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UNDERWATER SURVEILLANCE ROBOTIC FISH

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ABSTRACT: This paper deals with the manufacturing of an underwater robotic fish with the surveillance application. The controlling and development of this biomimetic fish is presented in this report. This simple and efficient mechanism of robotic fish got inspired from the natural fish. This robotic fish has the provision for Bluetooth communication which will work based on the operator decision. This efficient and simple mechanism of fish navigates in the underwater and having a provision for working with four servo motors and pump assembly mechanism. The different sensors help the robot to make automatic decisions as obstacle detection, live streaming, direction changes and temperature. This robotic fish helps to perform in aquatic complex areas.

Keywords-Arduino, robotic fish, locomotion mechanism

I. INTRODUCTION

The imitation of the biological creatures gives most significant understanding into the theories and applications in the field of robotics. The known thing is that ocean covers the majority of the earth's surfaces about millions of sq km, containing a huge variety of biological resources. This paper introduces the concept of robot in the form of fish developed to achieve the better efficiency, controlling mechanism of fish movement. By the improvement of robotic technology, the aquatic missions have been simplified and resolved to a greater extent. The use of robotic fish over the submarine is that their efficiency, flexible structure and operations in the critical condition. As it is not only used for underwater surveillance can also be used as a spy robot in military application.

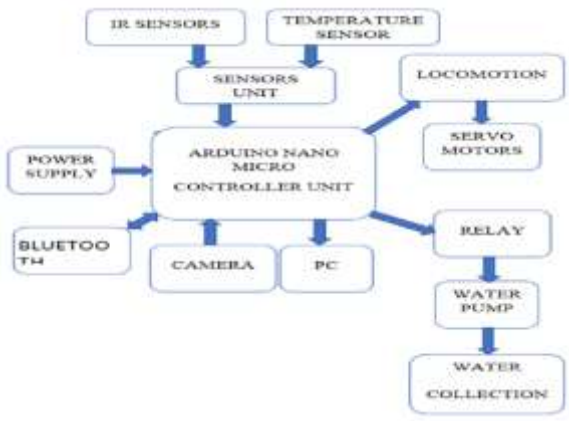

Fig 1.1 block diagram of proposed system

The block diagram of the proposed work is shown in the figure 1.1. The block diagram explains about the overall construction of system.

The sensor unit contain two sensors types, those are IR sensors and temperature sensor. Servo motors are attached to the fish for the smooth locomotion. 4 servo motors are connected which helps for the directional changes.

The Bluetooth is the serial communication mode for the fish to move in Automatic mode or in manual mode. If the fish should move in manual mode, then there 3 ways i.e forward, left, right. For the monitoring of the water bodies the waterproof camera is attached to the fish. This wireless camera will capture the images and videos in live.

II. MECHANICAL DESIGN

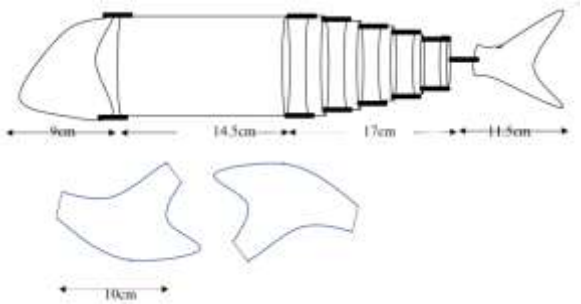

Fig 1.2 mechanical design of the robotic fish

Figure 3.1 shows the side view of biomimetic fish system with dimensions. For the flexible movement mechanism, the fish is provided with four servo motor. The internal structure of the robotic fish is provided with PVC material and coated with foam material. And all the electronic components are made waterproofing within the airtight container.

The robotic fish system with 4 servo motors. Those servo motors are connected for the moving joints. Two motors for right and left fins and One for the body and another for tail part of the fish. The body made of multiple jointed segments, the high torque servo motors are the main concerned for position changing and high speed for robotic fish locomotion. And it gives the flexibility and robustness for stable locomotion. In order to operate the fish manually Bluetooth communication module is provided.

III. ELECTRONIC DESIGN

Various electronic components are used to build the robotic fish. PCB designing contains sensors, controller (atmega 328), motor driver circuit and communication device.

A. Embedded system

Arduino Nano board is used as a controller. Atmega 328 is used as a microcontroller, and with flash memory of 32Kb. Supply for the robotic fish is given from the 12V LiPo battery.

B. Sensors and actuators

The advantageous servo motors are used for the propulsion mechanism with specified angle of rotation. The PWM pulses control the servo motor angles for the locomotion of the fish. And DC motor is used for the water collection.

