CHRONOLOGY OF UNDERWATER VEHICLE

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Abstract: Nowadays, Autonomous underwater vehicle have been used in wide range of application in military, commerical, scientific and in other sectors too. The underwater vehicles are used in different condition of operations and their suitability for studying the deepest hydrothermal vent in polar region of the world and ecosystem of ocean. They provide high resolution seafloor mapping data of ocean and deep water life. The main focous of developing these vehicles are in the field of advance geoscience and mapping.

Keyword: Autonomous Underwater Vehicle, Sea-gliders, Technological development of AUV.

I. INTRODUCTION

The earth's surface is covered by oceans, which cover 71% of the surface of the earth and remaining 29% is land. These underwater vehicles are broadly classified into 3 types; a). Remote Operated Vehicle. b). Unmanned Underwater Vehicle. c). Autonomous Underwater Vehicle.

Remote operated vehicles which are tethered. The vehicle's power, communication are controlled manually by remote operator above the water surface. Whereas the second type known as Unmanned underwater vehicle are sub-classified into military and non-military based on the application in which these are very supportive for gathering the information and mapping data deep below the water. The third type is Autonomous underwater vehicle in which it contains an on board system which is preprogrammed to controls itself and achieve the required task.

CHRONOLOGY OF AUTONOMOUS UNDER WATER VEHICLE (AUV) DEVELOPMENT

1.1 From 1950-1970:

Technologies have been developed over the period of time to explore the potential of these underwater vehicles for a specific application. From the major classification the first underwater device (AUV) was developed at the APPLICED PHYSICS LABORATORY in the USA in 1957 by Stan Murphy, Bob Francoi's and later developed by "SPECIAL PURPOSE UNDERWATER RESEAECH VEHICLE (SPURV)". Here on they used these vehicles to study the diffusion, acoustic transmission, and submarine wakes to gather data from the Arctic regions [1].

Later on the University of New Hampshire's Marine System Engineering Laboratory had started developing the EAVE (also called as open frame AUV) under the support of US Navy's facility in San Diego. Eventually by the time many other institute such as Institute of Marine Technology problems (IMTP), Russian Academy of Science (RAS) had begun their interest on solving the problems of the AUV and developing them. By the time in 1974, a group a scientists from the institute of Automation and Control Processes, who are far from the Eastern Scientific Centre of Academy created AUV as "SCAT". They further undertook major interest on "SCAT" development and research processes which resulted in introducing AUVs "L1" and "L2" on the basis of knowledge and experience. "L1" was used for testing and developing new technologies, which could be used for modifying and advancement of the present AUVs. "L2" was used for oceanographic mapping and data collection [2].

1.2 From 1970-1990: Development over the prototype.

In these two decades, there were developments in the technology of AUVs. In 1983 The Department of Defense and Canadian Hydrographic Service in collaboration with "International Submarine Engineering" for developing Autonomous and Remote Controlled Submarine (ARCS). Then the AUV called First Dive was developed in 1987, this device was using Motorola 32-bit processor, which allows the user to control and monitor in the real time application and also it has its self-mode operation. It even can operate underwater for 15-30hours (3). Thus, the ARCS had been successfully used as the test platform and other new technologies were also developing alongside such as communication system, navigation system.

In 1980, the first "International Symposium on unmanned untethered submersible Technology" was held at USA in Durham New Hampshire. Out of which nine countries were represented in this event. Over 24 Technologist, more than 120 companies, 20 federal agencies and 20 Universities attended this meeting. In USA,

for research programs and development, significant amount of funds were given for building the prototype of AUVs (4).

1.3 From 1990-2010;

In 1995, Henry Stommel and Doug webb had brought a new idea about "gliders". And nowadays these ideas are embodied in various models of underwater gliders. This new idea made a change in the AUV history; these gliders have capacity of gliding in underwater by using surface control and can stay underwater over number of weeks and months. And these vehicles are part of the AUV under autonomous buoyancy driven underwater gliders. Surface controls (as in fins to fishes) are used to stabilize and attain smooth drive movements (5).

In 1999, the company called iRobot produced sea-gliders which were made of aluminum; buoyancy of the device was controlled by small pump inside it. These sea-gliders have very high maneuverability and high cruising range about 4600milies (6). Further these "sea-gliders" were modified into "deep-gliders" by the end of 2006. There was an ambitious projects of underwater gliders knows as "SLOCUM" gliders and this was developed for the tracking paths and data analysis underwater. The SLOCUM gliders are further modified into "SLOCUM ELECTRICAL" and "SLOCUM THERMAL". Each of these gliders are designed for different applications (6).

SLOCUM Electrical works similar to the principle of the sea-gliders. It is controlled by means of hydraulic system of its buoyancy. It has a antenna for communication and navigation which is located at vertical stabilizer (tail).SLOCUM Thermal has a new buoyancy control technique, it uses thermocline effect for buoyancy changing in which ethylene glycol is used for changing temperature which results in vehicle buoyancy.
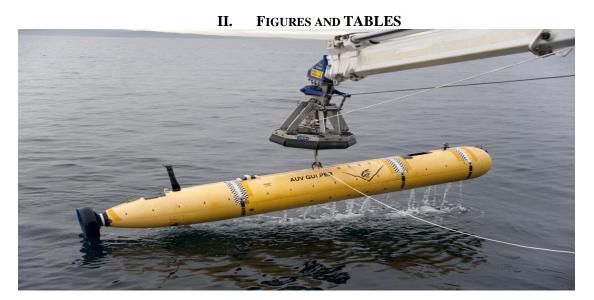
From 2010 to future

By the end of 2010, these AUV got classified again under the basis of size such as mini-AUV [mass less than 100kg] and micro-AUV [mass up to 20 kg]

Over a period, Bionic type AUVs were introduced which are used in wide range of military application and civil operation too.

But over the past three decades, several problems were identified which must be improved in this field are as follows:

- Intelligent systems and Technologies
- Energy management
- Navigation
- Communication
- Sensor system and processing
- 3D Imaging

The AUVs are expanded in military application; Navy uses these AUV widely for missions, research and exploring the ocean terrain by avoiding human lives at risk.

II.   FIGURES AND TABLES

III. CONCLUSION

The history of AUV gives a brief understanding and their development over period of time. It is clear from the history, we saw the effort that was part for advancement and research of AUV by different countries, which makes AUV's an important aspect to study and carry forward for the development. Earth has vast area of oceans covering. In order to explore those deepest resources hidden at the bottom of ocean, to keep an eye on the enemy line across the water surface and many more. We need technology that has a greater mobility to operate under different condition of underwater. So, the technology of AUV needs to be further studied and development.

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