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# IoT Based Digital Cities

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**ABSTRACT:** India has announced a project to build 100 smart cities. As most of the cities in India have adopted the underground sewage system, it is very important that the system works in a proper manner to keep the city clean, safe and healthy. A different kind of work was done to detect, maintain and manage these underground systems. It also provides a description of the water system and detection methods for detecting drainage pipe blockages. Also explained are some parts of a condition assessment model for underground sustainable water infrastructure and an intelligent system for assessment, rehabilitation and management of underground pipelines. Another application of the project is saving energy according to the number of people entering the forest. As an example, consider someone who enters the forest, then the corresponding path light turns on, otherwise it is in the off state. We save energy as well as the people present in the area.

**KEYWORDS:** Microcontroller, water level sensors, signal conditioning unit, gas sensor, IR sensor, WIFI module, relay.

## I. INTRODUCTION

Drainage is the natural or artificial removal of surface water from an area of excess water. They are carriers that transport water from rivers, streams and lakes. Common wastes are plant waste, plastics and some dirt. This is a large network that needs to be properly maintained and monitored. The underground sewage system is an important part of the urban infrastructure. Most of the underground sewer management is manual, so it is not efficient to have a clean and functioning underground system even in such big cities, it is difficult for the government personnel to located facing the problem.

It is essential to develop a system that can handle underground drainage without human intervention. Underground drainage includes the drainage system, gas pipeline network, water pipes and shafts. Without a proper drainage system, our society can be exposed to extensive damage to our lives. Some of the areas covered, based on economic and social considerations for sustainability in drainage design, are energy and control requirements.

## II. OBJECTIVE

The main goal of the implementation of this project is to design and develop a low-cost, reliable and effective technique for automatic switching on and off of street lighting and monitoring of drainage systems using sensors. There is no need for further waste of energy and there is no need to continue Monitoring and the municipalities will be notified earlier.



### III. LITERATURE SURVEY

The proposed system is designed in such a way that during daylight hours when street lighting is not required, the system remains in the off state even after the system is connected to power. When there is no vehicle on the road, an infrared sensor located on the road barrier detects the absence of a vehicle and sends a signal to the microcontroller to dim the brightness of the street lights. [1] In this proposed block diagram consisting of IR sensors that are used for interrupt detection and send a logic signal to the microcontroller to light up the LEDs in front of the vehicle For this situation, the infrared radiation produced by the infrared diode directly hits the photo sensor that is placed facing the IR sensor. [2] We must save or conserve energy because most of the energy sources we depend on, such as coal and natural gas, cannot be replaced. Saving energy is very important, instead of consuming energy at unnecessary times, it should be turned off. In every city, street lighting is one of the main factors of energy consumption. [3] The proposed work is to control the exchange of light on the road naturally as indicated by the strength of the light to create powerful current-based control measurements using the innovation of infrared identification and maintaining a remote correspondence between the light pole and the control terminal using the Zig-Bee wireless convention. [4] Ultrasonic sensors are attached to the sewage tank, which often sense the water level. The Arduino is programmed to activate the ultrasonic transmitter transducer when power is passed. It is combined with IoT technology. Power is provided from the breadboard to the Arduino board, which sends power to the ultrasonic sensor, the MQ2 gas sensor, the LM35 temperature sensor, and the SIM800L.[5]

### IV. PROPOSED SYSTEM

- In this proposed system consists of water level sensor, gas (methane) sensor as mentioned was designed for field use at remote location to measure water level, gas level in working drainage. Real data is collected from various sensors, water level sensors, gas (methane) sensors.
- This project focuses on developing an affordable autonomous drainage system using IoT and without human intervention.
- Light switching is automatic, light intensity can be regulated and electricity consumption can be reduced. The intensity of the lights can be controlled when there is less traffic in a certain area.

