

## ADVANCED SEWER CLEARANCE AND TOXIN INDICATOR

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**Abstract** – Manual scavenging was made illegal in 2013, but private contractors hired by the municipal government continue to employ manual scavengers. They are highly exposed to poisonous gases such as methane, hydrogen disulphide during the process of sewage cleaning. To provide a complete solution to this deplorable situation, a robot can be used as a replacement to manpower in sewer maintainance. The sewage inspection and cleaning is done by the robot. The robot inspects sewer lines for cracks, corrosion, obstacles, gas present, etc. A camera installed atop the robot carries out live streaming of the interior of the pipeline using IOT. After finding the nature of gas present in the sewer line, robot has a neutralizing agent that will reduce the harmful gases present in the sewer. After the identification of crack, corrosion, etc and after the neutralizing the gases human may enter the sewer to fix the corrosion of the pipe by sand blasting, recoating, etc by which the lifetime of the pipe will be extended. Thus, This device effectively decreases all the predicaments associated with sewage cleaning and inspection.

**Keywords:** IOT, poisonous gases, robot, camera, neutralizing agent, live streaming, manual scavengers.

### 1. INTRODUCTION

The sewage system plays a big important role in big cities where millions of people live. The process of monitoring and maintaining the drainage system is to make the workers at risk. The drainage may contain rainwater and unused water. The process of drainage monitoring and maintain plays a big role to keep the city neat and clean. This leads to an informal way of monitoring and cleaning

the drainage manholes when it is blocked. Manual scavenging was made illegal in 2013, but private contractors hired by the municipal government continue to employ manual scavengers. They are highly exposed to poisonous gases such as methane, hydrogen disulphide during the process of sewage cleaning which leads to various health issues. To provide a complete solution to this deplorable situation, a robot can be used as a replacement to manpower in sewer maintainance.

### 1.1 PROBLEM STATEMENT

In the Existing system, zigbee is used so the wide range of controlling is impossible and also the robotic arms are not adjustable to various diameters of the sewer pipes.

### 2. PROPOSED SYSTEM

The robot inspects sewer lines for cracks, corrosion, obstacles, gas present, etc and tries to clear the blockage and remove the obstacles. A camera installed atop the robot carries out live streaming of the interior of the pipeline and can be monitored and controlled even from long range of distance with the help of IOT. After finding the nature of gas present in the sewer line, robot has a neutralizing agent that will reduce the harmful gases present in the sewer. After the neutralizing the gases human may enter the sewer to fix the corrosion of the pipe by sand blasting, recoating, etc by which the lifetime of the pipe will be extended. All the status will be updated to the web page we have created. This system has the ability to adapt for pipes with variable diameter.

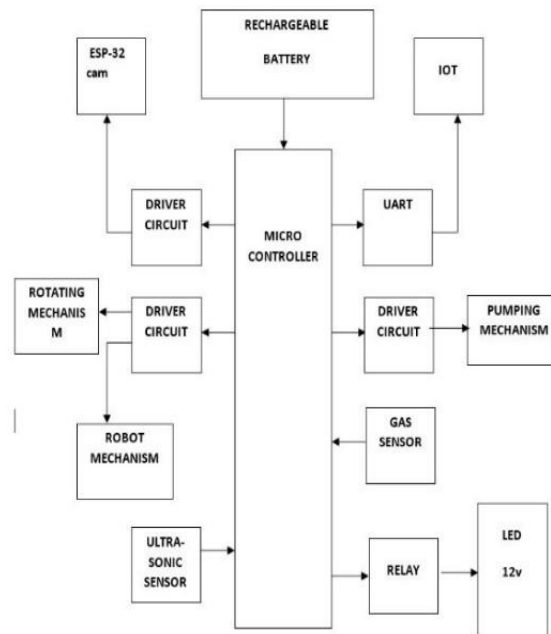


Figure 1- Proposed block diagram

### 3. SOFTWARE IMPLEMENTATION

computer interaction.

#### 3.1. Arduino IDE

ArduinoIDE IDE stands for “Integrated Development Environment”:it is an official software introduced by Arduino.cc, that is mainly used for editing, compiling and uploading the code in the Arduino Device. Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.

