SMART GARBAGE MONITORING SYSTEM USING IOT

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ABSTRACT

We are living in the era of Smart cities where everything is planned and systematic. The problem we are facing is of the population, which is rising rapidly. In recent years, urban migration has skyrocketed. This has resulted in the rise of garbage waste everywhere. Dumping of garbage in public places creates a polluted environment in the neighborhood. It could cause a number of serious diseases to the people living around. This will embarrass the evaluation of the affected area. In order to reduce waste and maintain good hygiene, we need a systematic approach to tackle the problem. We propose a solution to this waste problem which manages the garbage waste smartly. This research paper proposes an IoT based smart system based on clean waste management that assesses the level of waste on dustbins through sensory systems. In this system the microcontroller is used as a visual connector connecting sensor and the IoT system. We have worked for a village in native village of UP under the scheme Unnat Bharat and the results have been promising.

Keywords: Internet of Things, Smart dustbin, Arduino Board, GPS, GSM, Arduino IDE.

INTRODUCTION

As the world's population grows at an unprecedented rate, more garbage waste is being generated on a daily basis and waste management and proper collection from garbage bins is becoming more and more challenging and important [1]. In extreme scenarios, littered garbage causes unhygienic and unhealthy conditions that risk the surrounding areas and communities. Such dangers are witnessed in the form of flooded and leaking dirty waste containers. The leakage causes overflow of garbage waste all around the place making the area dirty and unhygienic.

This results in wastage of vital resources used due to a lack of coordination and keeping an eye on data in clusters and poor infrastructure. With the latest advances in information technology, smart cities and smart infrastructures are prospering. Smart Cities is a small sustainable development model. It is based on the use of human capital and technology to improve urban integration with the growing popularity of Internet of Things (IoT) and the availability of actuators and low sensors, technological advantages can be pave the way to solve used to solve the problem of current urban[2].

IoT is the ecological unit of compatible objects available online. The 'object' in IoT may disable the portable device with the ability to disseminate information via IP address and the ability to communicate data directly from the base station. IoT is able to interact with various online applications. In this project a new method has been introduced to integrate IoT green environment into automatic waste disposal and provide an efficient solution.

The main functions of the Smart dustbin are:

- Sends a "DUSTBIN FULL" warning message to municipal officials.

- The purpose of the project is to help manage waste management in urban and rural areas
- The project will send an SMS to municipal officials containing information about dustbin.
- SMS will be sent via GPS location
- Buzzer indicating a state of overflow.

This research project focuses on the Garbage Monitoring System using an ultrasonic sensor as a distance measurement sensor, GPS will assist in sending a garbage bins location and GSM will assist in sending a message to municipal authorities.

LITERATURE REVIEW

For a successful system, we should study about the research problem again and again. The question is "Is it possible to develop Smart dustbins which inform the municipality about the dustbins getting filled up". In literature review we read various research papers to get knowledge about the work done so far. For garbage wastage detection, several research papers employ a weight sensor [3]. This weight sensor gives the weight of the garbage waste as an indicator to the concerned authorities for appropriate action.

Andrei Brozdukhin and friends later proposed the new system with two working hands: software component and unique indicator equipment [4]. The unique indicator equipment is attached on the dustbin walls. It is made up of two parts: one is the receiver-transmitter and the other is the sensor. The sensor is used for indicating the level of garbage in the dustbin and is attached to the transmitter device that sends the "Dustbin is full, Please empty it" signal to the concerned authorities. It is now the job of Artificial Intelligence algorithms to find the shortest path and nearest truck driver to the concerned dustbin and notifies them for the waste collection.

The IoT/AI based garbage waste intelligent management system has been prototyped around waste items, household dustbin, a garbage bag and a garbage collection vehicle [5]. The project starts with the flow of garbage in the garbage container and in the household bin and terminates at garbage takeaway vehicles. Depending on the RFID technology, a new dustbin bag is placed in an integrated container.

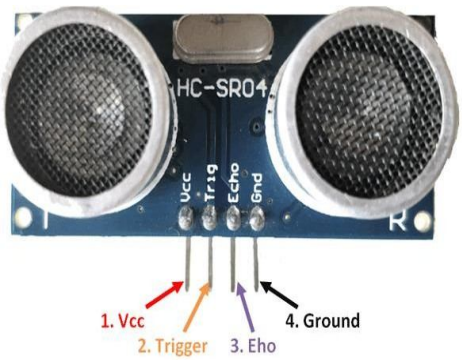
Arduino with IOT processes has overcome all the disadvantages of small-scale use, low cost, low fuel consumption and a clean environment.

METHODOLOGY

Hardware Requirements

- System Type
  64-bit Operating System, processor based on x64

- Ultrasonic sensor
  Ultrasonic sensor [6] is a device that calculates distance from a source using ultrasonic waves.



