

# Smart Manhole Lid Management System Using LabVIEW

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## Abstract:

Manhole construction is very important while implementing the smart city. Also maintains of manhole is toughest task for the workers, its highly dangers for common people when the manhole lid is remains open. Manhole lid open leads to death. Since manual monitoring is not having the skilled techniques, it will leads to slow handling of problems and it takes more time to solve it. Tosolve all these problems, the system using wireless sensor network, my Rio is designed. The proposed system is low maintains, LabVIEW based real time which give the alert messages to the managing station when the manhole lid is open.

**Keywords:** NI LabVIEW, NI myRIO.

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## I. Introduction

A Manhole is a big hole in a the road or path where the domestic waste, drainage will flow under it. It is constructed to maintain the drainage systems and sewage systems to be cleaned. Manhole leadings to underground supply are required for their maintains. It also consists of water supply networks, electricity networks,telecommunication networks and etc. Even though manhole is very important part in the smart city implementation, this is the least protected system in the society. Usually manhole is covered by lid which is made of metal or sometimes concrete that keeps it safe from the passerby.

## II. Design of hardware

All these procedures are implemented on myRIO.It is an embedded evaluation board made by National Instruments.LabVIEW interface for proposed design is shown in figure 1a and figure 1b.It is used to develop applications that utilize its onboard FPGA and microprocessor.Gas sensor(MQ2) is connected directly to the my Rio and the value is given through UART, And one led is connected to the myRio which indicates the gas range depending upon the brightness of the led blows. UART stands for Universal Asynchronous Reception and Transmission. It consists of two parts transmitting UART and receiving UART.It allows parallel communication between micro controllers, CPU,memory etc., Resister is connected across the Limit switch which is connect to my Rio. Basically limit switch is fixed to the wall of the manhole. This hardware setup is shown in Figure 2.

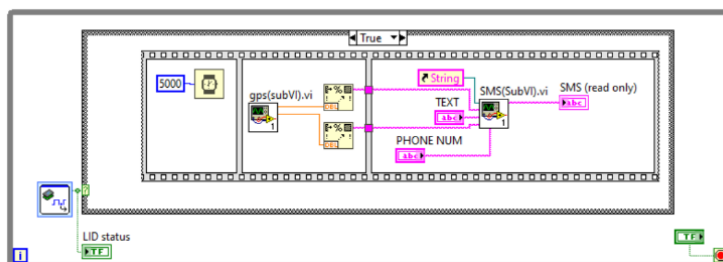


Figure.1a LabVIEW interfaced block diagram

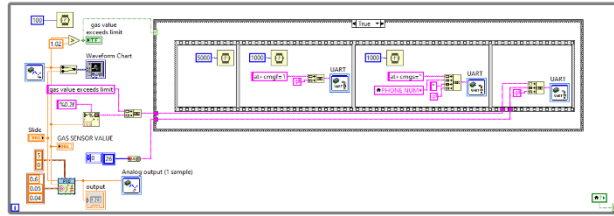


Figure.1b LabVIEW interfaced block diagram

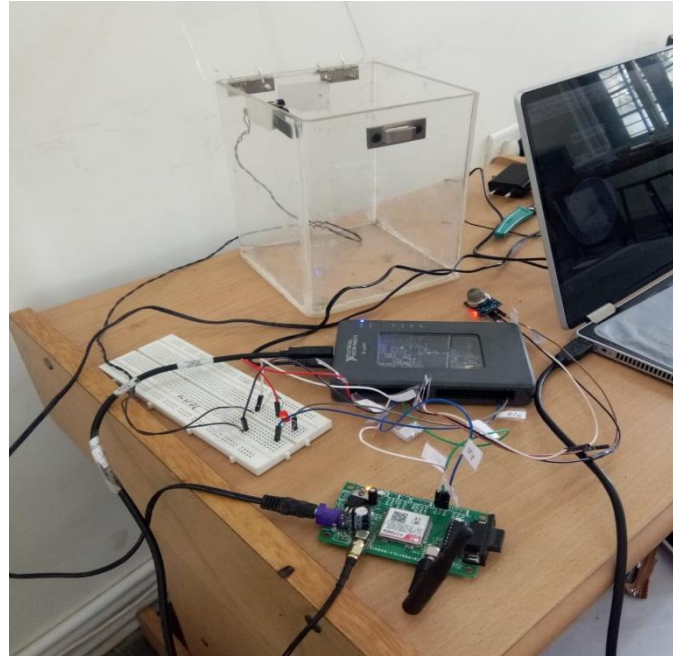


Figure.2 Hardware Setup

**A.GSM and GPS module**

GSM module used in the project is SIM808. This GSM module supports communication in 900MHz band. Indian mobile networks operates in the 900MHz band. But in other country it is 850MHz band. And next one is GPS with receiver helps to trace the location of the manhole.

**B. Limit Switch**

The Limit switch is a device that uses physical contact to detect the presence of an object. The limit switch consists of a switch body and operating arm. The switch body includes electrical contacts to energize a circuit.

