ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

Wireless Underwater Metal Detector Robot

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ABSTRACT: In recent trends the robots are working in vast applications. This paper concept will enhance and increasing monitoring function done by the robot. The robot is going under the water using wireless communication system. Here we use ZigBee communication to communicate with under water robot. In that ZigBee communication the data will be transmitted and also received from the robot. Data will be provided to the ARM controller, after depending upon the commands, the robot will be operated. Commands are used to specify the operation such as moving forward, moving left, moving right, up & down, or current status. Basically the ZigBee communication system is the simple and advanced communication unit. The receiver and transmitter pins of ZigBee are connected to transmitter and receiver of ARM controller respectively. Main application of this robot is under water metal detection with also measuring two parameters of water one is its pH (water quality sensor) & second is temperature.

KEYWORDS: ZigBee, ARM controller, Metal detector, pH.

I. INTRODUCTION

For robot mobility action under the water wireless communication is efficient. Once a communication is occurs then we can easily operate underwater robot or vehicles from a communication device at the surface [3]. In this paper robot is going to control under the water using ZigBee wireless communication system. Here the robot will be operated on the water to detect underwater metal resources [1]. Underwater wireless communication can enable many civilian and military application such as oceanographic data collection, scientific ocean sampling, pollution and environmental monitoring, climate recording, offshore exploration, disaster prevention, assisted navigation, distributed tactical surveillance, and mine reconnaissance. Some of these applications can be supported by underwater acoustic sensor networks (UWASNs),which consist of devices with sensing, processing, and communication capabilities that are deployed to perform collaborative monitoring tasks. To make underwater applications viable, real-time communication protocols among underwater devices must be enabled [5].

II. RELATED WORK

In [5] this paper, underwater wireless communication can enable many scientific, environmental, commercial, safety, and military applications. Wireless signal transmission is also crucial to remotely control instruments in ocean observations and enable coordination of swarms of autonomous underwater vehicles and robots, which will play the role of mobile nodes in future ocean observation networks by virtue of their flexibility and reconfigurability. To make underwater applications viable, efficient communication protocols among underwater devices, which are based on acoustic wireless technology for distances over one hundred meters, must be enabled because of the high attenuation and scattering that affect radio and optical waves , respectively. The unique characteristics of an underwater acoustic channel such as very limited and distance-dependent bandwidth, high propagation delays, and time varying multipath and fading-require new, efficient and reliable communication protocols.

In [1] this paper, we introduce three types of enhanced wireless control systems for when robot operates under water. The first system is ZigBee communication, second system is light approach and third one is magnetic field. In recent trends the robots are working in vast applications, if our concepts adopted, it will enhance and increasing monitoring function done by the robot. In [2] this work investigates whether a contactless, wireless underwater communication could be developed for underwater sensor networks. This requires the wireless transmission of power from the sensor hub to the transducer module, and the two–way wireless data communication between hub and transducer. Experiments are conducted which demonstrate that a ZigBee transceiver, operating in the 2.4GHz band, can communicate with low error rates in seawater. Ranges are slightly higher in fresh water.

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III. BLOCK DIAGRAM

These are blocks implemented in project. As selected ARM 7 LPC2138 micro-controller for operating all the blocks to operate Robot under the water. Using multiple sensors taking different parameters from water.WQS is used to test quality of water by which we can differentiate between polluted water and purified water. Metal detector for detect metal under the water. It also performs Bomb detection operation and also the shipwrecks. Temperature sensor is used to sense the temperature of water. Camera is used to take the live video under the water by which we can move our robot without crashing. Also we can sense multiple insects, sharks and fishes and multiple habitats. Motors are used to move Aquabot in multiple direction. All this data is taken and transmitted via ZigBee transmitter to ZigBee receiver which is connected to the PC which is placed outside the water. PC receives all the information and it displays this data to user.

