A New Design of AUV for Shallow Water Applications: H160

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A New Design Of AUV For Shallow Water Applications: H160

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ABSTRACT

This paper focuses on the design and control of a new Autonomous Underwater Vehicle (AUV) named H160. The first prototype of this AUV has been designed through a collaboration of two partners, which are the LIRMM laboratory and ECA-HYTEC company. We present an overview of this project regarding the development of this vehicle including the software and hardware architecture, modelling and control. In addition, the first experimental results relying on real experimental conditions are displayed and commented.

KEYWORDS

AUV, Vehicle description, Shallow water, Sea trials.

INTRODUCTION

Underwater robotic vehicles are helpful equipment for scientists to explore oceans and seas. Many examples have revealed that ROV (Remotely Operating Vehicle) and AUV are used for diverse applications such as inspection, object recovery or surveys. We can distinguish a "depth limit" for the different types of existing AUV. Indeed, from about 300 meters, the structure, the dimensions and the characteristics of these vehicles change. On the one hand, the AUVs specified for deep water, as for example Hugin 3000 from Kongsberg Simrad, Sea Oracle from Bluefin Robotics and Alistar 3000 from ECA, have a maximum depth of 3000 meters, a high autonomy, non-negligible dimensions and a weight that requires a heavy logistic. On the other hand, some AUVs (Remus from Hydroid, Gavia from Hyfmind) with less autonomy, reduced dimensions, more modular parts and a reduced logistic, are the perfect tool for the investigation of shallow water.

In the context of partnership between the LIRMM (Montpellier Laboratory of Computer Science, Robotics and Microelectronics) and the french company HYTEC (specialist in the design and manufacture of remote controlled systems in "hostile" environments), the first prototype of AUV H160 has been developed. In 2004, our original choice was positioned on a small vehicle with a 2 to 4 knots forward speed for 3 or 4 hours mission duration, with a reduced logistic. This prototype has been developed in the purpose of navigation and positioning with dead reckoning data and GPS fix. At the surface, the torpedo should be able to transmit trials data to our missions' computer. The desired applications are inspection, survey, bathymetry measurement, acoustic image acquisition, videos or still biology missions in shallow water and also the possibility to navigate within 1 or 2 meters depth (lagoon, lake) with a near zero pitch angle.

Different components of H160 are detailed in the next section of this paper including sensors, mechanical structure and software architecture. Section 3 briefly describes the model and the control law of the vehicle. Furthermore, different sea trials relying on real missions are displayed in section 4. At last, section 5 concludes this work and proposes some issues in order to improve both the control and hardware architecture.

VEHICLE DESCRIPTION

H160 is a small size and low cost torpedo-shaped AUV dedicated for shallow water applications, up to 160 meters. The dimensions of the vehicle can be resumed as 1.8 meters long for a 0.2 meters diameter with a weight of 60 kg (Fig.1).

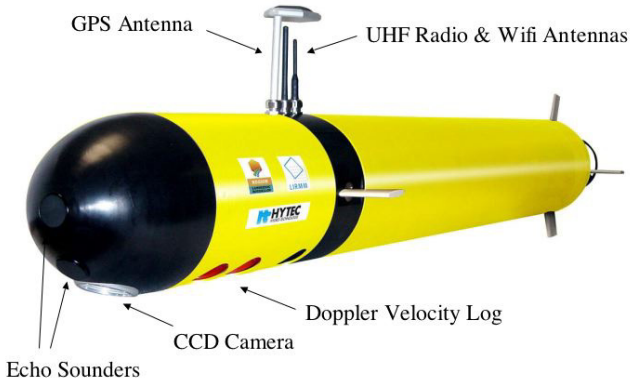

Fig.1: Sensors equipment (without Sidescan Sonar and CTD Sensor)