

IOT based smart drainage worker safety system

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Abstract: The process of drainage monitoring and maintain plays a big role to keep the city neat and clean. This leads to an informal way of monitoring and cleaning the drainage manholes when it is blocked. The process of unblocking and cleaning process may lead to much human death because of the gas. Additionally some of the time because of the absence of information the specialist may meet to a mishap as they have no clue about the state of the gas level in the seepage. This paper helps to solve the problem by a smart device with the help of the IoT. The MQ4 sensor and the single board computer raspberry pi 3 helps to detect the gas level with the LED display. This system will help to identify the gas level inside the drainage manholes so that the worker can get some idea of entering into the manholes. It very helps workers and safety to them before getting down into the manholes and it will sense the level of the gas inside. Savvy framework will be checking if the blockage has happened in the middle of two sewer vents and furthermore it will detect different gas level which is hurtful to individuals, and furthermore a framework observing the water level then it will trigger an alert and it will offer data to the crisis division and wellbeing offices which will make specific move at time. The framework will ready to screen every one of these things in the continuous situation which will enable us to make a legitimate move of the specific issue in seepage frameworks.

Index Terms: Smart continuous Drainage Monitoring, Web of Things (IoT), remote sensor frameworks (WSN), Gas Sensor, Blockage, IoT applications WSN redesigned structure, WSN organize, WSN show.

I. INTRODUCTION

The sewage system plays a big important role in big cities where millions of people live. The process of monitoring and maintaining the drainage system is to make the workers at risk. The drainage may contain rainwater and unused water. Rainwater and wastewater in drainage must be monitor and maintain properly. It leads to loss of human life and irregular condition of the drainage system if suppose this may not be conceder means this may lead in various skin infections. Manual monitoring and cleaning the drainage is necessary but this is system helps to prevent the huge accidental death of human due to over gas in manholes. The issue emerges in such waste lines can make difficult issues the day by day schedule of the city. Issues, for example, blockage because of waste material, unexpected increment in the water level just as different unsafe gases can be produces if the best possible cleaning moves are not made from time to time.

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The present seepage framework isn't mechanized because of which it is difficult to know whether the blockage is happening specifically area. Likewise some of the time due to the loss in those waste lines can deliver different gases like methane (CH₄) carbon monoxide (CO), and forth which are hurtful and can cause significant issue whenever breathed in by people in extensive sum and these issues are commonly looked by the waste specialists because of which demise can happen. Too we don't get early cautions of the blockage or ascend in measure of those gases or the expansion in water level. Henceforth location and fixing of the blockage move toward becoming tedious and wild. WSN is an observing innovation which in here of hub sensors that span and coordinate utilization of a remote system framework. Each hub comprises the information preparing (microcontroller, raspberry) memory (program, information, streak memory), NRF handset, control supply framework and includes at least one sensors. WSN frameworks have a more elevated amount of accuracy than wired organize framework regarding cost; flexibility and dependability are relied upon to supplant mixture or joined innovation. The following section explains briefly about the proposed method and working process of the smart safety device briefly and clearly.

II. RELATED WORK

The sewage maintenance support is important to keep the society neat, clean safe and healthy. If the waste upkeep is may quite good at environment and also the human being it causes the form a dangerous gas in the water [1]. The wireless sensor networks are mainly used to identify the environment changes and stored information in the database[2].MQ4 sensors to play the main role to identify poisoned gas in drainage. The disseminated sensor is ordinarily used to screen volcanic action both for danger observing and logical search [3]. It is also transmitting a continuous signal to the appropriate monitoring system. The ZigBee WSN contains XBee-s2 modules worked by a digit are arranged as end gadgets and convey remotely to a facilitator as a working topology. On the off chance that the end gadget is inside the scope of the organizer gadget, the framework runs like a star topology [4]. Structured a fiasco and ready framework utilizing wsn to send climate data and debacle cautions by a ZigBee module. This climate data was broke down utilizing choice tree procedures to report the cautions. Actualized remote information securing system to gather atmosphere information and mud dampness aimed at keen water system framework in Portugal to improve the proficiency of the water system. Proposed flood early cautioning framework utilizing SMS and network to greatest precipitation and liquid level information and SMS on overflow status to orderlies



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and partners. A flood early cautioning framework made, a programmed precipitation recorder (ARR) was set in upstream of Garang River and a programmed water level recorder (AWLR) put in Simongan weir. To get precipitation and water level information, a PC as server put in Semarang government office. These capacities for sending flood status to flood specialists, partners. This framework incorporated with data innovation that is SMS and Web that the flood early cautioning can be gotten to anyplace as long as correspondence organize is accessible [7].

