

# Underwater Robot Control Systems

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## ABSTRACT

In this Paper, we introduce three types of enhanced wireless control systems for when the 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 concept adopted, it will enhance and increasing monitoring function done by the robot.

## 1. INTRODUCTION

Now a day there are so many robots are working for several applications. Basically the robots are developed with the advancement technology which is available on the basis of current trends.

In this paper, the robot is going to control under the water using three wireless systems. Here the robot will be operated on the water to sense water resources i.e., sea animals behaviors, sand level, water gravity.

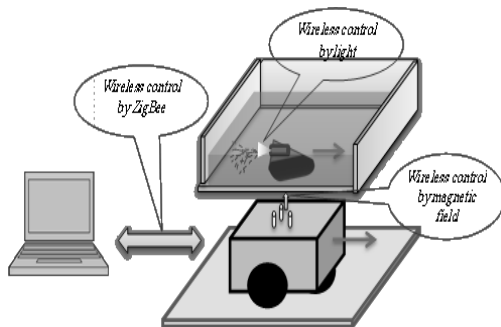


Fig 1: Concept of Underwater robot control system

## 2. ROBOT CONTROL SYSTEM

There are three enhanced wireless systems will be followed to control the robot operation under the water. i.e., Zigbee Communication, Light and Magnetic Field as shown in the Fig 1.

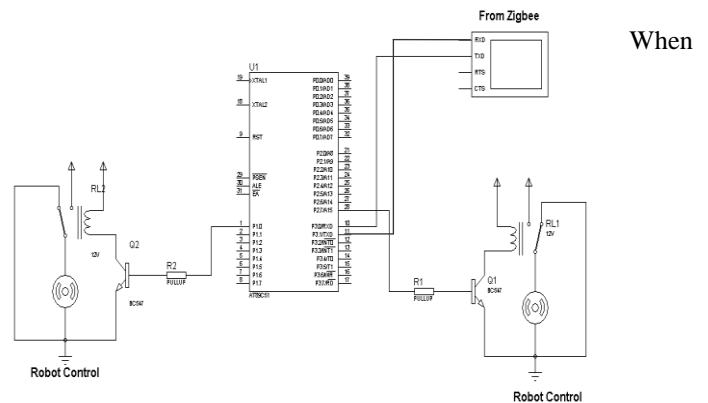
### 2.1. Zigbee Communication

In this Zigbee Communication the data will be transmitted and also received from the robot. Using system, it will be provide to the micro controller, then depending upon the commends, the robot will be operated. Using this all the comments (datas) will be passed to the system through the embedded programming.

Basically the Zigbee communication system is the simple and advanced communication unit. The Rx and Tx pins of Zigbee are connected to Tx and Rx of 8051 microcontroller respectively. The data's from microcontroller is serially transmitted to Zigbee module via UART port. Then Zigbee transmits the data to another Zigbee or PC.

Fig 2: Circuit diagram for Zigbee system

### 2.2 Light Approach



controlling the Robot under the water, this light approaches also one of the control system of underwater robot. On the robot mechanism while preparing robot board, the light sensors will be added. This light sensor will observe our external light rays. So that the robot also control with help of this rays. This method has some distance keep up. This light approach method is very useful to control the robot without any wire.

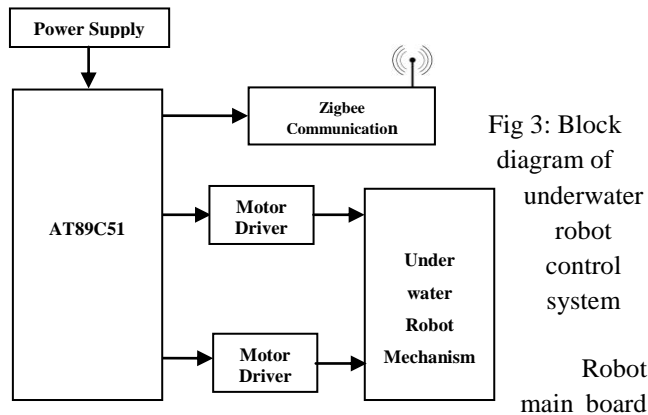
### 2.3 Magnetic Field

Basically every robot has constructed with help of motors. Hence, in this system also the robot mechanism has

two dc motors. Using this, we can able to achieve magnetic field control.