### V. BLOCK DIAGRAM

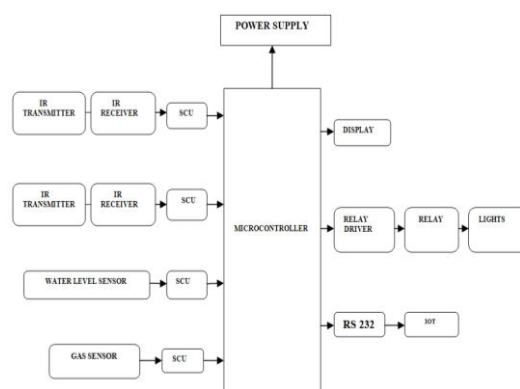


Fig no:1 proposed for block diagram



|| Volume 12, Issue 4, April 2023 ||

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## A. CIRCUIT DIAGRAM

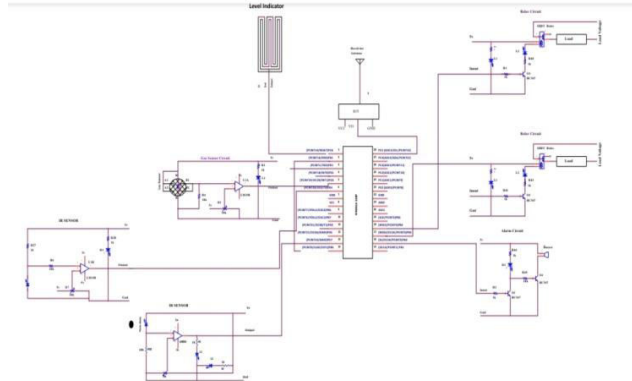


Fig no: 2 circuit diagram

## VI.HARDWARE REQUIREMENT

### 1. POWER SUPPLY

All digital circuits operate with low DC voltages only. An AC voltage typically 230 Vrms is connected to a transformer which steps this AC voltage down to the desired AC voltage level. The diode rectifier then provides a full wave rectified voltage which is initially filtered by a simple capacitor filter to produce a DC voltage. The regulation circuit causes this DC input to provide a DC voltage that not only has much less ripple, but also remains at the same DC current value even as the DC voltage changes or the load connected to the DC output voltage changes.



Fig no 3: Power supply

### 2. ESP8266 WIFI MODULE

Node MCU (Node Micro Controller Unit) is an open-source software and hardware development environment built on a low-cost SoC called ESP8266. This makes it an excellent choice for Internet of Things (IOT) projects of all kinds. The Node MCU is available in a variety of package styles. Architecture-based designs retained the standard 30-pin layout.

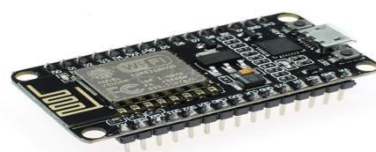


Fig no 4: WIFI device



|| Volume 12, Issue 4, April 2023 ||

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### 3. RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to do this. Relays are used where it is necessary to control a circuit with a low-power signal (with complete galvanic isolation between the control and controlled circuit), or where it is necessary to control several circuits with signal.



Figno:5 Relay module

### 4.DC MOTOR

A direct current motor is rotary electric motors that convert into direct current in motor.. The most common types rely on forces created by induced magnetic fields due to the current flowing in the coil. Almost all types of DC motors have some internal mechanism, either electromechanical or electronic, change the direction of current in a part of the motor.



Fig no 6: Regulator

### 4.ARDUINO UNO MICROCONTROLLER

Arduino is open-source electronics prototyping platform based on hardware and software. Arduino is a microcontroller based prototyping board that can be used in developing digital devices that can read inputs like a finger on a button, a touch on a screen, a light on a sensor, and convert them into an output like turning on an LED . , turning the engine, playing songs through the speaker.

An Arduino board can be programmed simply programming the microcontroller on the board using a set of instructions, for which Arduino board consists of a USB connector to communicate with your computer and a series of connection sockets that can be connected to external devices. such as motors, LEDs.

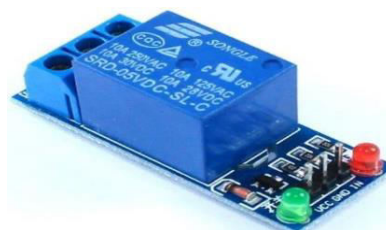


Fig no: 7 Arduino UNO



### 5.WATER LEVEL SENSOR

- The water level is used to measured the water level. A water level sensor is used to detected the level of substances that can flow.
- The sensor has been exposed copper traces, five they are power curves and the remaining five are sense curves. These traces are interspersed so that there is one sensory trace between every two force traces.
- Normally the power and sense traces are not connected, but they are bridged when immersed in water.

