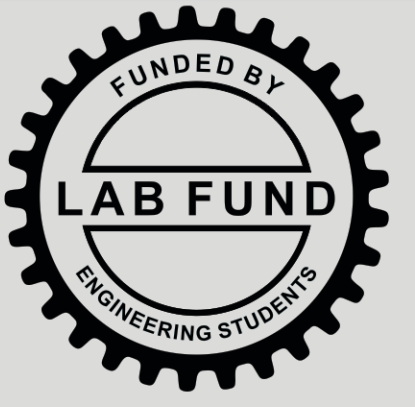


SOFT ROBOTIC AUXETIC GRIPPER

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PROBLEM STATEMENT

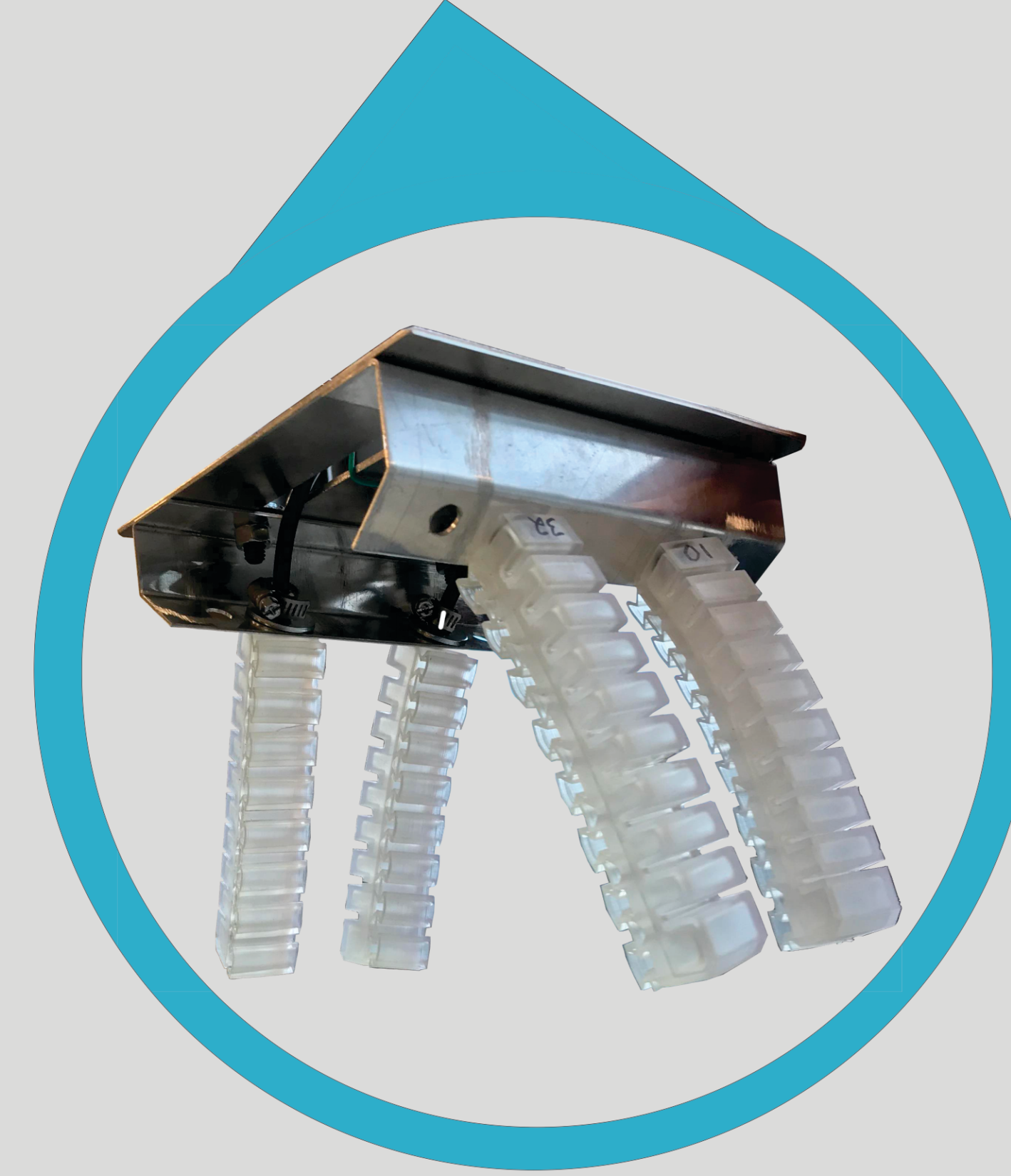
Auxetic metamaterials are a new technology which have yet to be fully explored. The aim of this project is to examine the viability of combining an auxetic metamaterial and a soft robotic finger.

