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Automatic Controller Service Package for Tank Water Management

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***Abstract*— Water is highly essential element required for the existence and survival of mankind. Though world is blessed with rich source of water, today it is at the junction of water crisis mainly due to poor management of this valuable resource. Thus main drawback of current system is, it does not contain any efficient mechanism for checking water quality, water level, leakage detection and flow of water etc. For example at present water quality is detected by chemical tests or laboratory tests. This is a manual process and time consuming. Thus efficient water management system becomes need of the hour. This paper proposes usage of Internet of Things(IoT) for water quality and flow management. This novel technique also provides mechanism for alerting user for every threshold water levels by using level sensors, pH sensors for checking water quality, finds the leakage in the tank, theft detection using IR sensor, and also gives the smart billing finally the data analysis has done based on the sensor data using machine learning algorithms. The data collected is also processed and stored to cloud using Raspberry Pi. This provides smarter, low powered water management system with higher mobility and efficiency. Finally all these features form a complete package for smart water management using IoT application.**

***Keywords*— *Raspberry Pi*, Level sensor, pH sensor, Flow sensor, Cloud**

I. INTRODUCTION

Water is highly essential and precious resource required for the existence and survival of the mankind. But due to number of human and natural activities this valuable resource is getting polluted day-by-day. Pollution level is increasing for number of reasons like deforestation, industrial growth, excessive use of pesticides, industrial effluents etc.

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In many countries researchers and scientists Excess and inefficient use of water resources drain out all the sources available. Thus saving water is one of the main aims of sustainable development plan for any country. With the growing use of technology and new inventions models can be developed to manage water sources at different levels. Researches are going on to develop smart water management system. Internet of Things (IoT) is one of such domains which has promised solution for the development of smart water management systems. The different sensors like pH sensor for quality management, level sensors for water level management etc. can be used in the development of smart and efficient water management systems. Number of smart application have been developed using different sensors. But these research works include segregation of different techniques that are used for water management. For example researches are carried out how pH sensors can be used to measure quality of water. Likewise researches are carried out how smarter water leakage management system can be developed using the concepts of IoT. But all of these do not provide one single package that can efficiently address all the issues of water management. The paper tries to nullify this gap. Paper proposes automatic controller service package for tank water management. The objectives are listed below:

- To develop an automatic controller service using Internet of Things (IoT) enabled techniques for water management.
- To show the analysis of water usage on timely basis for saving and quality checking.
- To visualize data in cloud with alert notification on mobile
- Water consumption calculations for billing, water leakage and theft detection.

The rest of the article is organized as follows: Section II gives the related work, section III gives insight of proposed system. Section IV. Section IV provides control logic diagrams. Section V gives application of proposed work. The article is concluded in section VI.

II. RELEATED WORK

This paper highlights how to control and monitor the water in metropolitan cities. Internet of Things application is designed by embedding sensors to it and distributed data management method is used. It also explores the techniques of processing sensor details using cloud. While at this point

automatic improvement of water quality is not feasible, effective use of modern technologies, methods and other economic procedures can aid to improve quality. It also helps to educate people and create sort of awareness among masses. Various articles are reviewed before proposing this work. They are discussed in this section.

In paper [2] authors highlight how to manage and plan water usage and how it can be installed in the residential apartments and it also informs water level using level sensor and also how the data can be pushed into the cloud and how to visualize in android app. Mainly this paper helps in how to use level sensor and how to upload this sensor data in to the cloud database.

Paper [3] highlights mainly water quality checking using pH sensor, turbidity sensor, temperature sensor and TDS sensor all these sensors help in water quality monitoring. They help in checking purity of water. The results are frequently monitored and steps can be taken to restore water quality. Regular monitoring of water quality helps in quick restoration of water quality and better water management.

Paper [4] highlights how to check the water quality using wireless sensors. It uses the internet through which all the sensed data from wireless sensor is moved into the cloud database.

Paper [5] focused only on the flow of the water and how to distribute the water in order to save the water and power consumption. The paper uses mainly flow sensor in order to find the flow unit of the water and also uses temperature and moisture sensor in order to find the water values the author have used the arduino board to setup the experiment trough which all the sensed data collected by the arduino board has sent to the cloud to visualize.

Paper [6] author have described about the smart water management using sensor and software module in order to find the required water quality and quantity of the water the model uses the GSM model to pass the message to authorized person regarding water details. It also uses flow sensor and level sensor to find the flow rate and level of the water finally the author has achieved the objective for quality of the water.

Paper [7] highlights how to check the water quality using pH sensor. It uses microprocessor to which all the sensor like flow sensor, PIR sensor and pH sensor. It shows how to use all these sensors and how to collect the sensor data and how to process all these data in microprocessor from which the data is moved to the cloud storage via internet. Mainly paper deals about the water monitoring sensor and there function with respect to the water levels. Finally it gives the results for sensor and uploading these results to cloud.

