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Ocean Going Robots Superior to Manual Labor in Marine Archaeology.

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Abstract:

Archaeology is important as learning from past can only improve future. Archaeological ruins not only work as treasure from history, but can also indirectly boost the economic condition of a country or place by supporting leisure industry of that region. Ocean being the dominant, covers more than 70% of the earth surface and holds thousands of mystery and untold stories. From scientific point of view, it is considered that ocean holds the secret of life, at the same time it withholds vast cultural heritage in form of archaeological site yet to be discovered. In case of marine archaeology, which is also known as nautical, maritime and underwater archaeology study of remains and ruins are common.

In this study we focus on various ocean-going robots used for excavation procedure, and their success rate.

Keywords: *Marine, Archaeology, Robots, Nautical, Submerged.*

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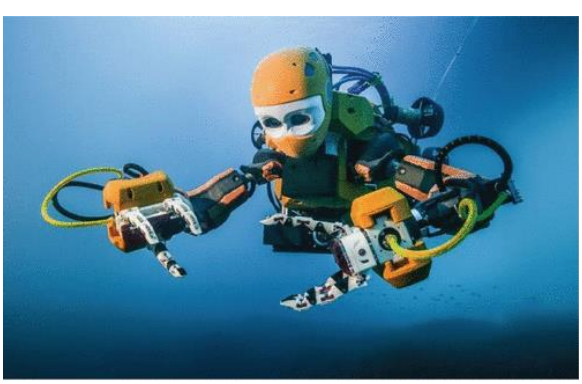
Introduction

Marine archaeology is a systematic study of human remains such as sites, structures and artifacts, which is considered to be physical evidence in the finding of past. Finding and locating underwater settlement sites have need of a *paradigm shift* from underwater archaeology's existing shipwreck- focused strategies for research to the one that consist of using existing technologies and oceanographic data.

Deep oceans has always been inhospitable to humans, making it impossible for the researchers to conduct smooth archaeological study, as nearly nine tenths of the ocean floor is deep as 1 km or deeper making it inaccessible to human drivers as it is not practically possible for drivers to go beyond 50m. But not in today's world as gradually it is being withdrawn by advancement in automation industry, empowering robotic has shown great results, bringing replacement of humans performing manual labor. As a robotic version can go into the deep where humans fail to have access, it embody human intelligence and intentions through immersive interfaces.

Ocean One:

Hannah Stuart talks about Ocean one's hands in her paper, were it went into Mediterranean for its first mission, the task included investigation of a shipwreck off the coast of Toulon. In her work she suggested that the hands is conspicuously humanoid, and gets benefit from being relatively anthropomorphic.



ONE OCEAN

During this expedition the task included acquiring and manipulating large and small objects with one or two hands.

TENDON-DRIVEN RED SEA EXPLORATORIUM HAND:

It uses one motor per finger, which is beneficial for multiple grasp, the elastic finger joints has low

Bending stiffness. Same principle is applied in Ocean One hands. Bemfica revealed in the study "Three- Fingered cable-driven gripper"- for underwater applications" that even a tendon driven hand can go as deep as 25m. It works on kinematic coupling and is precisely able to grasp objects with varying shapes and dimensions, hence being useful for underwater excursions. Its first expedition was tested at the harbor at Port de Soller, Spain.

In order to conduct low-cost archaeological operations group of European archaeologist came together to work on a project-"Archaeological Robot System for World's Sea" also known as ARROW, it is a European project were based on the needs of the archaeologists three different type of AUVs has been designed.

MARTA:

Also known as Marine tool for Archaeology, it is an AUV which is modular in nature, modularity gives upper hand as instead of having diverse vehicles for different kind of mission we have one reconfigurable AUV that is used by the archaeologists. Benedetto and his fellow researcher in their work under the heading- "Adapting and developing robotics technologies for under water archaeology" suggested that MARTA is an AUV designed so that it is characterized by strong hardware modularity that eases the payload and changes the propulsion systems configuration.

MARTA AUV CAD

MARTA is easy to carry and can be deployed from small boat also. It can be customized in accordance to the mission profile. Since it has redundant

propulsion system: it can be controlled i.e. if it is near seabed and propellers are not exploited, spreading and movement of sand is avoided, hence optical and acoustic data remains unaffected.

