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Newfangled Immaculate Trash Can Tracking System

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Abstract: The idea of trash can monitoring systems is for the Smart buildings, Colleges, Hospitals and Bus stands. In our day to day life, we see our cities facing many problems with garbage overloading, which leads to producing green-house gases and it leads to polluting our environment and also it is harmful to humans. The main natural process is the greenhouse effect that warms the earth's surface.

The emission of greenhouse gases can also affect the ozone layer. The most important need for having a smart way of life is being clean smart garbage system. Trash can monitoring system is a new idea of implementation which makes a normal dustbin as smart using Arduino Uno and GSM modules are used to send the SMS. The proteus software tool is used to create the schematic diagram of our project.

The trash can will constantly measure the level of garbage in the bin and automatically detect if any toxic gases present in the bin and also detect any burning occurs in the garbage and it Sense and sends a message to the higher authority. If that cleaning team will not initiate cleaning, then the dustbin will automatically move by using the line follower sensors to dispose of the waste at the desired location.

Keywords: Arduino, GSM, ultrasonic sensor, gas sensor, temperature sensor, Proteus tool, and line follower robot.

I. INTRODUCTION

All cities in the world are facing great challenges due to increasing urbanization and one of the major challenges is reducing the amount of dumping waste. In many public places, we see that garbage bins are kept but they have not been cleaned. Overflow of waste causes air pollution, land pollution, and respiratory problems. Some gaseous compounds are extracted from the wastes in the bin, it can cause health effects by causing shortness of breath, headaches, eye irritation. Some of the industries produce toxic products that are thrown away into normal dustbin against the rule.

Though the dustbin is filled there is a formation of gases such as ammonia, carbon dioxide, and methane and some of the contents in the garbage that react with each other and release Sulphur & Nitrogen. Burning of garbage releases very poisonous carbon monoxide gas in the air. This may cause fire and pollute the atmosphere severely. Fire can also occur due to people's careless and they are unaware of the burnings & combusting material. This fire may also spread to homes, working area & causes a threat to the surroundings.

To reduce these problems we can use the existing technology to sense these unusual conditions. Using the level monitor like an ultrasonic sensor we can sense the level of waste in the dustbin [1]. Using the gas sensor we can sense the formation of hazardous gases like CO₂, SO₂, NO₂, methane, and ammonia. Fire sensor is used to sense the temperature level in the garbage if any burning occurs it senses it. GSM & Arduino module is used to transfer data and messages.

If any unusual condition occurs in the waste like overflow, toxic gas or any burning of waste then it senses and sends the message or voice call to higher authority and scavengers for cleaning [3]. After sending these messages, if the scavengers are not coming to clean the waste.

Then the dustbin will automatically move towards disposing of the waste. Here the line follower concept is used. These line follower sensors are used to move the dustbin in that pre desired path or black line. When it reaches that destination it automatically disposes the waste at the desired location [5]. Upload the code to Arduino after setting up the smart trash can and providing a 5V power supply to the Arduino board to circuits. Thus using this method we can avoid some undesirable health problems and environmental pollutions. Using this idea we can make our India as smart cities.

II. LITERATUREREVIEW

This waste bin monitoring system consisting of several components like IR, gas sensors, ultrasonic sensors, GSM module, servomotor, and 12V battery supply. This project is explained about the dustbin that will be automatically open and close using the ultrasonic sensors and servo motors. If the person presence in front of the dustbin then the sensors detect the person and opens the bin. When bins are filled with waste at that point of time the ultrasonic sensor is used to detect the level and send the information to the cleaning team through the GSM model. Internet of Things (IoT) is used in this project.

The detection of the garbage level is through ultrasonic sensors (HC-SR04). Garbage level in the bin even if the waste is not removed from the bin, then GSM sends the specific bin information to higher officials.

For effective and efficient garbage collection an integrated Wi-Fi router, IoT, GSM, Ultrasonic Sensor system is implemented in this project. It can track the garbage level automatically and send the information to the truck driver.