In the paper [8], the authors have described how to create smart water management using IoT technique the author has explained about the various sensor and how to connect these sensor to the microcontroller in these paper they have shown how to manage and plan the usage of water using IoT techniques and also paper has shown how to use the level sensor in order find the levels of water in the tank and also explain how to use the ARM microcontroller.

In the paper [9] the author have described or focused on smart city application for drainage water management system. Every cities in India has facing the drainage issues due lack of infrastructure and lack of manpower in order resolve all these a smarter application as implemented through which it easy to find the drainage water overflow and the blockage in the drainage pipe and so on by using the IoT kit. In the paper [10] the author have described or focused on the smart city application using IoI kit it mainly deals with garbage cleaning like the sensor has been connected to the garbage kit if the garbage in the bucket has reaches high it will give immediate message to the garbage collector with location of the garbage bucket has fit in particular region overall the paper focuses on garbage collection.

In the paper [11] the authors have described or focused on smart agricultural development using IoT how to manage agriculture more efficient way and also more smarter way has shown in the paper it mainly capture all the environmental condition in a particular region based on the data collected by the IoT kit the data has been uploaded to the cloud to visualize the data and form some interesting insights in it.

In the paper [12] the authors have described or focused on the smart city application using raspberry kit these paper mainly helps for urban sector in order form the smart city and also the author has used cloud computing platform in order to store all the details of the cities and there availability and techniques that helps in order to achieve smart cities the author has used raspberry pi tool kit to carry out the model. As reviewed with earlier studies it is found that there is no complete package to handle all the issues of water management. The paper addresses this lacuna to propose a full package for water management with multiple features.

III. PROPOSED SYSTEM

The proposed model will used to overcome the drawbacks present in existing method. This uses pi as one of the core controller and various sensors are used in the Automatic Controller Service for Water Management. The block diagram of our system is shown in Figure 1. Raspbian operating system runs on the Raspberry pi to manage various types of equipment's including sensors and so on. Different sensors are connected to Raspberry pi to monitor the conditions of water[16,18,21]. The Raspberry pi will collect data from different sensors finally sensor data is pushed to thingspeak cloud and visualization is done in tableau toll using the machine learning algorithms and finally each sensor data has analyzed and shown in the tableau dashboard based on the avg sensor value for each week as been estimated. The main aim of these proposed models is to integrate all the sensors in one complete package so that the user can have more features in one IoT application. Due to these features it takes less time, cost is reduced, easy to deploy and gives more efficiency. In the proposed system we have used an ADC converter (MCP 3008) IC to convert analog signal into digital. In the proposed system both pH and Level sensor has connected to ADC converter in order to convert analog data into digital data[13]. Finally the proposed system concludes the integration of all these hardware modules will form a complete package for automatic controller service for water management using IoT kit which gives the end to end

