I&E Summer Scholar Research Program

Simulations of a Highly Underactuated Robotic Hand

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STEVENS INSTITUTE of TECHNOLOGY
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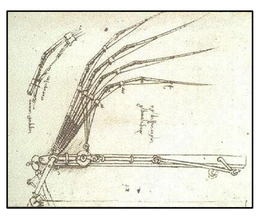
Robotic Hands and Grippers

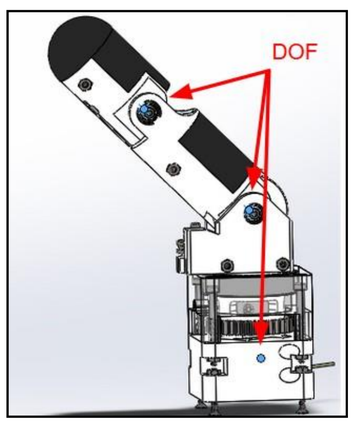
Robotic hands and grippers dominating the market today are fully actuated, meaning each joint is directly controllable.

- Increases **complexity**
- Very **expensive**
- Used widely in manufacturing

Research Description

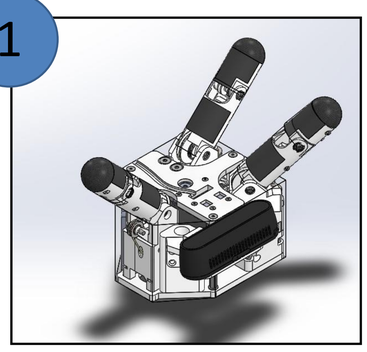
- Development and simulation of a robotic hand with a highly **underactuated** design
- 8 moving joints, 2 motors
  - Opening/closing
  - spreading apart
- Tendon-driven joint movement





Research Methods

1



.STL model

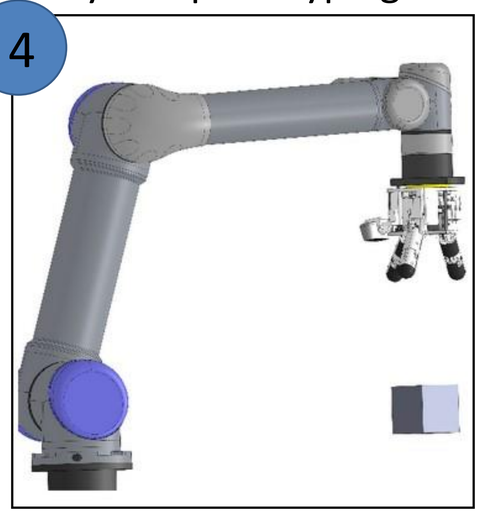
2

Physical prototyping

3

Direct joint control

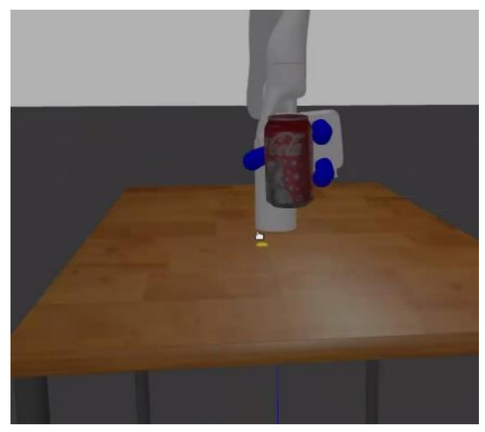
4



Autonomous manipulation

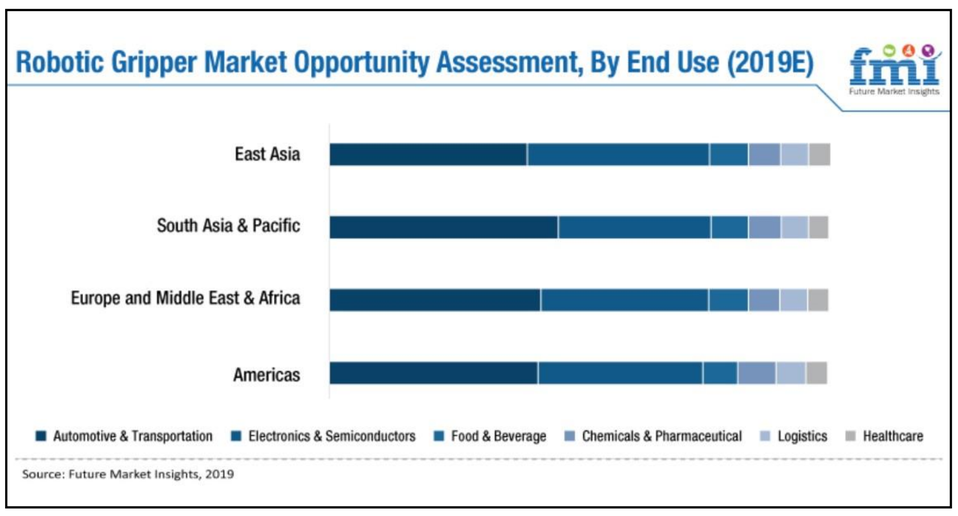
Results & Conclusions

- Through these simulations, this design was able to pick up objects through user teleop control
- Shows strength of the gripper, application, and potential for customization to fit the consumer's field
- Working on a script for autonomous object manipulation



Commercial Application

- The robotic hand/gripper market was valued at **$1.2 billion** in 2019 and a CAGR of 10% 2019-29
- Can be end effectors for a variety of systems
- This design is **5-10x cheaper** than current models dominating the market



IP Potential

The software accompanying this design to perform and automate manipulation tasks could be licensed. Novel designs are being prototyped for this hand but is not the research's focus due to COVID-19.