DEEP SEA DOGS

TECHNICAL REPORT

2023

MATE PIONEER CLASS

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OUR CEO

Fiona McGinnis is the team CEO for her knowledge and experience in robotics programs. She has been apart of FIRST robotics programs for the past 10 years and mentors a local FRC team.
She is majoring in Electrical Engineering.

"I hope to be able to build a lasting robotics program at Allan Hancock College long past when I graduate from the school. The fact we have this opportunity to participate in this program is huge for a lot of us. I look forward to seeing how we perform and I'm happy with our accomplishments in our first year as a team."

Fiona McGinnis

Fiona McGinnis

TEAM MISSION

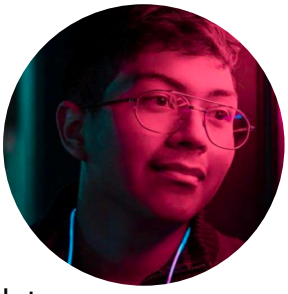
Our goal as a MATE ROV team and AHC school club is to provide opportunities to STEAM majors to participate in competitive robotics programs.

Due to the low amount of STEAM opportunities for college students in our area we hope to allow students to continue with STEM / Robotics programs into college.

MANUFACTURING

The Manufacturing subteam focuses on the process of creating and assembling any mechanical or structure based components of the ROV.
Lead : Angel Llamas

ELECTRONICS



The Electronics subteam focuses on waterproofing and routing all wires related to our control station and ROV.
Lead : Diego Caceres

DESIGN

Design is focused on overall robot design through CAD softwares. Our team focuses our design efforts in Fusion 360 and AutoCAD.
Lead : Lydia Nelson

PROGRAMMING

Programming focuses on all code relating to controlling the ROV, camera, and drivers station. They make the ROV function how the other subteam's envision it to.
Lead : Dylan Martin

PRESENTING ROVERT


As of May 20th

ROVert is our 2023 ROV product. While simple in design it can accomplish a lot in the water.

ROVert utilizes four barracuda propeller motors in order to move in all directions. The two outside motors are facing towards the back of the ROV while the inner ones are facing up in order to help the ROV maneuver.

In order to keep the ROV buoyant two air-tanks located on the top of the robot are sealed shut filled with air and small clay weights to help counter the weight of the tether on the back of the ROV.

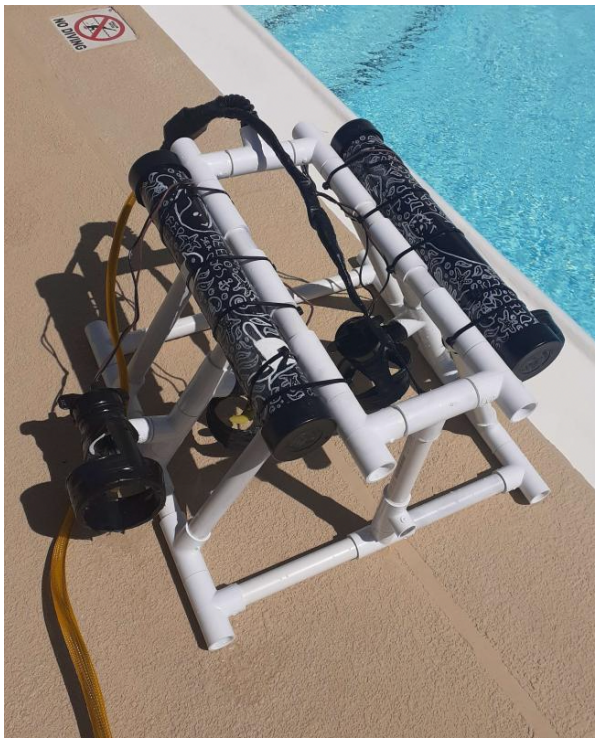
Electronics on the ROV are relatively simple and consist of the motor and camera wiring fed through the frame into the tether.

In order to assemble the ROV we used the MATE barracuda assembly guide. We felt using the guide was the best decision for our product since this is our first year participating in the competition.

MATERIALS

ROVert mainly consists of PVC pipe and various PVC pipe joints. It is constructed out of 3/4ths PVC pipe with 3/4th to 1/2 joints connecting them. Using PVC pipe made it easy for us to source materials since we did not have a ton of funding to work with at the beginning of the season.

In the later portion of the season we have moved into making more advancements with improving our already existing pieces of the robot. Our latest improvement was our motor shrouds which have been upgraded to 3D printed shrouds made out of PLA.