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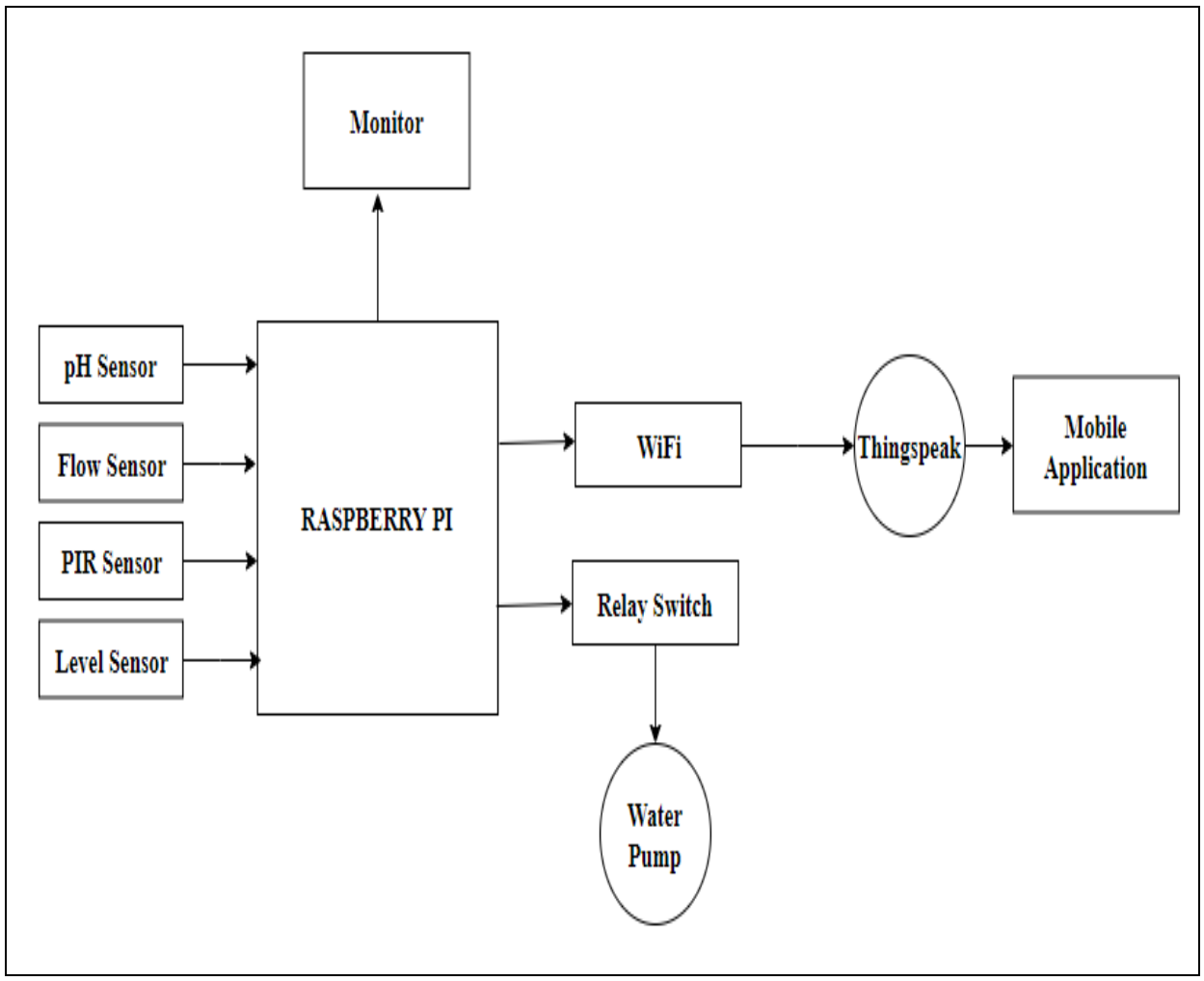

Fig. 1: Block diagram of controller system

IV. CONTROL LOGIC DAIGRAM

The data processing is the task of checking the various sensors data received from the Environment with the already fixed threshold values[17]. The control diagram shows the working of each sensor based on the threshold level and its charters for changing the threshold values.

A. Control logic for level sensor

The Control logic for level sensor is shown in the Figure 2 it collects the information from level sensor and checks the sensor values if the level sensor value is less than 50 it shows the low water level or if the level sensor level is between (50-150) it shows the mid water level else it shows the high water level. Based on the threshold values of level sensor the water levels can be detected [19].

