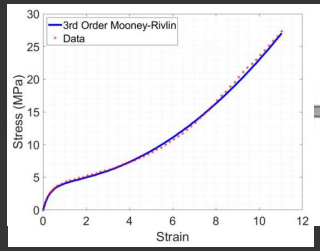
Next Steps & Anticipated Outcomes

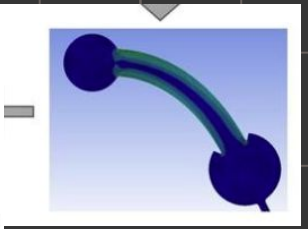
- Flush out collision implementation
- Flush out nonlinear implementation



Literature Context

- Hyperelastic and Constitutive Modeling of TPU
  - Gallup L. et al. (2023) - Predicting the Bending of 3D Printed Hyperelastic Polymer Components
- < In / Out of plane hex & grid in compression
  - Khatri N. R. et al. (2024) - Energy Absorption of 3D Printed ABS and TPU Multimaterial Honeycomb Structures





References

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