This proposed plan provides an assisting hand for those who can not support themselves at home. With Bluetooth technology in the mobile application, automated smart dustbin, people can have control over it through the wireless media. Whenever the dustbin reaches the threshold level, the message will automatically be sent via a mobile app.

In this system, PIR Sensor is used for the automatic opening and closing of the bin. It sensed the user's presence within a radius of 1 meter to avoid garbage spill, and open at the voice command (Bin Open). The bin closes when the user is moving away from the operating range or the close command (Bin close).

The model suggested plans for solid waste disposal. In some situations, if it creates any bad smell the dustbin needs to be cleaned and it is detected using a gas sensor and it will send a message to the registered mobile number that these interfaces are linked to the ARDUINO.

III. PROPOSED SYSTEM

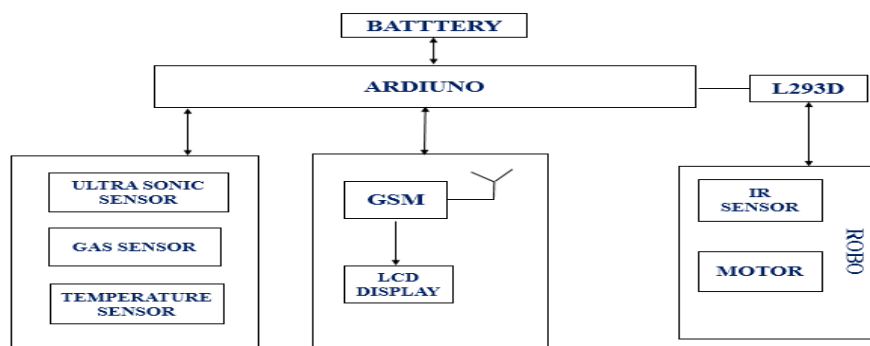


Fig: 1 Block Diagram For Newfangled Immaculat Trash Can Tracking System

The system involves the Arduino Uno board, LCD screen, and GSM modem to send data. The Human-machine interface (LCD) screen displays the status of the waste collected in the bins. Whereas GSM is built to show the status of the bin through the SMS.

In our day to day life, many people used to dump the waste in the dustbin even if the dustbin exceeds its limit point. When this happens regularly overflow occurs, it can be sensed by the ultrasonic sensor [2]. If any toxic gases like carbon-di-oxide, sulfur-di-oxide, nitrogen-di-oxide, methane, and ammonia formed in the dustbin which can be detected by the gas sensor [6]. If any burning occurs in the bin due to the human mistake or by irregular changes in weather conditions particularly in the summer season. It can overcome by using the LM35 temperature sensor to sense the temperature level in the garbage. This LM35 works when the burning exceeds its threshold value [4]. Whenever the sensors detect the above conditions, their respective messages will be sent to the higher authority and the scavengers for cleaning. If it is not cleaned at a particular time then another message will be sent to the higher authority about the carelessness of services. After sending these messages, if the scavengers failed to reach the destination to clean the waste. Then the dustbin will automatically move towards the disposing of the wastes at the desired location by using the line follower concept. In the line following concept, the IR sensor is used to detect the path and the values attained by the IR sensor sends to the Arduino Uno and Arduino command passes to the L293d motor driver and the motor driver works as per the command and drives the DC motor. This concept is used to move the dustbin in that pre desired path or black line. When it reaches that destination it automatically disposes the waste at the desired location.

Here battery is used to produce the electricity for charging the components. Upload the code to Arduino after setting up the smart trash can and by providing a 5V power supply to the Arduino board to circuits for further working.

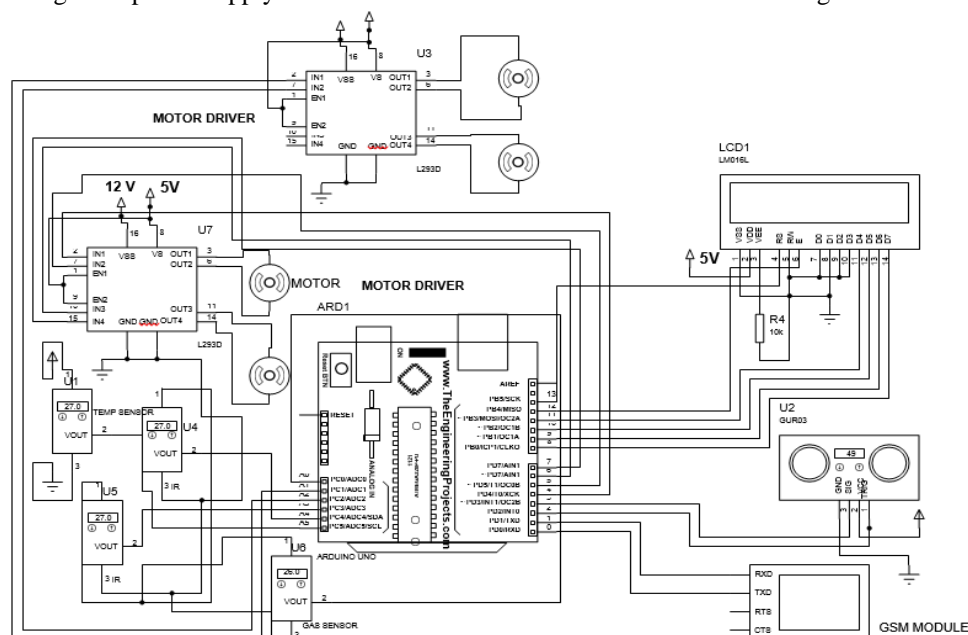


Fig 2: Schematic Diagram Using Proteus Tool

IV. HARDWARE DESCRIPTION

The hardware requirements for the system are as follows.

A. Arduino Uno

Arduino is a programming device that can feel and manipulate more of the physical world than your desktop computer. In our project, Arduino Uno is powered by an external battery. A 5V power supply is required for Arduino. This major advantage is to control the multiple applications in a single board.

B. GSM

GSM Modem can accept any SIM card from a GSM network operator and function as a mobile phone with a unique phone number of its own. The main advantage of this modem is the RS232 port by which we can communicate and construct embedded applications. In this project, GSM is used to transfer the data through SMS. This modem can be connected to the Arduino microcontroller and send the information about the trash can through the SMS.

C. Human-machine Interface (LCD)

The Human-machine interface which is commonly known as the LCD display. This device consisting of any amount of monochrome pixels that are projected in front of a light source or reflector. It is often used in electronics devices powered by batteries, as it requires very small amounts of electricity. In our project, the instruction or information about the bin is displayed on this LCD.

D. Ultrasonic Sensors

Ultrasonic sensors will be used in many applications like medical purpose and level monitoring. In our project, this sensor is used in the level monitoring purpose. The ultrasonic sensors will be placed at the top of the trash can where the wastes are dumped, when it gets filled then it will be displayed in LCD and the message will send to the higher authority by using GSM.

$$\text{Distance} = (\text{Time} \times \text{Speed of Sound}) / 2$$

Time=The time between the propagation of an ultrasonic wave and when it is received.

E. Gas Sensor

In this Trashcan monitoring system, we use the gas sensors for finding the harmful gases. Dustbins have different types of waste. These wastes may be combined and produce harmful gases like greenhouse gases, etc. These gases are very dangerous to humans and animals. So the harmful gases will be noted through this gas sensor and send the message to the higher authority and scavengers for cleaning.

F. Temperature Sensor

The temperature sensor is an important sensing element that is used to detect high temperatures and burning things (fire). The temperature sensor detects the temperature and when it exceeds the threshold values it sends the warning message to the corresponding higher authority.

G. Line Follower Robot

Two Infrared sensors are used in this line follower concept. Infrared sensors are the electronic sensors that are used to detect other elements in the environment. The object's motion can also be observed. This IR sensor is made up of photodiode and IR LED. IR LED used as transmitter and photodiode will be used as a receiver. These two parts have a different diameter. (IR->5mm, photo->3mm). In our project IR sensor is used for line following concept. When the trashcan is filled then the message will be sent to the higher authority. After some particular time, if the bins are not cleaned, the trashcan automatically moves along the black line or in pre desired path. When it reaches the destination it automatically disposes the waste at the desired location. The IR sensor is placed at both ends at the front portion of the dustbin.

H. Motor

Servo motor is a line actuator which is to control the angular and linear position. The motor drive will be used for moving purposes. In our project, it is used to move the dustbin in the desired path. When it reaches that destination it automatically disposes of the waste.

V. RESULT AND FINDING

This trash can monitoring system is a new idea of implementing normal dustbin into a smart dustbin by using sensors, and by adding the new features such as line follower robot it moves and disposes of the waste accordingly.

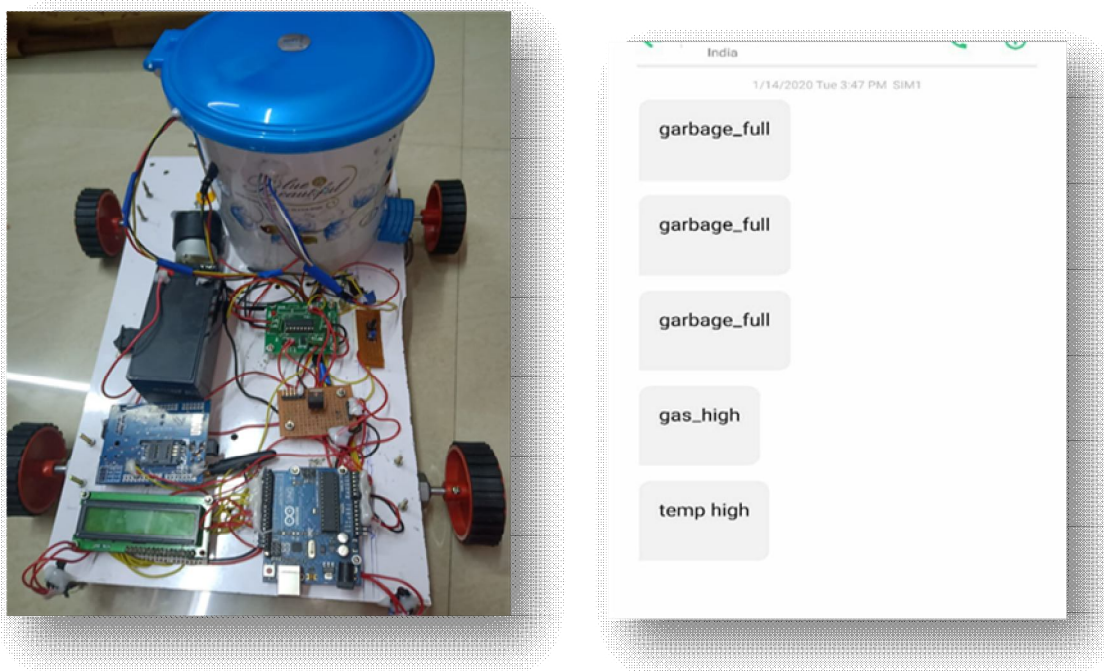


Fig 3: Hardware And Output

VI. CONCLUSION

Trash Can monitoring systems used for developing the city as smart. It helps us to reduce the environmental pollution, whenever the garbage is overflow, at that period many animals and bird's habitat will be disturbed.

To overcome these situations, the implementation of newfangled immaculate trash can idea which makes a normal dustbin into a smart dustbin using sensors for sending messages to the user, for updating the status of the bin, also it automatically moves and disposes the wastes to the desired location.

This system can prove solutions for the whole waste management system for future smart cities development.

VII. FUTURE SCOPE

The formed plastic waste aggregate is combined with hot bitumen and the resulting mixture is used for road construction. As well as using plastic waste for road construction to reduce the plastics.



In the future, we also used a solar panel to produce electricity for charging the components and also it is used to glow the nearby street lights.

Wet waste can be decomposed and used for biogas. Therefore, future works can be made in the study of models that offer the best result in terms of the decision – making. There is a great scope for this project to modifying our city as smart in the future.

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