

Drainage Monitoring System using Internet of Things

J. Anusha¹ - Assistant Professor

Sk.Fathima², V.Subhashini³, T.Satyanarayana⁴, Nousheen Fathima⁵

Department of Electronics & Communication Engineering,

Potti SriRamulu Chalavadi Mallikarjuna Rao College of Engineering & Technology, Vijayawada

Abstract - Drainage system observation plays a vital role to stay town clean. In fact, not all areas have evacuation observation team. It results in irregular observation of the evacuation condition. The irregular observation results in the interference of the evacuation that implies to the salutation that trigger flood. Manual observation is additionally incompetent. It needs a professional however they will solely monitor terribly finite and maintain low accuracy. conjointly generally thanks to lack of information the employee might meets to Associate in Nursing accident as they need no concept however are the conditions in those hole. This paper represents the appliance and style operates of a wise and period of time evacuation and whole observation System with the assistance of web of Things. The manholes gift within the evacuation can have a module that has Node MCU interfaced with gas detector, Flow detector, Solenoide Valve, Gas Sensor, inaudible detector. The system can monitor if the blockage is occurred in between 2 manholes and conjointly it'll sense the increase in quantity of assorted gases that area unit harmful to the folks, and conjointly a system of observation the water level, indicates blockage, leakage indication on output show can offer those info to the health departments from that the actual action are taken. The system can able to monitor of these things in period of time state of affairs which is able to permit U.S.A. to require correct actions

Keywords - Smart real-time Drainage Monitoring, Internet of Things (IoT), Node MCU, Gas Sensor, Blockage, Flow Sensor, Solenoide Valve, Ultrasonic Sensor.

I. INTRODUCTION

Drainage system plays a really vital role in huge cities wherever many folks live, system is thought because the base for land xerotes from the surplus and unused water. Rain water and waste water evacuation conditions got to be monitored thus on maintain its correct perform. In fact, not all areas have evacuation look team. It ends up in irregular look of the evacuation condition. The irregular look has contribution on the obstruction of the evacuation that imply to the salutation that trigger flooding at intervals the neighbourhood. Manual monitoring is additionally incompetent. It desires loads of dedicated persons UN agency square measure solely able to record restricted report with low accuracy. the matter arises in such emptying lines will cause serious problems to the daily

routine of the town. issues like blockage thanks to waste product, boost within the water level similarly as numerous harmful gases are often produces if the correct cleansing actions don't seem to be taken time to time. Today's system isn't processed thanks to that it's laborious to understand if blockage is happening especially location. additionally generally due the waste in those emptying lines will manufacture numerous gases like alkane series (CH₄), carbon monoxide gas (CO), etc that square measure harmful [and will|and may|and might] cause significant issue if indrawn by humans in great deal and these issues square measure usually Janus-faced by the emptying staff thanks to that death can happens. Additionally we tend to don't get early alerts of the blockage or rise in quantity of these gases or the rise in water level, hence detection and repairing of the blockage becomes time intense and feverish.

The system will monitor if the blockage is occurred in between a pair of manholes and to boot it will sense the rise in amount of various gases that square measure harmful to the origin, and to boot a system of observance the water level, indicates blockage, leakage indication on output show.

II. RELATED WORK

Smart town infrastructure might be in terms of intelligent traffic signals, sensors, active lanes, communication, and so on. Thus, sensible devices once integrated into the city's infrastructure through the effective readying of ICT, will create life during a town tons easier.

In this paper, we have a tendency to style sensible period of time evacuation observation system mistreatment numerous sensors like water level, blockage and gas sensing element. We measure the distance of water flow using ultrasonic sensor and display the related information on output display. The gas sensors live accustomed live the quantity of assorted venturous gases by that evacuation staff will take precautions whereas getting into in manholes. The blockage sensors can discover the blockage within the sewer lines and show connected info in order that we are able to clean it as early as doable.

Why Smart Drainage System is essentially needed?

Objectives:

- Predictive drainage clogging system: The intelligence of sensors and predictive system identifies the drain

clogged spot and gives us the details for further actions to take.

