Design and Implementation of IOT Based Real Time Monitoring System for Aquaculture using Raspberry Pi

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Abstract— Internet of things is one of the rapidly growing fields for delivering social and economic benefits for emerging and developing economy. The field of IOT is expanding its wings in all the domains like medical,industrial,transportation,education,mining etc.Now-adayswiththe advancement in integrated on chip computers like Arduino, Raspberry pi the technology is reaching the ground level with its application in agriculture and aquaculture. Water quality is a critical factor while culturing aquatic organisms. It mainly depends on several parameters like dissolved oxygen,ammonia, pH, temperature, salt, nitrates, carbonates etc.
The quality of water is monitored continuously with the help of sensors to ensure growth and survival of aquatic life. The sensed data is transferred to the aqua farmer mobile through cloud. As a result preventive measures can be taken in time to minimize the losses and increase the productivity.

Keywords:- Raspberry-Pi, Sensors, (IoT), WSN

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I.   Introduction:

Aqua culture is one of the flourishing sectors in India as it contributes nearly 1.07% of the GDP. It is estimated that fish requirement of the country by 2025 would be order of 16million tones but due to over fishing natural fisheries have been depleted as a result commercial aqua culture came into existence. But in recent years commercial aquaculture is facing many problems due to sudden climatic fluctuation which leads to changes in water quality parameters. At present aqua farmers are depending on manual testing for knowing the parameters of water. This will consume time and inaccurate because water quality parameters may alter with time. In order to overcome this problem, technology should be brought to aqua culture which increases the productivity and minimize the losses by constant monitoring of water quality parameters.

For monitoring Aquaculture system different parameters come into picture like PH, Ammonia, dissolved oxygen, temperature, Nitrates, Salt, Carbonates, Bi-carbonates. These sensors are mounted to sense the data and the data is transferred to the aqua farmer through IoT. This project uses an integrated on chip computer Raspberry Pi which has an inbuilt Wi-Fi module which makes it unique on IoT platform.

Wireless Sensors Networks (WSN) is well situated for long term environmental data acquisition for IoT representation.WSN solutions already cover very broad range of applications, research and technology advances continuously expand their application field. This trend also increases their use in IoT applications for versatile low cost data acquisition and actuation.

II. Literature Survey:

The method suggested by K.Raghu Sita Rama Raju, "Knowledge Based Real Time Monitoring System for Aquaculture Using IoT," help the farmers for accurate reliable monitoring of water quality parameters because manual testing can consume time and water quality parameters may alter with time being and it helps to take pro-active measures before necessary damage was done. Further there is no need for manual testing periodically. It saves time and energy. [1]

The method suggested by Jui-Ho Chen,Wen-Tsai Sung and Guo-Yan Lin, "Auotomated Monitoring System for the Fish Farm Aquaculture Enviornment" The central system is equipped with a Wi-Fi transmission module that can be used with most popular android mobile devices connected directly to increase the overall system convenience and timeliness.[2]

The method suggested by Mihai T. Lararescu "Desing of WSN Platform for Long-Term Enviornment Monitoring for IoT Applications"IoT has reached the farmers for reducing the risk from climatic fluctuations and ensure growth and health.[3]

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III.Related work

These project is already implemented by microcontroller for monitoring the aquafield but raspberry pi is more advanced when compared to microcontroller as it has inbuilt wi-fi module,reprogrammable capability,on-chip system.

The central system is equipped with a Wi-Fi transmission module that can be used with most popular android mobile devices connected directly to increase the overall system convinence and timeliness.

Water parameter are automatically detected under the control of single chip microcontroller all day . The single chip gets the data, and then processes and analyzes them.

IV.Proposed Method

1. Determine the required functionality for the work-Temperature sensor, Dissolve oxygen sensor, pH sensor, Ammonia sensor assigned different GPIO's
2. Determine what user modules are necessary to realize the required functionality With the help of wi-fi technology we upload the data from Raspberry pi on industrial website
3. Determine the analog or digital blocks resources that each user configuration uses.

