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Smart Drainage Solutions for Industries

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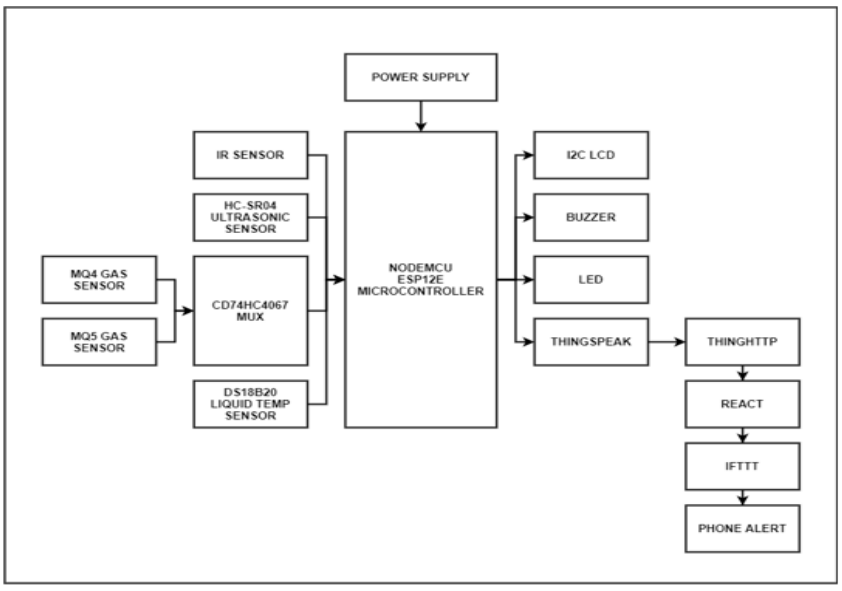
Abstract- *India has announced a project of making 100 smart cities. For making a smart city one needs to consider many parameters such as smart water, smart electricity, smart transportation etc. There will be a need of smart underground infrastructure which includes underground water pipelines, communication 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.*

I. 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, waterpipeline,



Fig, Hardware Design

and manholes. This project describes various functions used for maintenance and monitoring of underground drainage system.

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.

II. BLOCKDIAGRAM

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 WifiSoC from Espressif system, hardware which was based on the ESP-12 module. Later, support for the ESP32 32 bit MCU wasadded.

A1**. ULTRASONIC SENSOR**:HC-SR04 Ultrasonic (US) sensor is a 4-pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver.

The sensor works with the simple high school formula that
Distance = Speed × Time

B. **GAS Sensor:** Gas quality sensor for detecting a wide range of gases, including NH3, NOx, alcohol, benzene, smoke and CO2. Ideal for use in office or factory. MQ4 an MQ5 gas sensors are used in this project.
MQ-4: Sensitive for Methane, CNG Gas
MQ-5: Sensitive for Natural gas, LPG

C. **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 1databus.

D. **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 fromsensor.

E. **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 indicatingpurpose.

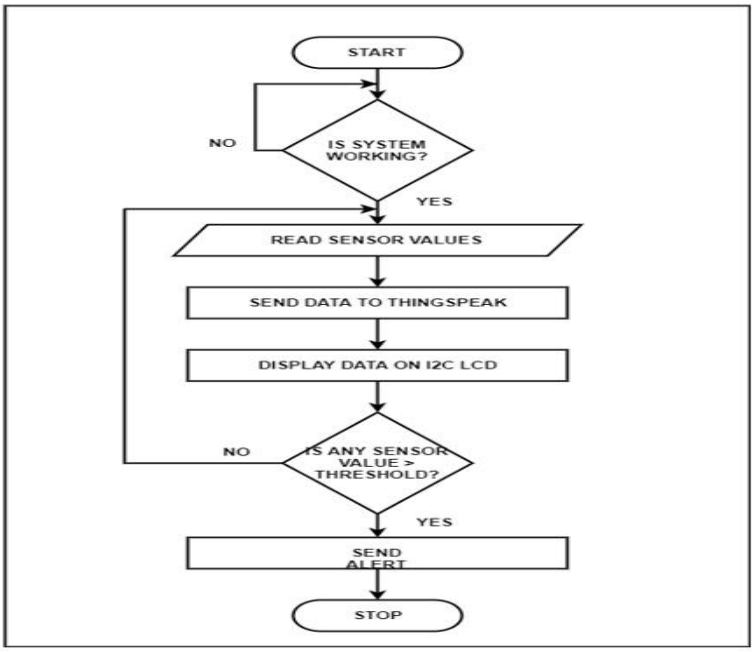
F. **BUZZER:** A buzzer is audio signaling device which may be mechanical, electro-mechanical or piezoelectric. Use of buzzer of alarming or Alert theSystem.

