



International Journal of Intellectual Advancements and Research in Engineering Computations

Development of autonomous robotic underwater vehicles (robotic fish) with embedded vision

Dr.M.Anto Bennet¹, S.Lokesh², R.Aravind³, S.Sivakavi³, S.Abisheak³, A.Gowri Shankar³

¹Professor & HOD, Department of ECE, Vel tech, Chennai-600062

²Assistant Professor, Department of ECE, Vel tech, Chennai-600062

³UG students, Department of ECE, Vel tech, Chennai-600062

ABSTRACT

Underwater robots can record data that is difficult for human to gather. In the recent years, robotic underwater vehicles (ROBOTIC FISH) have become useful for variety of industrial and civil sectors in exploring the water bodies. They are used extensively by the scientific community to study the ocean, fresh water and underwater environment. ZigBee is an efficient and effective wireless network standard for wireless control and monitoring application. It is an alternate technology that has changed connectivity between communicating system. The objective of this model is to design a wireless underwater robot for security purpose and better understand water and its environment with electronics, motion control and sensor system.

Keywords: Robotic System, Monitoring, Unmanned Vehicle, Wireless Sensors, UART.

INTRODUCTION

Robotic fish are underwater robots that emulate locomotion of live fish through actuated fin and/or body movements. They are of increasing interest due to their potential applications such as aquatic environmental monitoring and robot-animal interactions. In this work, several bio-inspired robotic fish prototypes have been developed that make use of periodic tail motions. A dynamic model for a tail-actuated robotic fish is presented by merging rigid-body dynamics with Lighthill's large-amplitude elongated-body theory. The model is validated with extensive experiments conducted on a robotic fish prototype. The main goal of our project is a controller based aquatic debris, monitoring temperature and ph level using robotic fish. Regularly monitoring aquatic waste or debris is of more interest to the environments, aquatic life, human health, and water transport. The project

presents the design of a robotic fish system that integrates with ZigBee and a robotic fish, for debris monitoring by an aquatic robot which can accurately detect debris in the presence of various environments. Robotic fish are underwater robots that emulate locomotion of live fish through actuated fin and/or body movements. They are of increasing interest due to their potential applications such as aquatic environmental monitoring and robot-animal interactions.

PROPOSED SYSTEM

Proposed model contain the multiple sensors data based on smart way. This system used to modeling and monitoring the temperature, ph level, boundary mapping of the water. This robotic fish transmitting data through the ZigBee. Result monitoring in User System [1-5].