ROV DESIGN

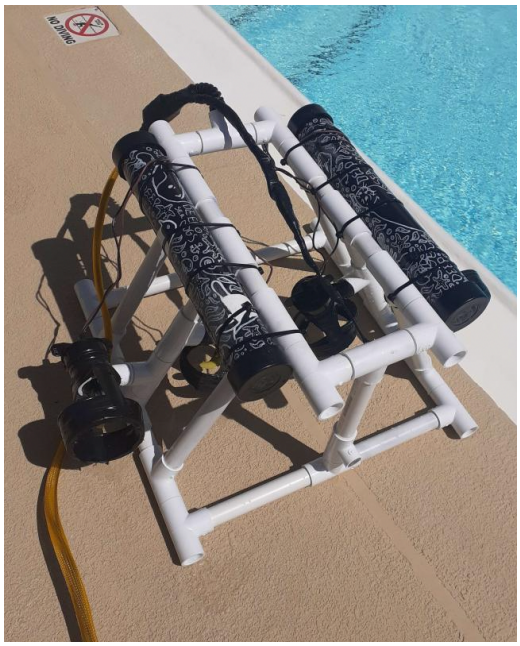
Since this is our rookie year we wanted to keep our product design simple but effective in the various challenges. We utilized existing MATE product construction guides to assemble and test our ROV throughout the season.

Our original intention was to use the current design as a reference and CAD a new model to utilize for the competition but due to the time constraints we had and the overall efficiency of our current ROV we decided sticking with our current product would be the best decision for our team.

To add our own personal touch to our ROV we included various Sea animals drawn over our air-tanks alongside our team logo and name. Although being a minor addition to our robot we hope that it makes us stand out and our product unique.

ROV Frame:

ROV Assembled:

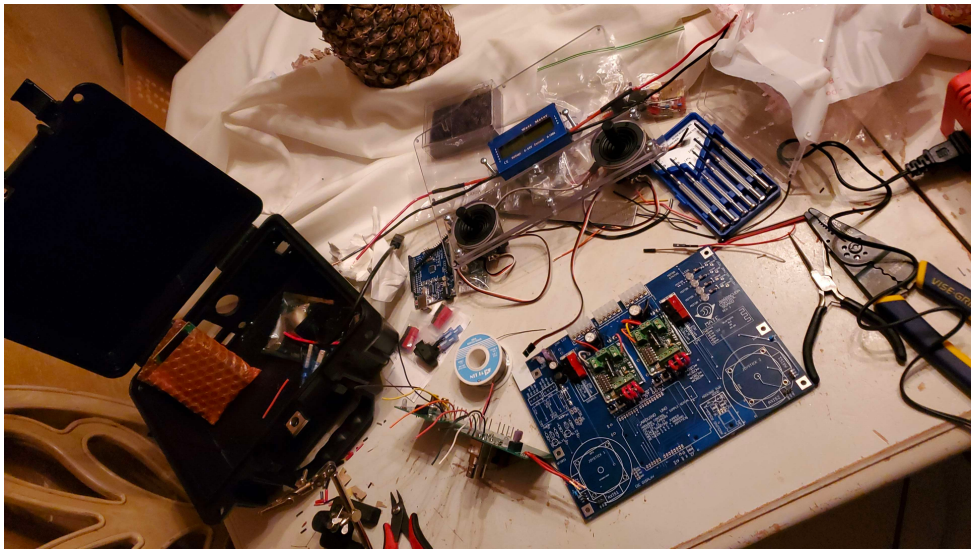


ELECTRONICS

On ROVert the electronics are relatively simple. All motor wires and the camera wires run through the frame into the tether in order for them to connect to our drivers station. The ROV has 4 motors and one camera meaning only 9 wires have to run through the robot into the tether.
In order to simplify our wiring process we utilized anderson connectors instead of crimps. This has allowed us to organize our ROV wiring inside of the frame and outside at our drivers station.

The electronics on the ROV are waterproofed using heat-shrink tubing, saran wrap, and electrical tape.

Outside of the ROV our control box is the Standard barracuda joystick box. We attached a screen onto the backing of the box in order for us to view the camera feed from the ROV.