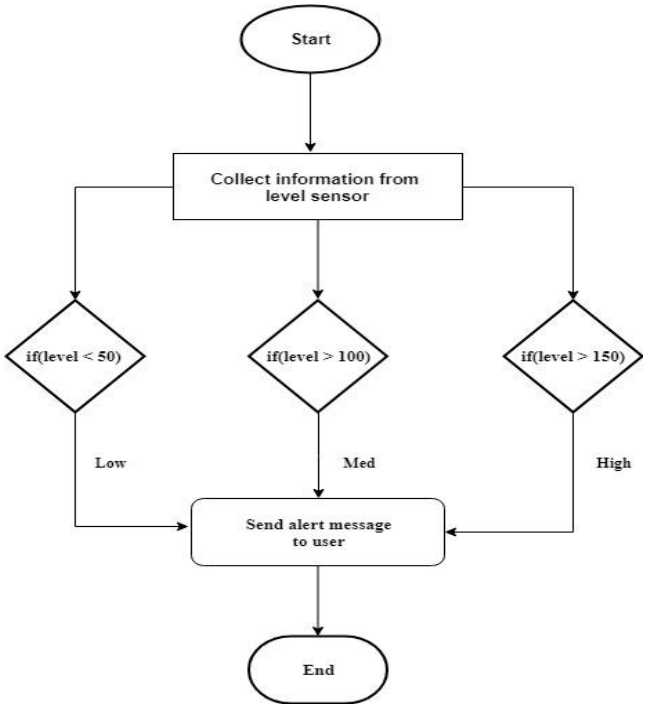

Fig. 2: Control logic for level sensor

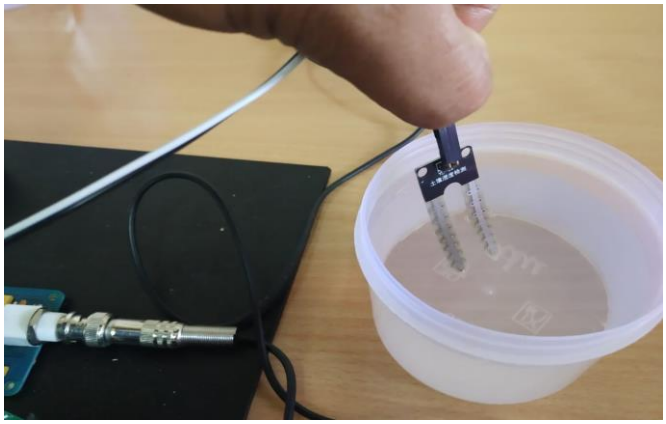

Fig. 3**:** Snapshot for Level sensor experiment

As shown in the Figure 3 gives level of water based on the level sensor is dipped in the tank. The level at which the water has shown in the thing speak cloud via microprocessor.

B.Control logic for pH sensor

The Control logic for pH sensor is shown in the Figure 5 it collects the information from pH sensor and checks the sensor values if the pH sensor value is less than 150 it shows the acidic in nature or if the pH sensor level is between greater than 150 it shows the natural. Based on the threshold values of pH the nature of water is detected[20].

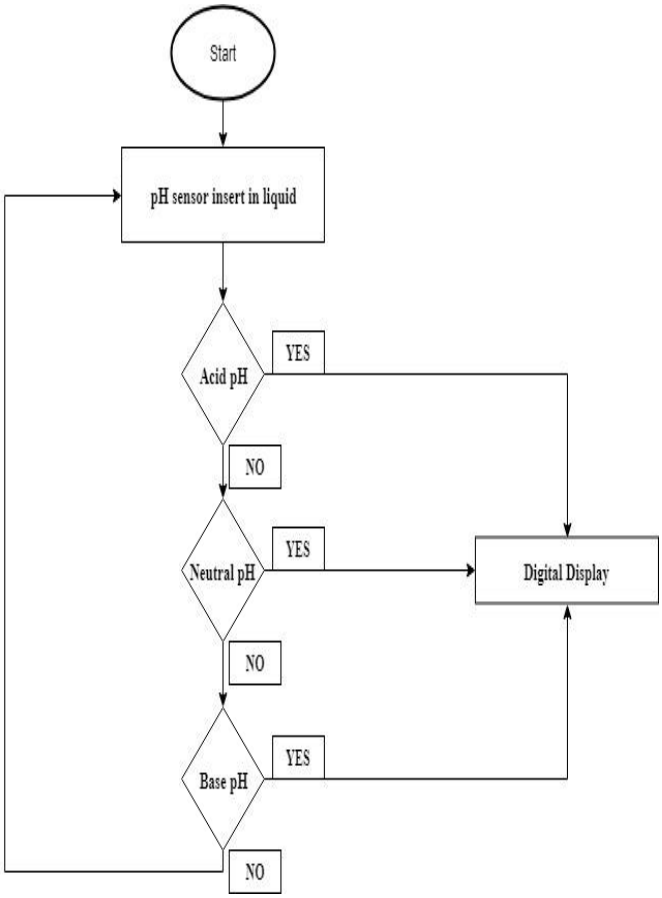

Fig. 5: Control logic for pH sensor

Fig. 4: Snapshot for pH sensor experiment

As shown in the Figure 4 the pH sensor gives the pH value of the water. When the pH sensor is dipped in the liquid if the pH value is greater than 150 then the liquid is in natural in nature i.e water. If the is less than 150 then the liquid is acidic in nature. Then finally the value is sent to the thingspeak cloud for visualization.

C.Control logic for PIR sensor

The Control logic for PIR sensor is shown in the Figure 5, it collects the information from PIR sensor and checks the sensor values if the PIR sensor value is one or True the human is detected and message as sent to the authorized person[14]. All the sensor will work based on pot configuration in the sensor and each sensor has supply, ground, Vcc, input and output based on the requirements the pins can be configured to get the required output all these sensors are connected to the microprocessor called raspberry pi unit through which the data can be pushed into the cloud using inbuilt wifi and finally all the data can be viewed in the thingspeak.

