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MANHOLE MONITORING AND DETECTION

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ABSTRACT

Nowadays, the drastic increase in road traffic congestion has led to severe consequences on individuals, economy and environment, especially in urban areas in most big cities worldwide. The purpose of using a road divider is to separate the incoming and outgoing traffic vehicles in the traffic. With increasing population, the vehicles are increasing, but there is limited resources which leads to more number of vehicles on roads The main aim of the project to use every second efficiently to save a human life while traveling in an ambulance. This can be achieved with a Movable road divider. In the proposed model, we are not using a machine and operating it manually rather operating it automatically with the help of sensors. Road traffic congestion is among the most challenging issues that current road traffic authorities as well as peoples are facing due to its compelling impacts. Among all these impacts, the delay of emergency services delivery to the emergency location is the most critical due to the incurred cost in terms of deaths, injuries and financial losses in case of fires, car crashes, terrorist attacks, etc. The communication system installed in the ambulance can clutch the traffic at signals until it crosses the crowded area. The system is designed for junction/cross-roads, where often ambulances have to wait until the normal traffic is cleared. This is quite an inconvenience for the patient who needs immediate treatment. Thereby this system is designed that can by-pass the existing signaling system temporarily.

I. INTRODUCTION

In recent years, with an ever increasing rate of development in metro cities around the world, there has been proportional increase in numbers of automobiles on the roads. Although the number of vehicles using the roads has increased, the static road infrastructure is almost the same and is unable to cope with changes like congestion, unpredictable travel-time delays and road-accidents that are taking a serious shape. Traffic congestion has been one of the major concerns faced by the metropolitan cities today in spite of measures being taken to mitigate and reduce it. It has emerged as one of the main challenges for developers in urban areas for planning sustainable cities.

In developing countries, like India, traffic is inherently chaotic and noisy. Identification of the magnitude of traffic congestion is an essential requirement for defining the congestion and finding appropriate measures. The main focus of this study is aimed at understanding the recurring urban congestion, its measurement, precautionary measure and suggests a remedial measure for the same. The implication of widening existing roads or building new ones will only result in additional traffic that continues to rise until peak congestion returns to the previous level. The total available space within the city for the construction of roads, railways and other transportation is restricted. The paper discusses implementation of movable traffic dividers as a congestion release strategy for metropolitan areas instead of the traditional solution of widening the roads. The Movable traffic divider helps in there configuration of road capacity, so as to attain optimum benefit from roadway usage on the existing road.

II. HARDWARE

Arduino:

Arduino is a tool for making computers that can sense and control more of the physical world than desktop computers. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive

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objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino systems can be stand-alone, or they can communicate with software running on computer (e.g. Flash, Processing, MaxMSP.) The boards can be assembled by hand or purchased pre-assembled; the open-source IDE can be downloaded for free. The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Figure 1: Arduino UNO

WiFi Adapter ESP8266:

The ESP8266 module is powered by a Tensilica Xtensa LX106 core processor, which runs at a clock speed of 80 MHz. It typically comes with various flash memory sizes, ranging from 512KB to 16MB, allowing ample space for program storage and data handling. One of the notable features of the ESP8266 is its built-in Wi-Fi connectivity. It supports 802.11 b/g/n standards, providing reliable wireless communication capabilities. The module can function as a Wi-Fi client, connecting to an existing wireless network, or as an access point, allowing other devices to connect to it. This flexibility enables the ESP8266 to serve as a standalone Wi-Fi-enabled device or as part of a larger network infrastructure. The ESP8266 module can be programmed using the Arduino IDE or using various programming languages such as C++ and MicroPython.