Speed of the fish is controlled by the adjusting servo motor angles. LM35 is used for the temperature measurement. The built in ADC converts signals to digital and this data can be transferred to the base station though the wireless communication.

The camera is attached to the robotic fish. This camera helps for the surveillance and monitoring of the underwater environment.

C. Communication System

To transfer and receive the data with the robotic fish from the base station through Bluetooth.

Fig1.3 Bluetooth communication Android display

By using Android application and Bluetooth communication module robotic fish can be work either in the manual mode or in automatic mode. The floating antenna helps to transfer the data to the computer for live streaming.

D. Flow Chart

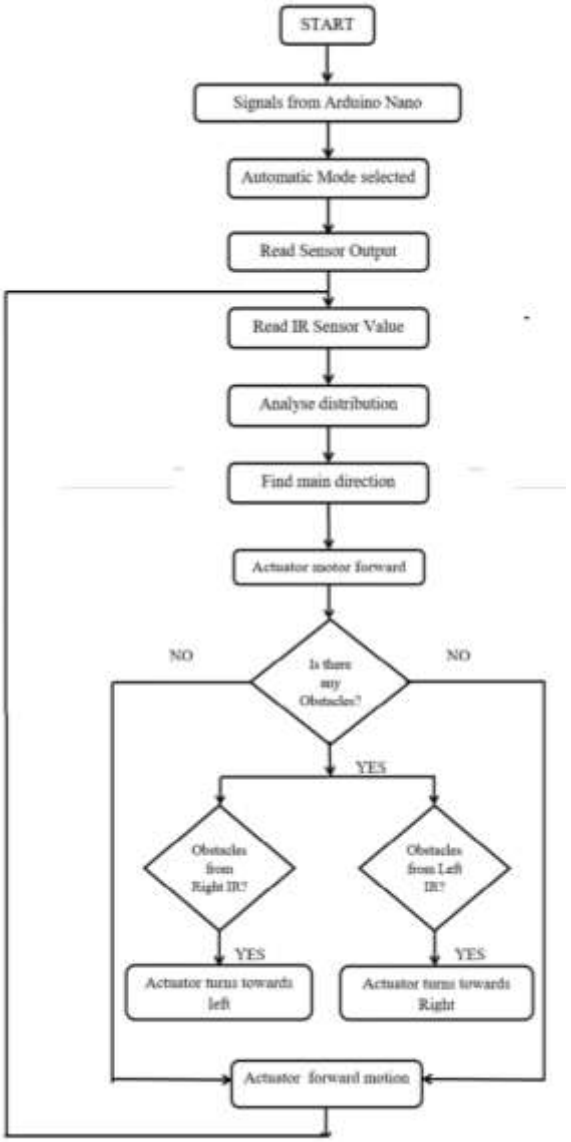

Fig1.4 Flow chart of robot's communication protocol

IV. CONCLUSION AND FUTURE SCOPE

This paper describes the methodology and structure of well-developed robotic fish. The rk has finally resulted in well-functioning Underwater robot. Which successfully surveillance and monitor the underwater environment. By using servo motors allow the robot to control the direction. By using DC motor the water is collected in the tank when the temperature crosses limits.

Table I
ROBOT SPECIFICATION

SPECIFICATION	VALUE
Weight	3.2kg
Actuator	Servo motor
Average speed	100rpm
Overall size	52cm×30cm×12cm

The future scope will be focus on the more number of actuator for greater propulsion movement of the fish.
The GPS tracker can be added to the fish for navigation purpose. And the waterproofing made with better material for long life.

REFERENCE

[1] JoelJ.Hubbard, Maxwell Fleming, Viljar Palmre, David Pugal, KwangJ. Kim, and KamK. Leang, Member, IEEE "Monolithic IPMC Fins for Propulsion and Maneuvering in Bioinspired Underwater Robotics"- IEEEJOURNALOFOCEANICENGINEERING,VOL.39,NO. 3, JULY2014

[2] 1Shrikant Arale, 2Chirag Pawar, 3Arvind Deshmukh, 4Shruti Dalvi, 5Pariksheet Pinjari, 6S. S. Ohol "Design and Manufacture of Bio-mimic Robotic Fish"- Department of Mechanical Engineering, 3,4,5 Department of Electronics and Telecommunication Engineering College Of Engineering Pune-411005

[3] M. Sfakiotakis, D. M. Lane, and J. B. C. Davies, — "Review of fish swimming modes for aquatic locomotion",‖ IEEE Journal of Oceanic Engineering, vol. 24, no. 2, p. 237, April 1999.

[4] M. S. Triantafillou and G. S. Triantafillou, — "An efficient swimming machine",‖ Scientific American, vol. 272, no. 3, pp. 40-48, March 1995.