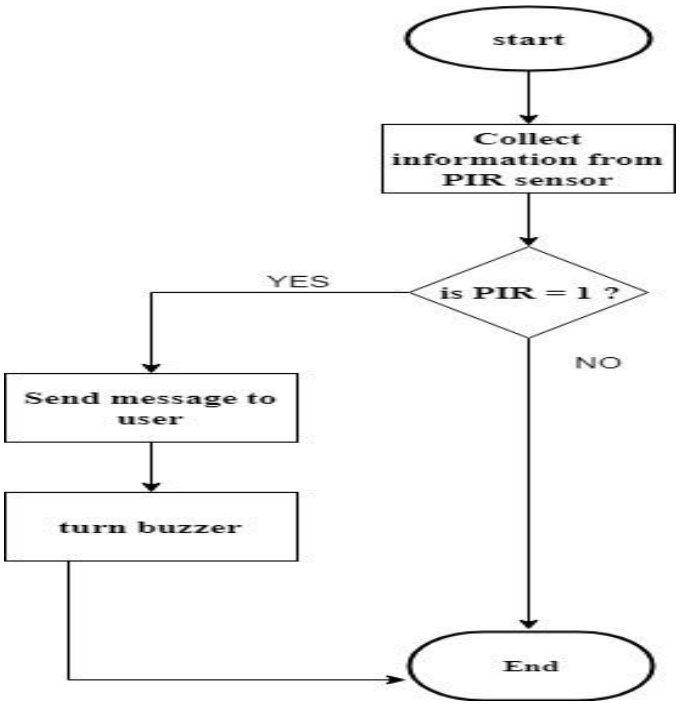

Fig. 6: Control logic for PIR sensor

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D.Data Analysis

The data that generated in the think speak cloud it has created in the form of .csv file the generated csv file can be taken for analysis to find the weekly average result for pH, flow unit and level of the water[15]. The machine learning algorithm is used such as k means, arima for data analysis and finally the data can be visualized in the visualization tool called tableau all the weekly based result can be viewed in the tableau dashboard [15].

V. APPLICATION

The proposed system finds its application in eefective water management. Water as the most valuable resource has to be used carefully as many of the freshwater sources are getting depleted[16]. Reguala maintenace of water pH level helps to take steps to restore water quality. Similarly altering users about level helps to use it with utmost care in water scarce areas. Some of the applications are listed below:

- This system is used in both domestic and commercial use.
- Mainly helpful for Water Supply Sector.
- It also helps in health department and also used to regulate water quality.
- Used to avoid inefficient usage by keeping regular check on the usage.

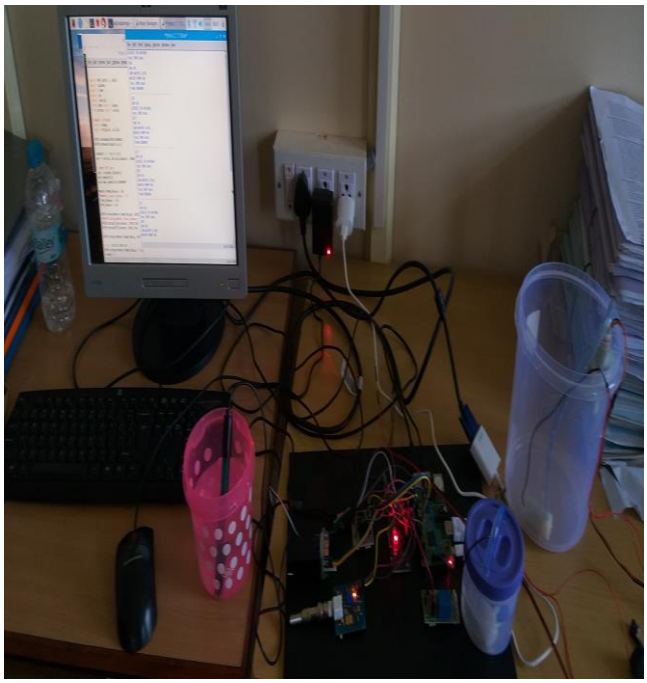

Fig. 7: Snapshot of Proposed model (Working Model)

As shown in the Figure 7 the snapshot for proposed model where all the sensor has connected to the raspberry pi. Through which all the data has sensed by the processor has sent to the cloud via inbuilt Wifi in the processor. Finally the sensor data has pushed to thing speaks cloud for visualization.

VI. RESULTS AND ANALYSIS

In the proposed and developed system the microprocessor is connected with four sensors (Level sensor, pH sensor, PIR sensor, Flow sensor) all these sensors are connected to Raspberry pi as shown in Figure 1. All these sensors regulate different parameters when they are dipped in water. Finally the main objective of the paper has been successfully completed in finding the leakage of the water in the tank, Flow unit of the water, Levels of the water, pH value of the water and the analysis of the data[18].

Fig. 8: Data displayed in Thing Speak

As shows in the Figure 8 the first pic shows the result for level sensor. When the level sensor is dipped into the water the sensor starts functioning and it send the data to the microprocessor. In the second pic it shows the result for pH sensor based on the pH value it shows the acid, basic, normal water. Finally the flow sensor shows the flow of water and speed of the water. Raspberry pi will collect all the sensor's data and process the data. This entire sensor's data is transferred to the thing speak cloud using API key via internet. The following section shows all the sensor results like level, PIR, pH and flow sensor and IR sensor.