Typically pneumatic soft robotic fingers have been used to grab small, light, cylindrical, or round objects. The goal of this gripper is to be able to grab heavier, larger, or odd shaped objects.

BACKGROUND

An auxetic metamaterial retracts in all directions on itself when under compression, opposite to a normal material. This is a useful property that allows the finger to conform to irregular surfaces.

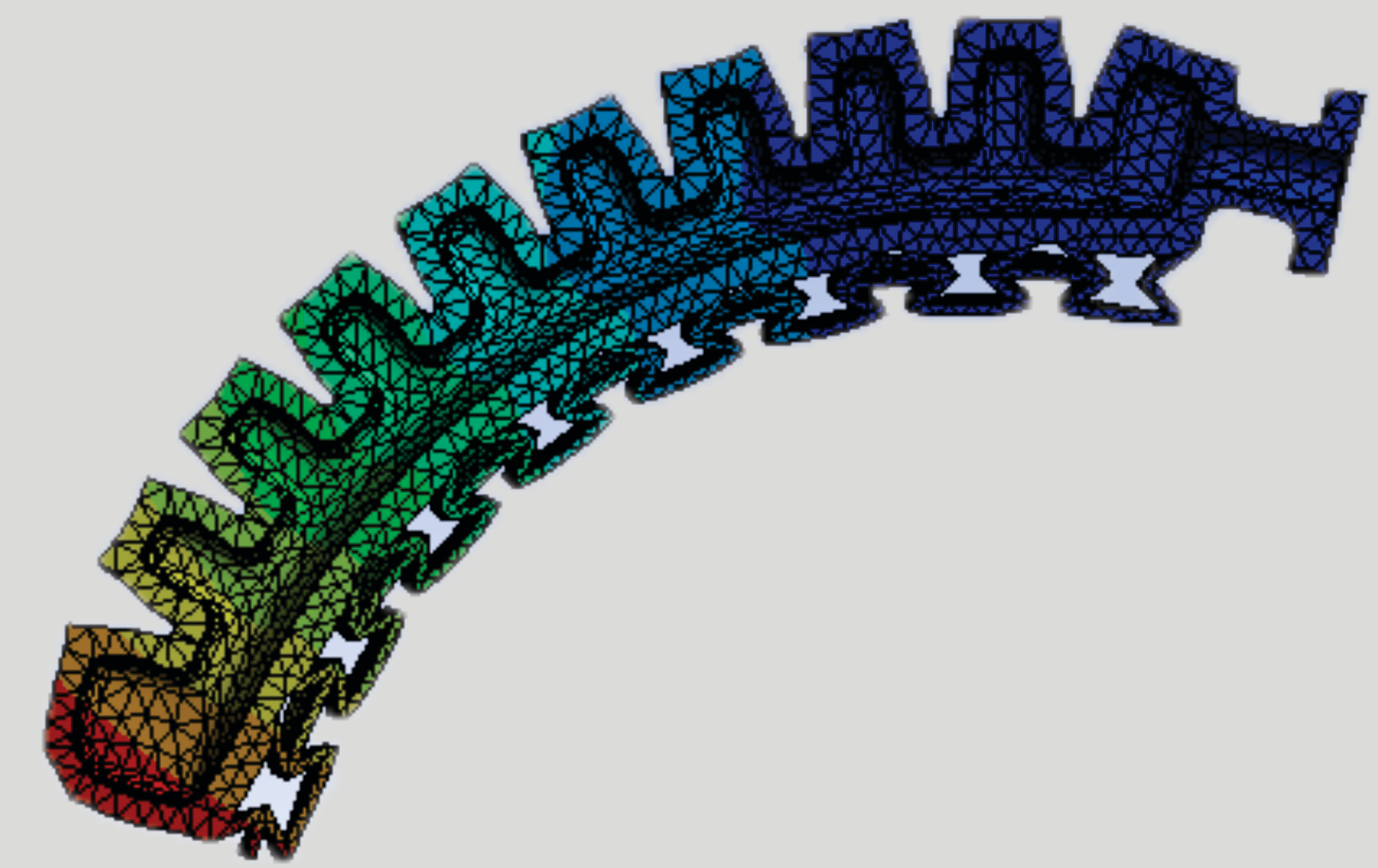
Soft robotics fingers are used for delicate objects where conventional robots are unsuitable. This gripper uses a soft polymer material as well as an auxetic metamaterial as opposed to the rigidity and inaccuracy of a conventional robotic arm.