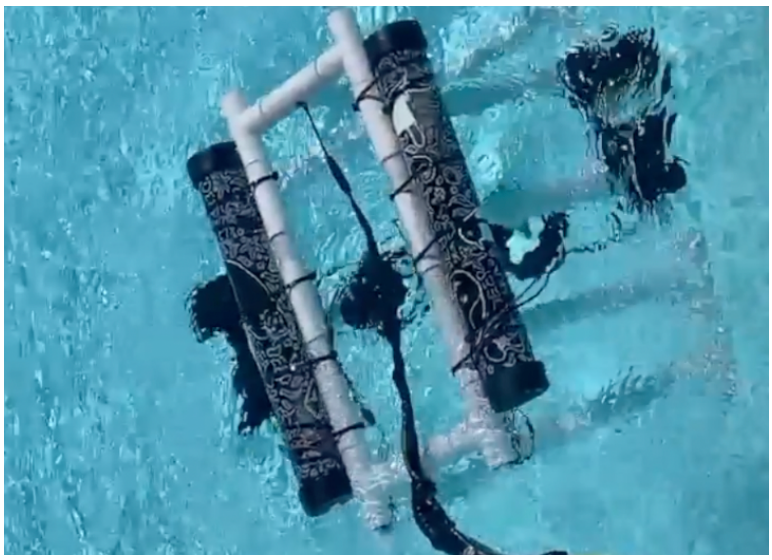
ROV SOFTWARE

Autonomous docking:
The ROV is able to autonomously dock itself in the station utilizing the camera to center with the red PVC pipe. In order to do this, the robot will use data from the camera to decide how to adjust itself for docking.

Scanning diseased coral:
We utilize our camera to extract topographic data with a scan. this data then needs to be brought into CAD software so we can determine the surface area of the diseased section, and make technical drawings.

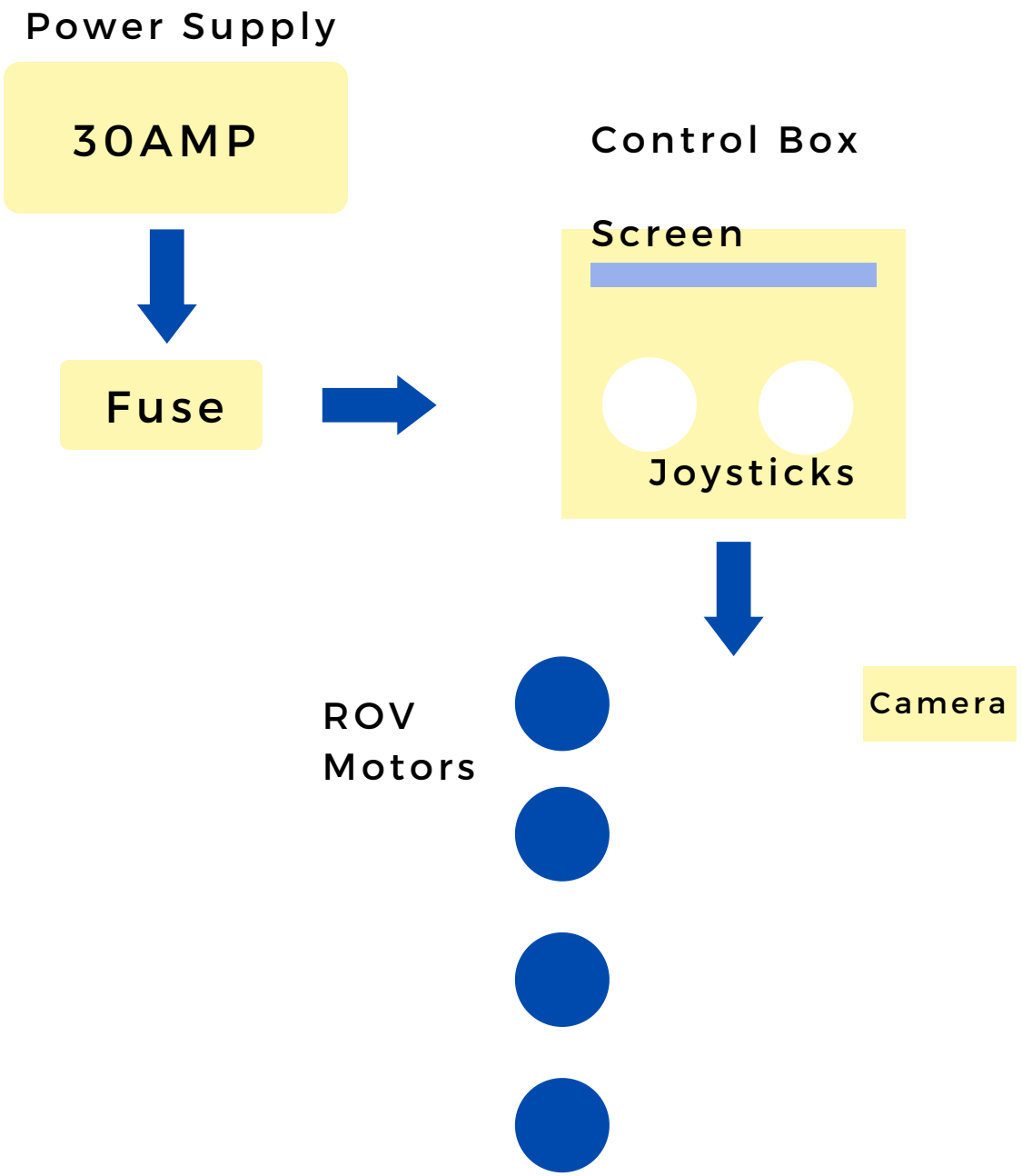
Administration of RX to sample collection:
We will be automating this process with some specific timing. We will be writing a script for the robot to follow in order to park and collect the sample.