A. Readings of Level sensor

As shown in the Figure 9 the level sensor result it mainly shows the different levels of water based on the sensor dipped in the water. Measurement of water levels is depending on the sensor dipped in the water.

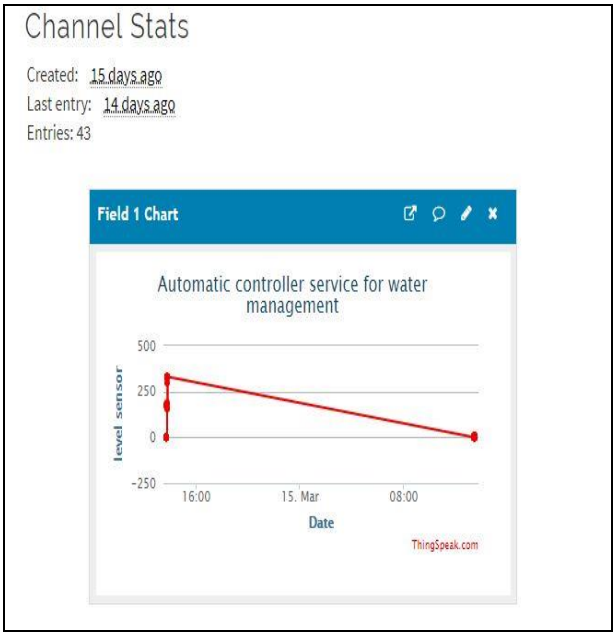

Fig. 9: Measurement of level sensor

B.Readings of pH sensor

Figure 10 shows pH sensor results. pH value of water in the range of 0 to 14. Depending on the pH value water is classified as three types: acidic, basic and normal. If the pH value less than 7 consider as acid. If the pH value greater than 7 consider as basic acid and if the pH value is equal to 7 consider as normal water.

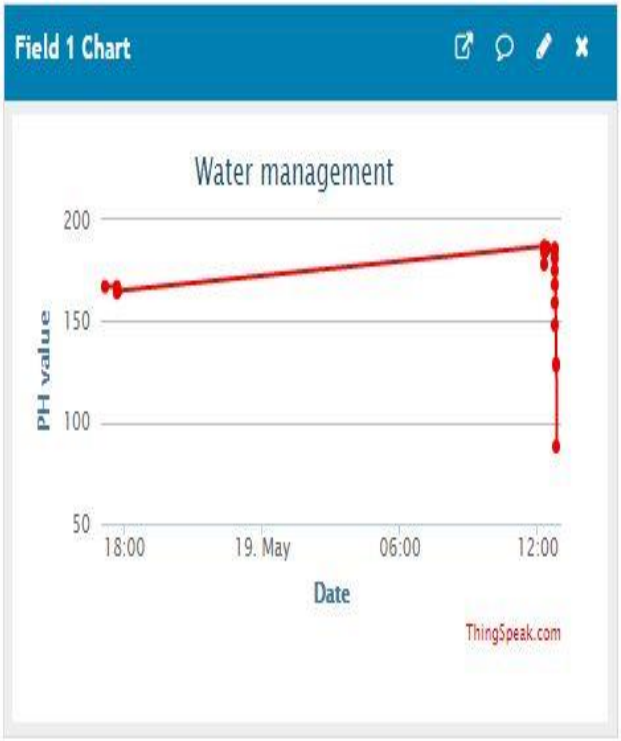

Fig. 10**:** Measurement of pH sensor

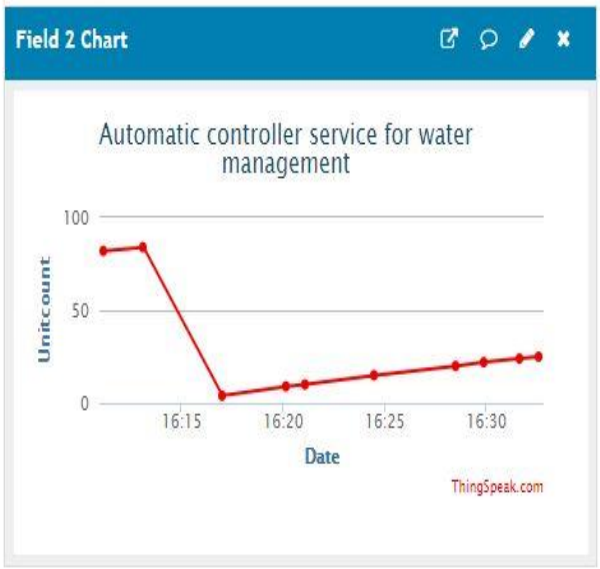

Fig. 11: Measurement of flow unit

As shown in the Figure 11 result for flow sensor it shows the water unit how much quantity of water is utilized is seen in the figure based on flow of water the flow sensor predict the unit count for each interval of time.

