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Design and Development of Water Monitoring System for Flood Level Measurement using IoT

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Abstract: *In this paper we implemented the system for sensing the water level and sending data to server through Wi-Fi module and wireless controller using Internet of Things (IoT). Recently flood has hit a north India; many people are affected and displaced because of flood. The important thing is diffusion of information related water level before the flood occurs; we design a system that gives information about water level to server. The threshold value is set for each level, if water level reaches that value corresponding data transfer to server which display on webpage in the form of colors which indicates three colors, each for different level.*

Keywords: *Internet of Things (IoT); Wi-Fi; Wireless Controller.*

I. Introduction

Recently flood hit a many parts of India which responsible for immense and major loss of life and property damage. At present in India the flood situation is monitoring by observing water level of major dam and rivers in country which worked on manual basis.

We need to improve the present system with the help of sensors in dam and rivers which give measurement values related water level. For this purpose we design a system for people who live in low lying areas and suffer the damage because of flood [1].

In current water monitoring system, observing and data acquisition related water level is administered by person that information may not be completely accurate. Delayed in diffusion of information can cause crucial situation to low lying areas people. There are various gauges available to measure water level but they are expensive in cost [3]. There are different technologies exist for wireless communication. Nowadays Internet of Things (IoT) technology used for home appliance and various devices with sensors, network and software, which entitle these things to interchange information. One of the expeditious impacts of Internet of Things is on environmental problems as well as on quick warning systems [8].

In this paper, we implemented water level monitoring system based on Internet of Things (IoT) and the cost of this solution is low compared to gauges that enable monitoring water level and warn to low lying areas. The background discuss in section II and details of sensors, Wi-Fi module and architecture described in section III, finally whole system work conclude in section IV.

II. Related Work

The paper by J. A. Hern´andez-Nolasco, et al. [1], discussed a flood early warning system that based on Internet of Things. In this work, micro-model is designed with a water level measurement sensor basis on open circuit which close when communicated with water. In the paper [6], Thinagaran Perumal, et al. explains IoT based water monitoring system which executed in real-time. In this system a water level sensor is used to observe the appropriate value, and if the water level accomplishes that value, the alert will be given in real-time to social network like Twitter. The future scope of this work, to develop a custom dashboard on android application, which easy to deal with the users.

Daniele Miorandiet, et al. [3], discussed the survey on Internet of Things (IoT) which gives overview to understand massive prospective of IoT and what are the immense issues in the research area. It described a survey of applications, research obstacle and applications for Internet of Things and described different aspects of it. Luigi Atzori, et al. [7] also discussed the complex research challenges, various perceptions of these IoT parameters.

Mihai T. Lazarescu [9], examined all stages of practical implementation of a wireless sensors network (WNS) for monitoring environmental IoT applications. The authors Yin Jie, et al. developed the integrated system for smart home system by applying IoT technologies [8]. RFID tags are used in communication process in between agents and appliances that tags are connected to appliances so that help in

identifying and detecting them. In this paper we referred above and similar work has been done by other author related IoT technologies and water level management system by using various software and hardware.

III. Implementation

This approach has two parts which shown in architecture of water level monitoring system (Fig. 1). In first part water level sensing is executed by water level sensor which placed in water tank and sending data through a wireless controller to cloud. In next part cloud processing is perform where the data will be processed on the cloud and email alert server will trigger emails on certain conditions.