- Arduino Uno R3
  Arduino [7] Has a microcontroller board based on ATmega328P (datasheet).

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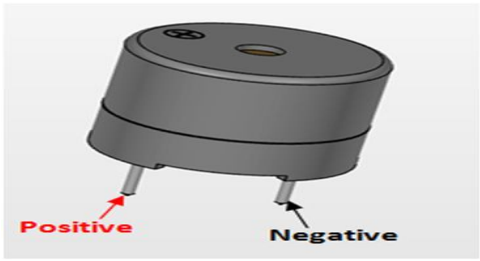
- GPS
  The products of the LS20030 ~ 3 series are fully equipped with GPS smart antenna receivers, including embedded antenna and GPS receiver circuits, designed for a wide range of OEM applications [8].

- GSM
  The SIM900A is an easily accessible GSM / GPRS module, used on most mobile phones and PDAs [9].

- Buzzer
  A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric [10].



- Connecting Wire
  For the connection of the Ultrasonic sensor to the Arduino microcontroller by using the jumper wire [11].

Software Requirements

- Application - Windows 10
- IDE Tool - Adruino IDE
- Third Tool - Google API
- Terminal - Windows Power Shell or Command Prompt

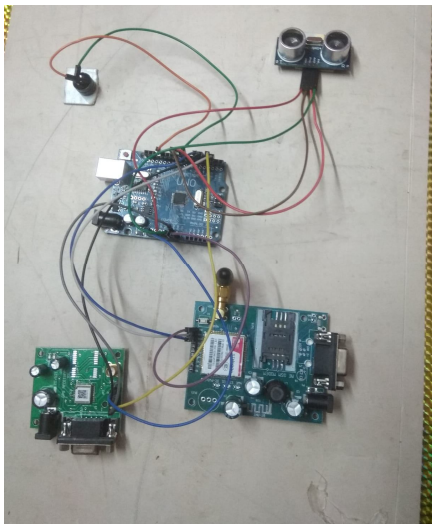


Figure 1

Figure 2

In Figure 1, you will see a hardware circuit made up of many components, which we can attach to the any size dustbin. In the visible hardware circuit, we can see the Arduino Uno R3 connected with GSM module, GPS, ultrasonic sensor and buzzer.

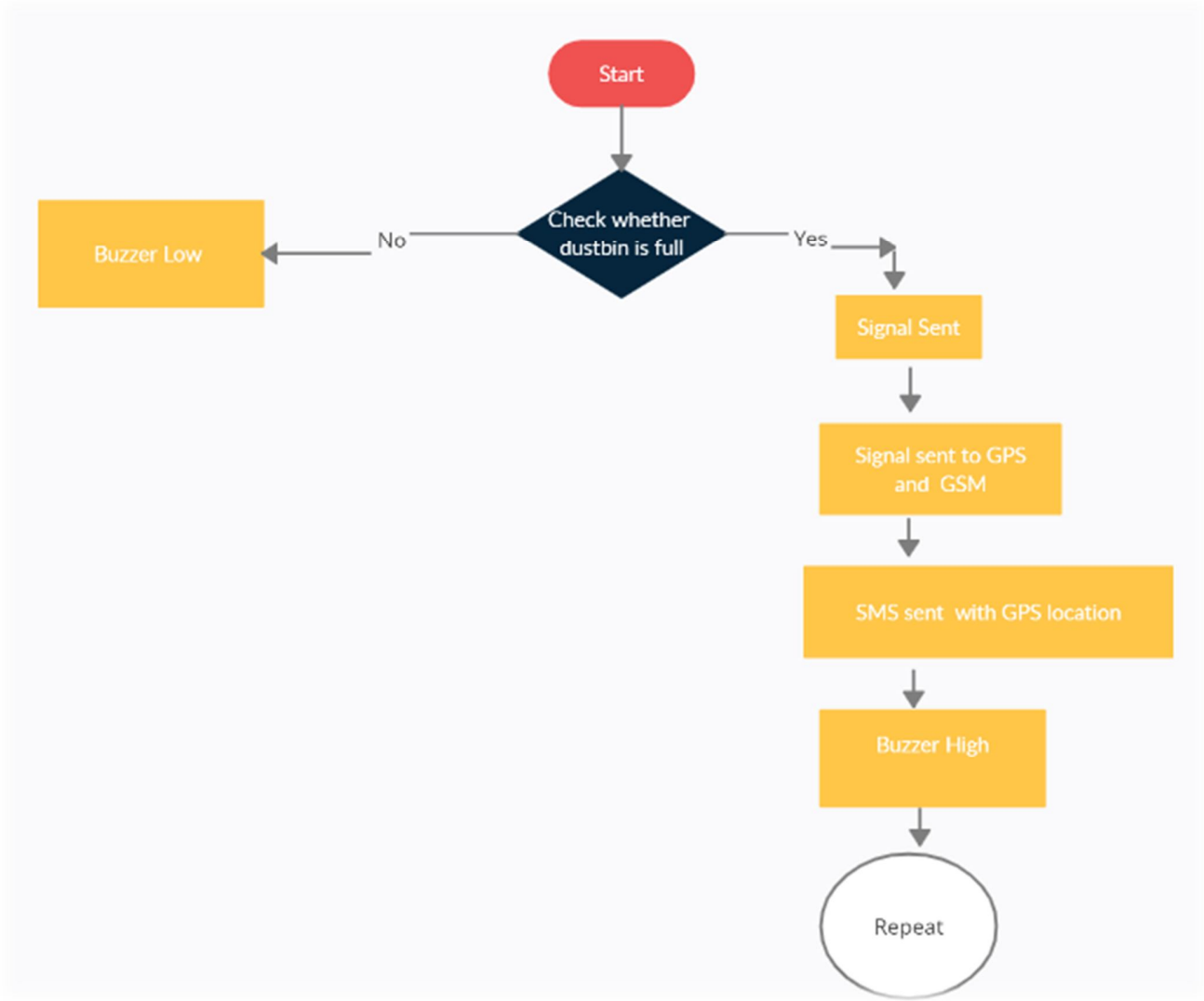
SIM has to be inserted into the GSM module and locked. We then power up the GSM module by connecting it to Arduino's 5V and GND and then connect the Antenna of the GSM. After some time (say 1 minute) we can see the blinking 'status LED' or 'network LED' in GSM module.