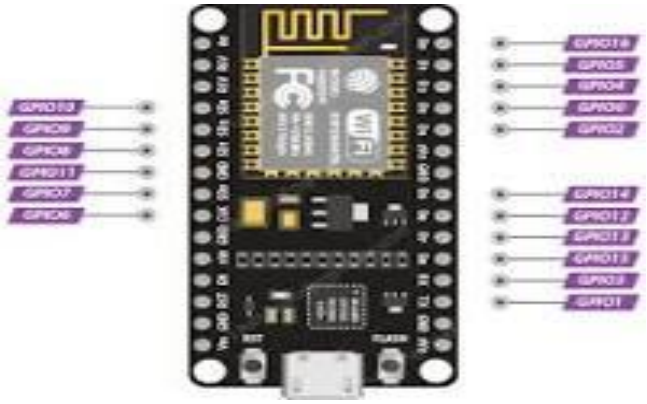

Figure 2: ESP8266 WIFI Module

LDR:

LDR (Light Dependent Resistor) as the name states is a special type of resistor that works on the photoconductivity principle that means that resistance changes according to the intensity of light. Its resistance decreases with an increase in the intensity of light. It is often used as a light sensor, light meter, Automatic Street Light, and in areas where we need to have light sensitivity. It is also called a Light Sensor. It is used in this project to detect whether the manhole is opened or closed.

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Figure 3: LDR

Gas Sensor:

Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gases. They are commonly used to detect toxic or explosive gasses and measure gas concentration. Here we use a gas sensor to get information of any harmful gasses present in the manhole.

Figure 3: Gas Sensor

Water Level Detector:

Water Level is detected using two anodes. One of the anode is placed at the bottom of the manhole and other is at a predefined level. When the water in the manhole reaches the predefined level, the anodes form a closed circuit, sending a notification through wifi module.

