

Smart Safety Monitoring System for Sewage Workers

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Abstract: *Most of the cities adopted the underground drainage system and it's the duty of Municipal Corporation to maintain cleanliness, healthy and safety of cities. If the drainage system is not properly managed then pure water gets contaminate with drainage water and infectious diseases may get spread. Drainage cleaning people are not aware of risk by sudden attack of poisonous gas since the gases are odorless if exposed for long time which may cause serious health problems. Due to the lack of using proper gas leakage detection system, a number of dangerous accidents occurred during the last few decades. To overcome all these problems effective monitoring system is needed in the drainage channels. The detected system is proposed with gas sensors like Carbon Monoxide, Hydrogen sulphide sensors and Methane, one Heart Beat sensor used to calculate the pulse rate of Human. Carbon Monoxide, Hydrogen sulphide, Methane gases are highly toxic to human hence the proposed system will gives alert through the LCD Display after reaching the threshold level of each gas sensors then people gets alerts Heart Beat sensor will calculate the range of the Pulse rate then output at the abnormal range will give alert through notification through an IOT.*

Keywords: Gas Leakage Detection System, Carbon Monoxide, Hydrogen Sulphide Sensors, Heart Beat Sensor.

I. INTRODUCTION

Sewage system is an underground system of pipes commonly used to transport wastewater from homes and business either to a treatment facility, where the water is treated and released into natural water bodies like lakes and streams or in any river to permanently drain out from the area. Sewer manhole is one of the most important parts of the sewer system. Sewer manhole is a structure through which a person can gain access to the underground wastewater collection system. Manholes are not designed for someone to work in regularly, but workers may need to enter inside the manhole to complete their jobs such as cleaning, repair, inspection etc. The lack of prior caring of sewage work is the witness for the deaths of thousands of sewage cleaners throughout the year from accidents and various diseases such as hepatitis and typhoid due to sudden or sustained exposure to hazardous gases like carbon monoxide, hydrogen sulphide, methane. A better knowledge related to hazards in the surroundings is necessary for the prevention of poisoning of gases. These gases have to be keep on track so that enormous rise in the normal level of effluents should be known and corrective measures can be taken. In contrary, the existing systems available are not much portable and are not affordable. Also it is hard to implement. In the previous the designed Surveillance rover detects the presence of carbon monoxide (CO) gas for monitoring system. The device consists of a processing section which takes input, processes it and provides output. This system requires base station should near to the sensors. In this paper an embedded system is designed with Arduino Microcontroller and various gas sensors for the purpose of detection and altering that helps in eliminating the lives of human which is being endangered. The system is affordable to implement at well-defined monitored.

II. LITERATURE SURVEY

Sudhanshu Kumar et al [1], Proper maintenance of the drainage system increases with the growth of cities. The real time health monitoring systems helps the Municipal sewage workers in very critical situations. It monitors the pulse of the involved person through pulse oximetry sensor and also checks the levels of various toxic gases which will be very

harmful for man like methane. Arduino UNO is the microcontroller used in this system. The sensor assembly communicates with the display unit via the UART communication. There are various led used for various purposes lie red led ymbolizes when any of the parameters are not in the safe range and green led symbolizes that all the parameters are within the safety range and the yellow light symbolizes urgent attention needed.

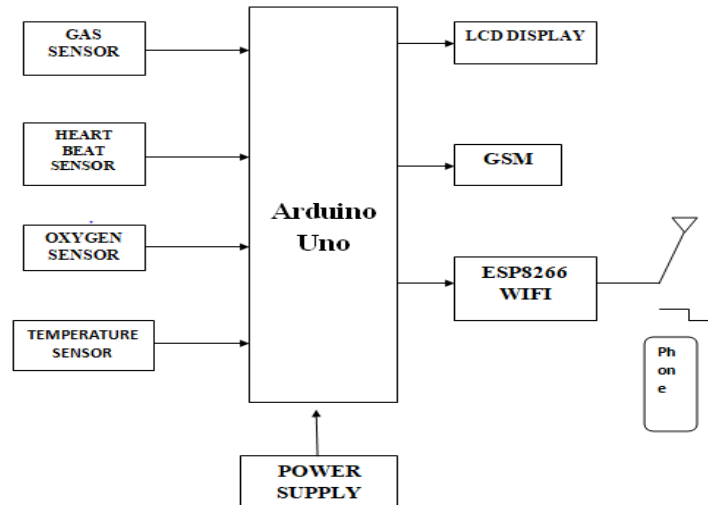
Vijayalakshmi R et al [2], Simulation gives an imitation of the operation of the process which represents the operation overtime and it is the best approach before designing a product or prototype so that any modifications or changes can be mad as per the requirements and the detection system is also a simulated tool. IOT based detection system has created a new path for creating a system for sewage worers based upon Internet of Things. The system detects the various toxic gases like methane, carbon monoxide and hydrogen sulphide which are harmful to the human beings through various sensors inside the manhole. The ultrasonic sensor is used to detect any backlogs in the man hole and the pulse sensor is used to detect the pulse rate of the individual inside manhole. Arm microcontroller has been used in this system forbetter results. Theas perthe requirements and the detection system is also a simulated tool. IOT based detection system has created a new path forcreating a system for ewage workers based upon Internet of Things. The system detects the various toxic gases like Methane, carbon monoxide and hydrogen sulphide which are harmful to the human beings through various sensors inside the manhole. The ultrasonic sensor is used to detect any blockages in the man hole and the pulse sensor is used to detect the pulse rate of the individual inside manhole. Arm microcontroller has been used in this system for better results. The data is sent to serial communication network through the help of GSM module. The sensors provide data to the microcontroller and the controller processes it and sends output. If the digital output is below the threshold limit then there is no indication.

