MANATI. MODULAR UNDERWATER VEHICLE FOR CONTINUOUS OPERATION

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Abstract – *Autonomous Underwater Vehicles (AUV) are a highly versatile survey solution for ocean monitoring. In the framework of INNODRAVAL project, the Manatí AUV has been specially adapted to be used as a tool for water quality monitoring of dragging environments. Its modular design allows for rapid sensor reconfiguration and battery replacement. The vehicle is based on "open source" components to ensure low costs and the opportunity of future enlargements using own technology.*

Keywords – *AUV, environmental monitoring, water sampling, cost-effective technology*

I. AUV MECHANICAL AND PAIDLOAD DESIGN

With the aim of providing the decision makers with innovative tools to be applied in the management of dredging operations, we have developed a mobile platform with several sensors which measure the impact of those operations in the marine environment. The MANATÍ AUV is lightweight and easy to use, with a highly configurable modular structure, whose batteries and internal components can be easily replaced on mission without putting on risk the sealing conditions.

It has a fiberglass shell composed of assemblable parts. The shell's interior gets flooded when the vehicle submerges, hence, flotability is not affected. The external profile has been conceived for hydrodynamic and structural strength and protection of the rotors from direct exposure to objects. The profile has proven its reliability by computacional tests of fluid dynamics (CFD).

Internal components are located in watertight boxes of PVC for ease production and maintenance operations. The propulsion system (magnetic coupling thruster system and hydraulic buoyance system) has been developed entirely seeking optimum performance at a cost effective.

Fig. 1. Explode design

Several versions for the AUV bow have been tested, which permits to configure it for several different functions: sampling, monitoring of hydrographic parameters, video recording, side scan sonar or simply navigation.

The acquisition module comprises a carousel with six 175 ml sampling tubes. The carousel system can be opened and closed through servomechanisms. Another configuration features a multiparametric SBE37 probe integrated in the bow, and accompanied by a single sampling tube. A third design has an illumination system and a webcam to get underwater images. The webcam is protected in a sealed Perspex window. Finally, to be able to use the side scan sonar, the original profile of the navigation bow is kept and the sonar is housed in the bottom of the AUV body.

II. ELECTRONIC AND SOFTWARE DESING

The main computer consists of a ARM cortex A8 operation at 700 MHz with an operative system Debian GNU/LINUX. The connexions of the peripheral devices and the vehicle control are centralized in the sensor board. Eight packs of high-energy capacity and low-weight lithium polymer batteries supply two independent power lines at 24V and 12 V, which are distributed through a powerboard. Communications include an Ethernet cable connection and several different-range radiofrequence systems: Wifi, XBee, GPRS, Iridimum. These systems enable the sychronization with a database on a remote server when the vehicle emerges. The storage of bulky data such as video or sonograms can be done on a SD card of 8Gb.

The control system in programmed in Python. This programming language is easy to use and presents a number of features which are particularly suitable for this project, like multiprocesing easy programing or an a large repository library covering a wide range of functionality.

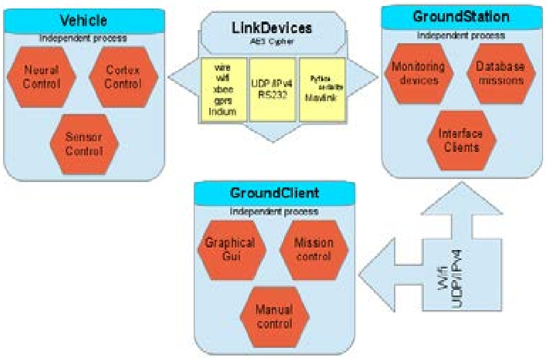

Fig. 2. Main architecture desing

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