III. CIRCUIT DIAGRAM AND BLOCK DIAGRAM

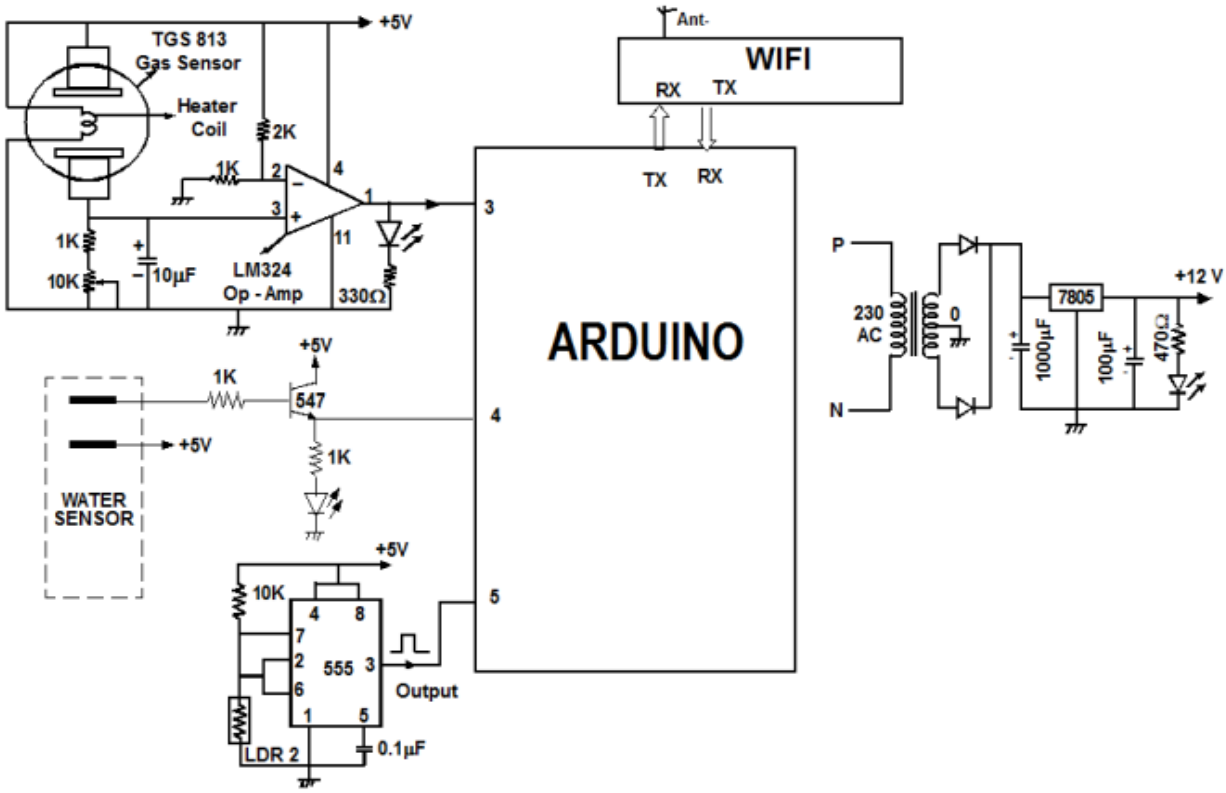

Figure 4: Circuit Diagram

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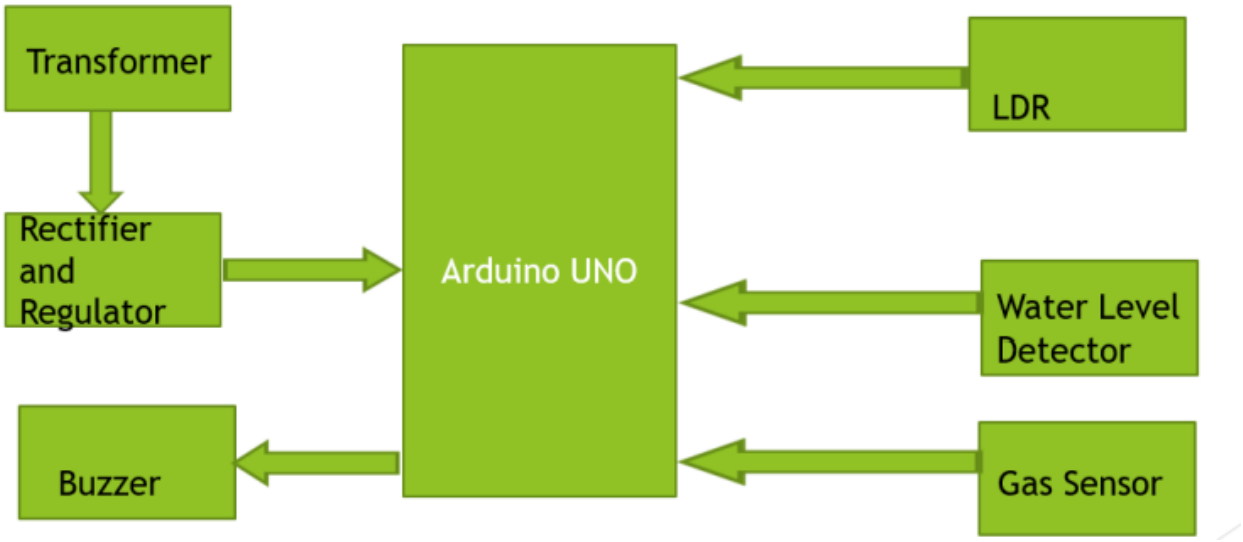

Figure 5: Block Diagram

IV. RESULTS

Test Case 1:

At Ideal condition, When no power supply for the circuit. All the connections are made as per the circuit diagram for proper functioning of the project. A transformer is used to convert AC to DC and regulators to regulate the power supply.

