CBBG Center for Bio-mediated & Bio-inspired Geotechnics

AN EXPLORATION OF A SELF-BURROWING ROBOTS VERTICAL PENETRATION INTO GRANULAR MEDIA.

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NSF

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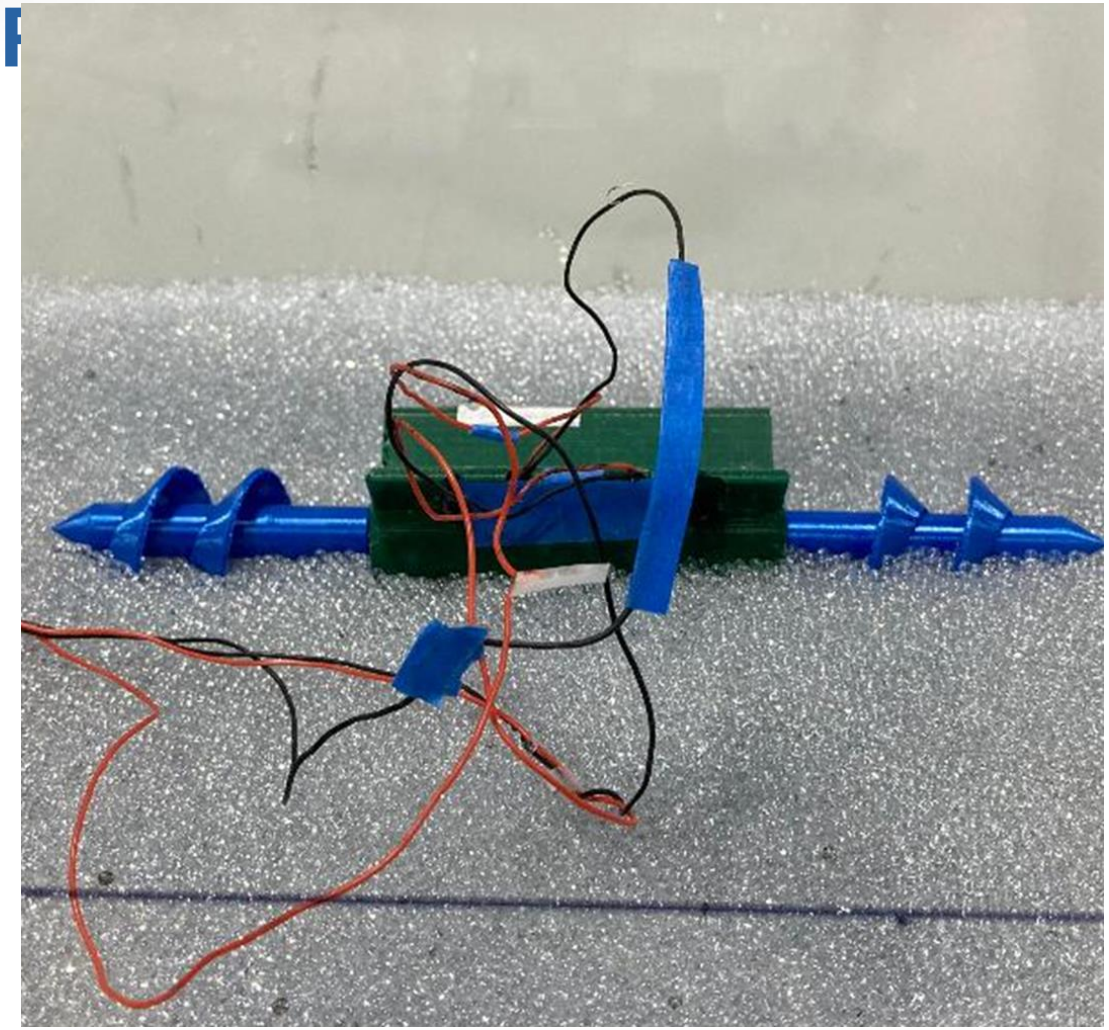
RET Lab Experience F

Research Background

- CBBG Researchers have created a two auger, self-burrowing robot to study the mechanics of self burrowing.
- Prior research achieved horizontal burrowing through a simulated soil. This stage of research begins experimenting with the robot's ability to vertically penetrate granular media.
- It's up to you what you put here, but consider using the following questions to reflect on this topic:
- What has already been done regarding this problem?