The key test in the plan of remote sensor systems is boosting their lifetime. The data about the measure of accessible vitality in each piece of the system is known as the vitality map, what's more, can be helpful to build the lifetime of the system. The present a vitality dissemination show that is utilized to reenact the conduct of a sensor hub regarding vitality utilization. Reenactment results look at the execution of the expectation based methodologies with an innocent one in which no expectation is utilized. The outcomes demonstrate that the forecast based approaches beat the innocent in an assortment of parameters [8].

This paper we design drainage worker safety system, a detection system using water temperature and gas level and monitored for gas poison level. MQ4 sensor used to identify various gas like Sewer gas level in drainage and gives the caution alert to drainage workers.

III. PROPOSED SYSTEM

The proposed methodology is based on the IoT, which helps to save the life of the drainage workers while working by getting into the manholes. The mixture of poisonous gas will attack them when they try to get into the manhole to clean the drainage. This smart safety system will help to save the workers live and to keep the society clean. This may also monitor the society when the drainage is filled and automatically send the notification to the department so that they will send the concerned worker to clear and solve the blockage of the drainage system.

As per the figure a, the sensor is placed under the drainage manhole and it is connected with the WSN so that the sensor sends the notification to the communication department so that they can send the concern team workers to find solutions to the problem. The second part is the major part that ensures the safety of the workers and save the workers life. The proposed process in the form of smart safety IoT device that is made up of raspberry pi which will control the gas sensor and display the gas level on the LED display. With the help of the gas level detection on display, the green light will glow that may confirm the gas level is normal if it is not in the normal level of gas the red light will glow so that worker can enter into the manholes with safety precautions.

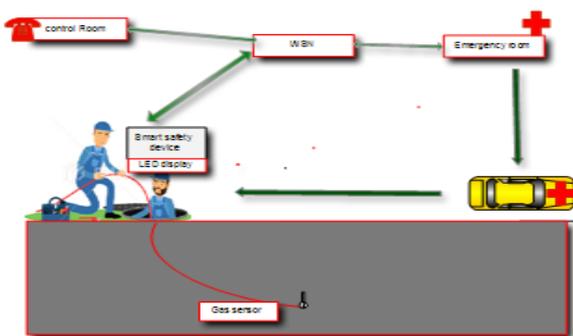


Figure 3.a Smart Safety device

The device also contains an emergency button that will help to give the emergency notification to the communication department and emergency department via the WSN. That supposes the worker is attacked by the dangerous gas the man will press the emergency button that will send emergency notification to their department and emergency departments so that without delay they can be saved. Below diagram signifies the major components of the smart drainage worker safety system.