Once the connection is established successfully, the status/network LED will blink continuously every 3 seconds. In the GPS module, we have to connect the +5V and the ground pin, from the power side of the Arduino.

Going into the detailed design, Arduino pin 3 is joined to RX pin of the GPS. Then join Arduino pin 4 to the TX pin of GPS. In Ultrasonic Sensor, VCC is joined to 5V pin on the Arduino. The Trig pin on the ultrasonic sensor is joined to pin 10 on the Arduino. Then we connect the Echo pin on the ultrasonic sensor to pin 9 on the Arduino. And finally connect the GND to GND on the Arduino. Connect the buzzer with a PORT pin of microcontroller and the Ground of the buzzer is connected to Arduino Uno R3. Then provide Logic 1 to turn on the buzzer and Logic 0 to turn off the buzzer.

In the fig 2, the dustbin is attached to the portable hardware. The dustbin detects the level of the garbage waste. If the garbage level is full, it sends an alert message to the local authorities with the GPS location. It helps the municipal truck driver to reach at the location by the given GPS data. The portable hardware part and buzzer makes our dustbin different from others. As the portable hardware part can be easily attached and de-attached to any type of garbage dustbin. The Smart Garbage Monitoring System using IOT is effective and help the community keep their city clean.

FLOW CHART



RESULT

The main objective of the Smart Garbage Monitoring System using IoT is to reduce the usage of the resources and efforts and to improve the city's smart vision. By using a sensor and GSM the environment is clean and hygienic and ensures environmental cleanliness. Improper disposal and storage of household waste creates problems for public health and pollution. Smart Garbage Monitoring System using IoT is developed using ultrasonic sensor as distance measuring sensor, GPS will help in sending the location of the garbage box and GSM will help in sending the message to the municipal authorities with the current location. The Smart Garbage Monitoring System using IOT was developed using Adruino IDE as IDE Tool and Google API as software tool. Video Link for Smart Garbage Monitoring System using IOT

CONCLUSION

We live in the beautiful world and want beauty all around us. We dream of clean sustainable smart world. The main goal of smart garbage systems is to maintain a clean surrounding in the

city and to create a better living environment. Computers will help us a lot in this endeavor. Through this software research initiative coupled with data analytics and block chaining, we can monitor the level of garbage in dustbins. Once a particular dustbin has reached a full level, the municipal authorities can be notified and can take immediate steps to get the garbage away. The users can search which garbage dustbins are empty and it saves a lot of time.

The proposed AI system along with IOT can be used to transmit message with the GPS location to the local authorities. Ultrasonic sensors are used to check the level of garbage in dustbins. Currently the proposed system can be used in some select areas but as soon as it passes its reliability test, it can be used in all major areas. In the near future, a dedicated team can be constituted to manage and maintain the smart garbage system and to control and maintain its maintenance.

Throughout the world, efficient waste management is a major challenge and a hurdle in hygiene. Latest technology and advances has been put into use to provide better ways to get rid of garbage in most of the areas of the city. Every citizen is cooperating and giving full support in maintaining clean localities and environment. Sustainable smart city will need cleanliness all over the places.

In our research project, future enhancements can be done too. We can make use of two dustbins which can be employed to accumulate two different types of garbage in different dustbins- wet and dry. We can further decompose wet garbage to use it as biogas . Further all components and the control unit can be embedded and put into in the bin. We can make a better GUI based interface so that even a layman can understand.

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