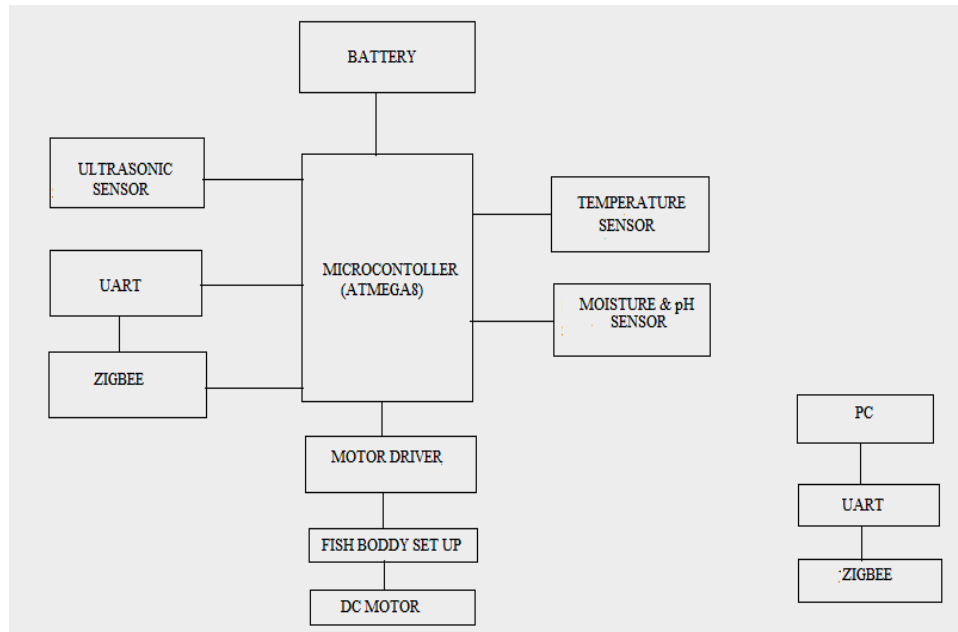


FIG 1. Block Diagram Of Internal Circuit

Module 1

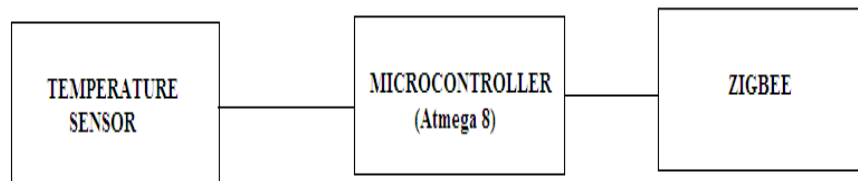


Fig 2. Block diagram for module 1

The measurement of temperature is one of the fundamental requirements for environmental control, as well as certain chemical, electrical and mechanical controls. Many different types of temperature sensors are commercially available, and the type of temperature sensor that will be

used in any particular application will depend on several factors. For example, cost, space constraints, durability, and accuracy of the temperature sensor are all considerations that typically need to be taken into account shown in fig 2.

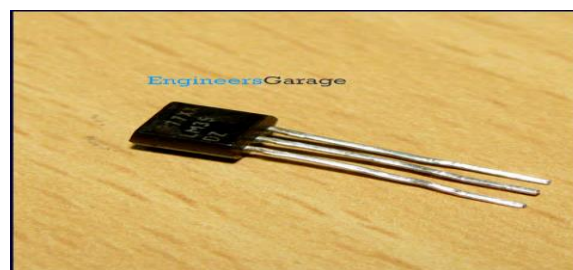


Fig 3.temperature sensor

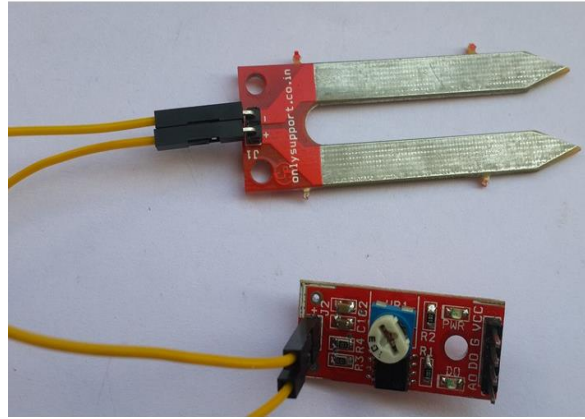


Fig 6. Moisture sensor

Module 3

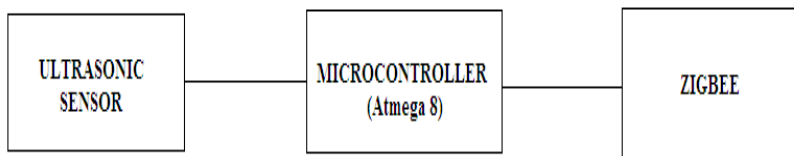


Fig 7. Block diagram for module 3

Ultrasonic sensors (also known as transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and

evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object shown in fig 7&8.



Fig 8. Ultrasonic sensor

EXPERIMENTAL RESULTS

Module 1

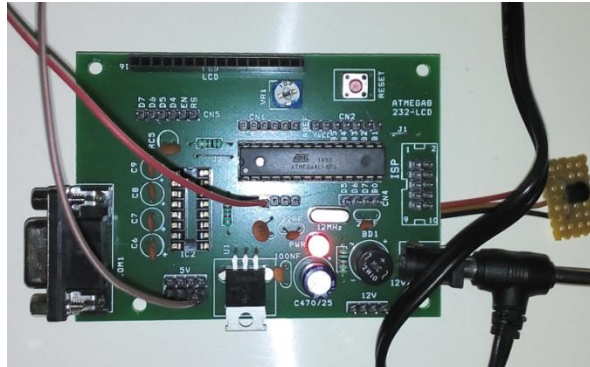


Fig 9. Module 1

The module1 consist of temperature sensor. A temperature sensor measures the hotness or coolness of an object. The sensor's working base is the voltage that's read across the diode. The temperature rises whenever the voltage increases.

The sensor records any voltage drop between the transistor base and emitter. It will measure a range of temperature in underwater. The throughput can be transmitted to the user system using zigbee by the AVR studio software shown in fig 9.

