

Real-Time Water Quality Monitoring Using Unmanned Surface Vehicle with Automated pH Index Mapping

Alexander T. Demetillo^{1,2,*}, Evelyn B. Taboada¹

¹ *School of Engineering, University of San Carlos, Talamban, Cebu City 6000, Philippines*

² *College Engineering and Geosciences, Caraga State University, Butuan City 8600, Philippines*

[Email: atdemetillo@carsu.edu.ph](mailto:atdemetillo@carsu.edu.ph)

Abstract: Most of the developing countries depend on conventional water quality monitoring methods, which are usually expensive, complicated, and time-consuming. In recent years, stationary and portable water quality monitoring and a mobile surface vehicle have increased the utilization of on-site water measurements and monitoring. The previous has a problem of a small coverage area while the latter has its cost and operational complexity. This paper addresses these issues by placing an unmanned surface vehicle with catamaran type for measurements of water parameters in water bodies. The parameters are water temperature and pH. The data are transmitted wirelessly to a remote place or adjacent station where they are archived or processed immediately for real-time display of parameters. Some pre-processing is needed in order to remove disturbances, drifts, or reject incorrect data. During testing, all captured data like water quality parameters, location, and other essential parameters were collated, processed, and stored in a database system. It can view relevant information on a website by a graphical format. It also tested the USV to conduct an unmanned water quality measurement using the pre-inputted navigation route, which shows a good result in navigation and transmission of data. Data acquisition is very comfortable and much faster than manual sampling. Using the acquired data, it is possible to perform a high-resolution map illustrating changes of selected water parameter in an aquatic area or an instant pH intensity map. The elaborated measurement platform is a basis which can be easily modified, developed, and adapted to a system with full positioning and sampling autonomy. Water bodies with calm water such as lakes and rivers can use this USV, in a stand-alone mode or part of a networked sensor system.

Keywords: water quality monitoring, pH, USV, pH mapping