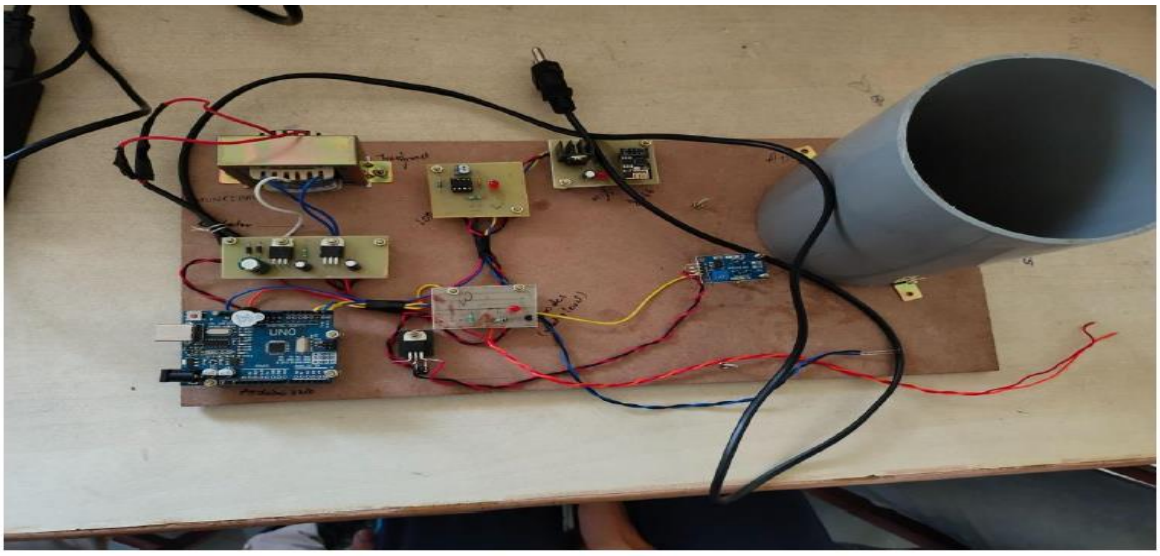

Figure 6: No Power

Test Case 2:

When the device is turned on, The circuit remains ideal as no sensors detect any error, the Wifi Adapter sends a notification of "Welcome" to the user, where the user can monitor the manhole using his application. All the LEDs and Buzzer are in off state until any error is detected by the sensors.

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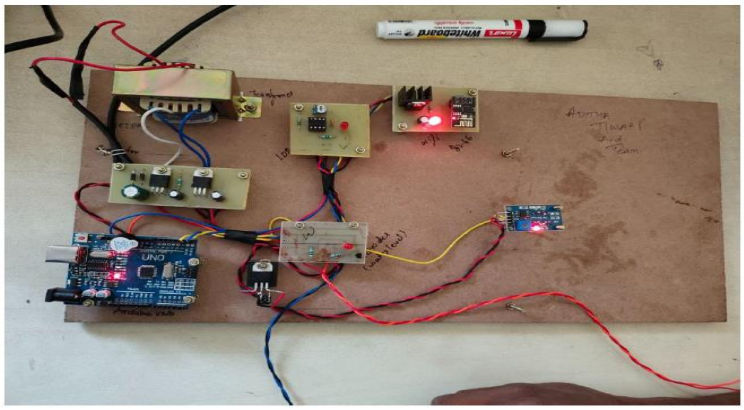

Figure 7: At On state and error detected

Similarly, If any error is detected by any of the sensors then immediately the LED is turned ON and buzzer starts buzzing to alert the maintenance team. Similarly the maintenance team can monitor the functioning of Manhole by using the Wifi Application, where regular updates are sent regarding the errors.

The notifications are sent to the monitoring team through WiFi Application, and immediate actions can be taken.

V. CONCLUSION

The project work is successfully designed, tested and a demo unit is fabricated. Since it is a demonstration unit, facility is provided only for single LDR and electrodes, but for real application a number of sensors for individual manholes may be used depending upon the area of the field. To achieve this, the same system with enhanced technology and with required modifications can be implemented. The LDR used for sensing the natural light can be kept in a suitable glass container and it should be kept inside the manhole.

In this project work the required power supply for the entire circuitry is derived from the main source, since the circuitry to be installed at roads, therefore this supply can be generated using solar energy. For this purpose suitable solar panels can be utilized for charging the battery and the stored energy from the battery can be utilized to generate required power supply for the circuitry.

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