

Marine Robotics Assignment

16-665: Robot Mobility on Air, Land, and Sea

2019

Assignment Parameters

This is an individual assignment. Conceptual collaboration is encouraged but students may not exchange work or code nor copy information from another source. Cite all references. This assignment is worth 16 points out of 100 total points in the class. Please type or neatly write your solutions. Submission will be in .pdf form. Points will be given for correct work and correct solutions.

Learning Objectives

1. Think about the utility and challenges associated with underwater robotics.
2. Demonstrate understanding of basic navigation.
3. Think about the tradeoffs of different marine systems.

Submission Instructions

- Create a single .pdf file with your solutions for all the sections.
- Ensure that your .pdf contains all explanations and images for the 5 questions.
- Submit to Canvas using the proper assignment link by the date specified in the course schedule.

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1 Underwater Robotics Challenges [4 points]

In lecture we discussed many challenges associated with having a robot under water. Name four challenges and explain them in one sentence each.

2 Navigation [2 points]

Is gravity constant around an ellipse that approximates the shape of the earth? Answer and explain how this affects marine navigation in two sentences.

3 Physics [2 points]

You have just finished making a basic submarine robot (not a sea glider) meant to move along the sea floor. Unfortunately the vehicle will not stay level under water despite attempts to right the vehicle using steering and propulsion. Why is this occurring? How could you fix this? Answer each of these in one sentence.

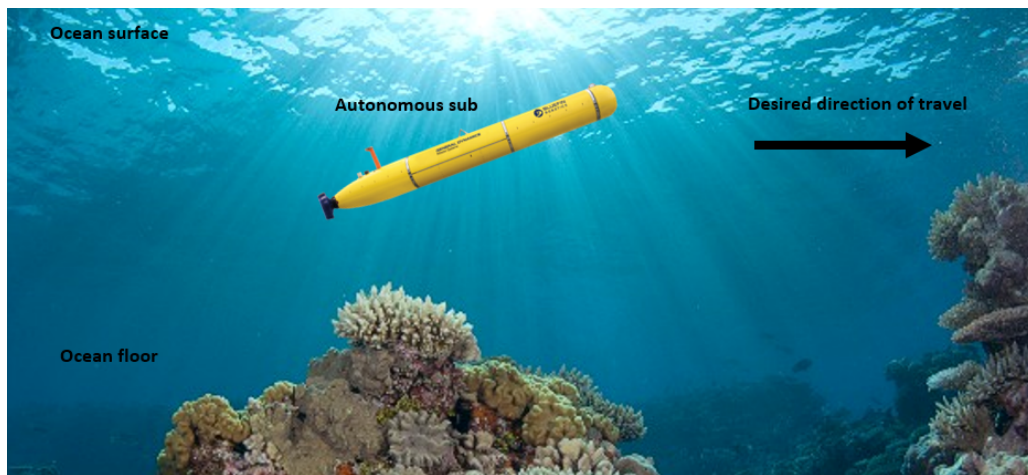


Figure 1: Robot orientation when submerged. Images from CNN and Bluefin Robotics.

4 Platform Selection [5 points]

You have joined a team of scientists studying volcanic deposits on the sea floor. You are tasked to design a robot that can dive to a depth of 50 to 100 meters, pick up small pieces of debris, and bring it to the surface. Choosing among some of the crafts we looked at in class (surface vessel, sea glider, remotely operated vehicle, autonomous underwater vehicle) which would you select for this job? Provide an image of a robotic craft already in existence and explain how it may have qualities that you would want to emulate. Answer this section with three sentences and one image.

5 Localization [3 points]

A new mission requires a robot that is able to map at a depth of about 5,000 meters. Describe one method of localization that could be used for this robot. Include one positive and one negative attribute of this method. Answer this section in three sentences.