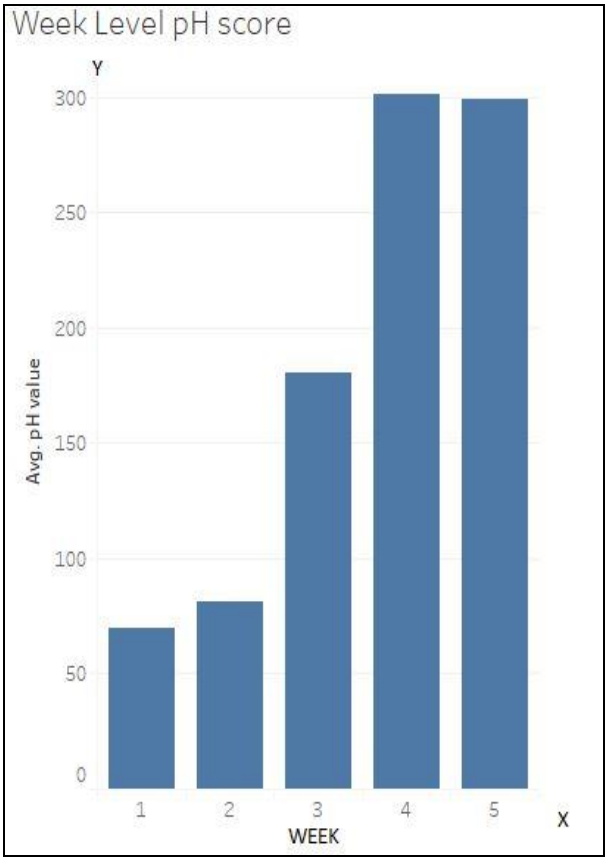

Fig. 12: Analysis of pH score

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As shown in the Figure 12 the detailed analysis of pH score v/s weekly analysis of pH score in the figure average pH value can be estimated for each week in timely bases due to this result it helps in finding the next pH score based on the graph value.

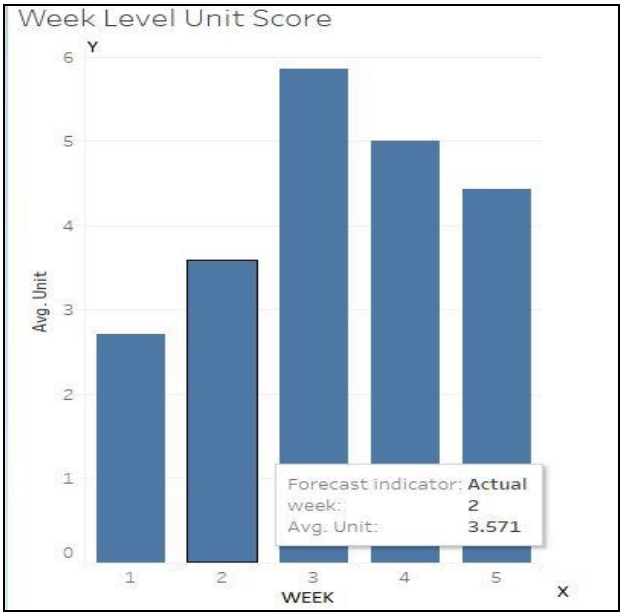

Fig. 13: Analysis of flow unit

As shown in the Figure 13 the detailed analysis of flow unit score v/s week. analysis of flow unit score is estimated. average flow unit can be estimated for each week in timely bases due to this result it helps in finding the next flow unit score based on the graph value.

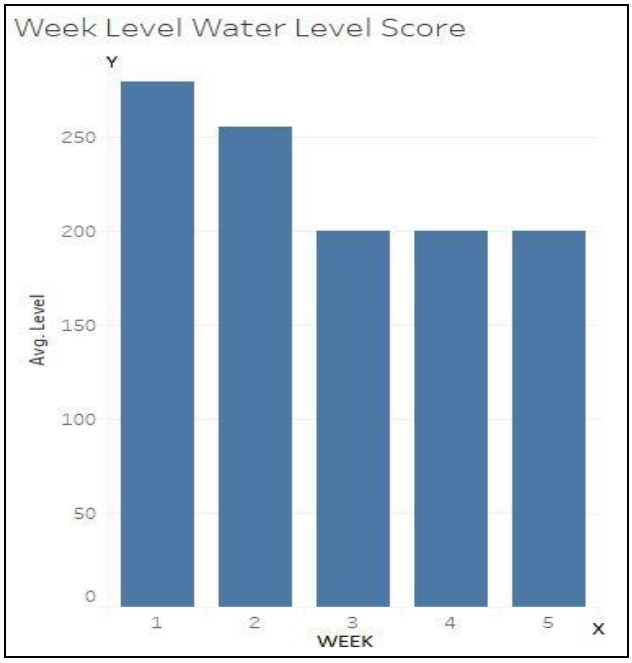

Fig. 14: Analysis of level score

As shown in the Figure 14 the detailed analysis of level score v/s week. Analysis of level score is estimated. Average level score can be estimated for each week in timely bases due to this result it helps in finding the next level score based on the graph value.

