VDR 3 Report

Team 520

John Baumann, Malik John Baptiste, Natalie Boggess, Cody Carlson, Megan Jadush, Anders Snell

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**1. Current State**

From the beginning of the semester, Team 520’s advisor, Dr. Clark, has continuously emphasized the importance of ordering and testing cheaper sensors. The team has taken this advice and has ordered multiple parts that will be necessary in the selected design to include an inertial navigation system (INS), two 2D angle sensors, a barometer, a level converter, and cables to ensure all sensors are compatible with an Arduino. The team has currently received the INS and the pressure gauge. Testing was performed on the INS and raw data was able to be collected using a secure digital (SD) card. The team is waiting on the Japan Solderless Terminal (JST) cables to arrive to begin testing the barometer. The team has also been able to pull off data from the Garmin GPS 78, the current GPS that Dr. Rassweiler is using, and will use this to compare to the INS. The remaining sensors that were previously mentioned will be picked up and implemented into the 3D prototype prior to VDR 3.

**2. Forecast**

Team 520 will use algorithms/code to get useful information out of our current INS. Then we will test the INS against its current product specifications. The question is then, Is the product accurate enough to do the job? If not, is its accuracy comparable to product specifications? If so, should we order a nicer INS from the same or similar company in hopes that it will be accurate enough to work for our project based on the new INS specifications. Once a suitable INS is selected the team will begin working on waterproofing the system.

Simultaneously, Team 520 will be testing the 2D angle sensors previously acquired. We will be working to see if this is appropriate or if a 3D angle sensor should be ordered and used. To incorporate the angle sensors in a useful way the team will need to find a way to stabilize the surface device they are attached to using gyroscopic stabilization. Another option is to incorporate a level on the surface device that can communicate with the angle sensors to get accurate diver location data. After this the team will need to look at waterproofing the angle sensor system.

Next the INS and angle sensor system will be integrated together. Once this is complete the whole system will be tested first in shallow pools, then deeper sections, and possibly in the ocean.

**3. Potential Problems**

There are several predicted obstacles coming up as this project continues. This system depends on the integration of data from multiple different sources including the INS, the angle sensor(s), the pressure gauge, and the GPS. They each have their own set of errors, and the hope is that the errors will mostly cancel each other out to get the most accurate location possible but there is also the potential of them propagating each other and making the error extremely high. There is also the issue of synchronizing the clocks of each device above and below the water since the time will be very important in finding the precise location.

There are also several potential errors that need to be considered regarding the location of use. One of these is that the device will be used in salt water so the potential of corrosion over time needs to be considered when picking parts and materials. The underwater parts are also going to be attached to the diver, so that subsystem needs to be small enough to not be a hinderance and needs to stay as stationary as possible to not add an additional variable in the orientation and angle of the rope. The device is also being used by a researcher who already has several pieces of equipment he is utilizing during his dives, so the goal is to make the system’s setup time as short and simple as possible.