



## **R.E.C.O. Robots For Change**

AY 22-23

In partial fulfillment of the requirements for the  
Degree of Bachelor of Science

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*Presented to*

The WPI Robotic Engineering Department

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## Projections for Future

### Arm considerations

What do we need?

- Compliant materials that can interact with coral at minimal levels without causing breakage or abrasions
- 5 Degrees of Freedom (including gripper roll actuation) Plus End Effector Movement
- Varying linkage lengths

### Servo Considerations

- 120 degrees minimum
- 100m depth

	Pros	Cons	Price per Servo
<a href="#">SER 2010</a>	<ul style="list-style-type: none"> <li>- 200m</li> <li>- Wide range of operating temperatures</li> <li>- 18.0 kgf-cm at 4.8V</li> <li>- 29.0 kgf-cm at 7.4 V</li> <li>- Not the most expensive</li> </ul>	<ul style="list-style-type: none"> <li>- Limited Range of Motion</li> <li>- No provided SDK</li> </ul>	\$395.00  Full Arm: \$2370
<a href="#">SER 2020</a>	<ul style="list-style-type: none"> <li>- 200m</li> <li>- Wide range of operating temperatures</li> <li>- 34.0 kgf-cm at 7.4 V</li> <li>- Not the most expensive</li> <li>- Can be continuous</li> </ul>	<ul style="list-style-type: none"> <li>- More Expensive than SER 2010</li> <li>- No SDK Provided</li> </ul>	\$495.00  Full Arm: \$2970
<a href="#">SER 2000 Kit</a>	<ul style="list-style-type: none"> <li>- Lets us choose our own Servos</li> <li>- A waterproofed shell</li> <li>- Rated for 200m</li> <li>- We could use a hobby servo with this making it easier to replace if damaged</li> </ul>	<ul style="list-style-type: none"> <li>- Doesn't solve the problem of figuring out which servo to use</li> <li>- Servo is an additional cost</li> <li>- No SDK Provided</li> <li>- Would need an additional hobby servo</li> </ul>	\$215.00  Full Arm: \$1290 Plus Servos (Expected \$2000)
<a href="#">Dynamixel XW Series</a> <ul style="list-style-type: none"> <li>- Prof. Farzan's Choice</li> </ul>	<ul style="list-style-type: none"> <li>- 360 Resolution</li> <li>- Comes with an SDK</li> <li>- 96 kgf-cm at 12V</li> <li>- Wide range of operating temperatures</li> <li>- Used by Kraken Robotics</li> </ul>	<ul style="list-style-type: none"> <li>- Ridiculously Expensive</li> <li>- Only Proven IP68: 1 meter for 24 hrs (not great) or 6m for 30 min (still not great)</li> </ul>	\$1,079.90  Full Arm: \$6479.40
<a href="#">ROVMaker Underwater Digital Servo</a> <ul style="list-style-type: none"> <li>- Only Option for under \$1000</li> </ul>	<ul style="list-style-type: none"> <li>- 150m depth</li> <li>- Cheapest option</li> <li>- 360 Resolution</li> <li>- Already filled with oil</li> <li>- 40 kgf-cm at 12V</li> </ul>	<ul style="list-style-type: none"> <li>- On the low end of the voltage power supply</li> <li>- Sketchy website (from China)</li> </ul>	\$139.00  Full Arm: \$834

## ***Ways to Make the Arm Cheaper***

Less Degrees of Freedom

→ Less mobile arm

3D Printed Linkages

→ Cheaper

→ Easier to test designs

Making the Robot's thrusters more responsible for large movements of the arm

→ Can Allow for less degrees of freedom

## ***Robot Configuration Considerations***

Things we will Keep or Reuse:

→ Operating on a Raspberry Pi System

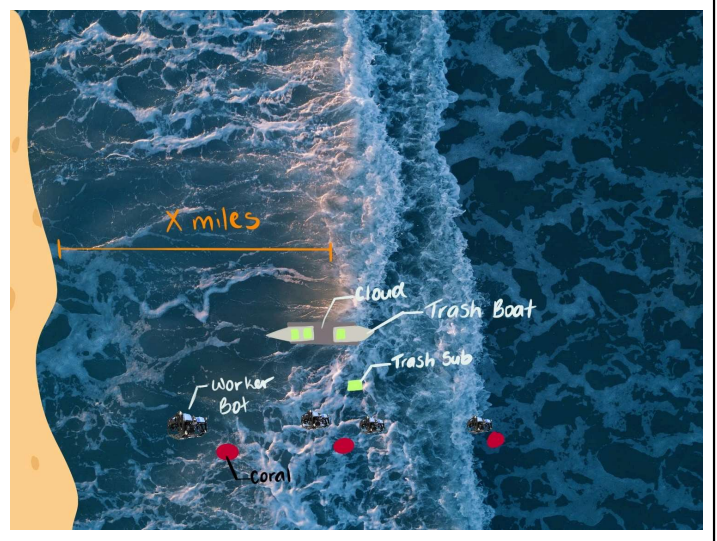
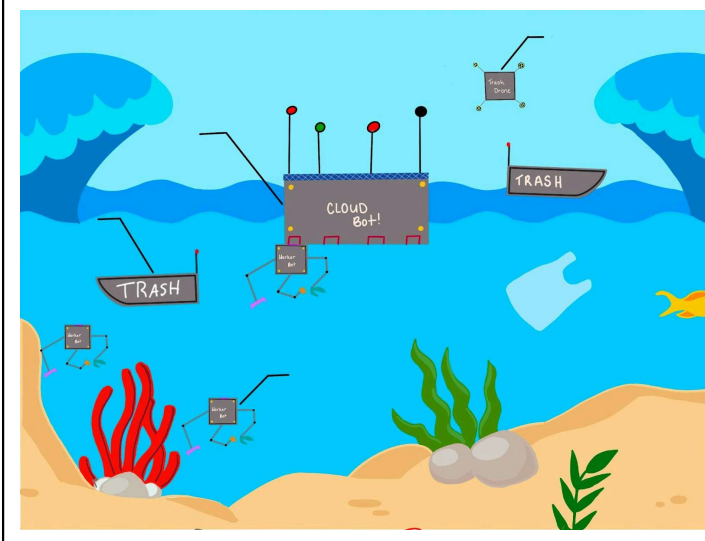
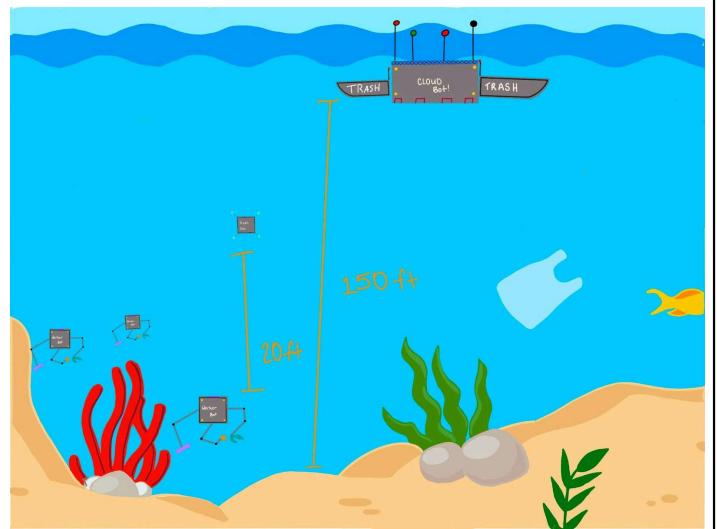
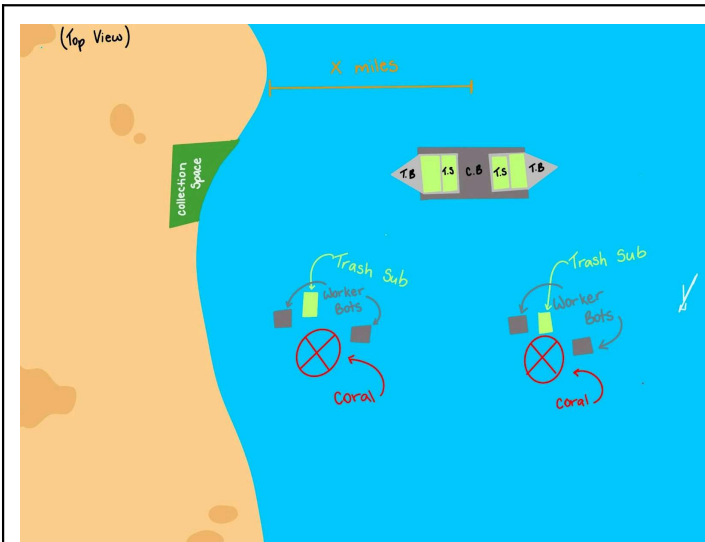
Things we would like to improve and alter:

→ Motor configuration (Liked the mobility of the Fifish and the Power of the BlueROV2)