Gaurang Sonawane et al[3], this system has been executed in real time through the help of Wireless Sensor Network technology(WSN) which is under part of Internet of Things (IoT). The main objective of the system is used to identify the blockage so as to prevent clogging of water and to check the level of various gases and also the water level at any period of time through water level sensor inside the tunnel or any manhole. This system provides the data of water level, gas level and any blockages inside the manhole in the server so that the location of the place is identified through the id of the place.

B.Sritha et al[4], Drainage blocking are the causes for water pollution,municipal bodies who managing this pay high prices to tackle this issue. A solution for the problem has been described in this paper which uses cost effective WSN to detect the clogging. Maintenance of the system and which could lead to spending of several millions of money. The proposed method in this paper helps to monitor the sewer level in the society by using WSN with arduino technology. This system cionsists mesh network which plays important role to configure clogging inside the sewer. The ESP 8266 module is a self contained SCC with integrated TCP/IP protocol stack that can give any microcontroller access to any wifi network.

III. METHODOLOGY

- Identify potential hazards: The first step is to identify the potential hazards that sewage workers are exposed to. These may include toxic gases, confined spaces, physical hazards, and biological hazards.
- Develop a risk assessment: Once the hazards have been identified, a risk assessment should be conducted to determine the likelihood and severity of each hazard. This will help prioritize which hazards need to be addressed first and which safety systems are most critical.
- Design the smart safety system: Based on the risk assessment, the smart safety system should be designed to address the most critical hazards. This may involve integrating sensors and developing monitoring systems.
- Alert Message: Whenever the values from the sensors increase above the threshold value the system will send the message to the registered number.
- Deploy the system: Once the system has been designed, it can be deployed in the field. Training should be provided to all workers on how to use the system.
- Evaluate and refine the system: The smart safety system should be regularly evaluated to ensure that it is effective and reliable.



IV. PROPOSED SYSTEM

The proposed system consist of gas sensor and temperature sensor, oxygen sensor. The gas sensor is used to sense the presence of various harmful gases such as Methane (CH₄), Sulphur dioxide (SO₂), Carbon monoxide (CO), etc in sewage and oxygen sensor is used to sense the oxygen levels in the presence of air. Temperature sensor is used to sense the temperature in atmosphere. A Heart Beat sensor is one used to detect the heartbeat per minute. The level of such gases passes the threshold value the system will generate the alert using gsm module send message through esp8266 wifi to which the Health Department will take proper action on it. Temperature sensor is used to sense the temperature in atmosphere. By using this system we can rescue the sewage workers.