- Completely connected: The sensors are communicated through communication modules to share information.
- The main objective of this project is to keep the city clean, safety and healthy. And replace the manual work of drainage monitoring for the safety of sewer workers, human and city.
- To help proprietors, contractors and workers to prevent gas poisoning in drainage work.

III. PROPOSED SYSTEM

The smart drainage system will have:

1. Sensors to detect blockage, Water and Gas Leakages.
2. The intelligence of sensors and system will identify the clogging inside the drainage system and will give the details of the location and other information for further actions.
3. The system will also sense the presence of various harmful gases such as Methane (CH₄), Sulphur dioxide (SO₂), Carbon monoxide (CO) etc.
4. As the level of such gases pass the threshold value the system will give the indication on output display by which the Health department will take proper action on it.
5. These data will be accessible in real-time scenario for continuous monitoring and display the output from NODE MCU is displayed on output display and also it will display on Blink App too.

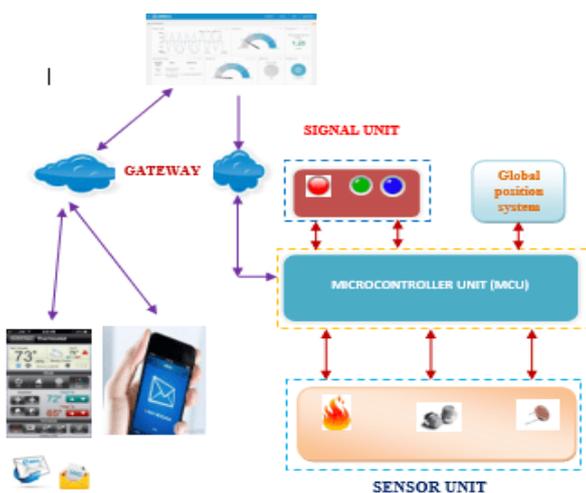


Figure 1: Proposed System

Using our smart drainage system we can easily monitor, modify and rectify the problems in real time.

IV. WORKING PRINCIPLE

The drainage channels are covered with manholes to operate and to clear the blocking present inside the channel. By placing the sensor node inside of the manhole will detects and transfers the appropriate sensed information

about the blockage, harmful gases and conditions to detect elevated flow levels of drainage system. Using the communication modules it will communicate with the sensor nodes placed at nearby manholes.

Sensors will monitor the water flow distance, blockage and leakage in drainage as well as amount of hazardous gases in real time scenario. Based upon the data values given by the sensors in drainage system the information which displayed on output display indicates the information of blockage, Leakage and harmful gases so concerned people will be alerted.

V. SENSOR UNIT

Based on drainage monitoring guidelines, the monitoring parameters are monitored.

1. Blockage in between two manholes.
2. Detection of hazardous gases.
3. Detection of Water Leakage.
4. Measure of Water Flow Distance.

So the sensor that we need is water flow sensor for blockage detection and leakage detection and we use gas sensor to detect hazardous gases. Water Flow sensor is used to determine the distance of water flow.. Similarly the gas sensor is used to measure the presence of particular gases as well as amount of those gases. Various gas sensors are MQ3, MQ6 etc.; which are used to sense the gases such as carbon monoxide (CO), sulphur dioxide (SO₂), methane (CH₄).

