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Autonomous Underwater Vehicle [AUV's]

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Abstract

This paper describe general overview of design and use of autonomous underwater vehicle and the function of [AUV'S] On the earth there is 70% of water is present and the less part is almost is 30 % is land. To better understand the part of underwater system in comparison to the dry land .this AUV system is invented. The development of AUV'S is for to better understand the underwater environment, research, accurate details, mapping of obstruction rocks, underwater survey mission etc. The autonomous underwater system have a large wide range in geosciences and large scope in underwater science and this is why the reason for the development of AUV,S

Keywords~ autonomous underwater system

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INTRODUCTION:

An AUV'S is an underwater vehicle and robot that travel underwater without require input from operator and capable of self propulsion .The AUV'S constitute part of large group Of undersea system commonly known as unmanned underwater vehicle. The AUV is a robotics devices that is driven through the water by the propulsion system.

The AUV was develop. In 1957 at the university of Washington .AUVs are now Being used for a wide range of application including oils and gas industry research military The application of this AUVs Is increase day by day .so it is better to use this application because these AUVs smaller and flexible vehicle as much as possible

There is no of different designed have been designed for the AUVs application .Hundred of different AUVs have been designed over the past 50 or so years,[1]but only a few companies sell vehicles in any significant numbers. there are around 10 companies sell AUVs to large diameter on international market ,including KongsbergMaritime[12],Blue finRobotics, TeledyneGavia(previously known as Hafmynd0,International Submarine Engineering (ISE) Ltd,AtlasElektronik,andOcean Scan.[3] Vehicles range in size from portable lightweight AUVs to large diameter vehicles of over 10 meters in length.

Vehicle Design

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Fig.1 Bluefin-12 AUV

Developer / manufacturer : bluefin robotic

Commercially available AUVs include various designs, such as the small REMUS 100 AUV originally developed by Woods Hole Oceanographic Institution in the US and now produced commercially by Hydroid, Inc. (a wholly owned subsidiary of Kongsberg Maritime[16]); the largerHUGIN 1000 and 3000 AUVs developed by Kongsberg Maritime and Norwegian Defence Research Establishment the Bluefin Robotics 12-and-21-inch-diameter (300 and 530 mm) vehicles and the International Submarine Engineering Ltd. Most AUVs follow the traditional torpedo shape as this is seen as the best compromise between size, usable volume, hydrodynamic efficiency and ease of handling. There are some vehicles that make use of a modular design, enabling components to be changed easily by the operators.

The market is evolving and designs are now following commercial requirements rather than being purely developmental. Upcoming designs include hover-capable AUVs for inspection and light-intervention (primarily for the offshore energy applications), and hybrid AUV/ROV designs that switch between roles as part of their mission profile. Again, the market will be driven by financial requirements and the aim to save money and expensive ship time.

Today, while most AUVs are capable of unsupervised missions, most operators remain within range of acoustic telemetry systems in order to maintain a close watch on their investment. This is not always possible. For example, Canada has recently taken delivery of two AUVs (ISE Explorers) to survey the sea floor underneath the Arctic ice in support of their claim under Article 76 of the United Nations Convention of the Law of the Sea. Also, ultra-low-power, long-range variants such as underwater gliders are becoming capable of operating unattended for weeks or months in littoral and open ocean areas, periodically relaying data by satellite to shore, before returning to be picked up.

As of 2008, a new class of AUVs are being developed, which mimic designs found in nature. Although most are currently in their experimental stages, these biomimetic (or bionic) vehicles are able to achieve higher degrees of efficiency in propulsion and maneuverability by copying successful designs in nature. Two such vehicles are Festo'sAquaJelly (AUV)[18] and the EvoLogics BOSS Manta Ray.[19]

Sensors

Fig 2 Parts of AUV.

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AUVs carry sensors to navigate automatically and map features of the ocean. Typical sensors included compasses, depth sensors, magnetometers, thermistors and conductivity probes . Some AUVs are outfitted with biological sensors including fluorometers etc. (also called as chlorophyll sensors), turbidity sensors, and sensors to measure pH, and amounts of dissolve oxygen.

A demonstration at Monterey Bay in California, in September 2006,it show that a 21-inch (530 mm) diameter AUV can tow a 400 feet (120 m)-long hydrophone array while maintaining a 6-knot (11 km/h) cruising speed.