It can be equipped with optical and acoustic payload too, as it has capability of housing devices for the mission.

U-CAT:

Ocean is filled with unique creatures, in order to create camouflage a bio-mimetic robot in form of turtle is developed, which devotes to shipwreck penetration. Samuel et al presented in their study that U-CAT is an extremely investigational bio-mimetic AUV. It is developed to penetrate shipwreck and collect data independently from enclosed areas of the wreck, which has proven to be dangerous for divers and remains inaccessible by tethered vehicles.

The biomimetic AUV U-CAT

It has various advantages, it is quiet during locomotion therefore sediment disturbance is less, has almost negative chances of getting tangled, requires few actuators and since diver does not goes inside compact places, diver's safety remains assured and so does the archaeological sites safety.

A_Size AUV:

It is a vehicle, small in dimension and weight. This can be easily deployed even by a single person hence, proving to be cost effective and handy. It provides with innovative aspects of addressing under water operations and missions. It optimizes the volume and weight distribution in the vehicles.

A_Size AUV

In oppose to active vane it uses directional propellers and the main propulsion is obtained through brushless motor that is usually fitted along with magnetic coupling. And as the standard approach all payloads communicate directly with the scientific computer through Ethernet.

FUTUREISTIC APPROACH:

Underwater archaeology has immense potential, to meaningfully add to our current knowledge of past. Expedition in this direction has unveiled evidences and artifacts of culture ranging from 6,000 years ago to far as middle Paleolithic era. (Flemming 2004).

Since, it is these artifacts that indicates the probable age, and make us aware of the time period to which it belong, the primary motive and focus should be on preservation of these items. Although collection of the submerged articles have become easy its preservation and travel from ocean to the surface is still the crucial part and modifications need to be considered for safe passage.

CONCLUSION:

Ocean going robots play a significant role in capturing the evidence of submerged articles, earlier it was just divers who would explore the secrets of oceans at the cost of their life. But with the advancement of technology it has become much easier, AUV's such as U-CAT and A_Size AUV's has proved to be handy as it remains cost effective plus allows divers to not get tangled or harmed.

Since some devices can be handled from boat, chances of getting hurt during the expedition lessens.

References:

Carlton, J. (ed.) (2007). Marine propellers and propulsion. Elsevier, Amsterdam, Holland.

Flemming, N. C. 2004. The prehistory of the North Sea floor in the context of Continental Shelf archaeology from the Mediterranean to Nova Zemlya. In Submarine Prehistoric ArchaeologY of the North Sea. Research Priorities and Collaboration with Industry. CBA Research Report 141 (N. C. Fleming, ed.): 11–19. York: Council for British Archaeology.

Khatib, Oussama, et al. "Ocean One: A Robotic Avatar for Oceanic Discovery." *IEEE Robotics & Automation Magazine*, vol. 23, no. 4, 11 Nov. 2016, pp. 20–29., doi:10.1109/MRA.2016.2613281.

Robinson, David S. "Archaeological Approaches to Identifying Submerged Cultural Landscapes and Ancient Native American Archaeological Sites in Southern New England." *Bureau of Ocean Energy Management*, www.boem.gov/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2012/PowerPoint_Source_Files/2D_0110_Robinson_PPT.pdf.

Salumäe T., Raag R., Rebane J., Ernits A., Toming G., Ratas M., KruusmaaM.Design principle of a biomimetic underwater robot u-cat Proc. of. MTS/IEEE OCEANS'14 (2014)

Stuart HS, Wang S, Gardiner B, (2014) a compliant under actuated hand with suction flow for underwater mobile manipulation. In: 2014 IEEE international conference on robotics and automation (ICRA), Hong Kong, China, 31 May–7 June 2014, pp.6691–6697. Piscataway, NJ: IEEE Press.

Stuart, Hannah, et al. "The Ocean One Hands: An Adaptive Design for Robust Marine Manipulation." *SAGE Journals*, vol. 36, no. 2, 1 Mar. 2017, pp. 150–166., doi: 10.1177/0278364917694723.