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IoT Based Smart Garage Vehicle Washing Water Nestor

Pavan Manjunath, Pritam Gajkumar Shah

Abstract*: Water is critical part of the human life. In most of the developing nation, water pollution is one of the bigger mess. These issues can be handled strictly by the Government organization, by implementing tougher action rules to the industries, were the water are released without any proper treatment. Where each industries (or) smart cities, should take up self-initiative responsibility for proper treatment of the polluted out flow water. In our research paper, we are not focusing on the wider area of the water pollution; our focus is limited within the smart cities vehicle washing garages. In very smart cities, were a regular multiple vehicles washing is done in the garage, our research paper will focus on the out flow of the populated water from these vehicle washing garages. Our design and implantation process is simpler and straightforward approach. Were we will monitor of the water quality; and how much level of the water is populated, and it requires at what level of the treatment. These process can be easily automated using the multiple IOT (internet of things) based sensors, the data can be streamed into the Big Data lake (or) it can be directly pushed into the cloud computing services for generating the real time graphs and analyses report instantly. These data collected in the Big Data lake (or) cloud computing services, can be used for detail analyses for research purpose. We will incorporate the block chain concept to keep track of the smart garage location address and the detail information of the number of garage in the smart cities details in the form of the blocks.

Keywords: Climate Change, IOT Monitored Water flow, Water flow Sensor, Smart city garage, Internet Of Things, Big Data lake, Cloud Service.

I. INTRODUCTION

As the world is growing, the water is becoming most important part of the human life on the day-to-day work life, if we do not save water now with in next few year there will be scarcity for the water. As in the recent trend as technologies are evolving, we can make effective use of these new technologies such as IOT (internet of things), block chain, cloud service and big data lake.

The IOT (internet of things) [1] is a collection of the different set of sensor devices, that tailor human needs together in order to serve specific tasks in an very well-organized method. It has the computational power to send machine-generated data value set about the environments (or) real-time data can be broadcasted for further use.

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* Correspondence Author
Pavan Manjunath*, Ph.D, Scholar in Computer Science, Jain University, Bangalore, INDIA,
Dr. Pritam Gajkumar Shah, Ph.D from Australia, Department of Computer Science, Jain University, Bangalore, INDIA

These set of devices can be in form of multiple sensors [2], embedded software systems, microchips electronic devices, electronic appliances integrated with environment, and embedded data analysis electronic microchips. This paper present a low cost water monitoring system, which is a solution for the water wastage and water quality. The set of the larger data collected during 24 hours of data is either pushed into the Big Data[3] lake database for further analyses (or) to the cloud computing [4] server database for detail graphical analyses. In our research, we have incorporated security concepts, there are possibility of data been hacked by the unknown person, while transferring data set values from the smart garage location to the government organization. Each washing garage details are transferred in the form of block, to the target system database. Here the final target system are government organization, these data will be consumed by the environment research team members (or) by the government sewage employee to keep check on the water pollution. The block chain [5] is evolved as a strong contender for providing security [6] for data values.

II. PROBLEM STATEMENT

Fig. 1. The figure showcase the car washing in the garage [7]

In the current vehicles washing existing system, as most of the chemical water are not treated (or) the populated water level are not measured on the real-time. As most the garage release populated water directly into sewage, it is a major concern for the development countries. The figure showcase the car washing using raw water, after washing the populated water are analyzed, the table contents values are mentioned in the figure 2.

The values analyzed are done manually the populated water is sent to the laboratory for the testing, as this process is time consuming process, and this process can be automated using the IOT (internet of things) sensors hardware components for faster results and time saving process, the main advantage of our research paper is to remove all the manual process.

Measurement Index	Analysis Results After Car Wash From XYZ Gaurage	Unit	Maximum Allocable Lim	Remark
pH	12	Not Applicable	(6 to 9)	Unsatisfactory
Oils and greases	60	mg/l	(4.9 to 5)	Unsatisfactory
Ammonia	50	mg/l	(19.9 to 20)	Unsatisfactory
Total Phosphorus	20	mg/l	(9.9 to 10)	Unsatisfactory
Chemical Oxygen Demand	500	mg/l	(74 to 75)	Unsatisfactory
Total Dissolved Solids	1700	mg/l	(1499 to 1500)	Unsatisfactory
zinc	13	mg/l	(9.9 to 10)	Unsatisfactory
Copper	10	mg/l	(4.9 to 5)	Unsatisfactory

Fig. 2. The readings of the polluted car wash raw wastewater are analysed at Laboratory tests through manual progress for the Garage XYA Company.

