Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

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Fish-Inspired Robot with Pectoral Fins

Background

Unchecked growth of algae and unwanted plants in bodies of water can result in undesirable changes that affect ecological stability, recreational value, and human health. Surface overgrowth of aquatic plants and algae restrict swimming, fishing, and boating, while depleting oxygen available for fish and other plant life. Excess levels of vegetation decay can also emit offensive odors and cause unpleasant water taste. Biological, mechanical, and chemical removal techniques are often effective but can be expensive and add to environmental disruption. Therefore, an effective, low-cost solution that imposes limited environmental disturbance stands to generate widespread market appeal.

Invention Description

Researchers at Arizona State University have designed a robotic fish modeled after the bluegill sunfish that features unique foldable pectoral fins. Movement of the robotic fish is controlled by a caudal fin and two pectoral fin mechanisms. Sinusoidal movement of the pectoral fins, inspired by the labriform swimming mode, generate propulsion and provide maneuverability while maintaining a relatively rigid body. Emphasis is placed on maximizing pectoral fin torque with the fewest motors. The body design itself, which features a large nose for drag reduction and air bladder housing, is divided into four parts allowing low-cost fabrication with 3D printing. With the aid of machine learning, prototypes can be specifically adapted for automated removal of unwanted algae and vegetation through less conspicuous operation within ecosystems.

Potential Applications

- Water quality improvement
- Bioenvironmental sensing
- Recreational equipment and toys

Benefits and Advantages

- Agile – Pectoral fin design provides robotic fish with high maneuverability
- Adaptable – Machine learning allows focused development of automated

applications

- Cost Effective – Design can be fabricated using 3D printers
- Unobtrusive – Robot mimics natural fish movement for lower-profile operation within the environment

Laboratory Homepage of Professor Daniel Aukes