VI. CONCLUSION AND FUTURE WORK

The proposed system "Automatic Controller service for water management" is mainly focused on the smart water management, checking the water quality using pH sensor, and finding the level of water in the tank using level sensor and also detecting the motion of human using PIR sensor. Due to these futures it is very useful for residential area and also for commercial sector and it is easy to deploy in residential area and it works efficiently. In the proposed system the results for level sensor, PIR sensor and pH sensor are estimated with the help of raspberry pi and various sensors. In the future, some of the parameters for checking the water quality are conductivity, chloride, ammonia, iron, fluoride etc also used to check the purity of water for many purposes like drinking water and daily requirements.

REFERENCES

[1] Dr. S . A. Shaik h, Suvarna A, Sonawarn. " Monitoring Smart City Application using Raspberry PI Based on IoT ", Published in 2018 International Journal for Research in Applied science and engineering Technology India, 2018.

[2] Dr. Sayali wadekar, Vinayak vakare, Ramratan prajpati, Shivam yadav, Vijaypal yadav, "Smart water Management using IoT" published in IEEE Conference India, 2018.

[3] Dr. Vaishnavi V, Daigavane and Dr. M. A. Gaikwad Quality Monitoring System Based on IoT" Published in Research India Publication India, 2017.

[4] Dr. Seema verma, Prachi "Wireless Sensor Network Application for Water Quality Monitoring in India" published in 2017 IEEE Conference India, 2017.

[5] Dr. Nikhil Kedia "Water Quality Monitoring for Rural Areas-A Sensor Cloud Based Economical Project." Published in 1st International Conference on Next Generation 15) Dehradun, India, 2017.

[6] Luan, Shang-Wen, et al. "Development of a smart power meter for AMI based on ZigBee communication", Power Electronics and Drive Systems, 2017. PEDS 2017. International Conference on. IEEE, 2017.

[7] Charles RackoffDaniel R. Simon, Non-Interactive Zero-Knowledge Proof of Knowledge and Chosen Ciphertext Attack, Annual International Cryptology Conference, 1991.

[8] S.Geeta, S.Goutami "Internet of Things enabled real time water quality monitoring system" Published in Springer Open journal Vol 5, in 2017.

[9] Jyoti Bhatt, Jignesh Pataliya "IoT based water quality monitoring system" Published in IJIEE Journal, Vol 4, in 2017

[10] Aaina Venkteshwaran, Harsha P "An IoT based system water quality monitoring" Published in IJRCCE Journal in 2017.
[11] Pradepkumar M. Manisha j ,Suganya Devi "The real time monitoring of water management in IoT Environment" Published in IJIRSET, in 2018.
[12] Mithali Borbade, Shruti Danve "Real time water monitoring system" published in IEEE in june 2017.
[13] P.Sushmita, G.Soumyabala "Design and Implementation of weather Monitoring and Controlling System" Published in International Journal of Computer Application, in 2017.
[14] M.Jayalakshmi, Dr.V.Gomathi "An Enhanced Underground Water Pipeline Water Leakage Monitoring and Detection System using wireless Sensor Network" Published in International Journal in 2017.
[15] Riasood, Manjitkaur, HemantLenka "Design and Development of Automatic water Flow Meter" Published in International Journal of computer scienc, engineering and application, in 2016.
[16] PranithaVijaykumarkulkarni, M.S Joshi "An IoT based water supply monitoring and controlling system with Theft identification" Published in International Journal of Innovative Research in Science, Engineering and Technology, in 2017.
[17] Kondamudi Siva Sai Ram, A.N.P.S.Gupta, "IoT based Data Logger System for environment monitoring using Wireless sensor networks" Published in International Journal of Engineering trends and technology (IJETT), in 2017.
[18] P.Sushmitha, G Soumya,"Design and Implementation of weather monitoring and controlling system", Published in International Journal of computer application, in 2017.
[19] Nashwar EI-Bendary, Mohamed Mostafa M. Fouad, Rabie A. Ramadan, Soumya Banerjee and Aboul Ella Hassanien, "Smart Environmental Monitoring Using Wireless Sensor network, Published in IEEE conference in 2017.
[20] S.Sharma, V.N Mishra, R.Dwivedi and R.R,Das "Quantification of individual gases/odors using dynamicresponses of gas sensor array with ASM featuretechnique", Published in IEEE Conference in 2018.

