A vehicle design for submarine observation

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1. Initial objectives

This project proposes the development of a low cost ocean observation platform, a hybrid between AUVs and ASVs to move on ocean surface and perform vertical immersions to obtain water column profiles in accordance with previously established plan. These two observation platform features would lower the production costs and would increase its efficiency. The development of the required technology is proposed for a longer autonomy at the sea, as well as for transmission of observation operations carried out and diagnosis of the platform. Finally, the assimilation of data collected by the platform is considered in a coast simulation model for a joint coast predictive system that will help in the management of marine environment.

2. Present state of the project

2.1. Mechanical design

Taking into account that the present design is a first prototype that would be modified in future, a mechanical design composed of a support structure on which the direction and propulsion engines will be coupled, is proposed. This structure is not watertight and allows any other mechanical operations.

Inside the support structure, a watertight cylinder module is coupled that contains an immersion actuator and control electronics as well as power supply batteries.

2.1.1. Support Structure

As we can see in figure 1, the support structure is built of a 1.2 meters long and 32 cm exterior diameter PVC cylinder. On this structure, a propulsion motor with a 110N drive and a 250W maximum power, is coupled. On the sides of the cylinder, two motors with drive of 24N and a maximum power of 80W, are coupled. The bow is covered by a carbon fiber semi-sphere.

2.1.2. Watertight module

As figure 2 shows, the watertight module contains the immersion and emerging group, the electronic modules for motor control and signal reception and power supply batteries. This module is coupled to the watertight PVC cylinder through a metal structure.

2.2. Electronic design

The development of the control system of the propulsion, direction and immersion engines is based on two stages.
2.2.1. Manual control stage
In this stage, the control is carried out manually by transmission of propulsion, direction and immersion commands from a land station to the vehicle through a radio control equipment.

The objective is the study and characterization of dynamic behavior of the vehicle in the marine environment in order to obtain the necessary parameters for future development of the autonomous control.

3. Tests
At present, the correct functionality of the manual control system shown in figure 4 has been tested, waiting to be assembled inside the watertight module.

4. Specifications
Weight: 73 kg
Exterior diameter: 320 mm
Length: 1885 mm
Maximum depth: 20 m
Estimated velocity: under study
Power supply: Ni-Cd batteries
Autonomy: under study
Navigation: GPS
Data acquisition and processing: PC 104
Communication: Radio modem

5. References
http://www.webbresearch.com/electric_glider.htm