A. Architecture:

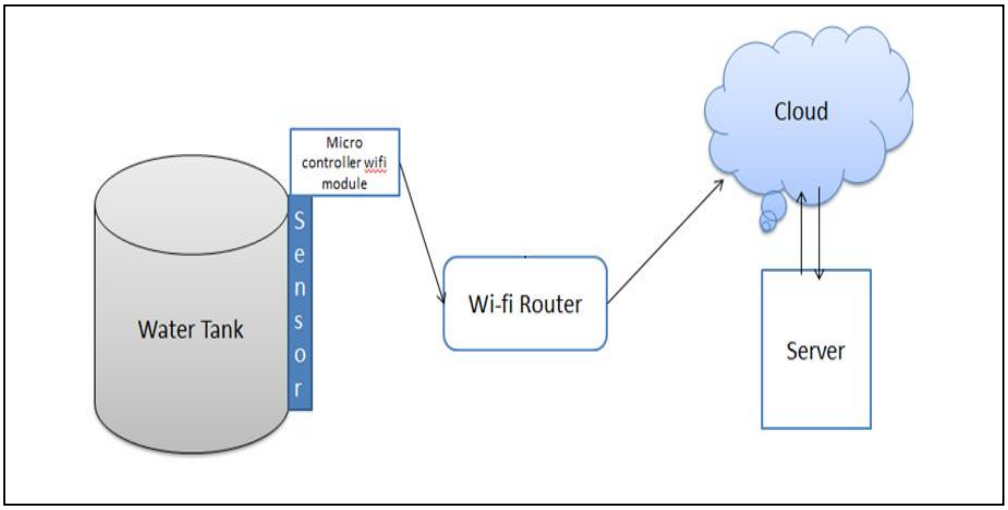

Fig.1 Architecture of Water Level Monitoring System

In this system following hardware are used,

1. Water level sensor: We used water level sensor is detect and identify amount of water.

It traces the volume of water with a parallel wire opened. It is an analog sensor which gives varying output in voltage depending on the water level.

The fig. 2 shows the diagram of water level sensor in which the VCC is connected to 5volts and GND ping is connected to GND on power source. Analog value of 0 volts indicates no water and 5V indicates maximum water level. The output analog voltage varies between 0 to 5 volts indicating the varying water level.

Fig.2 Water level sensor

Fig. 3 Micro-Controller

2. Micro-Controller: It is an integrated computer chip which is easy for receive and transmit data. It is inexpensive and come with an open source hardware paradigm. It has 14 different pins, easily connects to computer with USB which shows in fig 3.
3. Wi-Fi Trans-receiver: It is microcontroller with an integrated TCP/IP socket which give access to Wi-Fi network. It is the popular platform for Internet of Things (IoT).

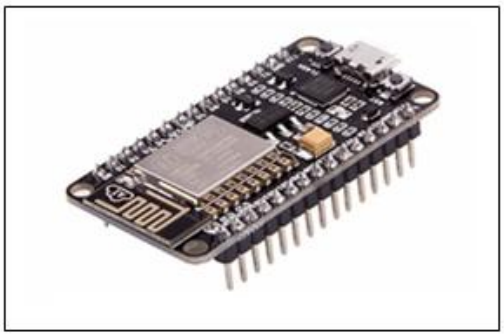

Fig. 4 Wi-Fi Trans-receiver

Above hardware are used for this system which interconnected to each other and worked to detection and identification of volume of water level. The fig. 5 shows the overall setup of water level monitoring system based on IoT.

B. Software:

l. Linux system (Ubuntu)
2. PHP
3. Python

C. Algorithm:

This Algorithm explains the working of the water level monitoring system step by step. System having two parts: Sensor node and Server node which steps are explain as following.

Sensor Node:

1. Water level sensor senses the water through resistance between its probes.
2. Micro-controller then scales the analog value from 0 to 1000 in digital format.
3. The Microcontroller send the digital value to ESP8266-01 Wi-Fi module using Universal asynchronous receiver-transmitter (UART) protocol.
4. The ESP8266-01 Wi-Fi module after receiving the digital data, sends the data to the Cloud Server through Hypertext Transfer Protocol (HTTP).
5. Step one repeats after every 5 seconds interval.

Cloud Server:

1. Receive data from sensor node.
2. Display the data on the webpage.
3. If data is less than 500 go to step 6.
4. If data is greater than 500 and less than 700, then go to step 7.
5. If data is greater than 700 , then go to step 8
6. Mark water level as safe, turn panel color to green, go to step 9.
7. Mark water level as rising, turn panel color to yellow, go to step 9.
8. Mark water level as critical, turn panel color to red, go to step 9.
9. Wait for other HTTP data from sensor node, go to step 1.

