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Remotely Operated Under Water Vehicle for Monitoring and Analyzing Water Quality

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Abstract: ***These days contamination turns into the principle concern whether it is noticeable in air (or) water. To handle air contamination there are various gadgets and strategies with regards to controlling water contamination it is less advanced for which this paper proposes a structure and improvement of a brilliant Remotely Operated Vehicle(ROV) for continuous water quality checking and investigating the parameters to get ideal outcomes. By contrasting estimated information and a pre-prepared database of water record parameters and with GPS as a key device for differing the gathered information can adequately monitor these parameters. Adding versatility to these amazing sensors by coordinating with ROV the efficiency and working range can be improved.***

Index Terms: ***arduino, ROV, sensors, windows application, zigbee transreceiver,***

I. INTRODUCTION

Monitoring and analyzing water quality has become a very crucial task in our day-to-day life , the main reason is that dependency on a numerous resources for the water like river, dam, reservoir, storage tanks etc. Due to the unpredictable nature of these resources there is a need to evolve our methods to tackle these changes occur in the water quality parameters by this modern world . In general the harmful effects in the water if these parameters either chemical or physical exceed the limit and the final outcome is beyond predictable. For example if temperature which is the main controlling factor for the life exits in water ,if it increases the solubility of oxygen decrease causing threat to aquatic life on the other hand decrease in temperature cause harm to the local ecosystems not only the variations in temperature effects the natural systems but it will lead to abnormality in each and every parameter in other words these parameters has to be in the limits or else it will be a total disaster .So there is a need to upgrade our methods to keep a track of these water properties. In order to perform this powerful sensor network system that contains methods to analyze and to collect samples if there are any abnormal conditions.

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The system described below is an effective solution to these tasks. the working of this ROV is to measure the data and transmit to the user to analyze and record the data with GPS to differentiate. This system has also integrated a wireless camera to observe the changes in the biodiversity existed around with respect to the present industrial world at a close level.

II. RELATED WORK

Preparing , observing , breaking down and make a record of all these in an enormous procedure includes both time and substantial capital particularly in a tremendous nation like INDIA and furthermore in the nation around 14 million representatives are subject to water enterprises. So to make the way toward breaking down the distinctive water bodies basic and powerful is the intention to pick this undertaking

There are such a large number of techniques to achieve this one like 1)fixed sensor systems 2)sample gathering which includes research facility 3)wireless sensor systems 4)remote detecting utilizing optical and thermal sensors however all these are troublesome in establishment and support if these sensor systems are incorporated with an automaton or a remotely worked submerged vehicle is the most effective strategy.

III. EXISTING SYSTEM

In the current strategies no setup is made which can move under the water, no setup which can gather the information at required depth (max 30m) and that to in any sort of water. Some existing techniques propose the sensors all are brooded in a pipe and suitable only the quality of one kind of water (eg: drinking water).There are additionally a few techniques in which just the water is checked from still position and recorded. After the setup turns out the visuals are checked to see for any undesirable exercises

There are likewise techniques which propose the control instrument of the automaton utilizing wired connection Using a wired association the automaton can go till 100 meters of profundity in water, typically it limits with the length of the wire . Up to now the widely used systems are fixed sensor networks which are limited to one particular location. Though they are doing a great job but their applications are limited to a narrow pipeline and stagnant shallow water systems, if the depth and flow of the water increases these systems are an absolute failure

IV. METHEDOLOGY

Water quality standards were designed by the World Health Organization(WHO) and in INDIA Central Pollution Control Board(CPCB)[17] provides the basic guidelines. Also indicates the water quality parameters to be monitored continuously in order to ensure safety of the consumer in their respective usages.

The choice of parameters to be measured in the system described is based on the priority in terms of cost effectiveness ,time to obtain results, availability of sensors with precision in measurement.

TABLE 1 describes about the parameters and their different ranges for the drinking water

Parameter	Units	Quality range	Measuring cost
Temperature	^{o}c	-	Low
PH	ph	6.5-8.5	Medium
Turbidity	NTU	0-5	High
Pressure	Pa	-	Medium

Table 1. typical parametres of drinking water

These parameters are listed above based on their respective measuring costs, based on the life time and the sensor availability in the market etc. Also the above table describes about the drinking water parameters alone. The other sources of water has different ranges depends up on the geographical, elevation from sea level, month of the year, water flow etc. Apart from these four parameters the parameter BOD plays an important role in calibration but it is cost too much due to he electrode is made up of gold and also the life time for the probe makes it difficult to use. For all the other parameters above mentioned shows abnormalities this system contains sample collector to extract samples at any depth and can be analyzed in laboratories. So in this system to analyze the parameters for the different water bodies at various conditions a unified pre database which confine to locations has to be implemented. For this purpose continuous data has to be recorded at various water sources, different times etc. So the analyzing methods has to be adjusted in accordance with the new data, this system has a privilege to change the key analyzing techniques with variation of present conditions.

V. PROPOSED SYSTEM

The proposed system contains user and underwater sections, in which user base contains the remote controlling mechanism and a windows application to analyze the measured data received from the underwater section which contains sensor integration and relay board to control the rover motion in different axis

A. UNDERWATER SECTION

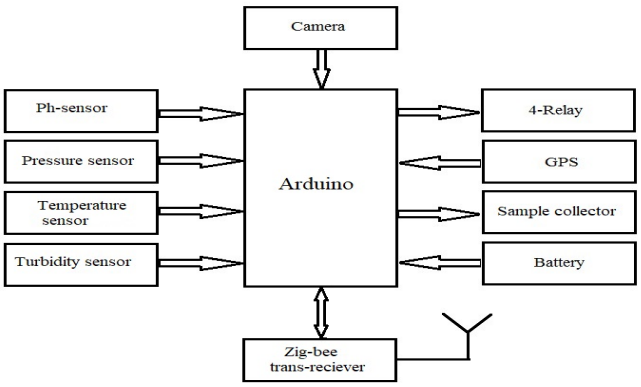

Figure 1. Block diagram of UNDERWATER section

The underwater section consists of arduino ,with integration of sensors and camera to it as basic components. It is the main body of the project and it goes underwater for surveying. this section consists of

1) **camera**:- the camera is for monitoring underwater and the live feed is transmitted through zigbee using wifi module to user base

2) **ph sensor**:- Used for measuring hydrogen ion concentration in water samples to describe the sample as acidic or alkaline. By the ph level of the water body it can clearly determine the solubility and aquatic life. High ph levels(9-14) can harm fish survival

Factors affect PH in water[7]-

- Acidic rainfall
- Increase and decrease in temperatures.
- Hardness of water
- Contamination by industrial wastes

3) **pressure sensor**:- This system uses a force measuring sensor which measures change in resistance when a force applied . The pressure plays a vital role in survival of organisms, it is proved that long exposures of different pressure makes a certain changes in their physiology. High pressure results slow activeness of fish making difficulty in fishing.

Factors effect pressure-

- Tsunami
- Waterspout

4) **temperature sensor**:- It resembles the degree of hotness or coldness it represents normally in ^{o}c(degree Celsius). Water temperature has to be monitored continuously in real time manner as it is the key to all major factors that affect life forms. As both high and low level of temperatures are not suitable for surviving

Factors effect temperature[7]-

- Surrounding air temperature
- Soil erosion
- Contamination by human activity
- Unknown chemical reactions

5) **turbidity sensor**:- It is a measure of cloudiness of water. Cloudiness caused by the suspended particles ,usually low level of turbidity level is safe higher levels of turbidity results in high concentration of viruses and bacteria. So it is important to keep turbidity levels in limit.

Factors effect turbidity[7]-

- Reduces water clarity
- Increase in temperature
- Decrease in photosynthetic activities
- Increase in microorganism activity

As these are the analog type sensors means the output is in the form of analog data to make it in to digital form and to transfer the data to the user arduino and zigbee are used respectively.