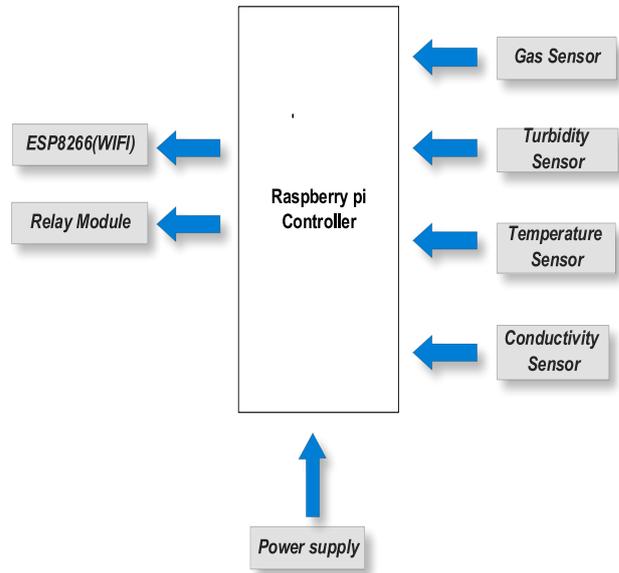


Fig 3.b. Block diagram of smart drainage worker safety system

A. SMARTREAL TIME DRAINAGE MONITORING

The smart real-time drainage monitoring system is the process helps to monitor and prevent the overflow of the sewage water. This gives the notification to the department so that they can take further steps to prevent the overflow. The workers can be sent to the particular area and the recovery action can be taken. Because of the overflow of drainage water leads to bad smell and some infection to the public and child for these reasons this smart device helps to prevent such overflow of water. Other major issues that arise due to the blockage of the drainage the accident of the swage workers. Sudden gas attacks the workers when they enter into the manholes without any idea about the mixture of gas level inside the drainage. For that, the proposed methodology helps to save the life of the workers. By the help of detecting the gas level inside the drainages will gives an idea to the worker about to get inside the manholes or not. The proposed system contains a device of the LED display so that it will provide a display of the level of gas level by the help of the sensor which is connected with the smart safety device. If the gas level is normal the device will show the gas level and green light will glow. Suppose abnormal level of gas inside the drainage means the device will glow the red light. That indicates the dangerous level of gas inside the drainage so that the worker can have some knowledge of risk identification. After the gas level is reduced they start their work. Additionally, the device contains emergency



button when the worker met with an accident means that time the red color emergency button is pressed. While the emergency button pressed the device will send the emergency notification to both the department and emergency department which is nearest to the worker's location. The notification contains the exact location of the worker and employee id. The smart safety device also contains the automation detection of the sudden rise of the gas level after entering into the manholes and emergency light will glow when another person standing above in the ground. Very helpful to the workers and society clean.

B. Water Flow Sensor

Water stream sensor contains of a plastic valve body, a water rotor, and a lobby impact sensor. At the point when water courses through the rotor, rotor rolls. Its speed changes with various rate of tributary. The lobby effect sensor produces the comparing weary pennant. This one is reasonable to identify stream in water distributor or espresso machine.

C. MQ4 Gas Sensor

MQ sensors exploit a tiny warmer inside with an electro synthetic sensor so as to gauge diverse sort of gases mixes. They can be aligned, at the same time, so as to do that a know convergence of the deliberate gas or gasses is required for that. For the modern reason, adjustments are done in exceptional metrology labs with precise tests and tests. For our situation, we will test it as it originates from the maker with no extra adjustment or settings. The fundamental thought before requesting this sort of sensor was to construct a custom made the alert sensor, which should make some disturbing commotion or light at whatever point somebody overlooked the cooker stove one, or my little child figured out how to play with stove switches, or there is a hole in my gas establishment. To achieve that, I needed a methane gas, easy to utilize, and furthermore good with Raspberry stage.

D. CO2 Sensor

This is stress free to use Carbon Monoxide sensor, reasonable for sensing CO emphases noticeably all from place to place. The MQ7 be able to recognize CO air emphases somewhere in the range of 20 to 2000ppm. This sensor has a high affectability and quick reaction time. The sensor's yield is a simple opposition. It has a great affectability to carbon monoxide in a wide range and has points of interest, for example, long life expectancy, minimal effort, and basic drive circuit and etc.

E. Algorithm

Catalyst equipment.
Instate equipment Module.
Show on LCD as "SAFETY SYSTEM"
Microcontroller sense Sensor esteem.
Temperature sensor sense temperature show an incentive on LCD CO2 sensor check for carbon dioxide level in condition.
At the point when the dimension increments and stream dedine around then.