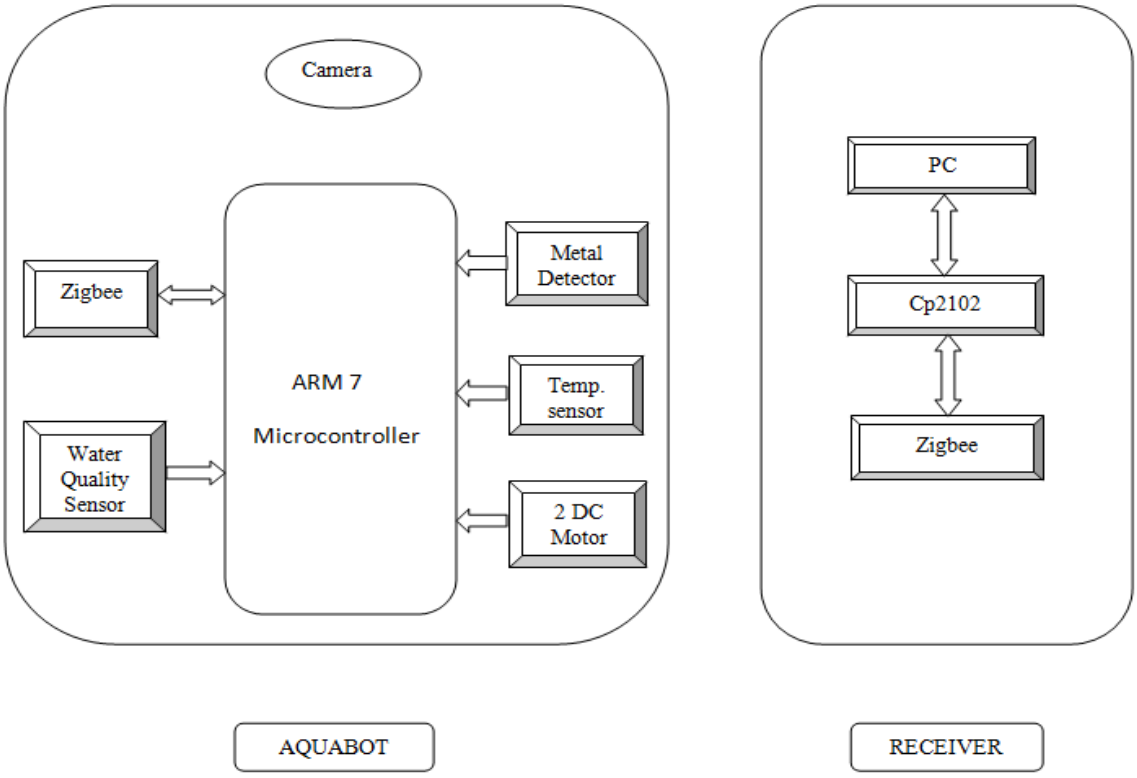

Fig.1. Block diagram of Under Water Robot

IV. POWER SUPPLY

In every electronic circuit, power supply is required. If the power exceeds its limit, it can be fatel. In this project, power is given to ARM controller as it works on dc. Power supply converts ac voltage to required variable dc voltage to switch ON the controller. The regulated plus and minus 3.3V supply is required for ARM controller. This voltages are generated from 230V line voltage.

A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another and as a result, power supplies are sometimes referred to as electrical power converters.

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The power supply used in this project is designed using the variable voltage regulator LM317 IC. Below is the schematic of power supply gives output of 3.3V as well as 5V.