RET Lab Experience Research Summary

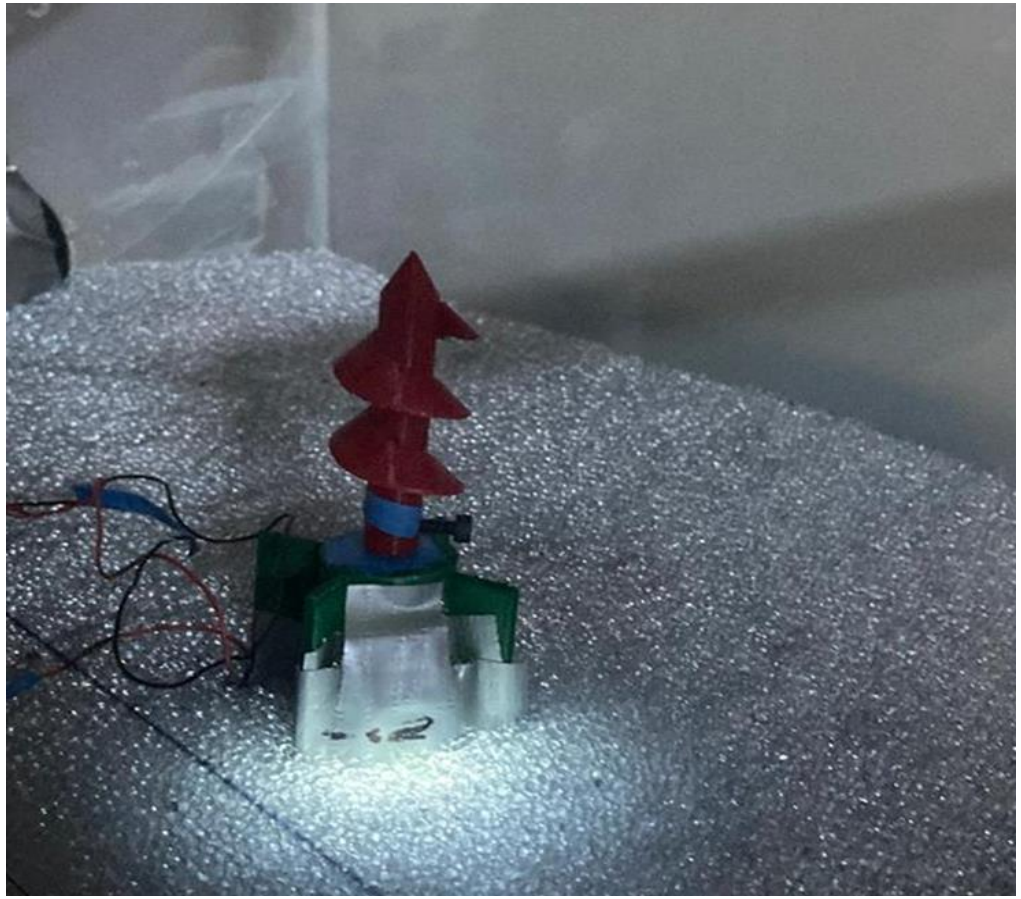
Research Objectives

- Determine if the robot can vertically penetrate the granular media.
- Determine how far downward the robot can penetrate.
- Determine the effects of changing the initial embedment depth and increasing the auger speed.

RET Lab Experience Research Summary

Research Conclusions

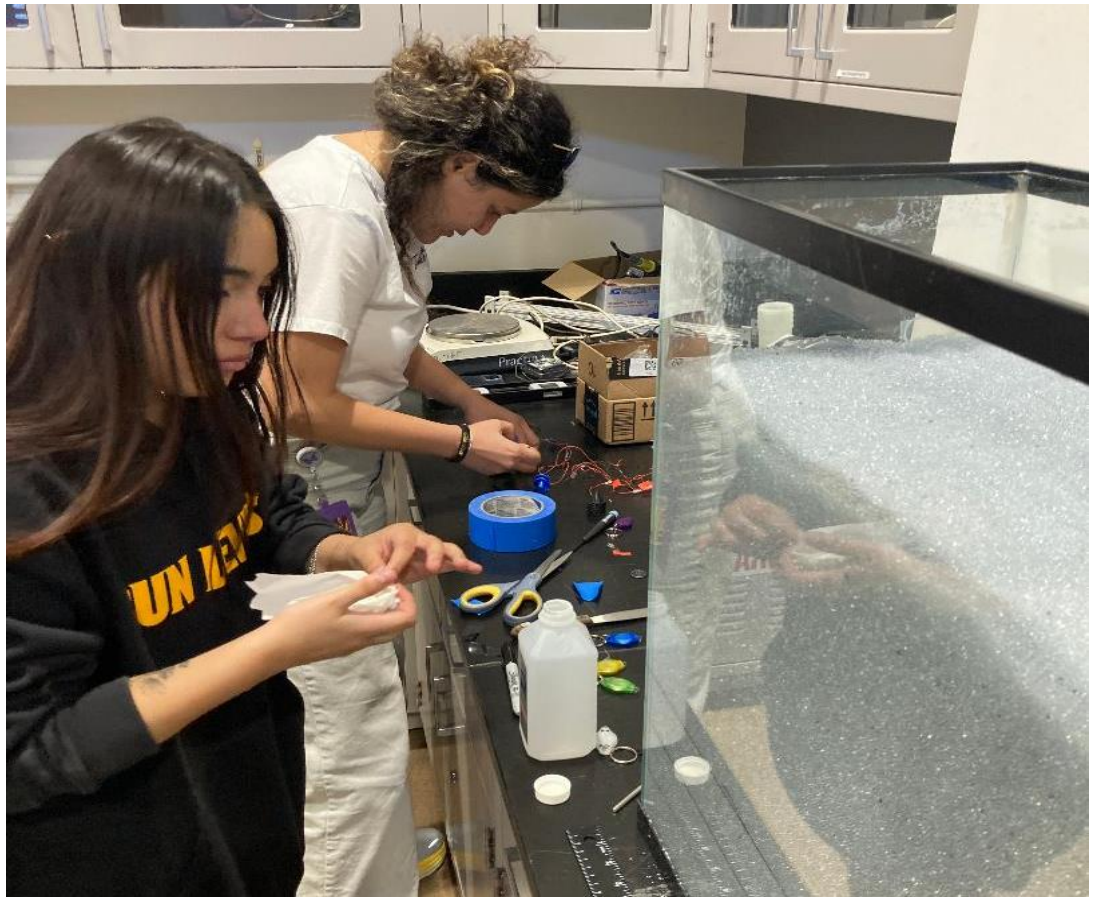
- When fully embedded under the surface before starting, the robot did not move.
- When starting partially embedded the robot did penetrate, but only about 5 cm before the thrust force of the auger was overcome by the resistant contact force of the media, causing it to stop.
- Increasing the auger's RPM did increase the speed of penetration, but not the depth.
- Future trials will examine the effect of changing the size and shape of the augers.
- Stronger motors may be needed.



RET Instructional Lesson Implementation

Lesson Description

- The development of a self-burrowing robot is an inherently difficult and interesting engineering problem, ideally suited for a problem-based learning activity to introduce students to the engineering process.
- High school students observe demonstrations of the robot's motion, describe and explain it using Newtons laws, identify obstacles and then develop their own ideas for how to overcome them.
- Students propose their own design changes and improvements to help plan the next stage of experiments



RET Instructional Lesson Implementation

Lesson Objectives

- Students will be able to apply the abstract concepts of forces and Newtons laws of motion to real engineering problems.
- Compare and contrast locomotion in fluids vs. solids.
- Students gain an understanding of the process of engineering by engaging them directly in engineering design process.

Thank you!
Questions?

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