III. PROPOSED METHOD

In our proposed method, we are integrating all the IOT (internet of things) based sensors. The current trending technologies such as IOT (internet of things) for capturing the device data, cloud computing for analyses of the data and block chain for the security purpose. The system design involves setting up of the different IOT (internet of things) sensors hardware components with the cloud database. Once all the sensors send across the data, the data is transmitted via LAN(Local Area Network) gate to the Cloud Computing Database for further processing. The data is populated into the cloud database. The comparison reports of different garage vendors. After vehicle washing the populated water report, can be sent over in the form of blocks data values, with hash generated for each block to the government organization. Using this approach no one can try to modify the block, even if the blocks are tried to manipulate then the wrong hash values will be generated, and this hash values does not match with the target hash values database then the block will be discarded, these concepts is showcased in the figure 1. The final block data are delivered to target system, and this block data values are stored into the target database system. These database values can be used for further analysis**.**

A. Architecture of IOT Garage Vehicle Washing Water Monitor Analysis.

The figure 3, is divided into two stages, due to space constraint. As in the first stage the sensors collects the data and pass on the data values to the LAN(Local area network) gate of the second stage. The data values are stored into the Cloud computing services data for details analysis, these data values are generated in the form of reports for each vehicle water washing details are captured into these reports, these reports are further encapsulated in the form of block, each block contains the unique hash values, if any hacker tries to modify these the data values in the blocks, the hash values of each block will also be changed, if the wrong values are received at the target side, then this wrong hash values will be discarded. The block chain concepts is used mainly for security factors, were any garage vendors or third party vendors cannot change the repots data once it's encapsulated into the blocks.