F. Flow chart

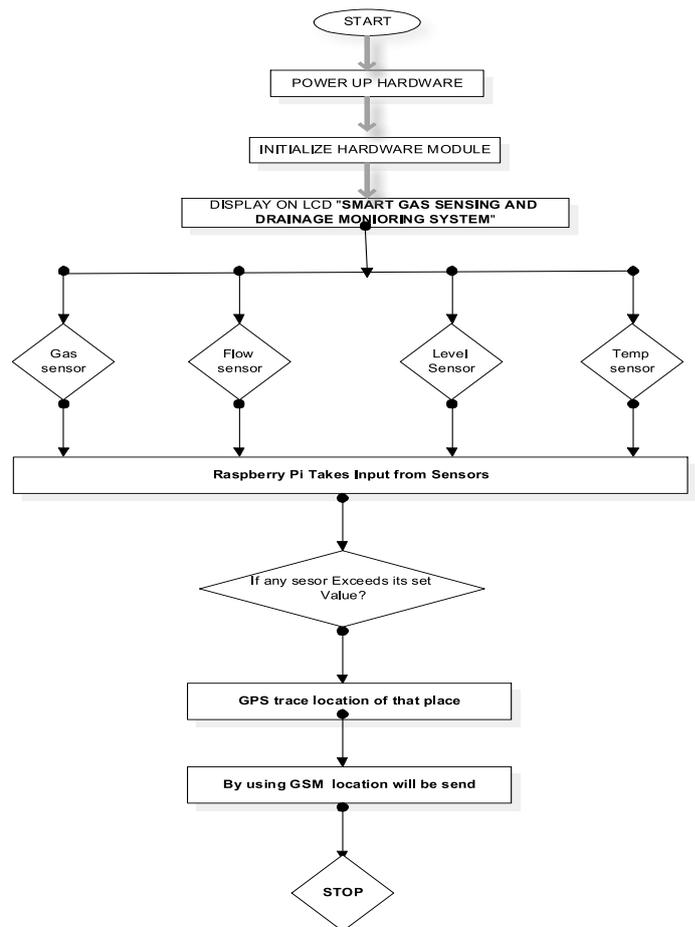


Fig F. Flow chart of smart drainage worker safety system

IV. RESULT AND ANALYSIS

The smart drainage safety system is used to detect toxic level of gas in drainage and identify whether the toxic level of the gas is manageable or dangerous, and to notify the worker before they enter into sewage. Here we used MQ4 sensor to analysis all drainage gas (methane, carbon monoxide) toxic level. In view of the over setup, sewage tank was loaded up with 60 cm water level at in the first place, all through the analysis, water was feed into the tank while water was depleted idea the outlet in the meantime for 60 minutes. The MQ4 sensor hubs readings are accounted for to the WSN coordinator and recorded in the Cloud stockpiling remotely through the GSM WSN and WCDMA versatile web. The gathered information as the estimated gas toxic level is plotted in Fig. 4. In this figure, the water level inside the tank is logged and checked. It demonstrates this figure, the gas toxic level inside the tank is logged and checked. It demonstrates the general drainage water level between 0.4 m to 0.8 m. By control the stream in water amount in a few time occasions, the water level was expanding, kept up and diminishing at a various time; these can be observed in the focuses. Other than the water level work, the proposed WSN helps the flood expectation based on the got gas toxic level information and its tendency.



For a simple methodology forecast at reason A as a precedent, in light of the past 10 minutes gas toxic level information taken, the water level expanding rate is resolved dependent on the subordinate, such the foresee water level is expanded to 30 cm and 45 cm in coming 10 to 30 minutes severally. The proposed WSN, forecast exactness is improved with smart information examination calculations and methodologies. The water level and the gas level in the seepage setup will be informed if the dimension of the water and dimension of the gas get expanded by means of GSM as an SMS to the close-by city organization office and emergency room.

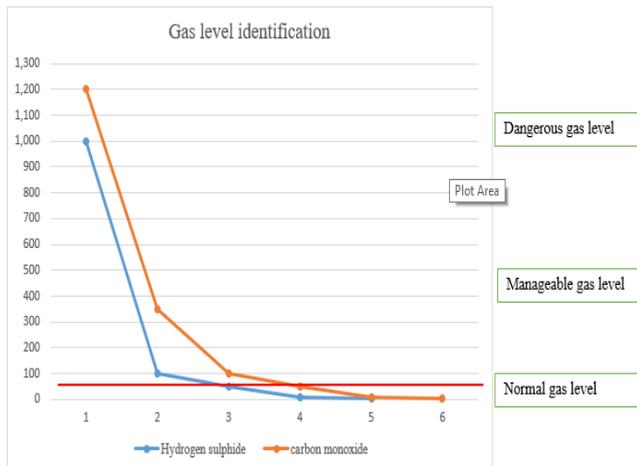


Fig 4. Gas toxic level detection

V. CONCLUSION

The proposed methodology helps to prevent the sudden accident of workers and also helps to keep the society clean. The smart safety device is cost wise less and fast in accessing the WSN and transfer the information to both the concerned department and emergency department. The proposed device helps the worker at a basic level of knowledge to understand the gas level and indication light. The smart device can be implemented and used across the world and also helps to monitor the overflow of the sewage water. The future work may be implemented in the form of android application which is connected with the smart safety device that provides the notification of monitor the drainage overflow and gas level via smartphone itself. As well the notification can also be sent via the Android application with the current worker's location. This implementation is done with good result.

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