Team 4

Section 2

Project Description:

Motivation for pursuing this project is to be able to map the ocean floor depths, which can provide useful information to others who are doing ocean exploration experiments or people who are interested in the topography of the ocean floor for biological reasons. A goal for our robot is to have it map the ocean floor first without an object in its path and then with an object in its path. Comparing these two maps will allow us to find objects underwater, which has shipwreck finding and ocean floor mapping applications. The height of the box that the robot reads will tell us how accurate our sensors are. In addition to the IMU, GPS, and motors already on the robot, the autonomous underwater vehicle will have the following three sensors:

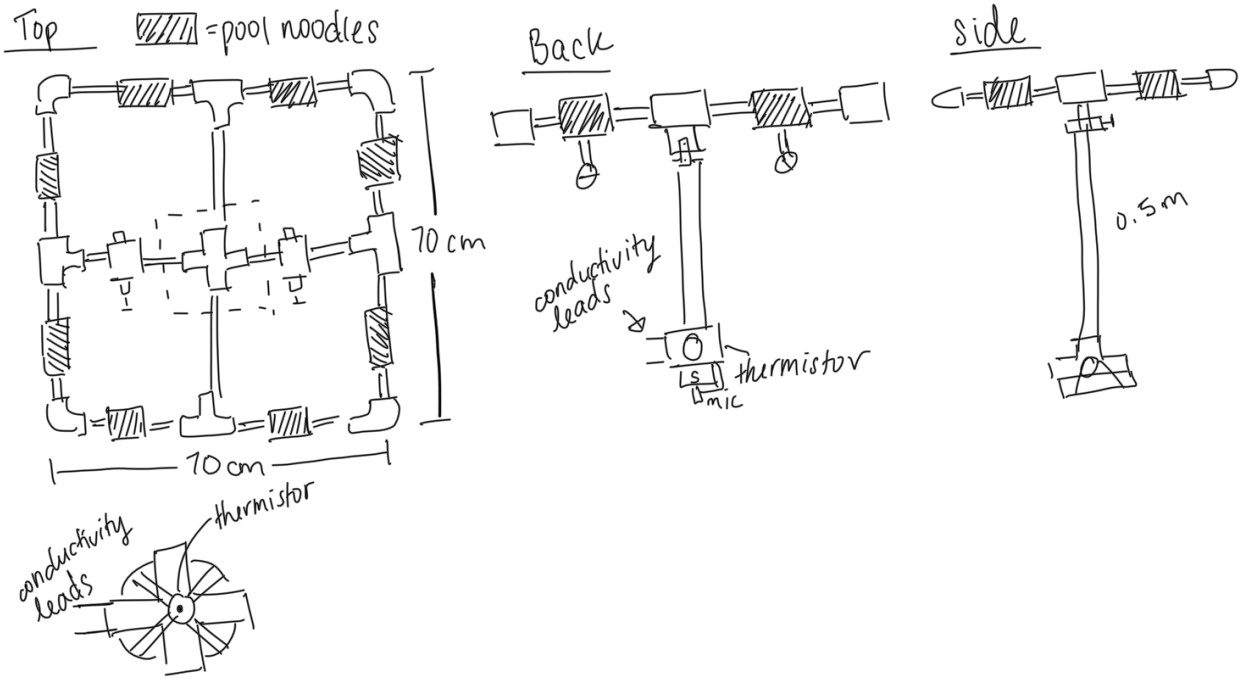
- Time of flight range finding speaker/microphone: This sensor is meant to collect data that will tell us how long it takes for the speaker signal to reach the microphone. If we know how long it took the signal to travel and how fast the signal travelled in the water, then we are able to figure out the distance the signal travelled. Once we know multiple distances along a path, we can then infer the changes in the depth along that particular path. The Teensy will need to provide the speaker with a square wave of a specified frequency. We will also make use of a bandpass filter in order to zero in on the frequencies we are going to output.
- Temperature sensor: The purpose of the thermistor is to record the temperature of the water at the location of the time of flight range finding sensor. Because the temperature affects the speed of sound in water, we must know the temperature at each location to know what the speed of sound is. Additionally, knowing how the speed of sound changes with temperature can also help us map the ocean temperature.
- Conductivity sensor (salinity measurements): Because the speed of sound in water is also affected by the salinity in the water, we will use this sensor to help us determine the conductivity of the water, which can then be converted into a salinity measurement.

One project alternative that we considered was a diving AUV equipped with light intensity and pressure sensors that could be used to determine the turbidity of the ocean at different depths. This would produce useful measurements if we were interested in the effects of pollution at different ocean depths.
Another set of sensors that we could put on a column like AUV are a variety of temperature and pressure sensors. This robot would allow us to map temperature and pressure at different depths for any given location.
We also considered creating a robot that would measure salinity at different vertical distances from the robot. The data collected from the conductivity and temperature sensors could help us map the salinity of the ocean surface.
In addition to the three alternatives above, we considered a design similar to our current design but without the hinge that was attached to the robot carrying the speaker, microphone, temperature sensor, conductivity sensor.
Our final design alternative we considered was finding the velocity of the robot as a function of the salinity, turbidity, and pressure.

Budget:

Description/Use	Part	Price	Quantity	Price + tax	Shipping	Total
Conductivity Amplifier	TL081	0	2	0	0	0
Temperature sensor	Thermistor	0	1	0.00	0	0
Speaker	DAEX25W	18.8	1	20.59	6.95	27.54
Microphone	CME-1538-100LB	3.65	1	4.00	4.99	8.64
Capacitors for Filter	BC5223CT-ND	0.15	10	0.16		1.49
					Grand Total:	37.666

Mechanical Schematic:



Weight Calculations:

Type	Number	PVC Diameter (in)	Weight (g)	Total Weight
50 cm length	1	1/2	124.3	124.3
30.5 cm length	10	1/2	76.5	765
13 cm length	4	1/2	32.3	129.2
tees	9	1/2	33.7	303.3
corner	4	1/2	23.8	95.2
cross	1	1/2	37.8	37.8
20 cm floaties	8	N/A	2.72	21.76
			Grand Total:	1476.56

Circuit Schematic: