IOT Based Smart Garbage Monitoring System Using Sensor And GPS

Mrs. S.Dhivya[1], J.RakheshDharshan[2], S.Prasanth[3], V.Vasuvaj Singh[4]
[1]Assistant Professor, Dept of Computer Science And Engineering
[2, 3, 4]Dept of Computer Science And Engineering
[1, 2, 3, 4] Sri Shakthi Institute of Engineering and Technology

Abstract- *Our proposed system presents to facilitate the idea of smart bin that identifies the fullness of rubbish bin. The system is used to collect and deliver the data to mobile application through the wireless network and uses the ultrasonic sensor places over the bins to detect the garbage level and compare it with garbage bins depth. The sensor then communicates the status to GSM system. The system then triggers an alert message to concerned authority.*

The system also addresses the issues like, greater access of garbage disposing point, efficient of time and cost, and also provides data collection facility

Keywords- Sensors, Garbage monitoring, Arduino, GSM module, Android application

I. INTRODUCTION

Internet of things (IOT) is the networking of physical objects with the help of sensors. The control room gets the information through sensor and objects surrounding the sensor.Our system is "Garbage management system" the level of garbage in the dustbins is detected with the help of sensor system and communicates to the authorized control room. Arduino is the interface between the sensor and GSM. There are many steps being taken to avoid the overfilling of dustbins. Waste management beaming tougher and tougher these days.

In Smart Cities Generation of waste is increasing due to rapid growth of people and industries in urban areas and the biggest problem to authorities is Collection of wastage from different locations i,e Houses, Public Places and Industries. Due to the lack of proper information an amount of 85% of the total municipal solid waste(MSW)budget is spent on waste collection and transportation to tackle this problem we need an intelligence to monitor waste and gives the complete information to authorities by this they can easily solve the waste management problem with well-organized manner

The Approached method given in this paper aims to monitor the bin full or not and proposed method will calculate the sensor levels in bin and data will be sent to database second to second. sensor will calculate the levels of bin Other method User can check the levels of bins located in House/Public Places by using android app also every bin has contains distinct id. User can check the levels of garbage in bin by given details of bin id.

II. LITERATURE SURVEY

The garbage management in cities has to be effectively and efficiently implemented. The various proposals were put forward and some of them already implemented. But it cannot be considered as an effective one. So a survey was done among different proposals and this survey paper includes survey among different methods for smart garbage management in cities using IoT. Smart Garbage Management in Smart Cities using IoT proposed a method as follows. The level of garbage in the dustbins is detected with the help of ultrasonic sensors system, and communicated to the authorized control room through GSM system. Arduino microcontroller is used to interface the sensor system with GSM system. A GUI is also developed to monitor the desired information related to the garbage for different selected locations. This will help to manage the garbage collection efficiently. Level detector consists of IR sensors which is used to detect the level of the garbage in the dustbin. The output of level detector is given to microcontroller. Four IR sensors are used to indicate the different levels of the amount of the garbage collected in the dustbin which is placed in public area. When the dustbin is filled up to the highest level, the output of fourth IR receiver becomes active low. This output is given to microcontroller to send the message to the Control room via GSM module. At receiver, control room is present where all the activities are managing. At receiver, control room is present where all the activities are managing. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned contractor. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduce the total number of trips of garbage collection vehicle

and hence reduce the overall expenditure associated with the garbage collection. It ultimate helps to keep cleanness in the society. Therefore, the smart garbage management system makes the garbage collection more efficient.

Another method for garbage management is introduced as follows. A dustbin is interfaced with microcontroller based system having IR wireless systems along with central system showing current status of garbage, on mobile web browser with html page by Wi-Fi. Hence the status will be updated on to the html page. There by to reduce human resources and efforts along with the enhancement of a smart city vision. Considering the need of modern technology, the smart garbage bin can expensive but considering the amount of dustbin needed in India, there for they used based sensors to reduce its cost and also make it efficient in applications. And at the sender side they used only a Wi-Fi module to send and receive data. But because of the use of weight sensor for detection of amount of garbage in dustbin. It will only detect the weight of waste; not how much level it is of. The message can be sent directly to the cleaning vehicle instead of the contractor's office. Thus garbage bins are managed. A Geographical Information System (GIS) transportation model for solid waste collection that elaborates plans for waste storage, collection and disposal has been proposed in for the city. An enhanced routing and scheduling waste collection model is proposed for the Eastern Finland, featuring the usage of a guided variable neighborhood thresholdingmetaheuristic. The aim of the research was to develop an optimal schedule for trucks on defined collection routes. The data from the bins are processed in the DSS and if it is correct it is sent to organizers of waste collection in this particular place and to the road police. The truck driver doesn't waste time for waiting, he/she goes to the next point and the route is dynamically recounted. the route for one of the available trucks and the waste from unlocked bin is collected. It is combined with dynamic routing algorithms to maximize the efficiency of waste collection.