G. **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.

H. **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 mobileapps.

I. **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 helpsyou

III. FLOWCHART



IV. FUTUREWORK

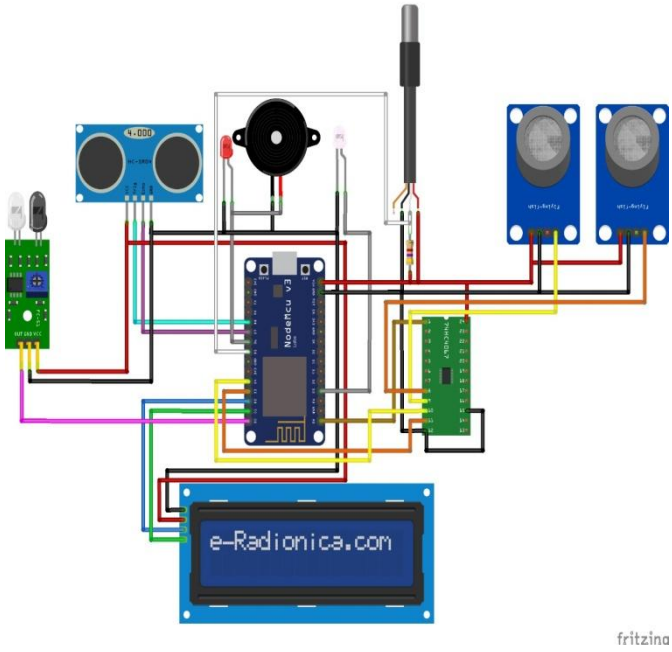
Sensor networks are considered as the key enablers for the IoT paradigm.
This project addresses all automates Internet of Things for Underground drainage phases of the practical development of an drainage Monitoring System through IoT applications for Metropolitan cities.
However, due to the widening variety of applications, it is increasingly difficult to define common requirements for the WSN nodes and platforms.
A real life demanding application is selected 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.

V. CONCLUSIONS

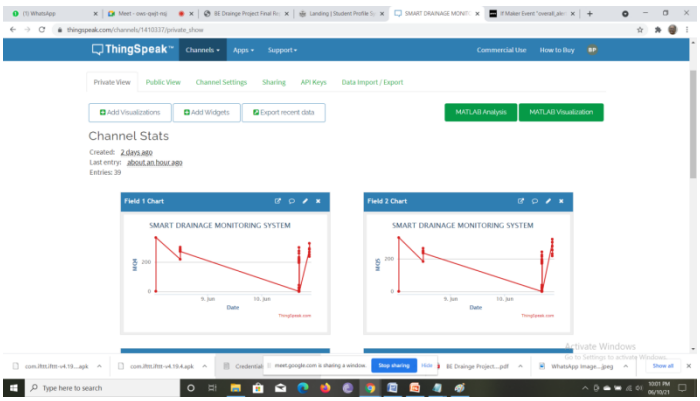
The smarter solutions help our world to become smarter and have a secure and bright future ahead. With an optimistic vision our project will help in reduction of known calamities and also the fatal accidents. By monitoring of the waste water many problems faced by the people can be reduced instinctively. It will also increase the scope of betterment, innovation and sophistication in developing solutions to the most common problems faced by mankind. This simple drainage monitoring system will help to maintaining proper health, neatness and safety of the citizens. With water as a flowing liquid the system has been tested successfully.

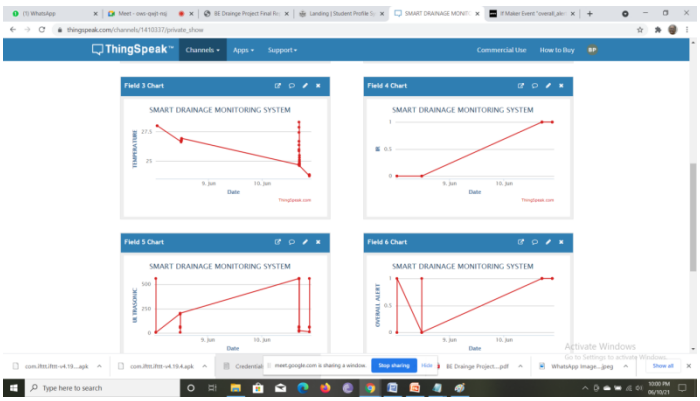
VI. Working

1. This project uses NodeMCUas the microcontroller. It has various sensors for controlling thesystem.
2. Multiple sensors are connected to monitor the drainagesystem.
3. MQ-5 gas sensor is used in order to monitor harmful gases coming out of the drainagelines.
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 drainageline.
6. A pH sensor is used to determine the acidity or basicity of the drainagefluid.
7. If any of the sensor values goes beyond threshold an alert istriggered.
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 drainagesystems.



VII. Test and Result





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