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undergraduate poster showcase

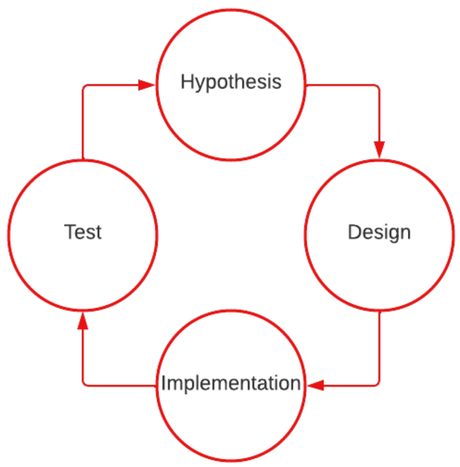
Tracking scuba divers underwater with an **autonomous robot**

Introduction

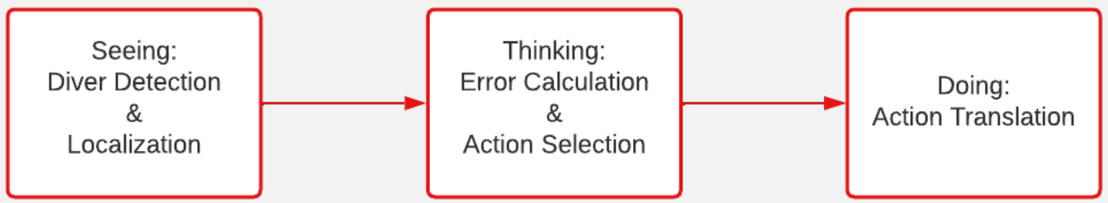
Our research tackles the tricky problem of tracking scuba divers in the underwater world using a specialized underwater robot. This challenge is important for a variety of applications, from human-robot collaboration to training novice divers. Tracking divers accurately is crucial for safety and success, but is currently difficult for robots to do underwater due to poor visibility, unpredictable movements of the diver, and the lack of wireless communication methods underwater. Our solution utilizes vision-based tracking by breaking down the problem into two parts: vision and control. We propose using a highly-maneuverable robot to perform tracking in open water and introduce new metrics to better evaluate different tracking methods. We keep the diver in the center of the image plane by using controllers that provide smooth and accurate movement. We hope this work furthers the development of user-friendly robots for real-world applications.

Workflow

Our work was conducted offshore of the Bellairs Research Institute in Barbados. Testing software in an uncontrolled the setting such as the Atlantic Ocean is challenging due to unpredictable environmental factors, making it necessary to follow a strict and iterative process. This consisted of an iterative cycle of hypothesis, design, implementation, and testing. Following this formula allowed us to consistently identify errors and make improvements.



Diver Tracking Pipeline



Acknowledgements

The research with which we had the privilege of assisting, was conducted by Dr. Faraz Lofti, Khalil Virji, and Prof. Gregory Dudek and is presented in this poster.

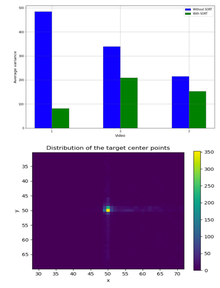
Aidan Jackson

As a 4th year software engineering student, Aidan has a passion for robotics and plans to pursue a career in robotics research and design.

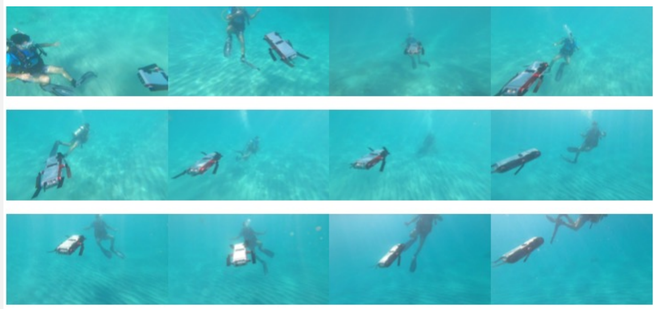
Ben Hepditch

Now in his 3rd year of Computer Science, Ben is avidly curious about AI & Robotics and how they can be used to improve the lives of everyday people.

Outcomes



Effectiveness of Diver-detection model



Robot tracking the diver in different directions

Applications

With a reliable technique for diver detection and tracking, the scope and scale of what divers can do with an underwater robotic assistant can be drastically expanded. For example, marine ecologists could use robots to help them monitor coral reefs by carrying heavy sensors and collecting data. Beyond just research tasks, robots can be used to assist divers on search and rescue missions or with the inspection of underwater infrastructure. In addition to the technical advantage they provide, underwater robots could provide a safer and more affordable solution to the personnel-based alternative. This would be especially beneficial for commercial operations such as monitoring aquaculture pens or tailings ponds.