IOT BASED SMART SAFETY MONITORING SYSTEM FOR SEWAGE WORKERS WITH TWO WAY COMMUNICATION

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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: *Carbon Monoxide sensor, Hydrogen sulphide sensor, Methane gas sensor, IOT, Heart Beat sensor, LCD, Drainage Channel, Thershold Limit.*

1. 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.

In the existing system, a number of jobs related with gas detection and ensure security system. It has been implemented among these some were theoretical research approach and some were demonstrated in practical field to detect the gas but both approaches were effective manhole gas sensing unit has been developed which is capable to detect the toxic and explosive gases individually within a minute and LCD Display. Harmful gases like carbon monoxide detection, Methane gas detection, Hydrogen Sulphide gas detection these gases are very toxic to the human, Heart Beat sensor this will be fixed on the workers hand watch and message will be sends to outside workers and Municipal Officers with the help of IOT.

1.1 Problem Statement

In the existing system the worker will be in danger zone, it will send only an vibration alert to the higher officials or to the control room by the vibrator module.

2. PROPOSED SYSTEM

The smart drainage system will have: Sensors to detect blockage, flood and gases. 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. The system will also sense the presence of various harmful gases such as Methane (CH4), Sulphur dioxide (SO2), Carbon monoxide (CO) etc.

 As the level of such gases pass the threshold value the system will generate the alert using alarm system by which the Health department will take proper action on it. The module is implemented using Wireless Sensor Networking (WSN) technology each node will carry its own data along with the data of neighbouring node and will pass it to next node by hopping techniques. These entire data packet will be collectively sent by the gateway node and stored at the cloud all these data will be accessible in real-time scenario for continuous monitoring.

3. BLOCK DIAGRAM
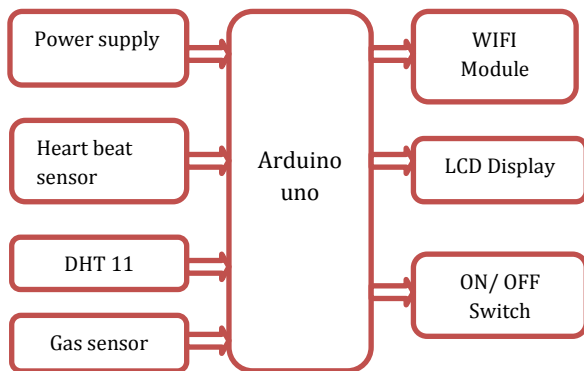
4. HARDWARE IMPLEMENTATION

4.1 Gas Sensor

Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration. Gas sensors are employed in factories and manufacturing facilities to identify gas leaks, and to detect smoke and carbon monoxide in homes. Gas sensors vary widely in size (portable and fixed), range, and sensing ability. They are often part of a larger embedded system, such as hazmat and security systems, and they are normally connected to an audible alarm or interface. Because gas sensors are constantly interacting with air and other gasses, they have to be calibrated more often than many other types of sensors.

Fig -1: Gas Sensor

4.2 DHT11 Temperature Sensor

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed).

It is fairly simple to use, but requires careful timing to grab data. The DHT11 calculates relative humidity by measuring the electrical resistance between two electrodes. The humidity sensing component of the DHT11 is a moisture holding substrate with the electrodes applied to the surface.
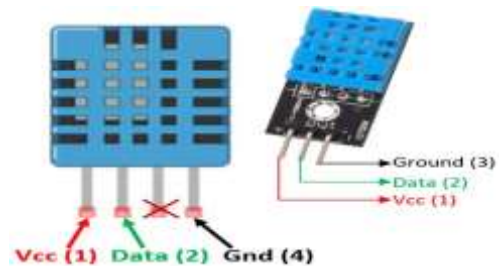

Fig -2: Temperature Sensor

4.3 Heart Beat Sensor

Heart Beat Sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

Fig -3: Heart Beat Sensor

4.4 Arduino Uno

Arduino board is being used used here. It also reffered as brain which means act as a main part in the project. It is connected with GSM which sends message to the user. Also an application 'Ubidots' being implied here which used as conversion. Wifi modules and LCD display is being connected.

Fig -4: Arduino uno

4.5 WIFI Module

The ESP8266 wifi Module is a self contained soc with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking function from another application processor. Each ESP8266 modules comes preprogrammed with an AT command set firmware, meaning , you can simply hook this up to your Arduino device and get about as much Wi-Fi ability as a WiFi shield offers (and that's just out of the box)!. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

Fig -5: WIFI Module

4.6 ON/OF Switch

A switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another. The most common type of switch is an electromechanical device consisting of one or more sets of movable electrical contacts connected to external circuits. When a pair of contacts is touching current can pass between them, while when the contacts are separated no current can flow.

Switches are made in many different configurations; they may have multiple sets of contacts controlled by the same knob or actuator, and the contacts may operate simultaneously, sequentially, or alternately.

- 6A 250VAC / 10A 125VAC
- 2 Pin Latching Switch.
- Panel Mount, Snap In
- On / Off Two Position
- Suitable for Car Horn / Ignition Switches / In Car Entertainment

Fig -6: ON/OF Switch

4.7 LCD

LCD used to display the leakage value will be high or low and also display the heart beat rate of the workers and displays the message as Emergency identified when the worker press the emergency button.
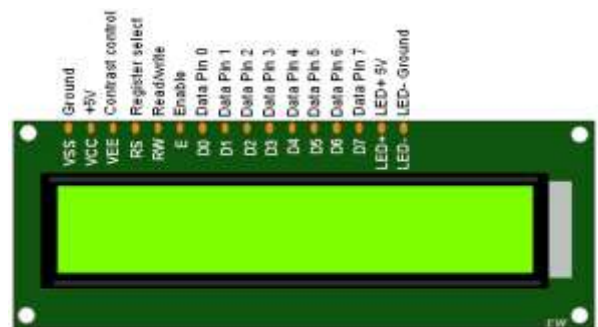

Fig -7: LCD Display

5. SOFTWARE IMPLEMENTATION

5.1 Arduino IDE

ArduinoIDE IDE stands for "Integrated Development Environment":it is an official software introduced by Arduino.cc, that is mainly used for editing, compiling and uploading the code in the Arduino Device. Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.
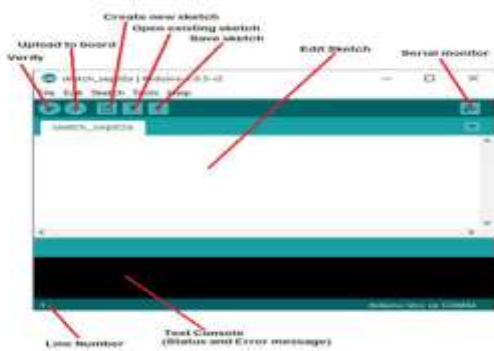
Fig -8: Arduino IDE

5.2 IOT

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Fig -9: IOT Implementation

6. CONCLUSIONS

Internet of Things has gained its wide popularity in recent days due to its various streams of applications which has paved way for smooth, safe and easier mode of living style for human beings. Though, several techniques is existing for the same, yet sewage cleaning is one major concern and a challenge always. This paper thus put forth a new proposed system which is microcontroller based application of sewage workers health monitoring systems using IOT. This device is designed keeping in mind, the measurement of necessary parameters, which needs to be monitored for unhindered safety of the workers. The device finds major application in household sewage systems, municipal manholes and sewage, sewer, deep well, gutters and drains etc. However, the places where toxic gases or fumes are present should never be handled by human workers directly. In country like India

where sewage is mostly cleaned by humans, which make this device useful around India.

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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