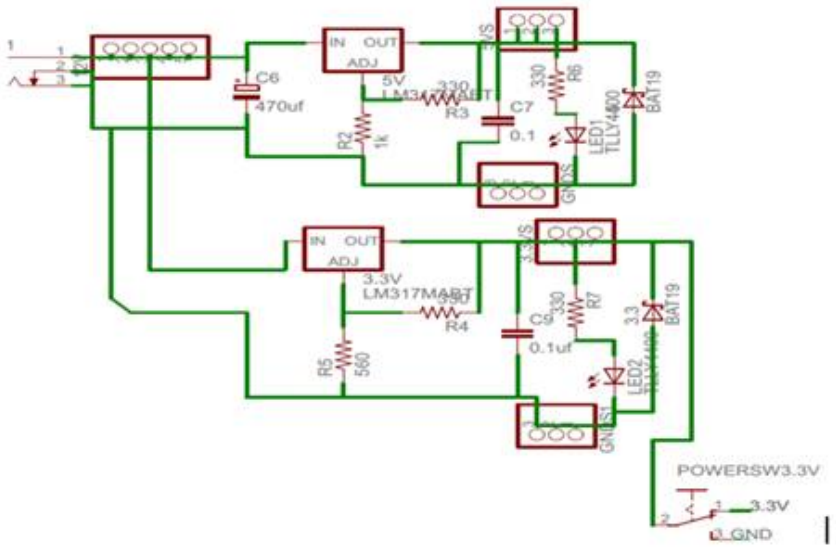

Fig.2. Schematic Power supply

V. MATHEMATICAL EXPRESSION

Designing calculations of power supply:

Motor driver IC = 5V

For Voltage Section

Vout = 1.25 (1 + R2/R1)
5 = 1.25 (1 + R2/330)
5/1.25 = 1 + (R2/330)
4 = 1 + (R2/330)
(3*330) = R2
R2 = 990
R2 ≈ 1KΩ

For ARM7 IC = 3.3V

Vout = 1.25 (1 + R2/ R1)
3.3 = 1.25 (1 + R2/330)
3.3/1.25 = 1 + (R2/330)

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2.64 = 1 + (R2/330)
(1.64*330)= R2
R2 = 541.2
R2 ≈ 560Ω

VI. ALGORITHM

1. Initialize I/O ports.
2. Initialize timer.
3. Initialize sensor.
4. Initialize ZigBee.
4.1 Communication in between two ZigBee station.
4.2 Send commands.
4.3 Receive data.
4.4 Stop communication.

5. Stop.

VII. FLOW CHART

When user going to operate AQUABOT under the water, As soon as supply is given to the robot it gets operated. All the sensors are being operated by the robot and robot going to move in all direction. The direction of robot is controlled by the user through the PC which is placed outside the water. As robot is moving inside the water sensors operates according to their specification that is temperature sensor measures the temperature of water, metal detector searches for the metal and water quality sensor senses the quality of water. There is a digital camera on the head of robot which continuously takes the video surveillance under the water. All the data which is sensed by the sensors re transmitted via ZigBee transmitter towards the ZigBee receiver. ZigBee receiver receives the data and gives it to the PC. User can now see the data received from the robot on the PC. Live surveillance is shown directly on TV for user to operate robot and to decide the direction of robot avoiding the obstacles. This is all the working of robot from starting to final receiving data and data display.

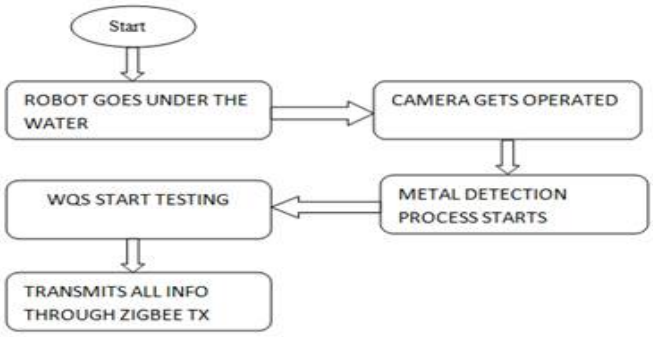

Fig.3. Flow Chart

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VIII. CIRCUIT DIAGRAM

Proteus is software for microprocessor simulation, schematic capture, and printed circuit board (PCB) design. It is developed by Lab centre Electronics. Proteus 8.3 is a Virtual System Modeling (VSM) that combines circuit simulation, animated components and microprocessor models to co-simulate the complete microcontroller based designs. This is the perfect tool for engineers to test their microcontroller designs before constructing a physical prototype in real time. This program allows users to interact with the design using on-screen indicators and/or LED and LCD displays and, if attached to the PC, switches and buttons.

