Like in the animal kingdom, the world of unmanned systems has vehicles for land, sea, and air. The unmanned aerial vehicles (UAVs) have the largest piece of the pie when it comes to research dollars. The unmanned ground vehicles (UGVs) take the next largest piece, which leaves the vehicles of the sea, including unmanned surface vehicles (USVs) and unmanned underwater vehicles (UUVs), splitting the smallest piece of the research funds. As a result of this division of research, UAVs and UGVs are leading the way in terms of autonomous capabilities. This project intends to provide some progress in the realm of UUV autonomy with a particular task at its core.

The Center for Marine Biodiversity & Conservation (CMBC) is a part of the Scripps Institution of Oceanography. This organization does underwater research all over the world. Often the research involves the emplacement of underwater sensors, which will collect data for years at a time. There are many problems with such long emplacement times. The most obvious problem is the lags in analysis and further progress while waiting on sensor data. Also, if a sensor breaks while emplaced, the researchers will not discover the problem until they finally retrieve the sensor and attempt to download the data.

There is great potential here for a semi-autonomous UUV to navigate to the sensors and download the data. Depending on the breadth of the sensor field, the UUV could do these sweeps monthly, weekly, or potentially even daily. This will provide the researchers a steadier stream of data to work with and therefore allow for much more flexibility to alter aspects of the experiments.

The vehicle that I propose using for this project is called the Stingray. This vehicle is owned and maintained by a non-profit organization called San Diego iBotics Student Engineering Society (SD iBotics). The vehicle was originally designed for use in the Association for Unmanned Vehicle Systems International (AUVSI) International Autonomous Underwater Vehicle Competition and is well suited for such a project. Also, I am currently working with the iBotics team in preparation for the 2009 AUVSI Competition, so there may be some overlap of resources and progress.

The near term goals for this project will be to compare different navigation techniques, including vision-based navigation and the use of underwater GPS systems. The Stingray already has the vision-based navigation infrastructure, so I will focus on how to use vision for navigation in open water and how to incorporate underwater
GPS solutions into the navigation planning. I will also research other sensors that may aid in navigation. One necessary step to prepare for this will be to create a simulator for the platform in order to do navigation tests in the lab.

The size of this project in its entirety is outside the scope of a one-quarter course. However, I think that I can make strides in preparation for future efforts that will be worthwhile to the unmanned vehicle community.

References