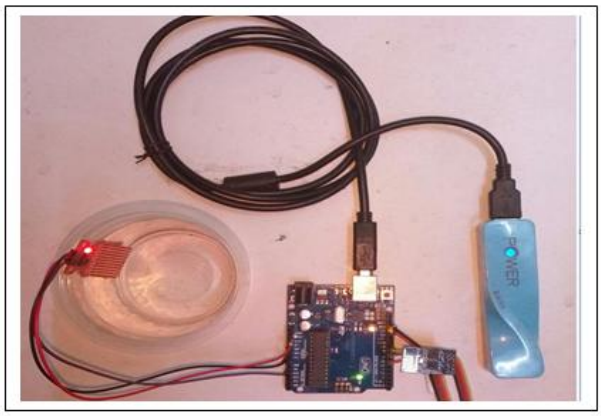

Fig. 5 Prototype of Water level Monitoring System

IV. Result And Discussion

We worked on water level monitoring system based on IoT, in this work the sensors plays important role for reading, observing and detecting the data related water level. The above algorithm explains the working of the system step by step. We get the result on webpage in the form of alert and color that shows in fig. 6 (a, b & c).

The Fig. 6 shows the different water level alerts, the low level water level alert in fig. 6(a), the fig. 6 (b) shows medium water level alert and fig. 6(c) shows high water level alert on webpage and server site. As explain in an algorithm, if the data value is less than 500 then it shows green light with low water level alert. If server receives the data values in between 500 to 700 it gives warning yellow signal which indicates the medium water level and it could be converting to critical water level. And last one is critical situation if the data values are above 700 which is indicate in red color on webpage.

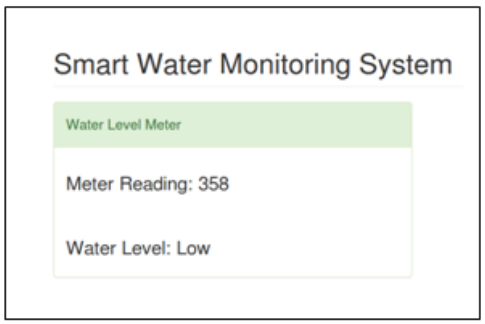

Fig. 6 (a) Low water level alert

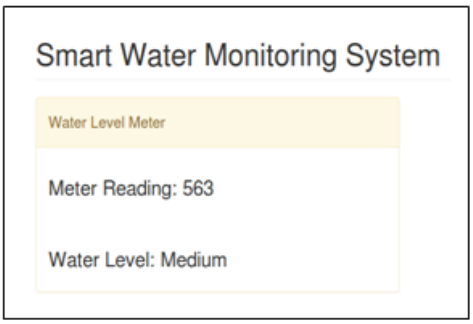

Fig. 6 (b) Medium water level alert

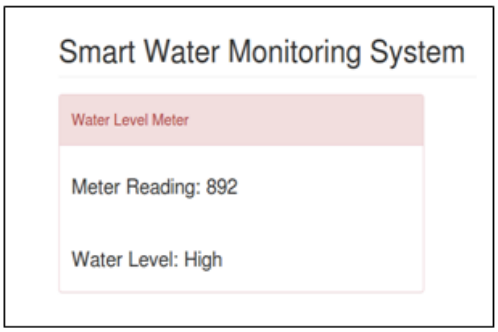

Fig. 6 (c) High water level alert

V. Conclusion

The water level monitoring system based on Internet of Things (IoT) is more advantageous than other existing systems to observing water level and warning. It is automatic technology which replacing solution for manual system. For furthermore with the help of gateways a device would develop sound system, for announcement in low lying areas before and during the flood.

This Internet of Things (IoT) based water monitoring system that measures water level in real-time. A water level sensor is used to detect the desired level and if the water level reaches the specific level, the data will be sending to cloud server. A cloud server will be configured as data repository. Alerts and relevant data will be transmitted over the Internet to a cloud server and trigger notifications & announcement on speaker near flood prone area.

