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AIR AND WATER QUALITY MONITORING THROUGH IOT BY USING AQUATIC SURFACE DRONE

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Abstract: This project describes Air and Water quality monitoring system on Aquatic form is based on Arduino platform and a multi cannel sensor variables are interconnected and in which the certain sensing parameters of temperature , humidity , gas and salt are measured and as well as ultrasonic sensor is measured with the underwater obstacle. The sensing data can be saved on the memory of the surface drone, and accomplished with a web server database. Thus the sensors linking with Arduino board with multiple signal was constrained modules to be completed. The Embedded C software scripts were developed in order to values can be taken from the sensors and upload to a local storage database. The local storage can be connected to a server setup implemented on Arduino level using sensing values reproduced, in which the web server data will always reform whenever there are changes in the sensor values. And also one GUI Android application is developed. The application access to the server database and the assume readings continuously updated for a system administrator. Additionally Android application can be extended to be utilized in the people working area for data conceive and statistical analysis.

Keywords: Arduino UNOR3 board, LM35, humidity, gas, PH, ultrasonic sensors.

1. Introduction

The Internet of Things the term to be admired pushes its roots firmly in the present days with upcoming devices with concept of making it an essential criteria. The IoT platform is getting enormously bigger with time and broad class of variety of sensors. This technology being developed and used for life style change of the people. There are many gadgets which are distinct in their use, performance and type of usage which are coming up with the IoT application but are user friendly at the same time are secured with suitable applications.

The goal in this project is to measure air and water quality parameters by interfacing the sensor modules with Arduino platform. The entire setup is equipped onto the water surface drone. The quality of the air and water depends upon certain parameters which we will measure in this project. This statistics can give account of the quality of the air and water of a place from which essential steps can be taken for controlling it according to the user discretion. Existing methods of the application works are discussed as following

As the manual testing takes more time and the parameters can get altered, to avoid that a robot and smart irrigation module is used for field activities and irrigation problems, for storage problems smart warehouse management system and an IoT platform is used for saving time and energy[1][2].
Raspberry pi B+ is an IoT module that is connected to different sensors and the data collected will be sent to the cloud server and then it sends to a web server via user interface[3].

For providing environmental sustainability and to reduce the air pollution a drone based system is used to collect different informations in different locations[4].
The wireless sensor technology in which monitoring in which swarms of aquatic surface vehicles in which developed by Raspberry pi platform[5]
Smart GPS based remote controlled robot to perform tasks like wending, spraying, moisture sensing, bird and animal scaring, keeping surveillance[6]

2. Proposed Method

The proposed work concentrates on measuring the variables of air and water quality parameters by using the sensor monitoring system by Arduino platform coupled with IoT and the entire kit is equipped on to a drone setup with GPS with WI-FI ad-hoc network.

The sensor module connected with the circuit for monitoring of the parameters measures certain parameters according to its ability in the Arduino platform in which embedded C scripts are enabled for controlling the sensor and the other processing of the data from the sensors. The ArduinoUNO equipped with sensors such as the temperature sensor, humidity

sensor, salt sensor, PH sensor and ultrasonic sensor collects all the data and these data are send through cloud platform for which a server database required.
The IoT module in which WI-FI module using the data can be send through website on internet server database. The hardware setup of the water surface vehicle finds it's classification under Unmanned Surface Vehicle (USV). Basically the proposed USV will have all the entire controller, sensors and other modules. The Arduino collects and dispenses all the data to the ESP8266. The ESP8266 is a commonly used WIFI microchip used for the IoT application. This module sends the data to the cloud platform through mobile application to the farmer.

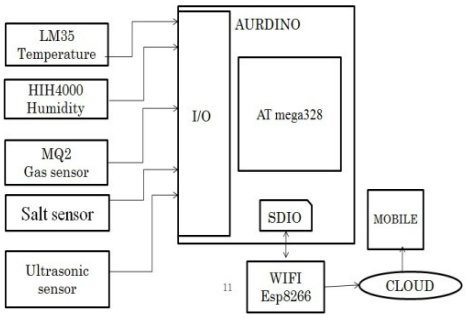

Figure 1. Proposed Block Diagram

A. Hardware and Connections

In our proposed system we use the Arduino UNOR3 board as the master controller with the help of Arduino IDE software using embedded c scripts. This Arduino board used in this project gets all the sensor values from the sensor modules used. The Arduino UNOR3 has 6 analog inputs, a 16 MHz ceramic resonator and 14 digital input/output pins in which the operating voltage is +5V with the recommended voltage of 7-12V.

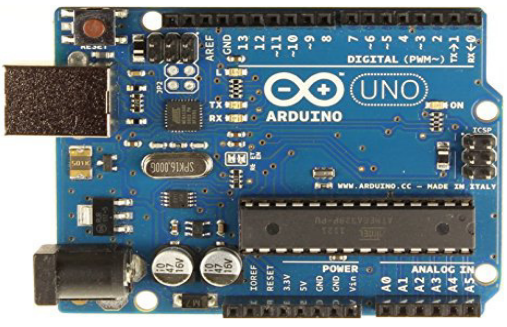

Figure 2. Arduino Development Board

The five sensors for air and water quality monitoring in which variables are temperature, humidity, salt, gas, ultrasonic sensors have 2pins VCC,GND as common. The ultrasonic sensor have 4 pins which are VCC,GND, trigger and echo where trigger is input echo is output. The other sensors has 3 pins 2 pins for VCC and GND and the third pin for the output, no separate input terminal is necessary.

The temperature sensor LM35 has operating voltage in the range of (0-5V) and resistance with a range of -55 to 1500. The humidity sensor(RH) has range of 0 to 100 percentage, it have 14 bit measurement resolution and relative humidity accuracy ±3% with supply voltage (3-5V).The MQ-2 gas sensor has high sensitivity to detect unfusionable gases LPG, Propane, Hydrogen, and methane. The ultrasonic sensor in which we are using for under water aquatics signal to find any obstacle by knowing the distance from system to obstacle.

In this system all the analog sensors will be interfaced with the Arduino UNOR3 I/O pins. For all the analog sensors input voltage is set at the range of (0-5V) in which all the analog sensors Vcc pin will be connected with Arduino UNOR3 power supply +5V and the ultrasonic sensor echo and trigger will be connected to the digital pins D1, D2 of Arduino UNOR3.

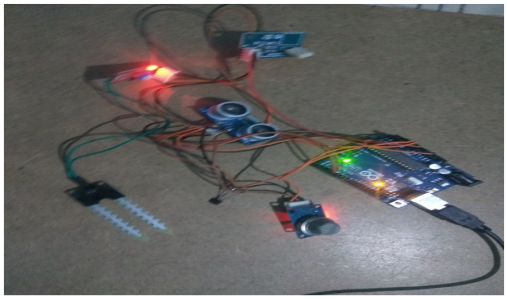

Figure 3. Hardware kit

The analog sensors in which all the ground will be connected to the Arduino UNOR3 ground pin. The O/P pins of all the sensors will be interfaced with the Arduino I/O pins which enables us to perfectly monitor the O/P connected to the system.

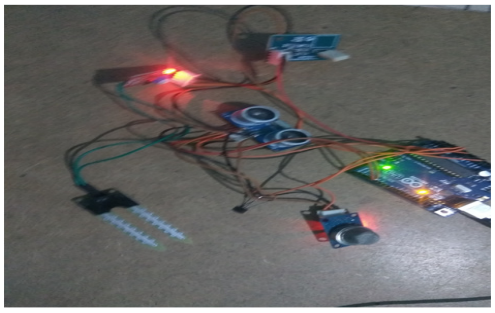

Figure 4. Hardware kit

B. Software

The system in which develop to using Arduino IDE compiler using Embedded C language scripts to get the values from the sensors with the help of Arduino UNOR3 micro controller. The programming in which Embedded C in which the values can be read from the sensors.

The Arduino IDE in which each sensor programming will be constructed to check the compilation errors and in which developing without compilation errors.

3. Experimental Results

A. Simulation Work

The sensor programming will be written in Arduino IDE with the help of Embedded C for the perfect calculation of the readings from the sensors which enables to build an efficient system with compilation without errors.

The simulation part of the project is done by using virtual simulation tool software Proteus. The entire project proposal with all the interconnections are done in the Proteus and checked for the working of the circuit with the simulation feature. This method gives a broad outlook of how the proposed project will work with simulated virtual inputs and outputs by correcting the possible errors which could occur in the real time hardware working of the project.

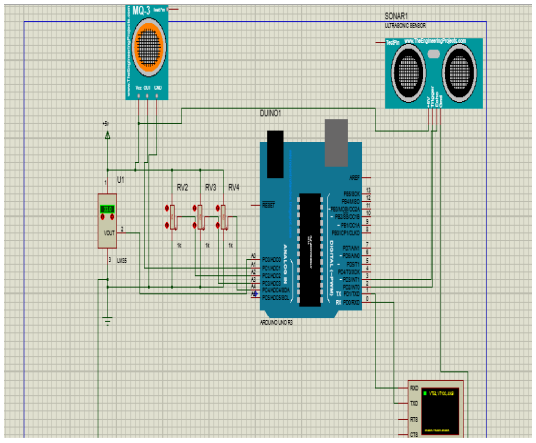

Figure 5. Simulation Circuit Diagram

The Arduino IDE sensor programming is used to create HEX file from the written Embedded C program. Open Proteus constructed circuit to click on Arduino processor and upload the HEX file. And the sensor monitoring readings can be visualized by the virtual terminal.

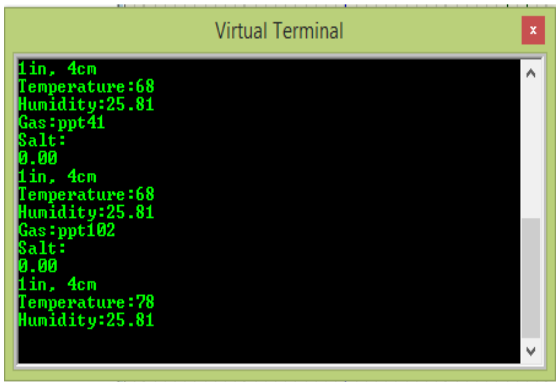

Figure 6. Simulation Results

B. Hardware Work

The system in which all the sensors interfacing with Arduino board and the kit was connected to the Arduino IDE system. The required programming is dumped into developed hardware kit for monitoring the values in serial monitor of Arduino IDE. The data from the Arduino can be viewed as shown in Figure 7, by using the serial monitor.

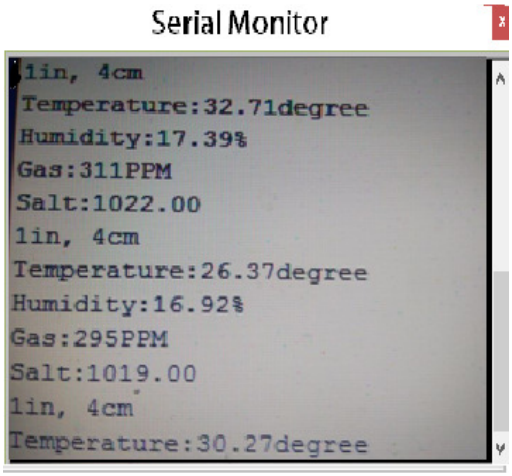

Figure 7. Hardware kit Results

4. Conclusion and Future Work

The aim of this project to the aquatic form for air and water quality monitoring to develop the abilities of executed system to provide the information to a different sensing parameters for an extended area.

The future work of in this project to develop the android applications and improvement their futures on software side. The hardware side in which develop the water surface drone in which facilitate implementation in the water and air quality monitoring.

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