Distance to the bottom of the pool:
We will be utilizing photogrammatry in order to properly determine the distance of the ROV to the bottom of the pool.



SIDS

System Integration Diagram for ROVbert



MARKETING

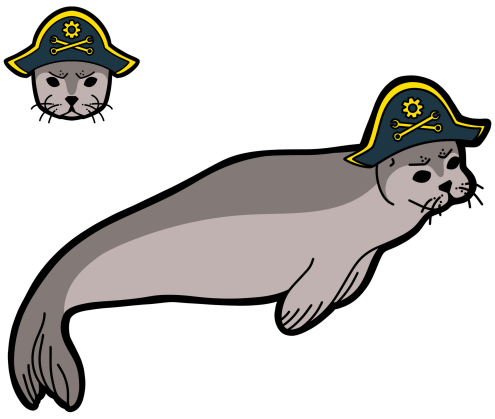
The marketing subteam is in charge of branding and design elements related to presenting our team to the public. They are in charge of managing all outreach aspects of our team and working with the school to promote our team to the students attending.
Lead : Lauren Davis

TEAM BRANDING

We are the Deep Sea Dogs. The name comes from the reference of Seals being referred to as "Sea Dogs" or "Dogs of the sea"

Our logo was created from a mixture of several different themes we wanted to go with. Based off of our schools logo format we decided on using a Habor Seal (A local type of seal) with various sea and technical elements showcased on it. The pirate hat has a gear and two screwdrivers to help represent the technical aspect of our team

Finalized Logo:



Initial Concept:

BUDGET

Money included in our budget comes from community donations, fundraisers, and Allan Hancock College's contributions to our club.

Expenses are divided based on the various applications of the funds and the labels given to the items needed.

Our 2023 budget was made with the intention to approximate the costs of the various items we will need order to have a successful season.

2023 Deep Sea Dogs Budget:

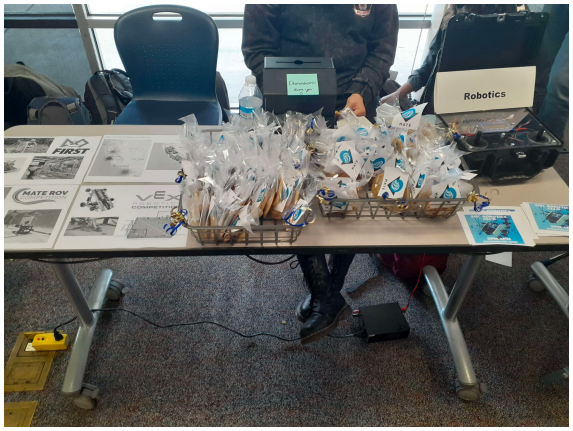
ROV Costs.....$2000
Tools / Equipment.....$300
Field Elements.....$250
Fundrasiers.....$120
Apparel.....$100
Travel.....$10,000

Total Cost.....$12,770

Future line items to include: Grants, Gas cost, Promotional Items, and Website/Social Media.

AT AHC

Despite being a new club at AHC we were able to set up at several events during the school year. We partnered with the STEM club to spread information at AHC's "Bulldog Bowwow" and also had a booth set up to hand out cookies for AHC's Diversity Day.