B. USER BASE

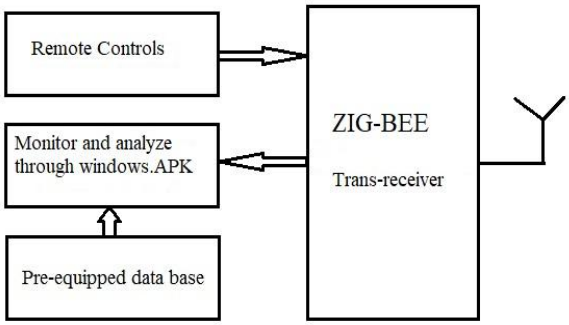

Figure 2. Block diagram of upper section

The figure 2 shown block diagram of outer section of project.It consists of majorly four parts. The first part is remote controls . It controls the movement of the underwater drone.The second part is the monitor and analyzing part. In this the camra live feed with the analyzig done by the pre equipped dat base with the sensors data received by the zig-bee transceiver .For analyzing there need to be a standard,There comes the third section called pre equipped data base.By reference to these standard values the data is analysed and result is obtained. The fourth section is Zig-bee transceiver which is the virtuval connection to the underwater part of his system The above flow chat tells the working of the system. As the power supply is started the propellers start moving ,there will be power supply for both userbase and the underwater section there will be the wireless transmission of data from underwater section to userbase through the zigbee model all the data is collected from the sensors if there is any change in data I will display in the user base or if there is no change the data will be checking again and again, If the data get change the data will be analized through the vb studio software ,through the parameters it gives the output after getting the output it will display and then it stops this is the entire procurer of the project

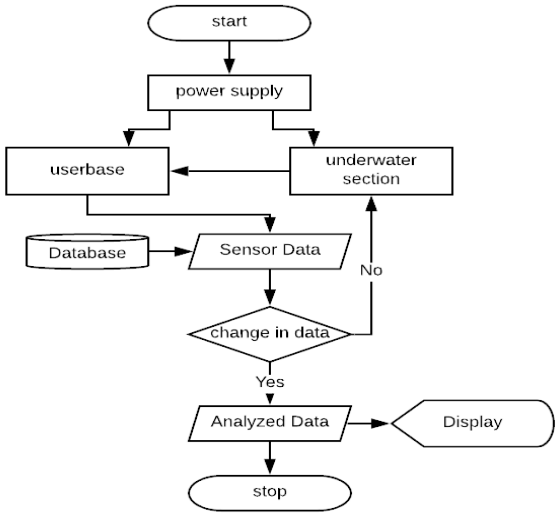

Figure 3. flowchart for system representation

When the connection is established between both the bases the sensors automatically measure the parameters in analog by the arduino the data converted to digital and it is transmitted to the user base by using a powerful transmitter and receiver known as zigbee. A customized application designed on windows platform by using a visual base studio 2017 with c# language record and display analyzed result

For analyzing below limits/ranges are used in this ROV system from organizations like WHO, CBCP , INDIAN sea temperature organization etc.

Parameters	River	Drinking water	Chlorinated water	sea	reservoir
Standard.TEMP ^{o}C	23-29	25	25-28	26.7-29.5	22.7
Measured.TEMP	25	27	29	27	-
Standard.PH	7.4	6.5-8.5	7.4-7.6	8.1	6.5-8.5
Measured.PH	6.5	7	8	6	-
Standard.turbidity	5-10	1-5	0.5	10-100	48-120
Measured.turbidity	15	1	3	49	-

Table2. standard range for various water sources

VI. RESULTS

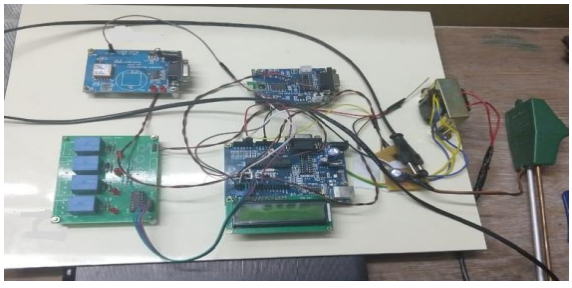

Figure 4 .Hardware model of the project.

The hardware of the project is working and it is tested with various water types from different water bodies the lcd1602 added in order to check the process before it is attached to the ROV to attain the final form of the project

VII. CONCLUSION

The proposed model is designed mainly to monitor and analyze the particular water bodies to overcome the disastrous affects that can be caused if ignored these tasks ahead of us. The components has been enclosed in a closed air tight space in order to prevent water leaking and also make an effective use of buoyancy. Customized windows application to gather results and to control the rover is the best optimistic solution.

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