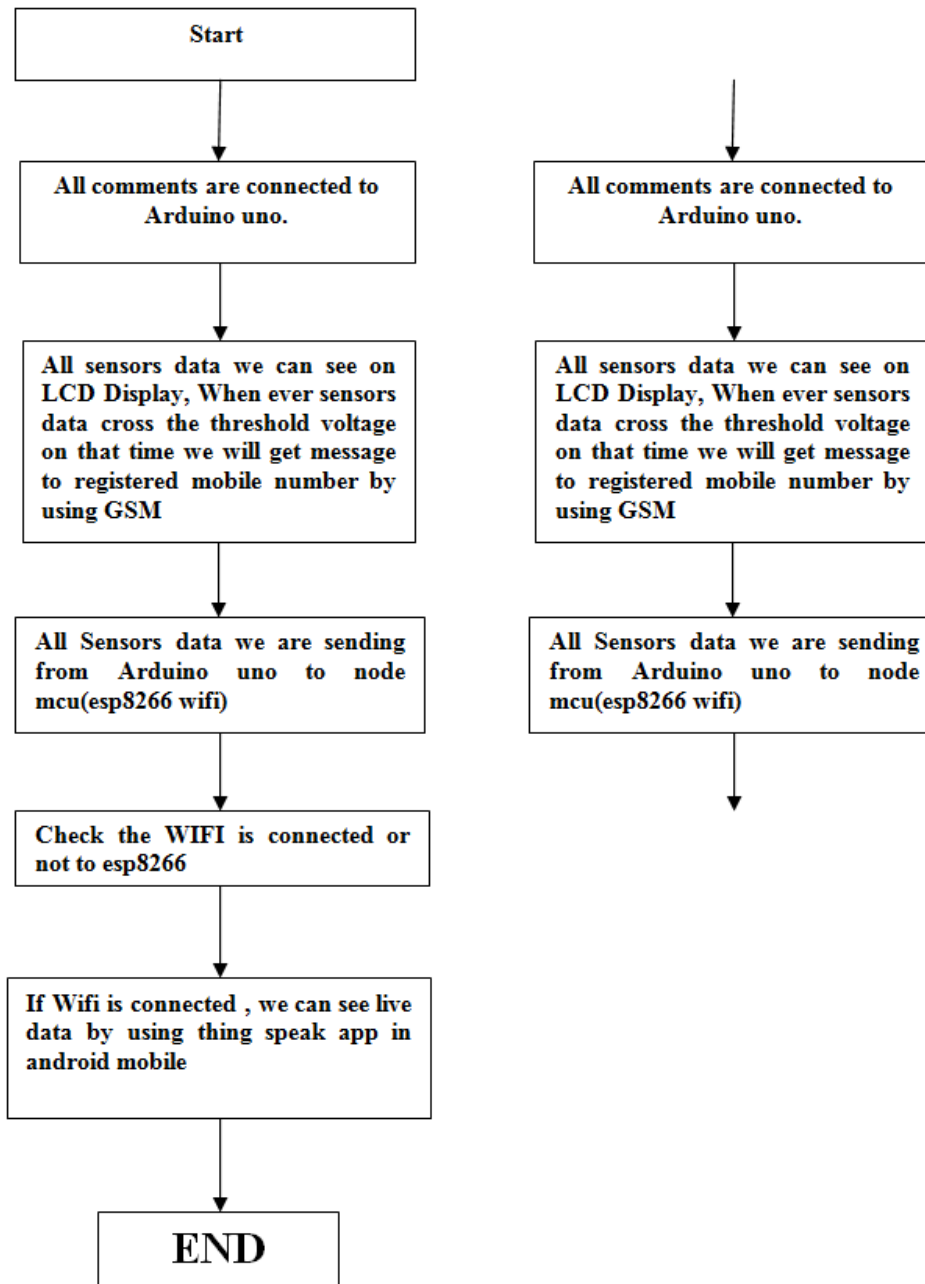
The proposed system consist of Arduino UNO, gas sensor, temperature sensor, GSM, LCD display, heart rate sensor, oxygen sensor, esp8266 Wifi module.

4.1 Objective

The purpose of this project is to provide the following objectives for safety of sewage workers.

- To provide safety for sewage workers
- To avoid deaths of sewage workers due to toxic gases.
- To develop cost friendly system.
- To find location of the worker in the sewage tunnel.
- To update the readings in real-time over ThingSpeak analysis tool.
- To alert the worker if any parameters exceeds.
- As soon as parameters exceeds, SMS alert is sent via GSM module.

V. FLOWCHART



VI. PROBLEM STATEMENT

Nowaday’ s people are becoming more and more busier with their own life and forgetting to clean their own surroundings. When the cleaning is not done, the waste either remains as stagnant in that area or the municipality cleans it. So when the municipality cleans the area all the impurities are dumped into the tunnel. These impurities are cleaned by the sewage workers. The sewage workers have to clean the impurities releasing from the communities, impurities dumped by the municipality and the industrial waste. So the sewage workers lives are always at risk. In-order to save their lives, A Smart Safety Monitoring System is developed that detect the condition of the worker, harmful gases inside the manhole and the temperature of the manhole so that when the values exceed the threshold values, buzzer is activated automatically and messages are sent to the head quarters via SMS and GPS in the device tracks the location of the worker so that the rescue team reaches the manhole on time and their lives are saved.

VII. 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 his pulse rate. The smart device can be implemented and used across the world and also helps to monitor the overflow of the sewage water

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