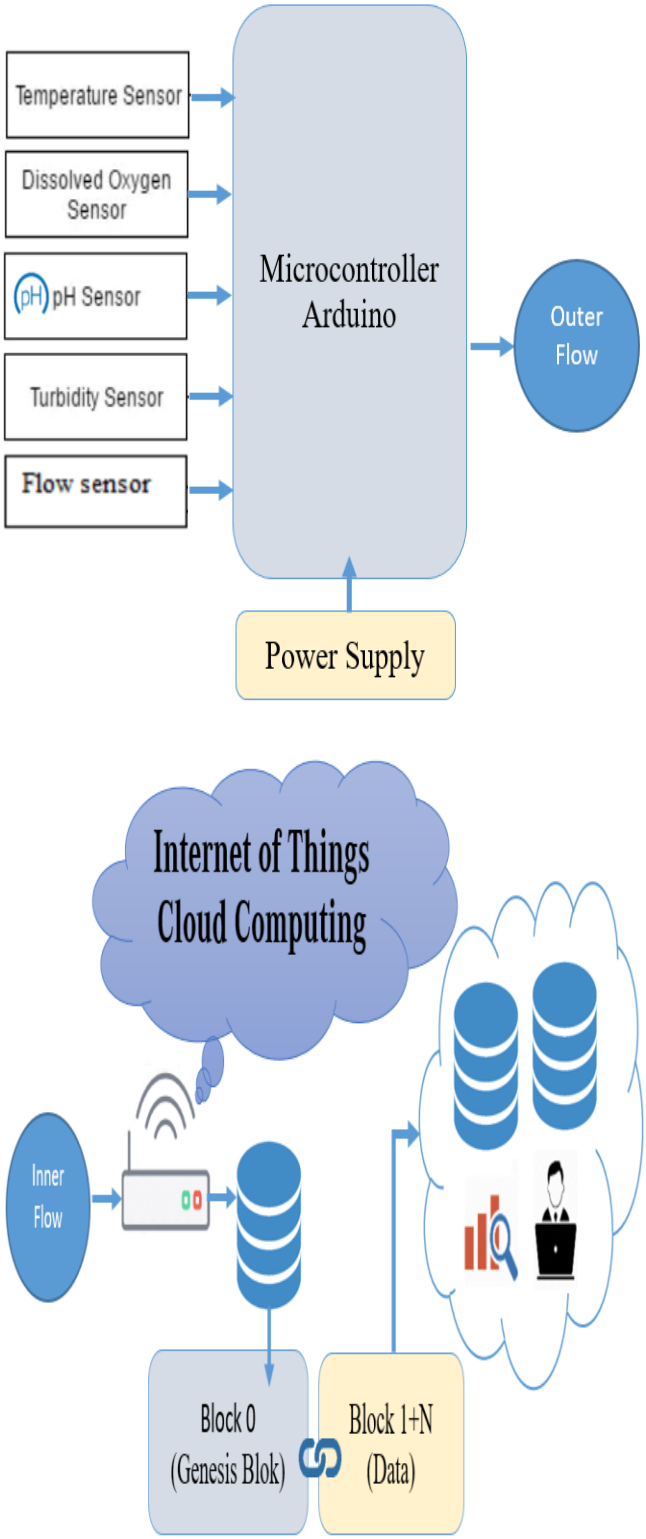

Fig. 3. A Schematic view of the Smart Garage Vehicle Washing Water Monitor Analysis

B. Implementations

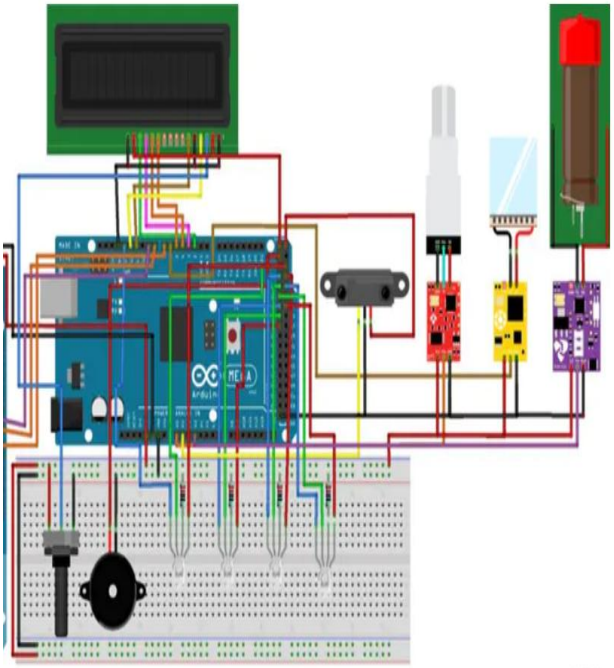

Fig. 4. A Schematic view of the Smart Garage Vehicle Washing Water Monitor Analysis

Temperature sensor: The temperature sensor plays a vital character in all biochemical and chemical and reactions, whichever it might be laboratory (or) in the environment nature field affecting the activity of all organisms, containing bacterial motion needed for biological oxidation developments the temperature of 20° C is considered perfect. The below showcased temperature sensors in figure 5, these required Maximum of 5.5 v power supply and it has three pin terminals [9].

Fig. 5. The figure showcase the Temperature sensors with 3 pin[10].

hemical oxygen demand (COD): The values of Chemical oxygen demand (COD) replicates the amount of oxygen essential for the oxidation of dissolved organic matter in polluted water in occurrence of a great oxidant, and a strong acidic media. The values in polluted water unindustrialized from garage vehicle wash stations oscillated during the period of study within 499 and 510 mg/l which is unsatisfactory as described in the figure 2.

Fig. 6. The figure showcase the Dissolved Oxygen Sensor[11].

pH: The pH value of polluted water has a greater effect on biochemical processes during treatment of this polluted water. A pH sensor is an senor object is used to quantity of the alkalinity or acidity of a solution[12].

Fig. 7. The figure showcase the pH Sensor [13].

Fig. 8. The figure showcase the Turbidity Sensor [15].

