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SMART DRAINAGE SOLUTIONS FOR INDUSTRIES

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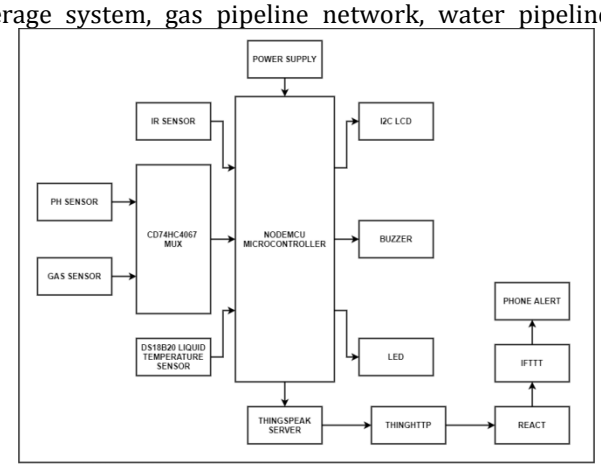
Abstract- *India has announced a project of making 100 smart cities. For making a smart city one needs to consider many parameters such as smart water, smart electricity, smart transportation etc. There will be a need of smart underground infrastructure which includes underground water pipelines, communication cables, gas pipelines, electric flow, etc. As most of the cities in India have adopted underground drainage system, it is very important that this system should work in a proper manner to keep the city clean, safe and healthy. If they fail to maintain the drainage system the pure water may get contaminated with drainage water and can spread infectious diseases. So different kind of work has been done to detect, maintain and manage these systems. Also, leaks and bursts are unavoidable aspects of water distribution system management and can account for significant water loss within a distribution network if left undetected for long period. This project represents the implementation and design functions for monitoring and managing drainage system with different approaches. It also gives a description of water wise system and detection method.*

INTRODUCTION

The underground drainage system is an important component of urban infrastructure It is difficult for the government personnel to locate the exact manhole which is facing the problems. Therefore, it is essential to develop a system which can handle underground drainage without human intervention. Underground Drainage involves sewerage system, gas pipeline network, water pipeline, and manholes. This project describes various functions used for maintenance and monitoring of underground drainage system.



Fig, Hardware Design

Regular maintenance of drainage system will ensure that it functions properly at all times. It should be ensured that the outlet ditches of the subsurface systems are free from blockages caused by sediment buildup and the debris does not seal the inlet covers. Drainage problems can cause significant damage to home, property, and the City of Shoreline storm drain system. Today's drainage system is not computerized. So whenever there is blockage it is difficult to figure out the exact location of the blockage. Also, we don't get early alerts of the blockage. Hence detection and repairing of the blockage become so time-consuming. It becomes very inconvenient to handle the situation when pipes are blocked completely due to such failure of drainage line people face a lot of problems. It is important to identify and correct drainage problems when they occur. If a tile of the drainage system breaks, it has to be replaced, otherwise, it can contaminate bodies of fresh water. Most management on underground drainage is manual therefore it is not efficient to have clean and working underground system also in such big cities, it is difficult for the government personnel to locate the exact manhole which is facing the problem. Therefore, it is essential to develop a system which can handle underground drainage without human intervention.

2. BLOCK DIAGRAM

In this, system consist of Node MCU Microcontroller for the controlling action, Things speak server, Power supply, pH Sensor, Gas sensor, Liquid temperature sensor, LED, Buzzer, DC LCD Display, phase alert. This system combines these all above components for solutions for drainage system.

A. **NodeMCU microcontroller**- Node MCU is a low-cost open source IOT platform it initially included firmware which runs on the ESP8266 Wifi SoC from Espressif system, hardware which was based on the ESP-12 module. Later, support for the ESP32 32 bit MCU was added.
B. **pH Meter**: A pH meter is a scientific instrument that measures the hydrogen-ion activity in water-based solution, indicating it's acidity or alkalinity

expressed as pH. The pH meter measures the pH content present in sewer water.