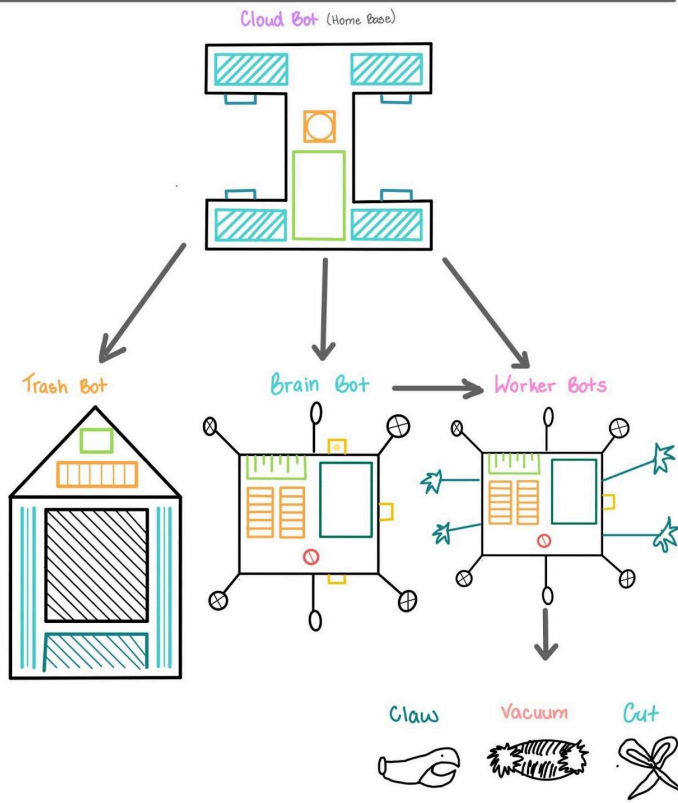
→ Robot Frame (Heavily dependant on the updates being made to the motor configuration)