Turbidity is a stuff that is a cause of particles of solid matter existence suspended in water, somewhat than dissolved into it [14]. Turbidity polluted water analysis is a very vital part of water quality upkeep. Bigger levels of the turbidity increases the water temperatures, as heat is absorbed by the suspended particles.

C. Algorithm

```
// now print out the temperature
float temperatureC = (voltage - 0.5) * 100 ;  //converting from 10 mv per degree wit 500 mV offset
//to degrees ((voltage - 500mV) times 100)
lcd.clear();
Serial.print("Surrounding Temperature: ");
Serial.println(temperatureC);

if(temperatureC > 50){
  digitalWrite(tempblueled, LOW);
  digitalWrite(tempgreenled, LOW);
  digitalWrite(tempredled, HIGH);
  digitalWrite(buzzer, HIGH);
  lcd.setCursor(0,0);//set cursor (colum by row) indexing from 0
  lcd.print("SUR TEMP:");
  lcd.setCursor(9,0);
  lcd.print(temperatureC);
  lcd.setCursor(14,0);
  lcd.print("*C");
  lcd.setCursor(0,1);
  Serial.print("Surrounding Temperature: ");
  Serial.print(temperatureC);
  Serial.println(" degree C");
  lcd.setCursor(0,1);//set cursor (colum by row) indexing from 0
  lcd.print("SURR TEMP HIGH");
  Serial.println("Surrounding Temperature high");
  delay(3000);
 }
```

Fig. 9. Glance of the code to monitor the temperature of the water.

As we are using the block chain concept, to encrypt the each garage vehicle washing repots into the blocks, and then these data values blocks are transferred to the government organization to perform analysis of these report, the code of generating the masking function as shown in the figure 10.

```
INPUT: MASKING BLOCK CHAIN FUCNTION(Vehicle Information Details)
Variable Vehicle  Processing Data = Vehicle Information Details
Variable Text Arrary Length = Input Data.Split("").lenght_Data_Value
For(Variable i =0; i < Text Array Length; i++)
{
Maksed Data Block += Processing Data.ChartAT(Math.floor(math.radomn()*Text Array Length));
}
OUTPUT: Mask(Maksed Data Block)
```

Fig. 10. Pseudo code for masking\ random generating algorithm.

D. Flow Chart of the Project

The figure 7, explains detail flow of the IoT weigh bridge, if the weigh bridge within government threshold values of 1 Kg as we are defined these values, if it exceeds 1 Kg values on the IoT weigh bridge then an SMS message notification is send to the government organization.

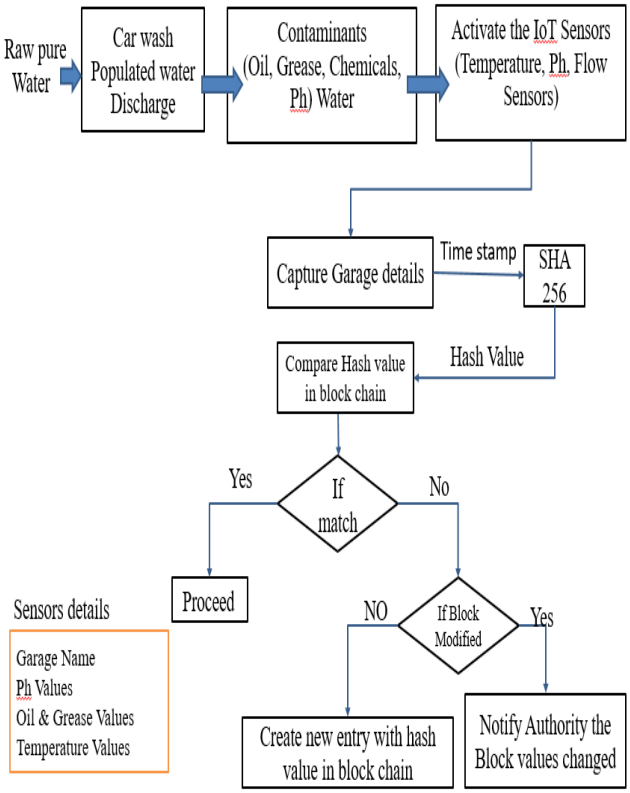

Fig. 11. The flow chart of the Smart Garage Vehicle information details captured in the block chain