C. **GAS Sensor:** A Gas sensor is device which detects the presense or concentration of gases in the drainage pipelines. Based on concentration of gas the sensor produces a corresponding potentional difference by changing the resistance of the material inside the sensor which can be measured as output voltage.

D. **Liquid Temperature Sensor:** DS18B20 is 1- wire digital temperature sensor from maxim IC. Reports degrees in celcius with 9-12 bit precision, from -55 to 125. Each sensor has unique 64-bit serial number etched into it- allows for a huge number of sensor to be used on 1data bus.

E. **Things Speak Server**: According to its Developers Thing Speak is an open source internet of things applications and API to store and retrieve data from things using the HTTP and Analyze, visualize and act on data from sensor.

F. **LED**: A light Emmiting diode(LED) is a semiconductor device that emits visible light when electric current passes through it. Here main motive to use this for indicating purpose.

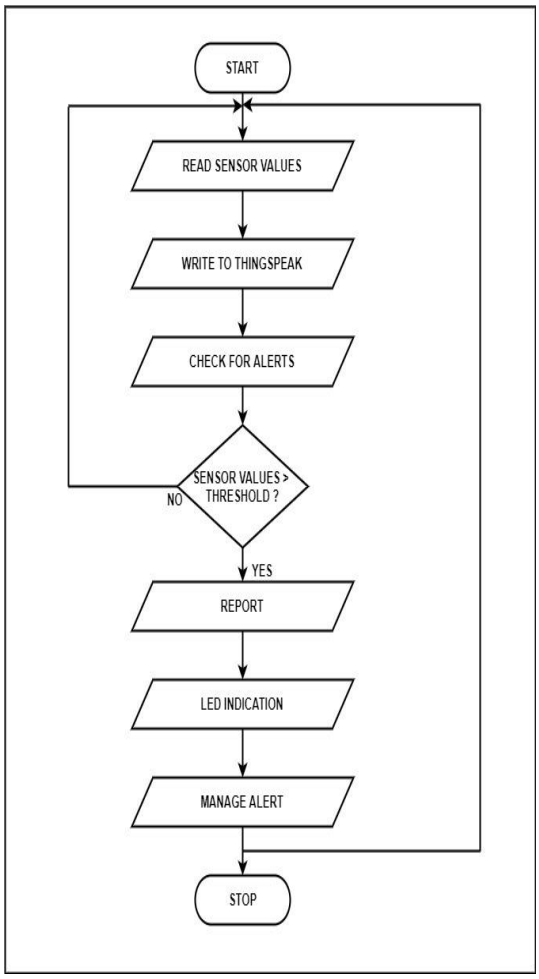
G. **BUZZER:** A buzzer is audio signaling device which may be mechanical, electro-mechanical or piezoelectric. Use of buzzer of alarming or Alert the System.

H. **I2C LCD DISPLAY:** This is an 16X2 LCD Display screen with I2C Interface. It only needs 4 pins for the LCD display: VCC, GND, SDA, SCL.

I. **REACT:** React is java script library for building user interface specially for single page applications. It's used for handalling view layer for web and mobile apps.

J. **IFTTT:** If This Then That, also known as IFTTT is a free web based service to create a chains of simple conditional statements called Applets. It helps you

3. FLOW CHART



4. FUTURE WORK

Sensor networks are considered as the key enablers for the IoT paradigm.

This project addresses all automates Internet of Things for Underground drainage phases of the practical development of an drainage Monitoring System through IoT applications for Metropolitan cities.

However, due to the widening variety of applications, it is increasingly difficult to define common requirements for the WSN nodes and platforms.

A real life demanding application is selected as reference to guide. Aspects of sensor network platform considered are: Platform structure, Flexibility and Reusability, Optimization of the sensor node, Optimization of the communication, Error recovery

from communications and node operation, high availability of service at all levels, application server reliability and the interfacing with Iot applications this project can be used to guide the specification, Optimization and development of sensor network platforms for other Iot applications domain.