**C. Gas Sensor**

This is a simple-to-use Carbon Monoxide (CO) sensor, suitable for sensing CO concentrations in the surrounding. The MQ-2 can detect COgas concentrations anywhere from 20 to 2000ppm. It has good sensitivity to carbon monoxide in a wide range and has advantages such as long lifespan, low cost, and simple drive circuit &etc.

**III. Design of control method**

The control method used in this system is Proportional Integral Derivative(PID) control.This is a closed loop system with gas sensor. The block diagram of PID controller is shown in Figure 4.

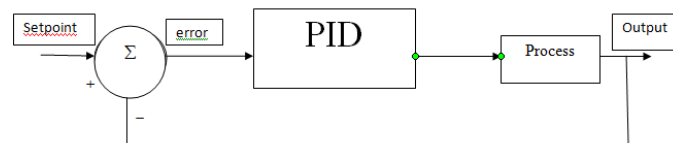


Figure.4Block diagram of PID

The PID method can be expressed by the equation  $u(t)=K_p e(t)+ K_i \int e(t)dt+ K_d de/dt$

$u(t)$ = PID control variable  $K_i$ =integral gain  
 $K_p$ = proportional gain  $de$ =change in error value  
 $e(t)$ = error value  $dt$ = change in time  
 The values of (pid gain)  $K_p$ ,  $K_i$  and  $K_d$  can see in the below figure.5

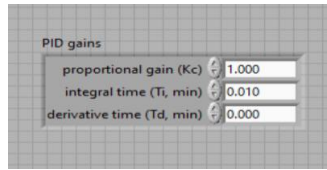


Figure.5 PID gains

**IV. METHODOLOGY**

A block diagram of the smart manhole lid management system using LabVIEW is shown in Figure.6. Limit switch and the Gas sensor is interfaced with myRio in order to make system smart. When the respective sensor or the limit switch is reaches its threshold value the signal is sent to myRio. Then the myRio sends the signal and location of the manhole to the municipal corporation through GSM and GPS. The messages are sent directly to the give mobile number.

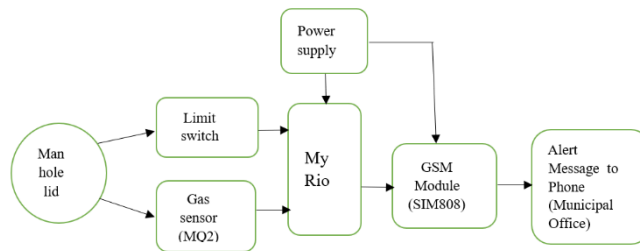


Figure.6 Block diagram

**V.RESULT AND DISCUSSION**

The prototype of Smart manhole lid management system using LabVIEW is designed.The system has been tested for two conditions namely lid status and gas limit. For both conditions output is obtained and the message will sent successfully.This is shown inFigure 7.

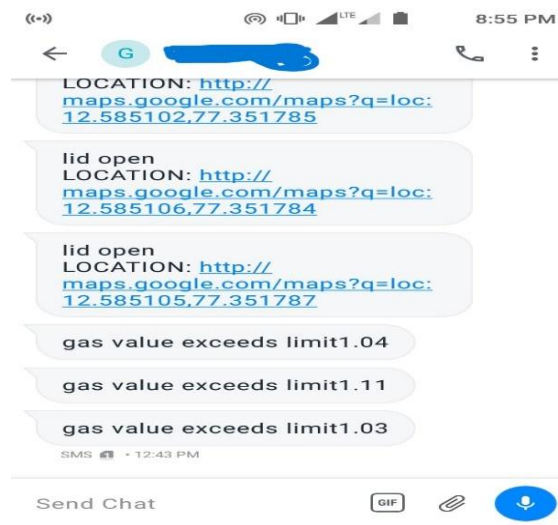


Figure.7 Alert messages

**VI.CONCLUSION**

Manhole monitoring is challenging task. This proposes different method for monitoring and managing the manhole lid. When the lid is open the alert message is sent to the given phone number and if the gas level

exceeds the level that is 1.02 then also alert message will sent to the given mobile number of the person in-charge to take further action. We can set the values for the gas sensor limit.

#### **REFERENCES**

- [1]. Ruheena M. A & Rukhayia Sheereen “Manhole Detection and Monitoring System” International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org NCCDS - 2021 Conference Proceedings
- [2]. S Sultana, A Rahaman, A M Jhara, AC Paul “An IOT Based Smart Drainage Monitoring System with Alert message”-conference on Intelligent, 2020 Springer.
- [3]. A Pendharkar , J Chillipalli K Dhakate, “IoT Based Sewage Monitoring System”, Available at SSRN, 2020, researchgate.net.
- [4]. U Andrijasevic, J kotic, V Nestic. “Lid Opening Detection in Manholes” 2020-ieeeexplore.ieee.org.
- [5]. Yi Luo, Cheng Gang Li, Feng Zang. “The real-time monitor system based on LabVIEW” International conference on computer science and network technology, 24-26 December 2011Harbin, China.
- [6]. P V Nikitin, “LabVIEW-based UHF RFID tag test and measurement system”, Industrial Electronics, research Transactions,2009.