→ Would need a Stereo Camera to use the arm

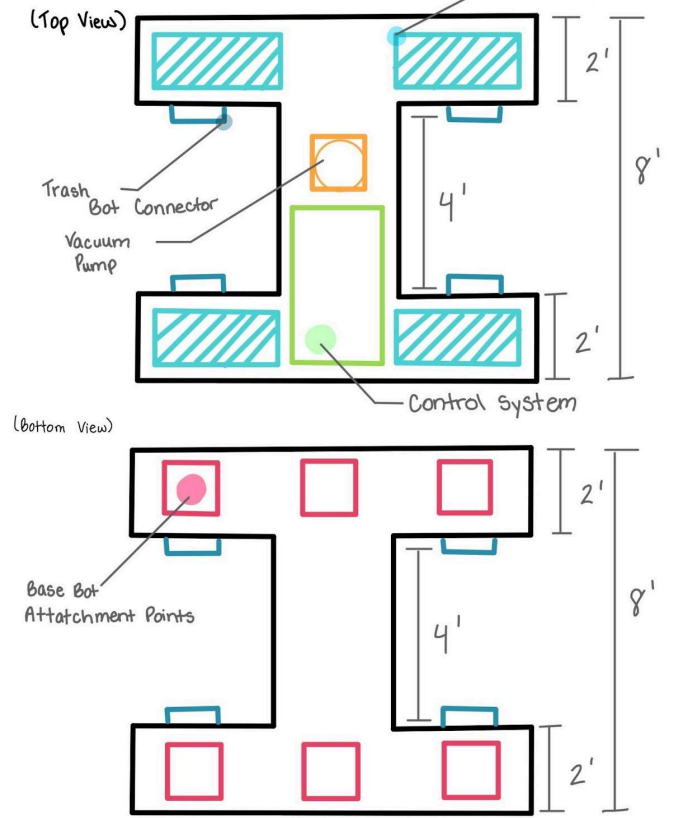
# Graphics



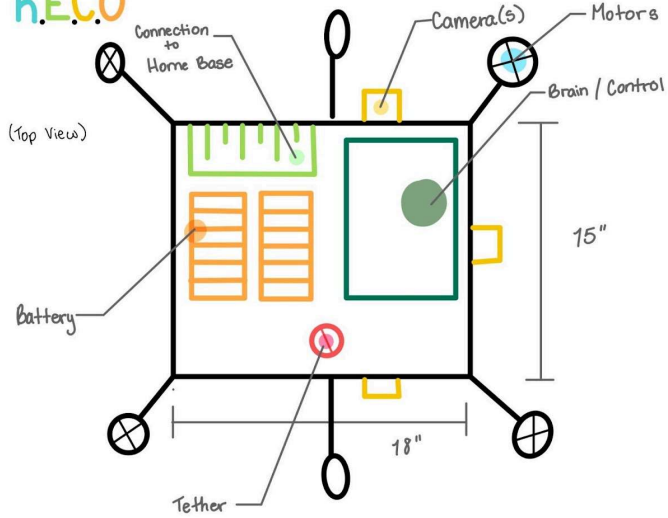
# R.E.C.O - System Heirarchy



# R.E.C.O Cloud Bot

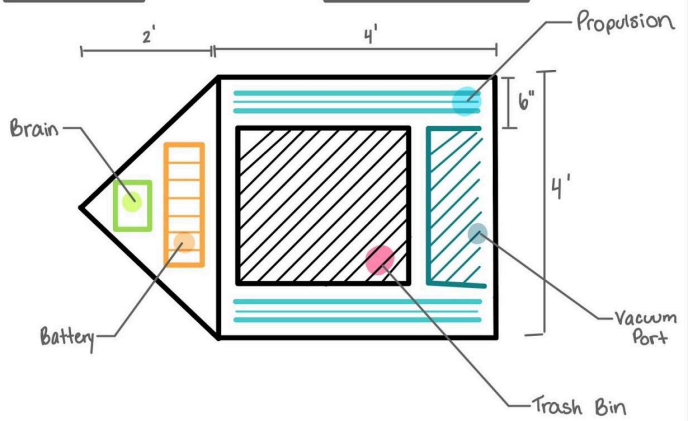


# R.E.C.O

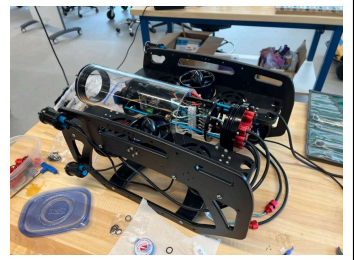
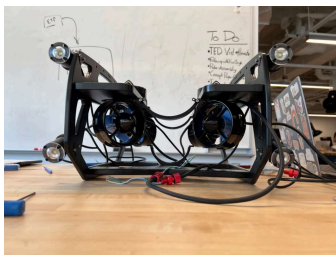
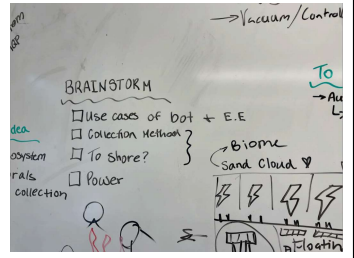
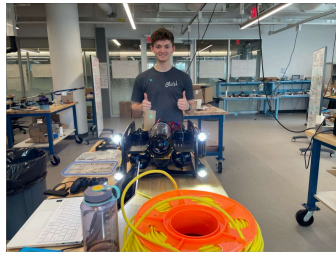
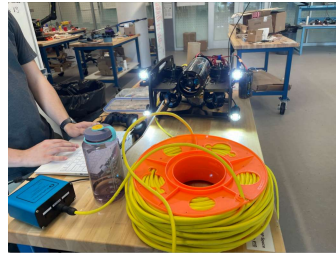
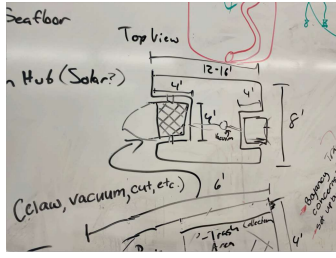
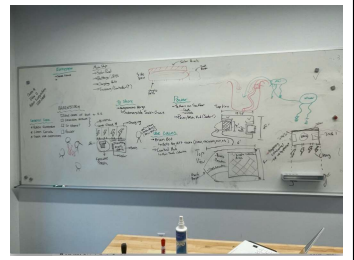
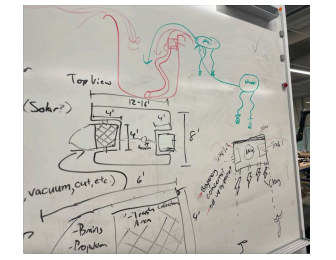
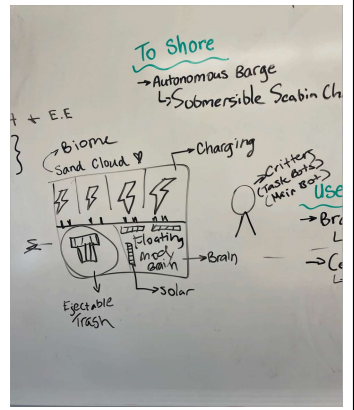
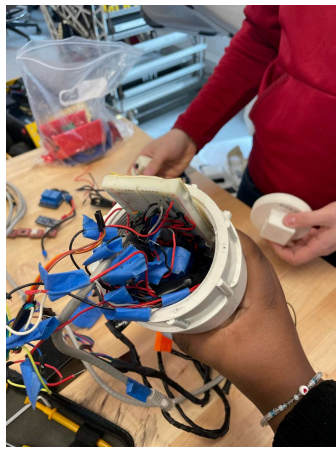


# R.E.C.O

# Trash Bot



# Photos



## Video

<https://youtu.be/t7qru-IpJOY>

## Sources

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