Editorial

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Robotic fish underwater vehicle

John Lazar*

Medical Director, Pinnacle Health Robotics Institute, Pennsylvania, USA

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Corresponding author:
Lazar J, Medical Director, Pinnacle Health Robotics Institute, Pennsylvania, USA

health@heidigodman.com

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Editorial note:

ANoteworthy part of the Earth is made of water provenience of rivers, lakes, and oceans, most of them still uncharted. Underwater robots have instigated to transform seabed examination, generally providing improved information at an inferior cost. The force system of an underwater robot eventually defines the types of movements and maneuvers it can perform. In the design of propulsion systems, aspects such as energy ingesting, robot hardware, and the effects on the marine environment should be careful. Autonomous underwater vehicles (AUVs) are robots that navigate based on algorithms and surrounding information. They are armed with multiple progressive sensors to carry out examination, operations of intelligence, and reconnaissance, as well as maritime research and development. AUVs are important for oceanography for exploration and collecting data. There are a variety of vehicles with different sizes, working depth limits, shapes, energy sources, and methods of propulsion; about 155 unique configurations exist which are in dissimilar stages of growth and are being used for scientific, oceanographic, commercial, and military applications.

The main components of underwater vehicles are the cabin or hull, energy source, sensor systems, and the propulsion system. Communications systems are challenging for AUVs due to constraints not found in other environments; autonomous systems are based on acoustic sensors. The more conventional propulsion systems mentioned in recent work are propellers, water gliders, injections, magnetohydrodynamic impellers, traction with the seabed, and bio-inspired systems. In underwater robotics, bio-inspired design is expected to improve energy efficiency, maneuverability, and stability. Researchers have found propellers to be significant sources of pollution of underwater environments, increasing the mortality of maritime creatures and ecosystem disturbances. On the other side, biomimetic robots harmonize with the environment and are expected to be lower, provoke fewer accidents, and more maneuverable.

Biomimetic AUVs (BAUVs) are founded on fish physiology, having fins with a degree of freedom located horizontally or vertically on the back of the underwater vehicle. In all designs published so far, the thrust is applied in only one direction. There are previous studies on BAUVs mimicking varied types of locomotion and fishes systems. There are no similar mechanisms used to control biomimetic propulsion as a caudal fin that have been reported previously. In this work, we introduce a novel design of a BAUV with a bio-inspired propulsion system based on a 3universal–cylindrical–universal and 1 spherical joint equivalent mechanism that allows vectored thrust. The authors reflect that the thoughts introduced in this paper are a step forward for improved maneuverability and energy efficiency. A novel BAUV design that employs a similar mechanism to manipulate the position of a caudal fin was industrialized. The planned propulsion system allows for the use of different types of swimming, e.g. vertical like a tuna and horizontal like a dolphin. Furthermore, it is possible to use intermediate locations of the fin and have a thrusted vector. These features will increase the maneuverability of the vehicle. Future work will also include underwater dynamics imitations, progressive control strategies for the desired path preparation, as well as physical tests with the example. To give more independence to the vehicle, a dependable communication system needs to be designed and applied. The graphical user interface will be developing along with the developments and application of the prototype.