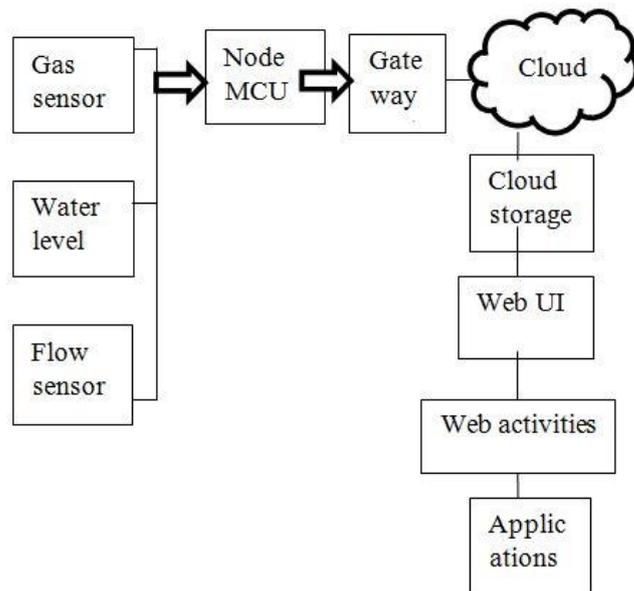


Figure 2: Component diagram for sensors

The figure below shows component diagram for the sensors which are used in a single node for the system

VI. HARDWARE OF SENSORS

Hardware on the node includes sensors, signal conditioning, gas sensor, the output of water level sensors,

gas sensor and blockage sensor conditioned as standard input signal for microcontroller. Output of signal conditioning will be input to the internal ADC (Analog to Digital Converter) of Microcontroller. RTC set the time of data collection and then RF Module (NRF) sends the data to other sensor nodes. Supply unit can be either battery or solar cell give the power to the sensor node

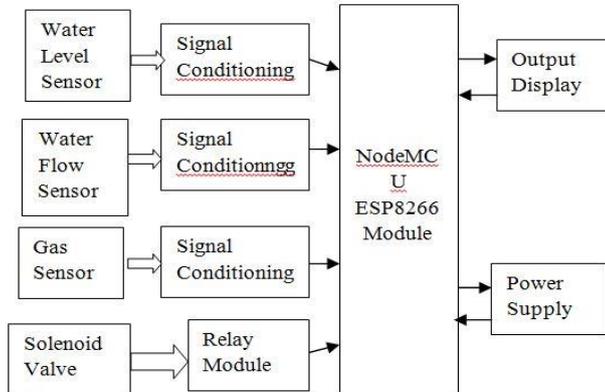


Figure 3: Block diagram for the sensor nodes

The gateway is sensor node that has additional functions to send data to the server. The communication mode that used in this design is GSM/Wifi connection. This component is used to send the entire collected data packet to the cloud where it is stored for further use. The figure below shows the block diagram of gateway node.

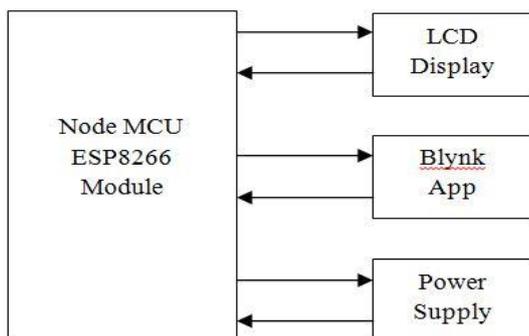


Figure 4: Gateway node diagram.



Figure 5: Sensing and Routing Node

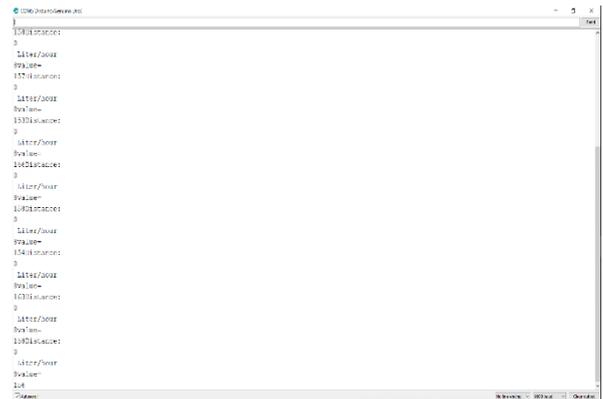


Figure 6: Sensor Output Values

VII. OPERATING SCENARIO AND THE NODE AND NETWORK ARCHITECTURES

The Sensors Gas Sensors, Water Flow Sensor, Ultrasonic Sensors are connected to Node MCU, Each Sensor Detects Accordingly like Gas sensor detects Harmful Gases , Water Flow Sensor Detects Leakage and Blockages of the Drain, Solenoid Valve Controls the Leakages and Blockages, a relay is used along with Solenoid Valve as a switch so that if there is more water flow level then it automatically turns Off the Water Flow.