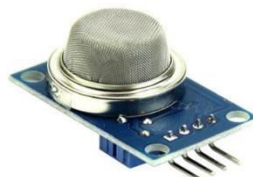


Fig no: 8 Water Level Sensor

### 6. GAS SENSOR

A gas sensor is a device that detects the concentration of gases in the atmosphere. The sensor creates a corresponding potential difference by changing the resistance of material inside the sensor, which can be measured an output voltage. Based on this voltage value, concentration of the gas can be estimated.

The type of gas that the sensor can detect depends on the sensing material present inside the sensor. These comparators can be set for a specific gas concentration threshold. When the gas concentration exceeds this threshold, the digital pin goes high. An analog pin can be used to measure gas concentration.

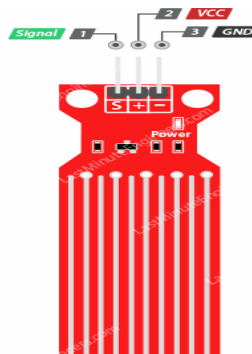


Fig no:9 Gas Sensor

### 7.INFRARED SENSOR

An infrared sensor is an electronic device that emits light to sense . The IR sensor measure the heat of an object and also detect movement. These types of sensors only measure infrared radiation and do not emit it, which is called a passive IR sensor. Typically, in the infrared spectrum, all objects emit some form of thermal radiation.



Fig no:10 IR Sensor



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These types of radiation are invisible to our eyes and can be detected by an infrared sensor. The emitter is LED (Light Emitting Diode) and detector is simply an IR photodiode that is sensitive IR light of the same wavelength as the IR LED emits. When infrared light hits the photodiode, the resistances and output voltage change in proportion to the amount of infrared light received.

### 8.LCD DISPLAY

The 16x2 LCD display is a very basic module used in various devices and circuits. These modules are preferred seven-segment and other multi-segment LEDs.

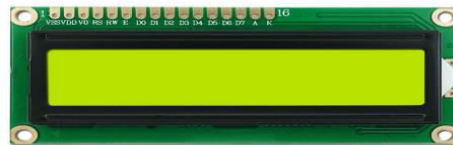


Fig no:11 LCD Display

The display consists of millions of pixels. Display quality commonly refers to the number of pixels; for example, a 4K display consists of 3840 x 2160 or 4096 x 2160 pixels. A pixel consists of three subpixels; red, blue and green – commonly called RGB. When subpixels in a pixel change color combinations, a different color can be created. Because all the pixels on the display work together, the display can produce millions of different colors. By rapidly turning the pixels on and off, an image is created.

### 9. BUZZER

An audible signaling device such as a buzzer or buzzer may be of the electromechanical or piezoelectric or mechanical type. The main function is to convert the signal from sound to sound. It is generally powered by DC voltage and is used in timers, alarm devices, printers, alarms, computers, etc. Based on different designs, it can generate different sounds such as alarm, music, bell and siren.



Fig no:12 Buzzer

The buzzer pin configuration is shown below. It contains two pins, namely positive and negative. The positive terminal is marked with a "+" symbol or a longer terminal. This terminal is powered via 6V, while the negative terminal is marked with a "-" symbol or an abbreviation and is connected to the GND terminal.

## VII. RESULT

As a result, the setting of the entire research work is shown step by step. Sample screenshots will appear once the components are attached and interconnected. All components are interconnected and this completes the system setup, which helps to understand each step in a simple and easy way. With these steps, even a person trying to implement the same, it is simple, clear and easy. When the system is started with external power, all sensors will start working. The gas sensor detects harmful gases and reports them to the MCU node. The ultrasonic sensor checks the water level and sends the values to the MCU node. An MCU node that has built-in Wi-Fi. This process processes the information/values sent by the sensors and displays them in the flashing server application. Recorded values are displayed on the 16X2 LCD and a buzzer sounds if readings exceed thresholds.

### VIII. CONCLUSION

This project proposes that excess energy can be saved with the Smart Street Light, which is done by replacing sodium lamps with LEDs and adding an additional feature for safety purposes. It prevents the unnecessary wastage of electricity caused by manually switching on street lights when not needed. It provides an efficient and smart automatic street lighting control system using IR sensors. It can reduce energy consumption and keep costs down. The system is versatile, expandable and fully customizable to the user's needs. And various methods of monitoring and controlling the underground drainage system. It explains various applications such as underground drainage and real-time shaft identification. Various parameters such as temperature, toxic gases and water level are monitored and updated online using IoT. This allows the responsible person to take the necessary measures in this matter.

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**|| Volume 12, Issue 4, April 2023 ||**

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