Module 2

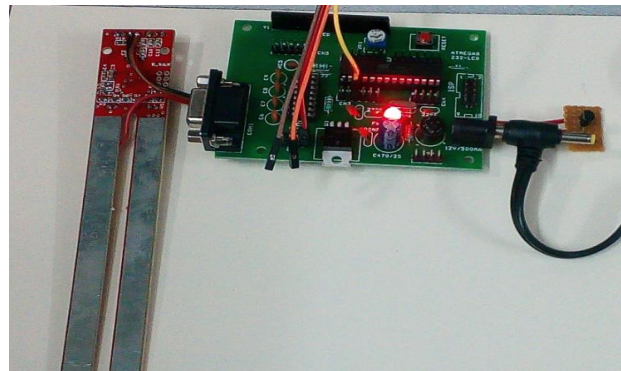


Fig 10. Snap shot of module 2

The module 2 consist of pH sensor. It can generate voltage depending on Hydrogen ion (H⁺) concentration. Acidic solution has more Hydrogen ion concentration than alkaline solution. pH probes measure pH by measuring the voltage or potential difference of the solution in which it is dipped. The pH sensor components are usually combined into one device called a combination pH electrode. The measuring electrode is usually glass and quite fragile. Recent developments have replaced the glass with more durable solid-state sensors. The preamplifier is a signal-conditioning device. It takes the high-impedance pH electrode

signal and changes it into low impedance signal which the analyser or transmitter can accept. The preamplifier also strengthens and stabilizes the signal, making it less susceptible to electrical noise shown in fig 10.

Module 3

It consists of ultrasonic, moisture sensor. Moisture sensors are designed to estimate soil volumetric water content based on the dielectric constant. Thus, measurement of the dielectric constant gives a predictable estimation of water content. Ultrasonic sensors (also known as

transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound

waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object shown in fig 11.

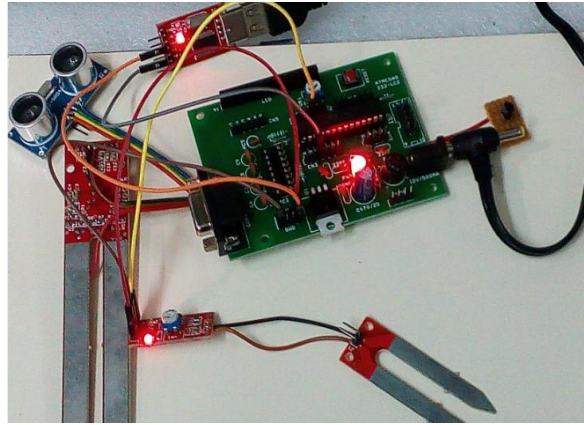


Fig 11. Snap shot module 3

CONCLUSION

In this work, we have proposed a robotic fish based underwater robot coordination platform, with the main emphasis placed on control methods and system verification. In the future work, we will devote our efforts to the autonomous underwater robots with considering embedded underwater vision. It will provide subsurface data

on a higher frequency and large scale acquiring in the water body. The sensors will detect the environments and collect a data and it transmit through the ZigBee. In the future work, we will devote our efforts to the autonomous underwater robots with considering embedded underwater vision.

REFERENCES

- [1]. Alessi, A., Sudano, A., Accoto, D., and Guglielmelli, E. (2012). Development of an autonomous robotic _sh. In *Biomedical Robotics and Biomechanics (BioRob)*, 140, 2016, 1032-1037.
- [2]. Bi Z M, and Kang B, Motion purity of robotic mechanisms with desired and undesired motions, *Advanced Robotics*, 25(11-12), 2014, 1539-1556.
- [3]. CHEN Shi-Feng, YU Jun-Zhi, "Underwater Cave Search and Entry Using a Robotic Fish With Embedded Vision," *Proceedings of the 33rd Chinese Control Conference* 9, 2014, 305-317.
- [4]. Jiabao Wang, YafeiZhang, Janjiang Lu and Weygang Xu, An Intelligent Security Robot System Detection, Recognition And Tracking In UAV Videos 11(2), 2012, 56-66.
- [5]. J. Yu, Y. Fang, L. Wang, and L. Liu, "Visual tracking of multiple robotic fish for cooperative control," in *Proc. IEEE Int. Conf. Robot. Biomim.*, Kunming, China. 214, 2013, 158-183.