International Journal of Engineering Research and Technology. ISSN 0974-3154 Vol.13, No.4 (2020), pp. 802-806

Proposal for a Robotic Platform Design for the Control and Monitoring of Physicochemical Parameters in Contaminated Water

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Abstract

This article purpose is to describe the investigation carried out to design a robotic submersible platform for taking samples of contaminated water. This endeavor undertook a review of the actual robotic technologies used for aquatic exploration focusing the attention on low-cost designs. In recent years, the use of robotics is changing the approach to assess and control the impact that pollution is generating as a result of the human's industrial activities and modern life. Technology is helping to create a breakthrough in environmental management processes in a world more aware of the consequences of human activities and more concerned of making a change; for this reason, this research aims to outline a solution that could help the environmental regulatory agencies by providing a cost effective solution for monitoring levels of pollution in a safe manner, and ultimately could impact positively in the communities next to bodies of water, such as rivers or lakes, that are affected by a poor pollution.

Keywords: Robotic platform, programming language, engineering, competences, assisted design.

1. INTRODUCTION

Sampling and monitoring water bodies are a highly time and effort consuming tasks that involve taking a lot samples over a widespread areas, and try to make sense of the information of pollution, which is indeed statistically difficult to model, due to its intrinsic changing conditions. Robotic technologies for collecting pollution data is a field that is continuously growing and reaching new heights [1]. The possibilities that these technologies can provide are allowing to cover vast areas in oceans, rivers and other environments, and comprising a large amount of parameters that can be monitored, such as temperature, pH, salinity, oxygen, oil traces, chemical plumes, toxins, and much more, with an unprecedented resolution and area coverage that can go from surface to deep water applications.

For the present investigation, the Fucha River was selected since is one of the most contaminated tributaries of Bogota River. This river runs for 12.5 kilometers from the El Delirio Forrest Reserve, located at the eastern hills of Bogota City, connecting various urban ecosystems and highly populated urban areas, until it reaches the Bogota River. The ecosystems found in this body of water include a variety of local and migrant bird species in an environment with a deep anthropogenic impact in terms of pollution and deterioration of physicochemical. Since 2010, different government and non-government organizations have been proposing a number of projects to intervene and decontaminate the Fucha River. Nevertheless, these efforts have not provided sufficient data to support the implementation of the proposed plans creating a lot of controversy about some of them, for instance the one to create a linear park alongshore of the river. The need for collecting reliable information to device effective plans for resolving the environmental problems of this river, motivated this project initiative for developing and designing such tool.

Monitoring pollution in this river is not easy due to the amount of contamination sources causing water conditions variations in time and location. A possible solution for sampling and monitoring may consist of implementing measurement stations along the river, but this approach requires a large number of sampling stations to each of the parameters and sites to be evaluated, making it quite difficult to execute, from the cost impact and infrastructure perspectives [2]. In order to take data in a more flexible and cost effective way, the use of mobile sensors with wireless communication capabilities seems to be