All the above Sensors mentioned are connected Node MCU as inputs and the output will be seen on the Console Screen or Output Display. A Programming is done in C language accordingly so that all the sensors works and detects the blockages, leakages and hazardous gases.

VIII. ENERGY HARVESTING TECHNIQUES FOR SENSOR NODES

Many papers focus on the use of renewable energy sources to power sensor nodes. Solutions exploiting radio frequency and mechanical vibrations are not suitable for underground environments such as the proposed scenario. Nevertheless, this kind of source is often exploited to power low consumption systems such as sensor nodes. A 5v power supply is used to provide the power to NODE MCU.

IX. DATA ACQUISITION AND TRANSMISSION SYSTEMS

In this section, all the sensors used for the monitoring as well as the transmission system, are described. Our system consist 3 sensors. Ultrasonic sensor, Gas sensor and water level sensor. The above sensors senses the intensity levels of water level , smoke and gases such as carbon monoxide CH₄, Hexane, CO. Ultrasonic Sensor measure the distance of water flow and provide the related information on the output display using Node MCU. Water Flow Sensor Detects Leakage and Blockages of the Drain, Solenoid Valve Controls the Leakages and Blockages , a relay is used along with Solenoid Valve as a switch so that if there is more water flow level then it automatically turns Off the Water Flow.

X. RESULT ANALYSIS

Sensor unit senses all the physical parameters like Gas intensity, water flow distance, water leakage, blockage, smoke because of unleash of chemical and gases within the hole and convert these inputs into electrical output, this electrical output received as a input to NODE MCU and programmed in such how that everyone info knowledge |the data displays all live readings of each node and the alert information into clear text in chart .Offline text display LCD and Blynk; also are sent to the given predefined Mobile range with node data and alert.

XI. CONCLUSION AND FUTURE SCOPE

Sensor networks are considered as the key enablers for the IoT paradigm [1]. This paper addresses all about smart and real-time Drainage monitoring system through IoT applications for metropolitan cities. By using various sensors such as gas detection, water flow as well as blockage detection, leakage detection. We can monitor the real time scenario of drainage system by for detecting the problems in drainage system. By doing this we can able to take particular action on the problems as we will receive the early alerts of blockage as well as leakage. This paper can be used to design the smart and real time drainage system for monitoring as well as troubleshooting purpose.

XII. REFERENCES

- [1]. Víctor-M. Sempere-Payá, , Salvador Santonja-Climent “Integrated sensor and management system for urban waste water networks and prevention of critical situations”, Volume 36, Issue 1, January 2012, Pages 65–80.
- [2]. Internet of Things in Drainage Management System invention provides a smart drainage management system that monitors certain parameters under the manhole and removes blockage based on the indication received and also controls power consumption by the utilizing solar power.
- [3]. <http://www.ayarafun.com/2015/07/esp8266-nodemcu-for-fritzing/>
- [4]. <http://omnigatherum.ca/wp/?tag=fritzing>
- [5]. <https://docs.blynk.cc/#widgets-displays-lcd>
- [6]. Wireless Sensor Network for Environmental Monitoring: Application in a Coffee Factory - J. Valverde, V.Rosello, G. Mujica, J. Portilla, A. Uriarte, T. Riesgo, 2012
- [7]. <http://www.prodapt.com/what-is-iot-why-do-we-need-it-significance-impact-on-modern-life/>
- [8]. <https://www.memsql.com/solutions/monitoring-and-anomaly-detection/>
- [9]. <https://www.ijcaonline.org/archives/volume124/number10/22138-2015905608>
- [10]. https://mafiadoc.com/flood-alert-system-by-using-weather-forecasting-data-and-wireless_59d9de111723dd41422457a4.html