



Soft Robotics Hand Gripper

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Background

The use of robots to automate tasks is widely used in many industrial fields including manufacturing, logistics and large-scale retailers. Whilst robots can be extraordinary effective, the limitation of a robot is determined by a robot's end effector, the component located at the end of a robot's armature. This component is responsible for interacting with the environment, such as specializing in gripping. Traditional robots are built and manufactured with the use of hard materials for their end effectors. Today, soft and compliant materials are being used for design and construction of end effectors. This rapidly emerging design trend is referred to as 'Soft Robotics'.

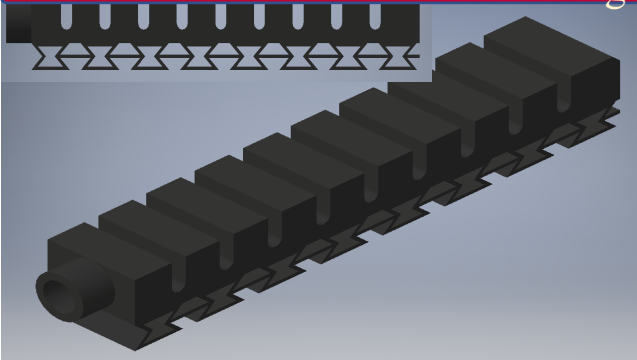
Problem Statement

- Majority of end effectors are constructed of hard materials, limiting the safe and reliable gripping of various shaped and surfaced objects
- Delicate and small objects such as eggs can easily be damaged during gripping
- The use of soft materials will simplify the complexity of gripping onto irregular and delicate objects, without causing damage or deformation

Design Objectives

- Prevent damages done to small, delicate and curved shaped objects
- Provide strong flexibility and accuracy during gripping
- Maximize production time efficiency and productivity, while providing positive social, environmental and economic impacts including better health and safety of general labour workers

Design Solution



- Auxetic figures along length of the finger create optimal gripping interface for all shapes
- Manufactured using 3D printed TPU filament making the fingers flexible, soft, and strong
- Fingers are pneumatically actuated using air pumps and solenoid valves
- Use of piezoresistive force sensor in each finger for increased grip force accuracy and controllability

Future Recommendations

- Lift/grip heavier and larger objects
- Build a whole robot arm, not just fingers
- Design a more accurate and efficient model with the use of more than one sensor, such as displacement sensor to completely and accurately interact with the environment



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