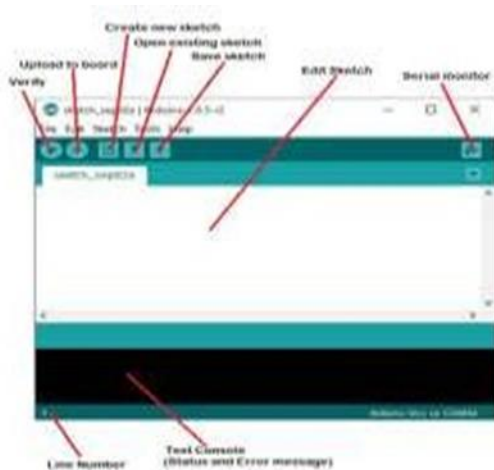


Fig -2: ARDUINO IDE



Fig 3-IOT

### 4. HARDWARE IMPLEMENTATION

#### 4.1. GAS SENSOR

Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration. Gas sensors are employed in factories and manufacturing facilities to identify gas leaks, and to detect smoke and carbon monoxide in homes. Gas sensors vary widely in size (portable and fixed), range, and sensing ability. They are often part of a larger embedded system, such as hazmat and security systems, and they are normally connected to an audible alarm or interface. Because gas sensors are constantly interacting with air and other gasses, they have to be calibrated more

often than many other types of sensors.



Fig 4-gas sensor

#### 4.2 ULTRASONIC SENSOR

Ultrasonic transmitter emitted an ultrasonic wave in one direction and started timing when it launched. Ultrasonic spread in the air and would return immediately when it encountered obstacles on the way. At last the ultrasonic receiver would stop timing when it receives the reflected wave. The distance of sensor from the target object is calculated. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. Its operation is not affected by sunlight or black material.



Fig 5-Ultrasonic sensor

#### 4.3 UART

UART stands for Universal Asynchronous Receiver/Transmitter. In UART communication, two UARTs communicate directly with each other. The transmitting UART converts parallel data from a controlling device like a CPU into serial form, transmits it in serial to the receiving UART, which then converts the serial data back into parallel data for the receiving device. Only two wires are needed to transmit data between two UARTs.



Fig 6-UART

#### 4.4 Arduino Uno

Arduino board is being used here. It is also referred as brain which means it acts as a main part in the project. It is connected with GSM which sends messages to the user. Also an application 'Ubidots' is being implied here which is used for conversion. WiFi modules and LCD displays are being connected.



Fig 7-Arduino Uno

#### 4.5. WIFI MODULE

The ESP32 WiFi module is a self-contained SoC with an integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP32 is capable of either hosting an application or offloading all WiFi networking functions from another application processor. Each ESP32 module comes preprogrammed with an AT command set firmware, meaning you can simply hook this up to your Arduino device and get about as much WiFi ability as a WiFi shield offers (and that's just out of the box)!. The ESP32 module is an extremely cost-effective board with a huge, and ever-growing, community.



Fig 8-wifi module

#### 4.5 DRIVER CIRCUIT

The ULN2003 is a monolithic high-voltage and high-current Darlington transistor array. It consists of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single Darlington pair is 500mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED gas discharge), line drivers, and logic buffers.



Fig 9-Driver Circuit



Fig 11-sensing blockage

4.7. LED

LED stands for light emitting diode. The lighting emitting diode is a p-n junction diode. It is a specially doped diode and made up of a special type of semiconductors. When the light emits in the forward biased, then it is called a light-emitting diode.



Fig 10-LED

4.8. ROBOTIC MECHANISM

We are implementing the robotic mechanism for detecting and eliminating the blockage in pipe line here we are using wireless camera for monitoring which is inbuilt with microcontroller controlled with robotic mechanism so that robots can move to and fro over the pipe line.

4.9. PUMPING MECHANISM

We are integrating pumping mechanism in order to remove the blockage inside the pipe line camera detects the blockage, this event is monitored by the user with wireless camera via Wi-Fi, also pumping mechanism activates by blowing force water were ever blocks inside the pipe.

