Republic of the Philippines
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INTERNET OF THINGS (IOT) – BASED FISH POND WATER CONDITION MONITORING SYSTEM

INTRODUCTION

The research project is an Internet of Things – Based Fish Pond Water Condition Monitoring System. With the use of advance technology, fish farming has developed and is being widely known in the country. But there are two major factors affecting water quality for fish farming: water pollution and climate change. In regard to this, the researchers provided an innovations through developing a device that will monitor water conditions. In that way, it would be easier for farmers to control their water parameters and minimize damages. Internet of Things – Based Fish Pond Water Condition Monitoring System measures pH level: acidity of the water, dissolved oxygen level: total amount of oxygen that is present in the water, salinity level: amount of dissolved salt in the water, temperature level and ammonia concentration of the water. These are the major factors that needs to be monitored to maintain the quality of the water. It is an IOT based system that would integrate the functionalities of the device using smartphones. Smartphones are used to save data of the logs for every water reading done with the device. It automatically output the reading on the smartphones that are connected to 2 the device as well as on the prototype's LCD. As a result, the changes in water quality can be recorded and can be easily monitored and adjust water parameters by the users. The users could also save and download the data in excel format with time stamp using smartphone or computer as long as it has a browser.

OBJECTIVE

The general purpose of the device was to monitor the pH level, temperature, dissolve oxygen, salinity and ammonia concentration of the water using smartphones to prevent the increasing number of dead fish and maintain the quality of the water.

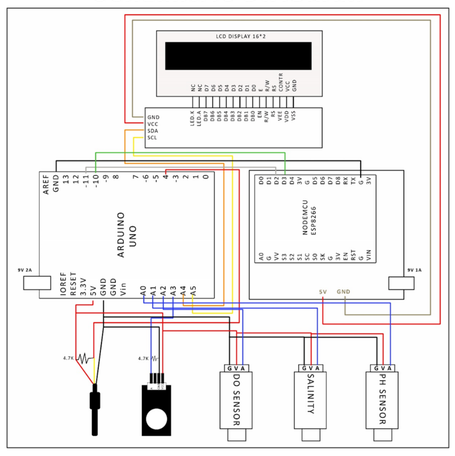
Specifically, the study aims to:

1. Designed a system that would monitor water condition and quality for fish farming;
2. Developed an application that store information of the device logs and display readings;
3. Test and evaluate the systems
   a.) accuracy
   b.) efficiency and
   c.) time; and
4. Conducted performance testing of the system.
5. Evaluated the device using ISO 25010.

