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Review Paper on Water Quality Monitoring System using RC Boat with Wireless Sensor Network

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Abstracts: ***Water quality monitoring is important in recent years; this is because many factors pollute the water resources. As there is rapid growth in human population, it results in environmental degradation. Now a day's different wireless network systems are present but they are fixed at a particular site. Here is the cost saving RC boat prototype is used to identify the quality of water in different areas such as river, lake, cannel, pond or sea. The different water parameters to be identify are PH, water temperature and air temperature, conductivity, turbidity etc. The movements of RC boat prototype viz. left, right, front are controlled by RF remote with the help of motor. When the prototype is moving on water surface it will collect the real time sensors data and upload on server and the host will analyze the data.***
Keywords: RC boat, Turbidity sensor, Ph sensor, Temperature sensor, Conductivity sensor, Camera.

I. INTRODUCTION

Water is a valuable resource. It is used for different purpose such as drinking, irrigation, food production, electricity production etc. 3% of world's water is suitable or drinking on earth and 2% is ice and glaciers found so only 1% of water is available for mankind. The 75% human body is fulfill with water and the water minerals are used for growth and development. The water quality is a big issue now days. To overcome this issue different techniques are applied, but not safe. Since 19th century industrial sector is present, but number of industries was limited. As compared to other countries, India was the one of third world in race of globalization. The industrial sectors have increased more from 20th century in India. As development increased the pollution also increased namely air, water etc. The water pollution has increased due to hospital waste, farm waste, human waste or it may be industrial waste.

Monitoring water quality is a challenge in the 21st century; this is because the large number of chemicals is used in day to day life which gets added in water, results in water pollution. The industrial waste water is added into river which contains lots of different chemicals which are harmful to the living being, will results in diseases. To overcome this, monitoring of water should be done along with real time analysis. The proposed system contains the RC boat for water quality monitoring in real time. The RC boat is a wireless boat which is operated on 2.4GHz band. The approach for this system arises from the robotics technology. Recently the water quality measuring systems are present but they need to take the water samples and test its quality which is a manual process. The upgrades in the system are the wireless sensor network. This system needs to be installed on the river side. The system only monitors the quality at the side of river, the central part remains as it is when the water is continuously flowing and the reading available will be inaccurate. The RC boat can test water quality from anywhere namely river, sea, lake, pond etc. The different sensors are installed on the boat such as temperature sensor ranging from -40 degree C to 250 degree C, turbidity sensor ranging from 0-50 NTU and 0-1000 NTU, PH sensor ranging from 0 to 14, conductivity sensor ranging from 0.01μS to 1.999 S and additional part is camera with gimbal. [5] The RC boat is operated by the remote control by person in water. The RC boat and sensor system will collect the real time data of water from different areas and send the appropriate information to base station. The water quality data received to base station is stored and analyzed. This real time data will be more helpful to identify the quality of water in terms of different parameters. If the water quality is too bad or water is contaminated then the alert is sent to the authorized person of respective department. So the proposed system can be used to identify the contaminated area of river, also it can be used to find the purity of industrial waste water. The benefit of this system is the results can be automatically stored at base station. The analysis is done according to water quality standard and the analysis reports can be made accordingly.

II. LITERATURE REVIEW

Many researchers have worked in this domainof monitor the quality of water, its leakage and its water level. In order to measure the quality of water the sensing system is used. The different sensors used are PH sensor, Turbidity sensor, Force sensitive resistor (FSR) etc. The FSR is used to detect the pressure of water. The water level is measured with the help of LED sensor inside the water, then it may be tank or pipeline. This approach is based on wireless sensor network and communication is via zig-bee. The