5. CONCLUSIONS

Underground monitoring is challenging problem. This project proposes different methods for monitoring and managing underground drainage system.

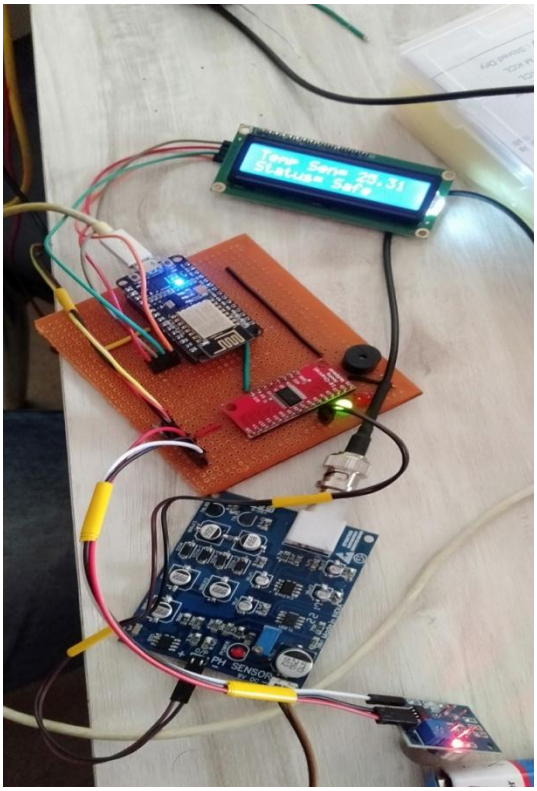
It explains various applications like underground drainage and manhole identification in real time.

Various parameters like PH meter, toxic gases, Humidity and Temperature of water are being monitored and updated on the internet using the Internet of Things.

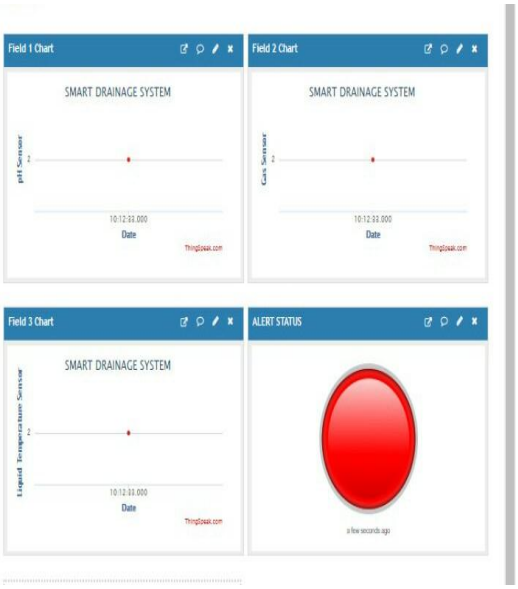
This enables the person in-charge to take the necessary actions regarding the same. In this way the unnecessary trips on the manholes are saved and can only be conducted as and when required. Also, real time update on the internet helps in maintaining the regularity in drainage check thus avoiding the hazards.

6. Working

1. This project uses NodeMCU as the microcontroller. It has various sensors for controlling the system.
2. Multiple sensors are connected to monitor the drainage system.
3. MQ-5 gas sensor is used in order to monitor harmful gases coming out of the drainage lines.
4. Water temperature sensor DS18B20 is used in order to measure the temperature of drainage water.
5. An IR sensor is used to detect overflow status of drainage line.
6. A pH sensor is used to determine the acidity or basicity of the drainage fluid.
7. If any of the sensor values goes beyond threshold an alert is triggered.
8. Data is sent to cloud server ThingSpeak. Notification for alert is given using IFTTT platform.
9. An I2C LCD is used to display the data in real time locally.
10. Data sent to ThingSpeak server can be used for further analysing the drainage systems.



7. Result



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