# Dynamic Simulation and Modeling of Gripper for Applications in Autonomous Drone Catcher

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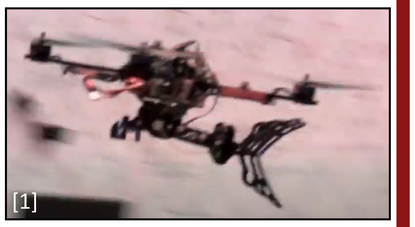
Biomimetics & Dexterous Manipulation Laboratory

SURF STANFORD UNDERGRADUATE RESEARCH FELLOWSHIP

## Introduction

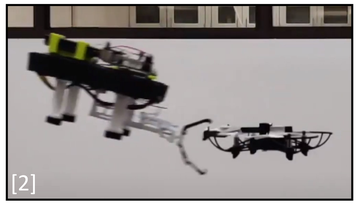


[1]

- Advancing technology making drones more evasive
- Drawing inspiration from nature we looked for solutions in drone catching techniques
- Previous investigation into aerial grasping has been experimented by UPenn robotics labs

## Objective

Long Term (Team):

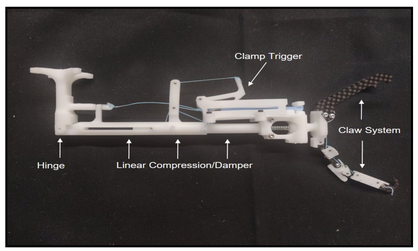
- How do we develop a drone that captures objects midflight?


[2]

Short Term (Me):

- What type of dynamic systems can be modeled within Solidworks and how can we use that to better understand the mechanism being used?

## Methods




| Tasks | | Triggers | | | Actions | | | | | Time | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Name | Description | Trigger | Condition | Time/Delay | Feature | Action | Value | Duration | Profile | Start | End |
| Task4 | Hinge Swing | Time | | 0.1s | RotaryMotor | Change | -90deg | 0.5s | | | |
| Task5 | Claw Closing at en | Time | | 0.05s | (2) | Change | -104de | 0.02s | | 0.05s | 0.07s |
| Task6 | Claw Closing at sta | Time | | 0.05s | InnerClaw | Change | 55deg | 0.02s | | 0.05s | 0.07s |
| Task7 | NewSlider | Time | | 0.05s | NewSlideBlo | Change | 25.5m | 0.02s | | 0.05s | 0.07s |
| Task8 | MainCollision | Time | | 0.05s | LinearCollisi | Change | 0mm/s | 0s | | | |

- Use previous version of gripper as reference of where to put simulated mechanisms
- Base model of gripper design and mechanisms used is modeled through Solidworks
- Dynamic simulations using Motion Analysis