Navigation

Radio waves cant penetrate water very far, so as soon as an AUVs dives it loses its GPS signal. so, a standard way for AUVs to navigate underwater is through dead reckoning. Navigation can however be improved by using underwater acoustic positioning system. When operating within a net of sea floor deployed baseline transponders this is known as LBL navigation. When a surface reference such as a support ship is available, ultra-short baseline (USBL) or short-baseline (SBL) positioning is used to calculate where the sub-sea vehicle is relative to the known (GPS) position of the surface craft by means of acoustic range & bearing measurements. To improve estimation of its position, and reduces errors in dead reckoning (which grow over time), the AUVs can also surface and take its own GPS fix. Between position fixes and for precise manoeuvring, an Inertial Navigation System on board the AUV calculates through dead reckoning the AUV position, acceleration, and velocity. estimates can be made using data from a Inertial Measurement Unit, and it can be improved by adding a Doppler Velocity Log (DVL), which measures the rate of travel over the sea/lake floor. Typically, a pressure sensor measures the vertical position (vehicle depth), although depth & altitude can also be obtained from Dopper velocity log measurements. These observations are filtered to determine a final navigation solutions.

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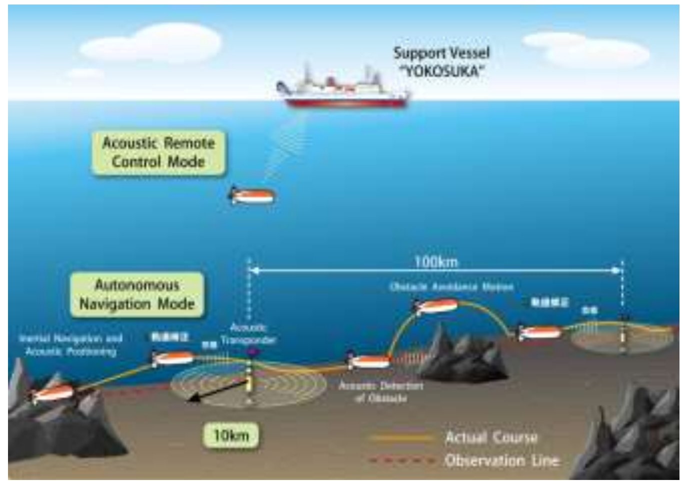

Fig 3 The Concept of The Navigation Modes

Propulsion

a couple of propulsion techniques for AUVs. Some of them use a brush-less electric motor, gearbox, Lip seal, and a propeller which may be surrounding by a nozzle or not. All of these parts embedded in the AUVs construction are involved in propulsion. Other vehicles use a thruster unit to maintain the modularity. Depending on the need, the thruster may be equipped with a nozzle for propeller collision protection or to reduce noise submission, underwater gliders do not directly propel themselves. by changing their buoyancy and trim, they repeatedly sink and ascend; airfoil "wings" convert this up&down motion to forward motion. The change of buoyancy is typically done through the use of a pump that can take in or push out water. The vehicles pitch can be controlled by changing the centre of mass of the vehicle. For Slocum gliders this is done internally by moving the batteries, which are mounted on a screw. Because of their low speed and low-power electronics, the energy required

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to cycle trim states is far less than for regular AUVs, & gliders can have endurances of months and transoceanic ranges.

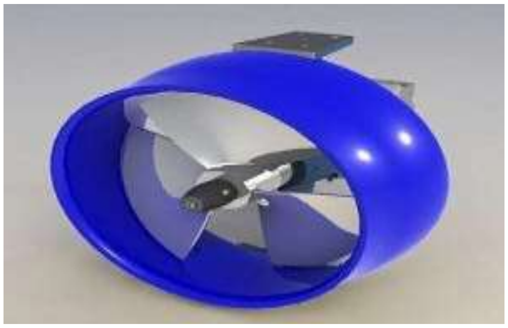

Fig 4 Propulsion (img from google**)**

Application

Autonomous robots not only present in the next great milestone for science, but their practical uses span a wide range. In particular, AUVs are being used to explore underwater environment, mines clearing operation. Another area where these AUVs are in monitoring and maintenance tasks in environment where hazardous for humans . For example, monitoring and cleaning the inside of a nuclear reactor vessel is a situation that is dangerous for human divers but not for AUVs.

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