IV. RESULTS ANALYSIS

Measurement Index	Vehicle-1 Results	Vehicle-2 Results	Vehicle-3 Results	Maximum Allocable Limit
pH	12	9	10	(6 to 9)
Oils and greases	9	8	2	(4.9 to 5)
Ammonia	50	30	20	(19.9 to 20)
Total Phosphorus	20	44	15	(9.9 to 10)
Chemical Oxygen Demand	500	100	79	(74 to 75)
Total Dissolved Solids	1700	1400	1650	(1499 to 1500)
zinc	13	11	9	(9.9 to 10)
Copper	10	4	2	(4.9 to 5)

Fig. 12. The above result is showcased in tabular format readings of the polluted car wash raw wastewater are analyzed by IOT (internet of things) sensors devices, on the real time generated reports for the Garage XYA Company.

The above report results are not generated via Laboratory manual tests, these values are loaded into the cloud computing service, the reports are generated in the table format. The analysis graph of the each measurement index, such as temperature, pH, and dissolved oxygen values for each garage vehicle washing are shown in the figure 13, the graphs values shown below are the water samples collected for for the Garage XYA Company for different set of vehicles.

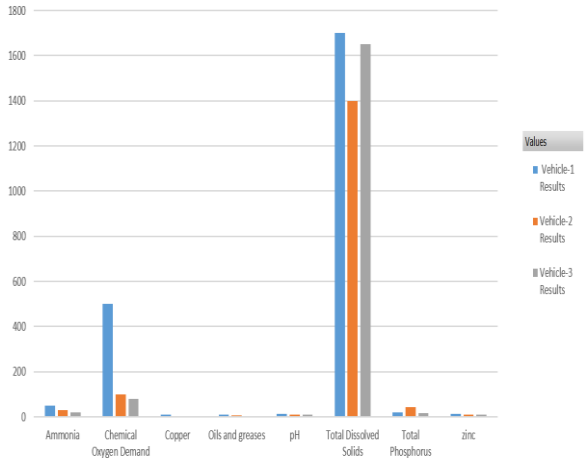

Fig. 13. The figure shows the analysis graph for various index measurements value(Chemical Oxygen Demand, copper and oils and greases)

V. CONCLUSION

As lastly we end with conclusion part, in these research our focus was to get real-time data analysis of the polluted water for each washed vehicle. These data values can be used effectively by every industries (or) smart cities to keep environment cleaner and safer.

In this research paper, our model is based on the IOT (internet of things) garage vehicle washing water monitor inputs are showcased. The proposed concepts will focus only on the water quality measurement after a car wash in garage, and re-treatment of the water is based on the measurement values shared by the IOT (internet of things) sensors. The sensor collected data values, from the all the IOT (internet of things) sensors are used for the examination; this analysis's report can be send over to the government organization to make sure that the water is treated as per the norms of the government standards. Once the water is treated correctly, it is drained out to sewer channel in appropriate manner. The data values collected by the IOT (internet of things) sensors is loaded into the cloud-computing server (or) stored into the big data lake. So these proposed model application will be useful for the government organization to monitor the real-time data form smart cities, each smart cities has multiple garage for car washing. All these smart garage is integrated with the latest technologies such as block chain, IOT (internet of things) and could computing which gives a higher security of the data values and gives an real-time monitoring of the treated water flow to the sewage & these approach solve effectively populated water treatment.

Our paper is just to integrate with the latest technologies, and share across these data values to government organization for free of cost (or) these water populated data values, can also be in use for the environmental research scholar to analyses for their research work on the effect of the populated water to the environment.

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AUTHOR'S PROFILE

Pavan Manjunath, Ph.D, Scholar in Computer Science, Jain University, Bangalore, INDIA, actively involved in the research work for the IOT, Block chain, Data Science, Astrology topics.

Dr. Pritam Gajkumar Shah, Ph.D from Australia, Department of Computer Science, Jain University, Bangalore, INDIA and also the Chief Editor Australian Journal of Wireless Technologies, Mobility and Security
Verified email at ausjournal.com.