

DESIGN AND IMPLEMENTATION OF AN EMBEDDED SENSOR NETWORK FOR THE OBSERVATION AND RESEARCH OF HARMFUL ALGAL BLOOMS IN SOUTHERN CALIFORNIA COASTAL WATERS.

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Abstract:

Harmful algal blooms (HABs) are an active area of research along the western coast of the United States and are of large concern for coastal communities in southern California. Predicting when HABs will occur, as well as where they will travel, is an essential part of managing and protecting our coastal environment. To this end, we present ongoing research focused on the design, procurement and analysis of oceanographic data by use of a sensor network, cyberinfrastructure and aquatic, mobile sensor platforms.

Freewave radio modems form the base of our sensor network. They are a minimally-intrusive wireless communication infrastructure that we installed throughout the southern California coastal region. This communication tool allows for rapid and cost-effective data transfers from our sensing platforms such as moorings, HF radar stations and Autonomous Underwater Vehicles (AUVs).

In addition to sensor platforms and communication infrastructure, we also discuss the incorporation of ocean modeling and prediction tools. Collaboration between researchers at the University of Southern California (USC) and the Jet Propulsion Laboratory (JPL) provides the opportunity to utilize a sophisticated ocean model to assist in predicting the movement of HABs and gathering data to help predict future occurrences.

All of the previously mentioned pieces fit together to create a technology chain that has led to the development of an innovative algorithm to design sampling missions for AUVs. Such intelligent mission planning is required to maneuver a vehicle to high-valued locations within a HAB for data collection. The *in situ* data collected can then be transferred via Freewave radios to be assimilated into the ocean model to increase the skill of future predictions.

We present the algorithm, generated sampling missions, and experimental results demonstrating the effectiveness of the sensor network as well as the designed sampling plan.

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