A block schematic (fig.a) and flowchart (fig.b) of proposed system is as shown below
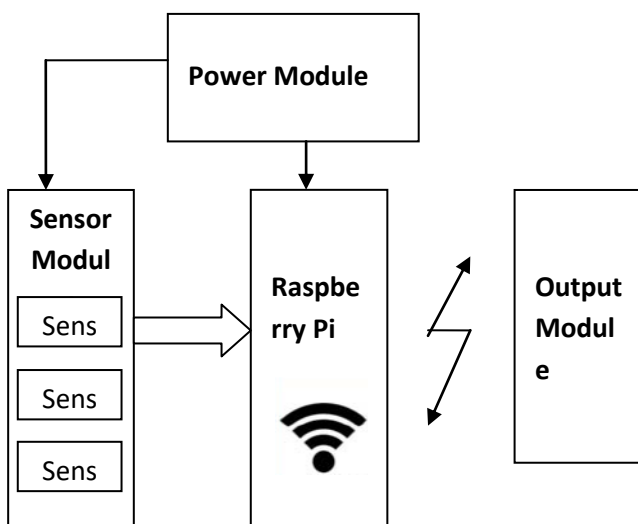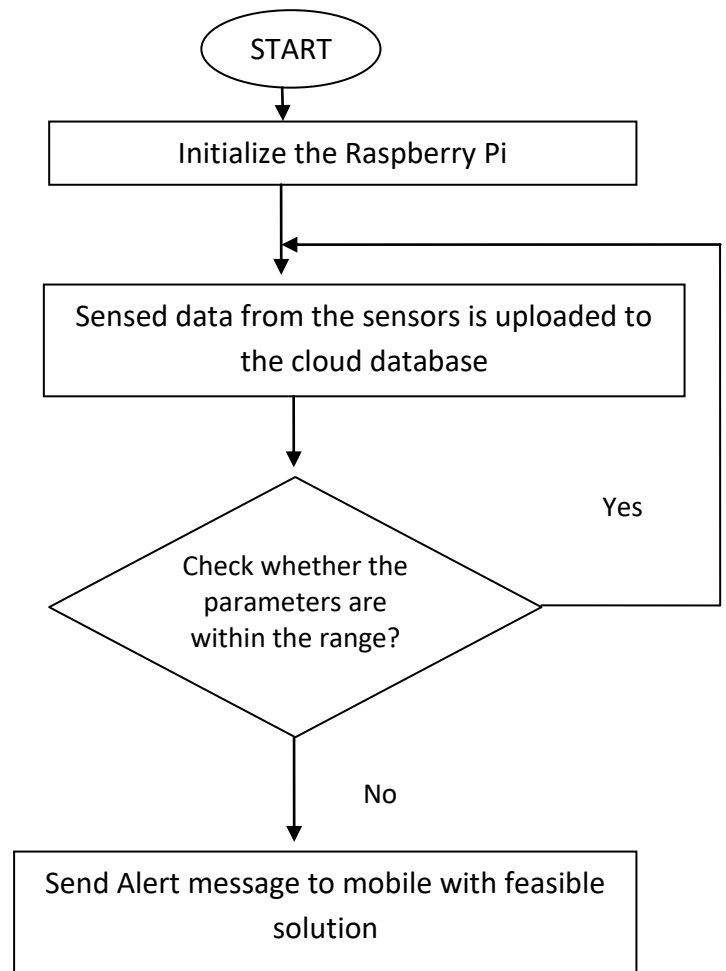

Fig.a Block Diagram Of Proposed System

Fig.b Flowchart of Proposed System

1) Sensor module:

The sensor module comprises of several sensors such as Dissolved Oxygen, Ammonia, pH, Temperature. These sensors are mounted on Raspberry pi and are used for sensing the water quality parameters from time to time.

2) Raspberry Pi:

It is considered as heart of this architecture. Raspberry pi is a low cost, small computer board with Linux as operating system. It has several advantages when compared to other micro-controllers such as inbuilt Wi-Fi module. The Program for collecting the sensor data is written in python language and sends that data to the cloud database.

Fig c.Raspberry pi 3

3) Output module:

Output module consists of a circuit to store data on a cloud and to send a message to aqua farmer in a critical condition.

Facilities required for proposed work:
Hardware: Raspberry Pi, Sensors
Software: Python

Fig d. Raspberry pi 3 GPIO

V. Conclusion:-

Now a days commercial aquaculture is facing many problems due to sudden climatic fluctuation which leads to changes in water quality parameters. At present aqua farmers are depending on manual testing for knowing the parameters of water. This will consume time and inaccurate because water quality parameters may alter with time.
 By using automated farming systems allow the following benefits:

1) Origin of production close to the market demand
2) Improved environmental control
3) Reduced losses caused by major disasters
4) Reduced management environment

for the aquatic life. Further the collected data can be analyzed using big data analytics and preventive measures can be taken before the water quality parameter crosses the threshold range. The aqua system can be made automation using IoT which reduces the energy consumption and labor cost. [3]

VI.Referances

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