Bionic Squid-Inspired Robot Facilitating Underwater Monitorization and Preservation of Coral Reefs

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The ongoing climate change and water pollution crises have threatened coral reefs and their ecosystems, leading reefs to terrible fates such as bleach, disease, and loss of growth. From this crisis, a rise in demand for better means of biological monitoring of coral reefs has occurred. The divers who are given this job are exposed to decompression sickness and other related illnesses, and the traditional robots meant to alleviate this are experiencing obstacles, including disturbances to aquatic creatures or plants and confined workspaces while operating. This paper proposes a bionic prototype taking inspiration from the squid to remedy the situation. The design allows exploration of complex coral reef ecosystems and can provide crucial data needed to preserve them. This is thanks to its squid-like features: its small size permitting it to traverse complex biomes, imitation of squid movement mechanics (water pump) reducing the threat of seagrass and disturbance to marine creatures, and bionic fins made from flexible materials to improve its maneuverability. Several discussions are hosted in this project to examine both the process and result. These discussions include topics such as: the rationale behind the selection of the water pump; generations of components and the motivation behind each modification; the separation of the overall structure, with descriptions of each department's construction and use; the electric modules utilized and the motivation behind the choice; logical flowcharts for robot and controller control programs; and various experiments to seek the optimal design. Overall, the bionic squid's use of buoyancy force, dimensions, and water pump make it an outstanding prototype and inspirational design for future monitoring systems of coral reefs.

Awards Won:
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