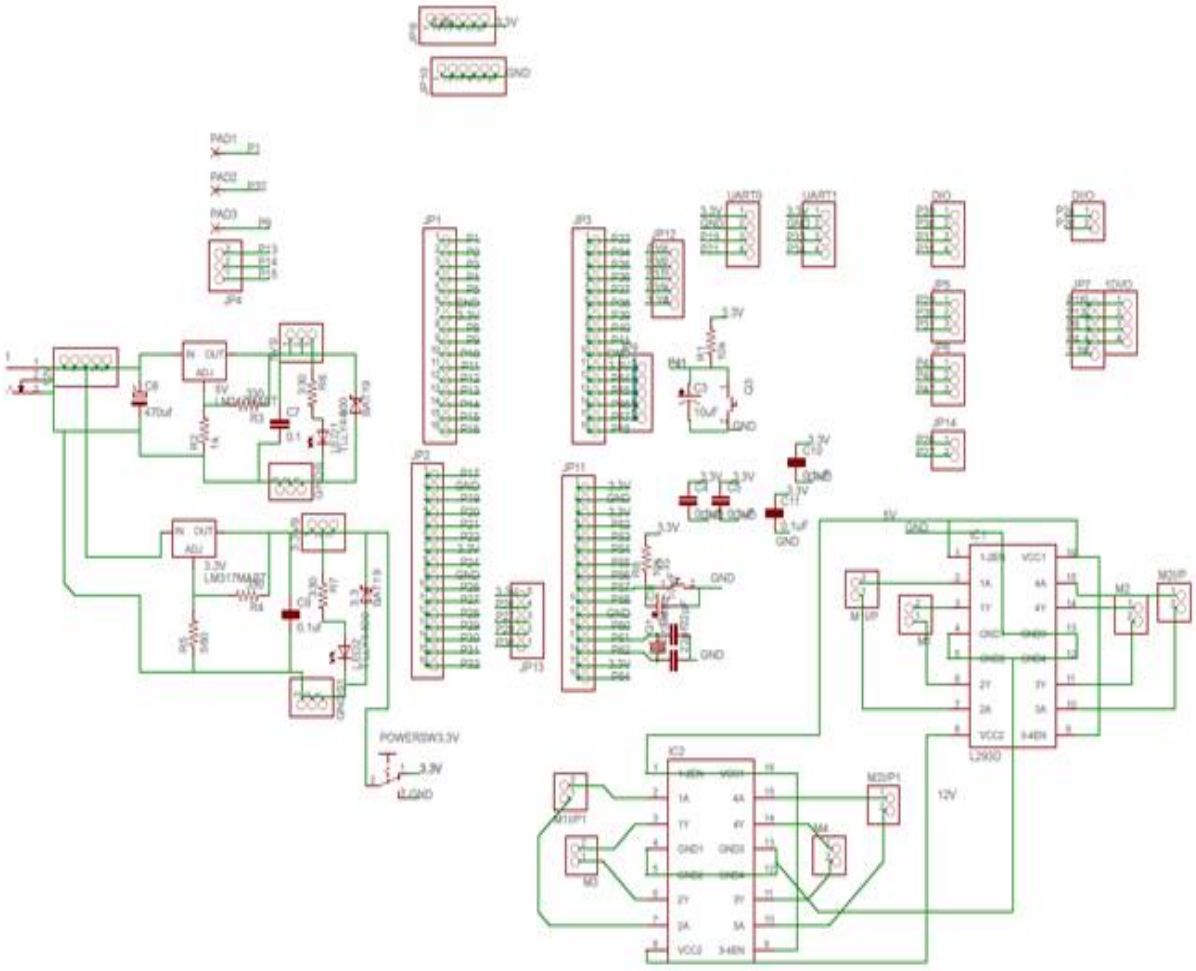

Fig.4. Proposed Circuit Diagram

IX. METAL DETECTOR

A metal detector is an electronic instrument which detects the presence of metal nearby. Metal detectors are useful for finding metal inclusions hidden within objects, or metal object buried underground. They often consist of a handheld unit with a sensor probe which can be swept over the ground or other objects. Usually the simplest form of a metal detector consist of an oscillator producing an alternating current that passes through a coil producing an alternating magnetic field. If a piece of electrically conductive metal is close to the coil, eddy currents will be induced in the metal, and this produces a magnetic field of its own. If another coil is used to measure the magnetic field(acting as a magnetometer), the change in the magnetic field due to the metallic object can be detected.