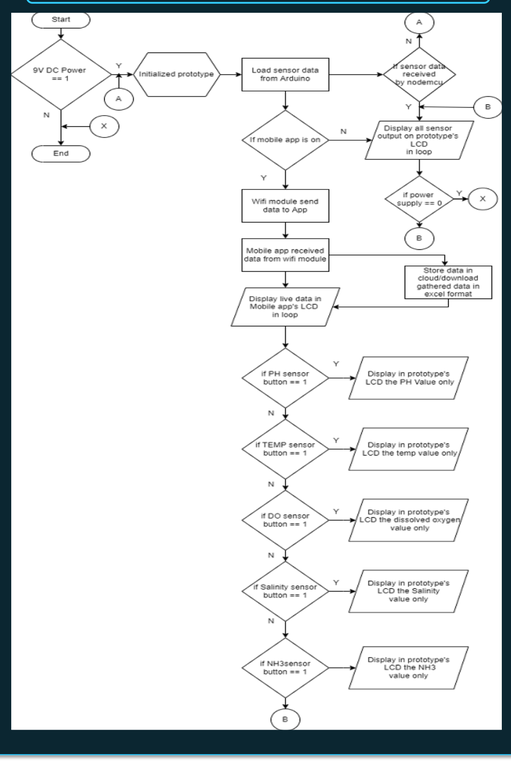
METHODOLOGY

The internet of things (IoT) – based fish pond water condition monitoring system driven by a 9v adapter into 220v AC power, as shown in the figures , which the system integrate the functionalities of the device using smart phones such as display and store sensor data's and the results for monitoring would be displayed on the system's LCD. The hardware of the IoT – Based Fish Pond Water Condition Monitoring System consists of an Arduino Uno, Nodemcu 8266 Wi-Fi Module, DS18B20 Waterproof temperature sensor, Dissolved Oxygen sensor, pH sensor, Electrical Conductivity Sensor and Ammonia Concentration Gas Sensor. Arduino IDE, C++ and Blynk.Console were used for the application and backend of the system that involves digitally controlling the hardware based on the ladder logic programming was used.

SCHEMATIC DIAGRAM



PRINCIPLE OF OPERATION



RESULT AND DISCUSSION

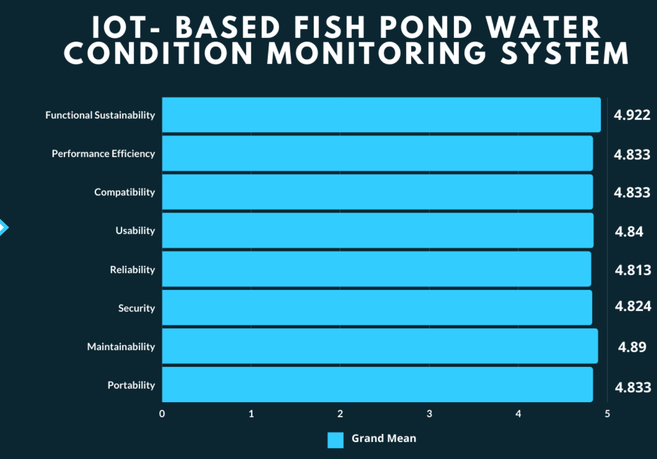
Result for the testing of accuracy of the system

END - USER	1ST TRIAL	2ND TRIAL	3RD TRIAL	ACCURACY
A	4	5	5	4.66
B	5	5	5	5
C	5	5	5	5
D	4	5	5	4.66
		TOTAL:		4.83

END - USER	1ST TRIAL	2ND TRIAL	3RD TRIAL
A	0.8s	0.8s	0.8s
B	0.8s	0.8s	0.8s
C	0.8s	0.8s	0.8s
D	0.8s	0.8s	0.8s

Result for the testing the speed of the system

Software and hardware evaluation result using ISO 25010 Product Quality.



CONCLUSION

The researchers were able to develop a system that can monitor water parameters and giving them assistance using their smartphones even in a far distance. The final design of the project gave a clear view of what actually the physical prototype is. The components used in the study were all suitable for the system's function of IoT – based fish pond water condition monitoring system. The prototype can accurately read all the water parameters. Based on the testing results, it can accurately read all the data that are expected. Comparing the buffer solution and the actual water test it can proved that the system are working properly.The speed of the system is constant since it is programmed to read parameters every 0.8s and the speed of the application is always depends on the speed of the internet connection. Once that Arduino Uno detect the sensor data it will automatically display on its LCD as well as on the mobile device. The NodeMCU are the bridge to send the data from Arduino to the mobile application. The data travels from the prototype to the system display that fast.he system can accurately and effectively store all the sensor readings that has been registered to the cloud on the system into Blynk.console. The information includes pH sensor data, temperature sensor data, dissolved oxygen sensor data, salinity sensor data and ammonia sensor data with timestamp on every readings. There were no problems encountered in storing of data into the cloud. All of the data that was received by the cloud can be seen on the mobile application.The technical aspects of the hardware and software were evaluated using ISO 25010 Quality Model. The ratings of the prototype in all categories are ranging between to 4.633 to 4.966 which falls in the rating scale of very satisfactory. The lowest rating is 4.824 under the category of security while the highest rating is 4.922 under functional sustainability. Therefore, the result of this study shows that the output project successfully met all of its objectives. The study has proven its accuracy, functionality and effectiveness.

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