UPCOMING EVENTS

July 24th-28th : Santa Maria Discovery Museum
We will be providing demonstrations and information on robotics programs to students participating in the SMDM's Robotics summer camp.

August 8th : Hancock Hello
Providing club information to incoming STEM students at AHC

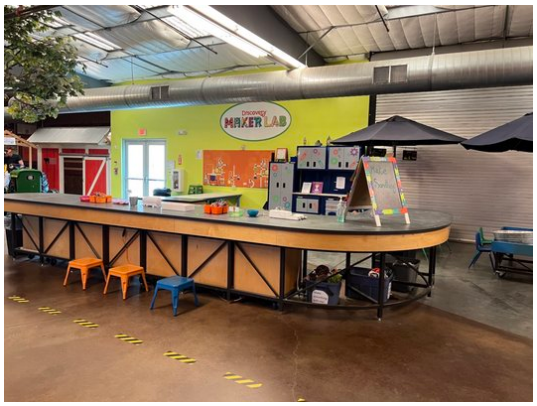
August (TBD) : AHC Week of Discovery
We will be providing demos of our ROV alongside information about joining our team/club.

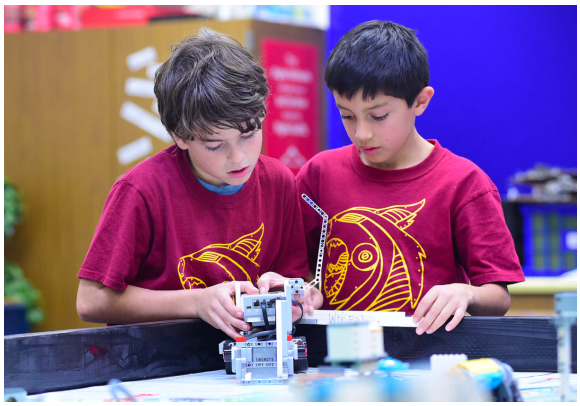
FUTURE OUTREACH

Over the next year we plan on providing assistance to local FIRST Lego League teams by helping mentor the students alongside volunteering at our towns local regional event.

Helping these programs does not only help the students involved but helps us in the future when the students attend AHC.

We have built a partnership with our local children's Discovery Museum and will not only be assisting them with their future camps but will be providing demonstrations and information about our team to students in attendance.
We are hoping to expand demos outside of the museum and into local high-schools to teach them about the program and promote AHC and our team.





OUR FUTURE

In terms of our marketing department we would like to expand greatly in scale of our current activities and amount of student we have involved since we are a small team.

We would like to have our yearly marketing and event plans finished early in the fall semester so we have our year planned prior to finals and spring where we will spend the majority of our time working on the robot.

During our summer meetings our main goal will be advertising and recruiting for the 2024 season. We have several upcoming opportunities to accomplish this through school provided events.

PRODUCT TESTING

Initial Test:
Our first test helped us improve in a lot of ways since we realized we were missing several key elements of the ROV. The initial test should have been held back till the next week as we had not yet added important pieces such as our air-tanks and our ROV camera.

Without the air-tanks the ROV sunk straight to the bottom of the pool but despite it seeming like a completely failed effort we were able to practice driving and figure out what else was needed to improve the ROV to work as intended.

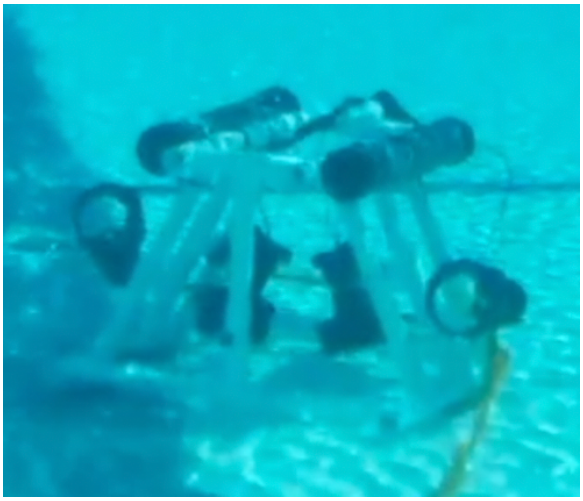
Product Demonstration Video Testing:
Due to us having limited time with the school pool we had our next chance to test on May 12th. Since the prior test we redid all the wire waterproofing, redid the camera waterproofing, added air tanks, and added temporary motor shrouds.
Compared to our initial test the ROV was now able to float and didn't sink to the bottom of the pool. Through this test we found that our ROV was too buoyant and we would need to find an alternate way to balance out the buoyancy.