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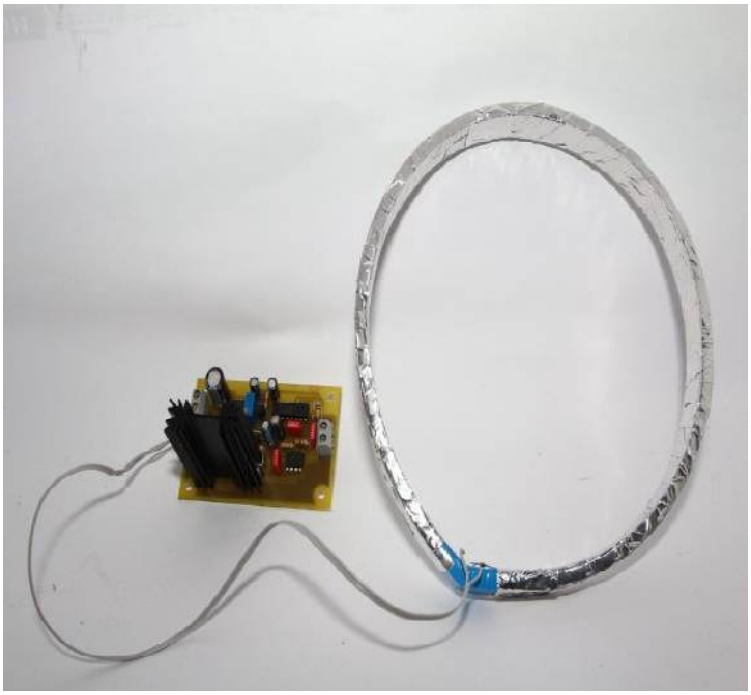

Fig.5. Metal Detector

X. CONCLUSION

In this paper, we introduce wireless underwater robot control system which is used to detect underwater metal resources by using metal detector sensor along with pH and temperature sensors.
The wireless underwater robot control system used ZigBee standard to control the moving robot by PC/Laptop.

ACKNOWLEDGEMENT

Authors give thanks to Mr. Suraj Namdeo Rathod for his support and guide. He is working as a lecturer in Abhinav Education Society's Engineering College, Shivaji University with working experience in SM Wireless Solution Industry.

REFERENCES

[1]. Govindarajan .R 1, Aruselvi .S 2, Thamarai .P 3.'Underwater Robot Control System', Dept of Electronics and Communication Engineering, Bharath University, Chennai, Tamil Nadu, India.
[2]. Neil W. Bergmann, Jonathan Juergens 1, Liqun Hou 1, Yunlong Wang 1, 'Wireless Underwater Power And Data Transfer', School of International Technology & Electrical Engg 1, The university of Queensland, Brisbane, Australia.
[3]. Ted Shaneyfelt, Student Member IEEE, Mattew A. Jooedens, Member IEEE, Kranthimanoj Nagothu, Student Member IEEE and Mo Jamshidi, Fellow IEEE Autonomous Control Engineering (ACE) Centre and ECE Department, 'RF Communication Between Surface and Underwater Robotics Swarms', the University of Texas, San Antonio, TX, USA.
[4]. Milica Stojanovic, 'Wireless Underwater Communication and Networks Current Achievements and Future Research Challenges', Massachusetts Institute of Technology.
[5]. Dario Pompili, Rutgers, 'Overview of Networking Protocols for Underwater Wireless Communication', The State University of New Jersey lan F.Akyildiz, Georgia Institute of Technology.
[6]. Kuldeep Singh Jadon, Praveen Kumar Mudgal, 'Problems in Underwater Wireless Sensor Network (UWSNs)', CSE IITM Gwalior, India.
[7]. Mofeed Turky Rashid, Abduladhem Abdulkareem Ali, RamzySalim Ali, 'Wireless Underwater Mobile Robot System Based on ZigBee' University of Basrah, Basrah, Iraq.