This is very helpful for people not having access to modern devices such as smartphone, television, radios etc. for alert messages or real time information. We will have historical data on server, so that we can use this for future references and take necessary precautions or actions.

References

[1] J. A. Hern´andez-Nolasco, Miguel A. Wister, Francisco D. Acosta and Pablo Pancardo, "Water Level Meter for Alerting Population about flood," *IEEE 30th International Conference on Advanced Information Networking and Applications*, 2016.

[2] Mark Langdon, "A Flood Watershed," *IEEE magzine, Vol. 4, Issue 7*, May 2009.

[3] Daniele Miorandi, Sabrina Sicari, Francesco De Pellegrini, Imrich Chlamtac, "Internet of things: Vision, applications and research challenges," *ELSEVIER-ScienceDirect, Ad hoc Networks Vol. 10, Issue 7, pp.1497-1516*, September 2012.

[4] Mihai T. Lazarescu, "Design of a WSN platform for long-term environmental monitoring for IoT applications," *IEEE J. Emerg. Sel. Topics Circuits Syst., Vol. 3, No. 1, pp. 45–54*, Mar. 2013.

[5] Nova Ahmed, A.K. Azad, Mahmudur Rahman Khan, AhsanHabib, Shuvashish Ghosh, Sabiha Shahid, "ShonaBondhu: a cloud based system to handle flash flood," *IEEE International Conference on Networking Systems and Security (NSysS)*, 2016.

[6] Thinagaran Perumal, Md Nasir Sulaiman, Leong.C.Y, "Internet of Things (IoT) Enabled Water Monitoring System," *IEEE 4th Global Conference on Consumer Electronics (GCCE)*, Febuary 2016.

[7] L. Atzori, A. Iera, and G. Morabito, "The internet of things: A survey," *ELSEVIER Computer Networks, vol. 54, no. 15, pp. 2787 – 2805*, 2010.

[8] Yin Jie, Ji Yong Pei, Li Jun, Guo Yun, Xu Wei, "Smart Home based on IoT Technologies," *IEEE International Conference on Computational and Information Sciences*, June 2013.

[9] Yong Li, Yu Wang, "Design and Implementation of Reservoir Dam Safety Monitoring Platform Based on ASP.NET*," IEEE 2nd Advanced Information Technology, Electronic and Automation Control Conference (IAEAC), pp. 2644 – 2648*, 2017.

[10] M Saravanan, Arindam Das and Vishakh Iyer, "Smart Water Grid Management using LPWAN IoT Technology*," IEEE Global Internet of Things Summit (GIoTS), pp. 1-6*, June 2017.

[11] Hasan Arshad Nasir, Algo Car Erik Weyer, "Control of Rivers with Flood Avoidance," *IEEE Austrilian Control Conference (AuCC), 2016 Australian, pp. 141-146*, November 2016.

[12] Qiang Yue, Fusheng Liu, Changqing Song, "A Study on the Reservoir Intelligent Inspection System Based on the Internet of Things Technology," *IEEE International Conference on Computational Science and Engineering (CSE) and Embedded and Ubiquitous Computing (EUC), Vol. 2, pp. 181-183*, July 2017.

[13] Chengfang Hu, Xuejun Cheng, Xiao Xiao, "Integrated application of water informatization: A case study from Zengcheng Guangzhou China," *IEEE 6th International Conference on Agro-Geoinformatics, pp.1-5*, 2017.

[14] J. Boon, R. Heitsenrether, and W. Hensley, "Multi-sensor evaluation of microwave water level measurement error*," in Oceans, 2012, pp. 1–8*, Oct 2012,

[15] G.W. Choi, K.Y. Chong, S.J. Kim and T.S. Ryu "SWMI: new paradigm of water resources management for SDGs", *Springer Smart Water, 1, no. 3*, Dec. 2016.

[16] How Liquid Level Sensors Work - http://www.tc-fluidcontrol.com/aboutus/ blog-posts/how-liquid-level-sensors-work/ [06 Feb 2017].