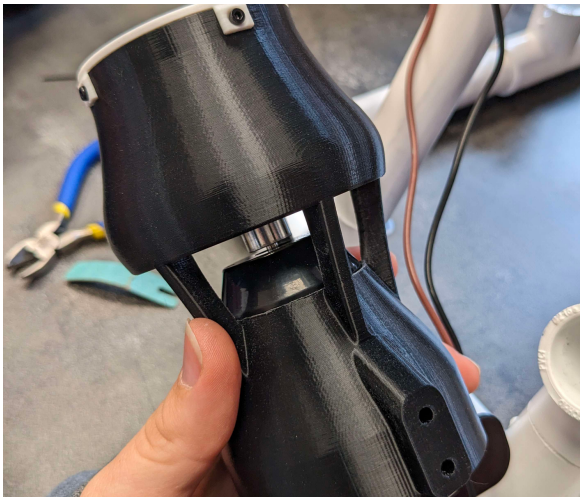
We were able to practice a lot with driving the ROV on top of the water and configured our controls to better suit the next test.

PRODUCT TESTING CONT

Recent Testing / Product Improvements:
Our most recent product test in the pool was performed on May 19th.
This test was our most successful test yet as we were able to fix our issues with buoyancy and fix our motors in a way to improve our ROV's ability to maneuver in the pool.
We recognized our issue with the robot being off balanced for some of our tests was due to the weight of the tether attached to the back end of the ROV. In order to fix this issue we tested various different methods with the air-tanks before settling on utilizing balloon and clay weights.
Since the test we have secured the weights so they will not leave the air-tanks but it has allowed our ROV to drive smoothly in the pool.

We made improvements to the motor shrouds as well since the temporary ones didn't hold up after several tests, which was expected. We moved to 3D printed PLA material shrouds.





RESULTS OF OUR TESTING

We have learned a lot from the 4 pool testings we have done over the past month. Since we are limited to the pool once a week for two hours it is difficult for us to test after making adjustments

Since our last test we have made huge improvements to our motor shrouds 3D printing acceptable and lightweight shrouds to guard our propellers while completing tasks.

The overall frame of our ROV works very well and the size and shape allow us to make quick repairs and additions with ease. Our air-tanks can easily be modified to help the robot be more buoyant by either sealing less air inside or adding more of our custom weights inside.

Our major takeaway from our testings are the improvements we can make to our current control / drivers station. While the joysticks are working fine at the moment we are working to switch to an easier method of driving the robot such as using a wheel, joysticks, or an Xbox controller.

Through feedback from our peers, advisors, and MATE we have been able to make major improvements within our robots design and functionality.

WHAT WE LEARNED

As this is our rookie year as a team we have learned a lot about the process of manufacturing and designing an ROV product for competition. We have learned how to properly suit our ROV to fit the regulations presented by the competition.
In terms of our organization we started our season in late February which took away a lot of our build time. This made it difficult since we had to form our organization, fundraise, make logos, and basically start from scratch in the midst of the season.
We have made major improvements on our organizational efforts to improve our teams schedule and processes for the 2024 season.

LOOKING TO 2024

Alongside expanding our knowledge in ROV's we are looking to expand our team and workspace since we are currently restricted to a small office.
We are looking to use 3D printed materials more alongside the PVC pipe to make wire access easier and ultimately the ROV assembly easier.
During our offseason prior to the 2024 competition we are planning to experiment with previous years challenges in order to expand our knowledge and ablities within the competition.

SPECIAL THANKS

The Deep Sea Dogs would like to give special thanks to Allan Hancock College's MESA center for providing us space the entire semester to create our ROV.
We would also like to thank our team and club advisor Jonathan Okerblom for continuous support of our students and strives to improve robotics activies in AHC.

REFERENCES

MATE

- Barracuda Assembly Guides
  - https://materovcompetition.org/rov-kits/barracuda-rov-guide
  - https://docs.google.com/document/d/e/2PACX-1vRCU3re9hjpXlCpqAbbnbhqjXUWYlvxyt13oBMHq8KZOgtz6oHc_M1xJr9-qBHnW8dJ1sekO24oAmvQ/pub
  - https://educate.materovcompetition.org/protected-page?destination=node/3&back=barracuda&protected_page=7

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  - https://www.hancockcollege.edu/news/gis.php?locale=en
  - https://www.hancockcollege.edu/mesa/index.php?locale=en