Such as we are going to keep one external magnet near the robot. The magnetic system the moves by user the robot will get move. Due to this process, wherever we can move the robot.

### 3. UNDERWATER ROBOT DESIGNING



Robot main board is the brain of mobile robot which receives the motion pattern parameters from PC through Zigbee wireless connection and processes these parameters to perform pattern motion control. The main part in the robot main board is AT89C51 microcontroller; it is used to generate two set of PWM signal for each wheel motor.

The two active wheels of the robot are actuated by two independent servo motors modified for continuous rotation as shown in the Fig 2.

Zigbee is a standard that defines a set of communication protocols for low-data-rate short-range wireless networking. Zigbee-based wireless devices operate in 868 MHz, 915 MHz, and 2.4 GHz frequency bands. The maximum data rate is 250 K bits per second.

Zigbee is targeted mainly for battery-powered applications where low data rate, low cost, and long battery life are main requirements.

Zigbee/Mesh RF module has been used for support Zigbee wireless network. For the applications where robust mesh networking topologies are preferred. Employing dynamic self-healing, self-discovery functionality for reliable communications, XBee ZigBee/mesh RF modules make mesh networking simple and easy to deploy.

#### 3.1 Robot Mechanism

Number of motors used in under water mechanism are Pump motors, Solenoid valve and Dc motor.

The pump motors have a mechanism which operates them, and consume energy to perform mechanical work by

moving the fluid. Pump motors may be operated in many ways, including manual operation, electricity, an engine of some type, or wind action. The pump motor is also a mechanical device used to convert its energy to that of pressure in a liquid in order to move the liquid from a low elevation to a higher elevation or, from a low pressure to a higher pressure system. Here the pump motors are used for moving the robot inside or outside the water surface.

A solenoid valve has two main parts, the solenoid and the valve. The solenoid converts electrical energy into mechanical energy which, in turn, opens or closes the valve mechanically. A solenoid valve is an electromechanically operated valve.

The valve is controlled by an electric current through a solenoid, in the case of a two-port valve the flow is switched on or off, in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold Solenoid valves are the most frequently used control elements in fluids. Their tasks are to shut off, release, dose, distribute or mix fluids. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design. Here the solenoid valve also used for move the robot inside or outside.

A DC motor is an electric motor that runs on direct current electricity. DC motors were used to run machinery, often eliminating the need for a local steam engine or internal combustion engine. Here the dc motor is used to move the robot from one place to another place.

#### 3.2 Robot Specification

Total mass of robot	200 g
Number of drive motors	2
Radius of drive wheel	0.5 inch
Velocity of robot	0.2 m/s
Maximum incline	30 deg
Supply voltage	12v
Desired acceleration	0.2 m/s <sup>2</sup>
Desired operating time	60 min
Total efficiency	65 %

#### 4. Future Enhancement

We are implementing a prototype of the robot in which it performs only some limited actions, if we want to implement in real time, with advanced technology and with latest designing we can achieve the robot perfectly in order to work in real time.

## 5. Conclusion

In this paper, we introduce new idea for wireless robot control system which is used as a tool to perform a wireless control on a group of Artemia to achieve several patterns to extract behavior of these organisms.

The wireless robot control system contain three types of wireless control, first is used light to control the motion of Artemia group, second is used magnetic field to control the motion of underwater mechanical robot while the last one is used ZigBee standard to control the mobile robot by PC. This system is easy to construct, low cost and can control small organisms in small area with perform several patterns.

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