OBJECTIVES

Design a 3D printed auxetic gripper that:

- Decreases the impact felt by the object when the gripper is applied
- Maximizes the bending curvature of the gripper
- Creates a diverse gripping mechanism able to pick up irregular objects
- Has the capacity to pick up wet/damp objects



DESIGN

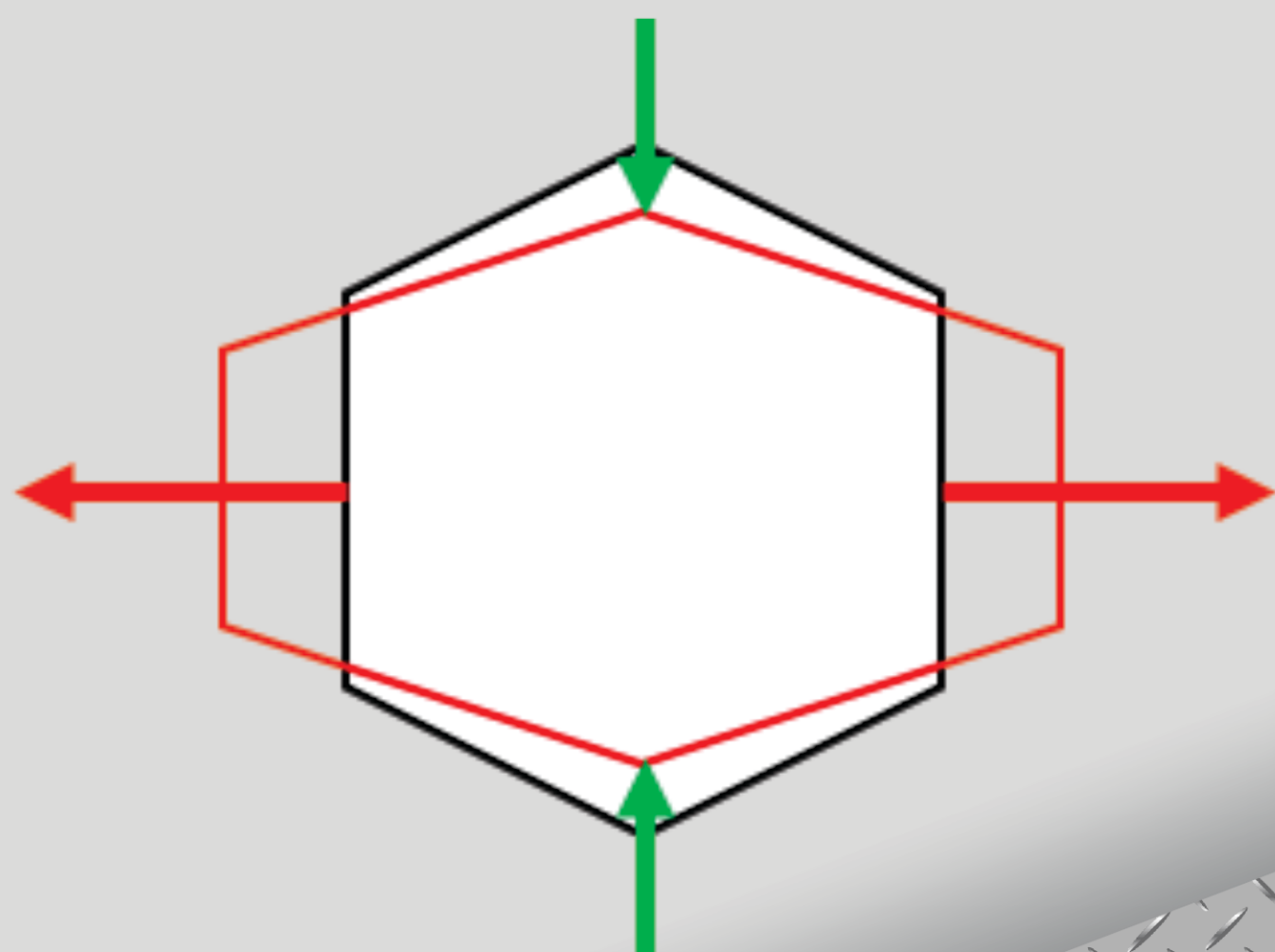
Constraints:

- Small overall finger size (under 14.5 x 14.5 x 17.5 cm)
- 3D printed using a soft, flexible polymer
- Pneumatically actuated
- Non-toxic for the purpose of food processing

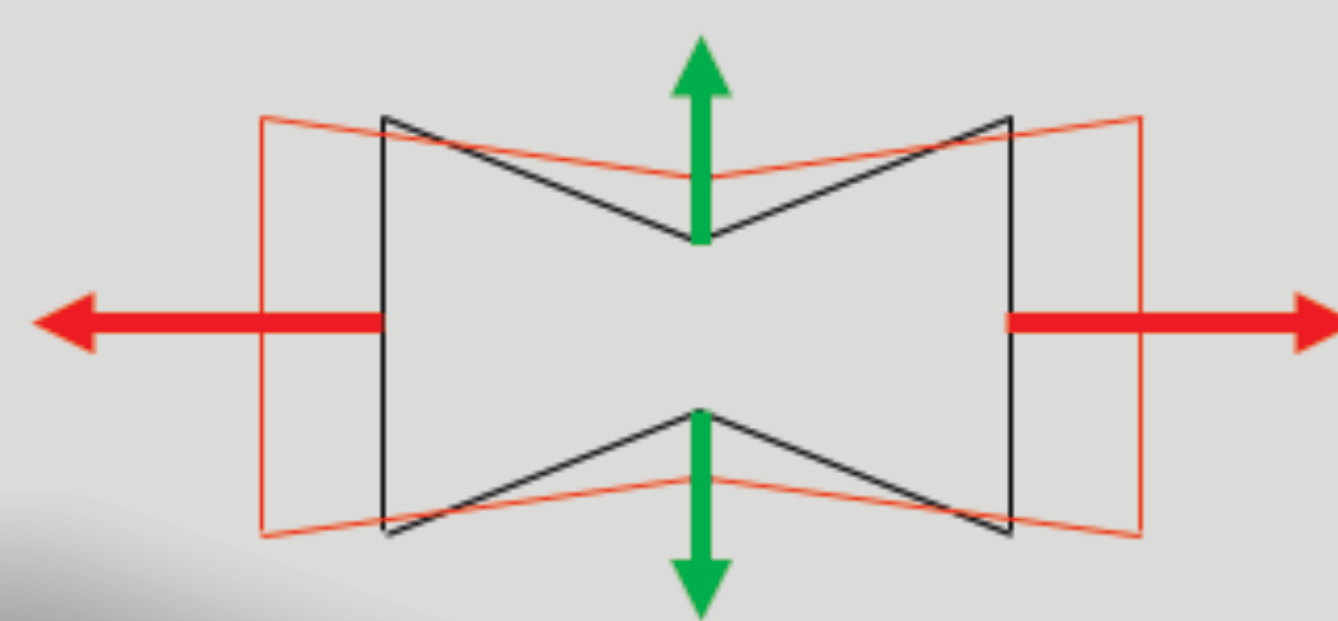
Criteria:

- Exhibit the auxetic effect
- Maximize actuation and deformation
- Ability to grip fragile/delicate objects
- Cost effective to manufacture
- Be able to pick up wet/damp objects

Non-Auxetic Material



Auxetic Material



POSSIBLE APPLICATIONS

- Large, heavy, and irregular objects
- Integrable with existing robotic systems
- Implementation in a packaging/sorting setting
- Agriculture & food processing