## Gripper Modeling

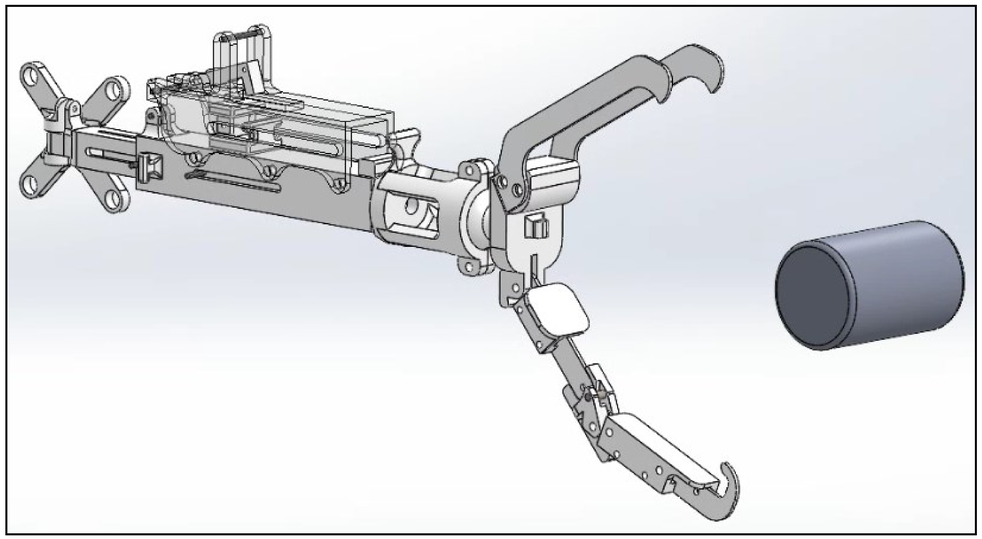


**Figure 1:** Final gripper model with object

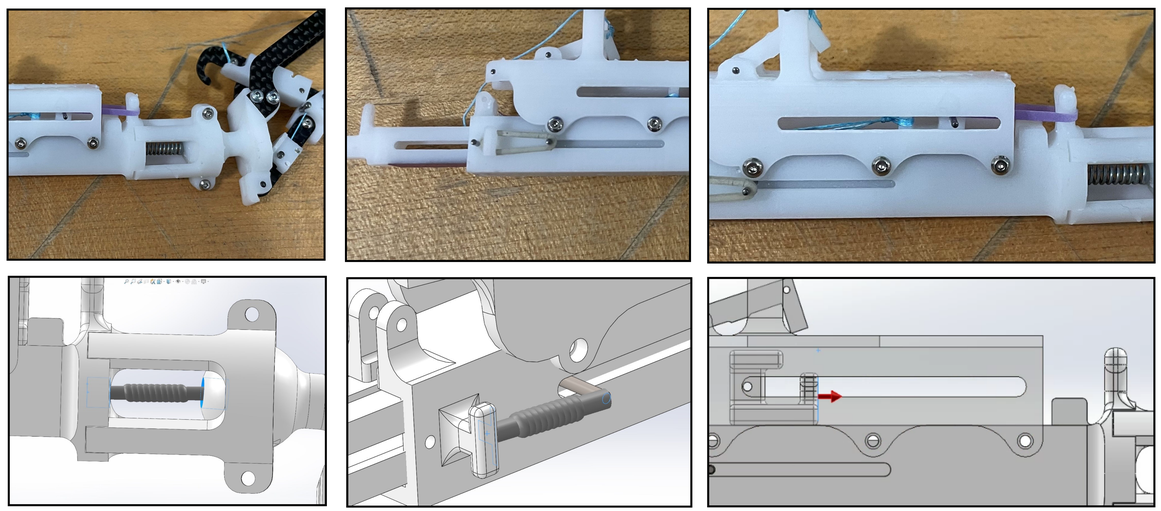
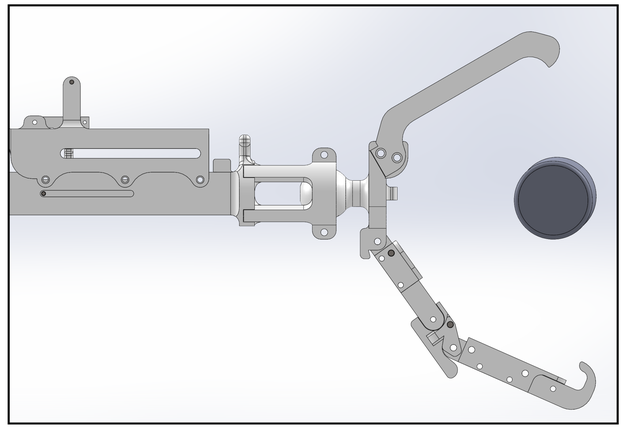
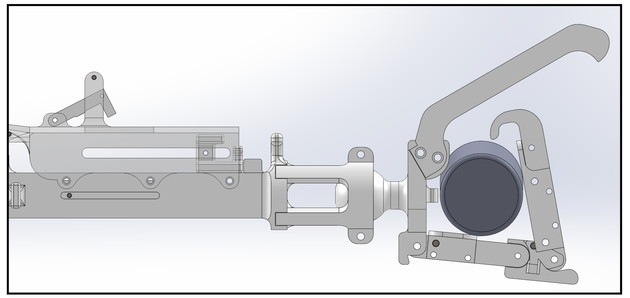


**Figure 2:** Comparison of gripper model to physical spring

## Results





## Conclusion

- Solidworks has limited computing capability for high speed collisions on small scale devices
- When scaling motion speeds down, calculations are better and motion is much easier to visualize
- Grippers ability to capture objects allows for secure grasping of objects, even during movement

## SURF Takeaways

- Learned more how graduate school functions
- More prepared for graduate school applications
- Put more thought into future plans after undergrad

**Acknowledgements**

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**References**

[1] Justin Thomas et al., "Toward Autonomous Avian-Inspired Grasping for Micro Aerial Vehicles," Bioinspiration & Biomimetics 9, no. 2 (May 2014): 025010, accessed August 11, 2021, https://doi.org/10.1088/1748-3182/9/2/025010
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