4.10. ROTATING MECHANISM

The rotating mechanism is used to provide force for the robot to drive against the water and also remove the blockage.

5. SYSTEM PERFORMANCE

These are the following steps carried out in our project.

STEP 1-. Robotic arm enters the sewage pipe which is controlled through the web page

STEP 2- Ultrasonic Sensor is used to sense the blockage present in the sewer pipe.

STEP 3-the process taking place underground is viewed through live streaming with the help of camera.

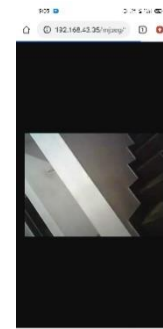


Fig 12-camera live streaming

STEP 4-If the blockage is present,then the water is flushed out forcibly to clear the blockage.

STEP 5-Gas sensors is used to sense the poisonous gas if present inside the sewer pipe.

STEP 6- If the poisonous gas exceeds the threshold value,then the neutralizing agent is sprayed to clear the harmful gases.

STEP 7-If the blockage is too hard for the robot to clear or if crack or corrosion present,manual scavengers are now safe to enter without risking their life.

6. CONCLUSION

Internet of Things has gained its wide popularity in recent days due to its various streams of applications which has paved way for smooth, safe and easier mode of living style for human beings. Though, several techniques is existing for the same, yet sewage cleaning is one major concern and a challenge always.A very important design goal of this robotic systems is the adaptability to the inner diameters of the pipes.The underground performance of the robot is monitored by live streaming in our created web page and can be monitored and controlled over wide range of distance using IOT.In the future,we can elaborate the system by implementing artificial intelligence so that the robot can make decision by their own for clearing blockages and the database can be maintained for futher purposes.

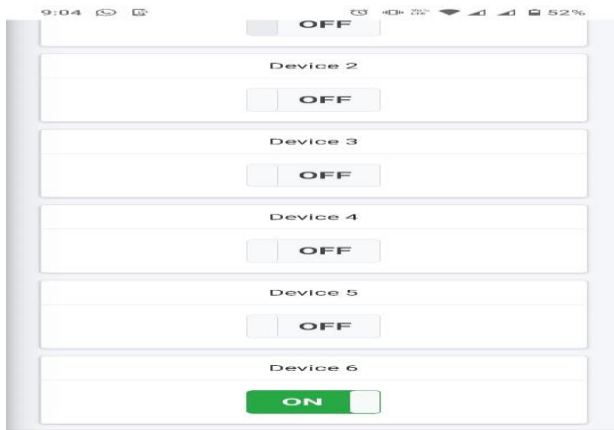


Fig 13- server page

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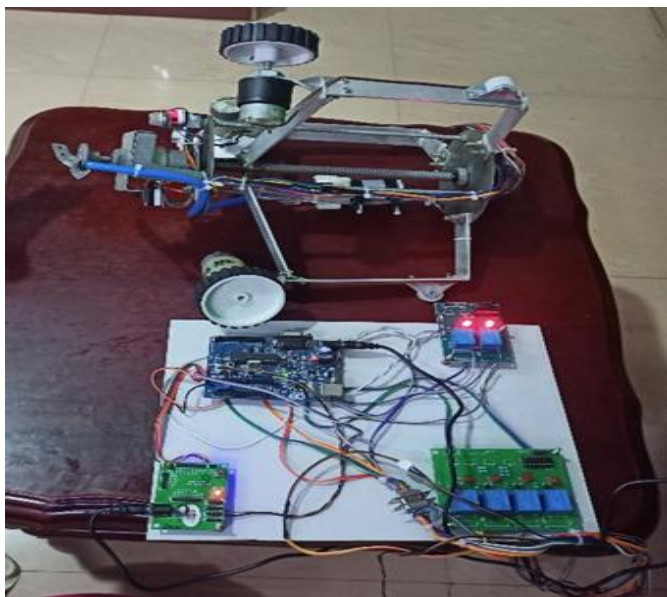


Fig 14- Hardware kit

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