scientific sensors are deployed in water and the real time data is fetch by the base station. So due to this technology different parameters are monitored remotely. The sensor data can be temporarily stored in Arduino board or any other controller and the data of interfaced sensors can be transmitted through wireless medium.[1] The second category was focused on development of system for monitoring the quality of water in terms of water parameters such as PH, water level, CO2 etc. with real time data acquisition, data transmission and data processing.[2] The water quality system (WQMS) consists of FPGA board, sensors, zig-bee based wireless module and Arduino controller for data collection node. The FPGA board is programmed in VHDL language. In WQMS the different sensors are used viz. ultrasonic, PH, CO2 and Turbidity sensor etc. are situated at different places to identify the change in water parameters. This data is computed on board using VHDL. Afterwards data is transmitted wirelessly to base station, where respective person monitors the data. This task is done through the zig-bee module. The implemented idea here is similar to the RC boat and additional part used is camera. The prototype of boat is controlled by remote based on RF signal i.e. radio frequency. Gear motors are used for the movement purposes either in forward/reverse or in left/right directions. On the other hand for video signal and audio signal, the wireless camera is interface to the controller. The controller used here is a Raspberry pi [3], which has different features for transmission of data. RF remote consists of RF Transmitter and RF receiver. The IR sensors are used to detecting the obstacles in order to avoid the collision. IR sensor transmit the signal to the controller and when the IR signal is receiver back then the object is been detected and the boat sharply turns the direction with the help of gears. This method [4] shows the work on monitoring the single PH parameter using wireless sensor network. The techniques used for monitoring parameter are Signal conditioning, signal processing and then communication. Here the sensor nodes are placed at different locations at river side. The PH sensor is continuously monitoring (real time monitored) and then signal conditioning and signal processing (conversion of signal) takes place and then sent to base station. This data is sent to main node (head node) and with the help of zig-bee module and the data is transmitted to the base station with the help of internet. If the parameters value goes above threshold level, then the alert message is automatically sent to the pollution control department. The data is received to the database i.e. base station for monitoring and analyzing. The technology implemented is Robot sensor boat (RSB) which is an autonomous boat for detecting water quality of lakes, rivers etc. The system is of low cost and web programs are made under NASA's earth system technology. The YSI-600R water SONDE sensor is used for measuring different parameters. The multi sensor water quality SONDE sensor is a 4 port sensor which measures different parameter such as temperature, conductivity, dissolved oxygen & PH. The GPS is used on autonomous boat for navigating in different areas. This sensor data is uploaded to the web. The cyber infrastructure is built, it has an ability to remotely monitor the real time data and analyze it. [5] In this method the water environment monitoring system based on the wireless sensor network. The MSP430F1611 controller is used to collect the sensors real time data. The monitoring system is divided into three parts i.e. data monitoring nodes, data base station and remote monitoring. [6] In this proposed system two sensor parameters are measured viz. PH sensor and temperature sensor. The system identifies that water is either contaminated or not, and if it is so then this information is informed to respective person. This system uses the different data monitoring nodes in different geographical areas. This data is received by the base station of that particular area. The zig-bee module is used to send the data from sensor nodes to data monitoring nodes. With the help of GSM/GPRS module the data is transmitted to the remote monitoring center viz. from data monitoring nodes to base station. The data is stored into the database of the base station and it can be access remotely any time. The new invention was underwater glider and the different sensing techniques used. They have developed a mature technology along with cost saving for real time ocean sampling purpose. The earlier ocean sampling was done from ships, cruise and small boats. The buoyancy engine is used in glider to control the up/down, forward/backward glide cycles. The GPS is used for underwater location for comparing the surface and depth of underwater with the help of preprogram and computer. Underwater gliders use the IRIDIOM satellite connection (line of sight) and the ARGOS transmitter is used for communication purpose. When the glider comes up at the water surface then the data is collected and the new mission is loaded in it. [7] The scientific sensors used are conductivity, temperature and depth along. Additional instruments such as photo-synthetically active radiation and Flurometers. Due to this advancement in glider, the gliders mission time is reduced due more power consumption.

Here the implementation of buoyancy based operation in glider and the motion is controlled by the internal mass redistribution control. The gliders are used for sensing and for long duration missions. The glider is of low cost, flexible and boats or ships are not required as a backbone. The gliders collect oceanographic data such as water temperature, conductivity, depth, and water currents. [8] They also carry other scientific sensors, such as Fluor meters, optical backscatter or bioluminescence sensors. The main purpose of this prototype model is to describe model parameter identification for the SLOCUM using experimental flight test data, focusing in particular data, from steady straight glides. The scientific sensing is done mainly by SLOCUM and this is the main focus of project. The buoyancy engine is electric piston based and the glider can go till 200m depth and Navigation sensors on the glider measure heading, pitch, roll, depth, sliding mass position and the piston drive position.

TABLE I Comparative Analysis

Sr. No	Name Of Author	Hardware Applied	List Of Sensors Used	Technology Applied	Publication Year
1.	Arjun K et.al	Raspberry pi	Force Sensitive Resistor, Leakage And Its Water Level, Ph, Turbidity	WI-FI	2017
2.	Cho Zin Myint et.al	FPGA, VHDL, Arduino	Ultrasonic, PH, CO2 And Turbidity	ZIG-BEE	2017
3.	Allula Rajini et.al	Raspberry pi	Camera	ZIG-BEE	2017
4.	K. A. Unnikrishna Menon et.al	Raspberry pi	Ph Sensor	WI-FI	2012
5.	Gregg Podnar et.al	Advance Controller	Sonde Sensor	GPS	2010
6.	Peng Jiang et.al	MSP430F1611	Temperature, PH	GSM/GPRS	2009
7.	R. Bachmayer et.al	Advance Controller	Sonde Sensor	IRIDIOM	2008
8.	Joshua G. Graver et.al	Advance Controller	Sonde Sensor	SLOCUM	2003

III. CONCLUSION

Water pollution is due to contamination of river, lake, pond water which changes the water quality and these days it has become dangerous issue. Water pollution is harmful for flora and fauna along with the human being. As the industrial waste gets added to the water, so the water color gets change and large amount of unwanted minerals get added to fresh water. Industrial waste contains the harmful chemicals which can have a bad impact on the human life. One of the major factors is if water bodies' temperature increases, it results in global warming. So the polluted water has a bad effect on human health also. Increase in globalization will increase the water pollution. So the water quality monitoring plays an important role; it shows the exact nature of water. Based on different study we can conclude that existing systems are not able to give the real time water quality data. Different methods are used for water quality monitoring but they are either manually operated or fixed at a particular location such as wireless sensor network. To reduce water pollution there should be a system where the real time data can be collected along with its location with a visual. So for surveying and continuously monitoring water parameters there should be an automated system which will collect the real time data using IOT.

IV. ACKNOWLEDGEMENT

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