A survey presented in reviews the researches done on waste collection in developing countries from 2005 to 2011 and considers challenges for developing countries in waste collection sphere. The research focuses on determination the stakeholders actions/behavior and evaluation of influential factors defining their role in waste collection process. The models in the survey were tested on real data. Considering system approaches for solid waste collection in developing countries is presented. The research compares the history and the current practices, presented from 1960s to 2013. The output of the survey is drawing a conclusion that developing and implementing solid waste collection approaches in developing countries are of a great importance. The main issue is that waste collection does not include innovation that IoT can provide. Models do not use real time information of the waste collection, although some approaches use advanced scheduling and routing via exploiting modern ICT algorithms. Information about bins status was not considered as part of waste collection. All the reviewed surveys do not propose a model that will use IoT technology for Smart Cities, though they consider different approaches for waste collection. Another method proposed an advanced Decision Support System (DSS) for efficient waste collection in Smart Cities. The system incorporates a model for data sharing between truck drivers on real time in order to perform waste collection and dynamic route optimization. The system handles the case of ineffective waste collection in inaccessible areas within the Smart City. Surveillance cameras are incorporated for capturing the problematic areas and provide evidence to the authorities. The waste collection system aims to provide high quality of service to the citizens of a Smart City. System architecture aims to suit two main targets. First target is providing software as-a-service (SaaS) products for customers. Mainly, these customers are private companies that are involved in waste collection, owning waste trucks, organize work of drivers, get contracts from municipalities and pass wastes to recycling organizations or city dumps. Second main target is developing a system, which makes possible mutually beneficial communication between all the stakeholders involved in the chain of supplying goods and utilizing solid waste in smart city. This paper presented a novel cloud-based system for waste collection in smart cities. The system aims to provide services for different kind of stakeholders involved in this area - from city administrations to citizens. Still, the design focuses mostly on providing SaaS services to commercial waste management companies.

another proposed model of Garbage Management using Internet of Things for Smart Cities in organizing the garbage collection system of residential or commercial areas. In the proposed system, the garbage bin has been detected with the help of ultrasonic sensor and it will continuously communicate to the authorized control room through GSM module. Microcontroller is used to interface the sensor system with GSM system. A GUI is also developed to supervise the desired information related to the garbage for various selected locations. The main feature that differs from other systems is that MATLAB based GUI. In this system there is a requirement of master and slave units. Slave unit is placed in the garbage bin likely wise master unit is placed at the control room. Slave unit consists of Arduino Uno board which has Atmega328 IC, ultrasonic sensor and GSM module. The entire circuit is placed at top of the dustbin. In ultrasonic sensor, the trigger pulse is continuously sent in the dustbin and echo pulse reflects back to ultrasonic sensor. Ultrasonic sensor

continuously checks the garbage level in dustbin. Once the level of garbage reaches to specified threshold values, ultrasonic sensor gives indication to Arduino Uno board and through GSM, SMS will be send to control room which will indicate that the ―Please inform the cleaner of specific floor as the dustbin of that floor is full‖. In master unit when the SMS is received at control room, it will indicate on GUI the percentage of approximate garbage collection of that floor and it will automatically inform the cleaner of that floor.

Another method is that, Once the garbage reaches the threshold level ultrasonic sensor will trigger the GSM modem which will continuously alert the required authority until the garbage in the dustbin is squashed. Once the dustbin is squashed, people can reuse the dustbin. At regular intervals dustbin will be squashed.in In this method, GSM 900A modem is used to send the messages. It consists of a GSM/GPRS modem with standard communication interfaces like RS-232 (Serial Port), USB, so that it can be easily connected to the other devices. The ultrasonic sensor is used to find the height of garbage filled at different intervals of time. They use three sensors at various heights like h/3, 2h/3 and h, where h is the height of the bin but to make it affordable and to achieve the same results, only one sensor is placed at surface level. This system has various features such as durability, affordability, prevention against damage and maintenance issues. But they require a more amount of machines and labors.

Another solution was proposed, there are multiple dustbins located throughout the city or the Campus, these dustbins are provided with low cost embedded device which helps in tracking the level of the garbage bins and a unique ID will be provided for every dustbin in the city so that it is easy to identify which garbage bin is full. The project module is divided into two parts Transmitter section and receiver section. Here in the transmitter section we are using 8051 microcontrollers, RF Transmitter and sensors these are attached to the dustbin. Where sensor is used to detect the level in the dustbin whether the dustbin is full or empty. The sensor senses the content of the dustbin and sends the signals or the data to the 8051 microcontroller, Power Supply +9V Battery power supply is given to the 8051 18753 microcontroller to drive the system and the 8051 microcontroller reads the data from the sensor and process the data received from sensor, and the same data wirelessly transmitted to the Central system (Intel Galileo microcontroller) using RF Transmitted. RF Transmitter is to transmit the signal form 8051 microcontroller to the Intel Galileo microcontroller. Here RF Receiver is used to receive the data sent by RF transmitter to the Intel Galileo microcontroller. The Intel Galileo Gen2 Microcontroller is used to receive the data sent by the multiple transmitters and process the data and the same data transmitted to the Client i.e., Web Browser. But comparatively the number of components used is more such as 8051 microcontrollers, IR sensors that make an excessive cost and complex codes

III. MATERIALS REQUIRED

Arduino UNO, HC-SR04 Ultrasonic sensor, GSM 900A and API.

A. ARDUINO UNO

Arduino UNO is a microcontroller board based on the AT mega 328p. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ISCP header and reset button. Simply connect the controller using USB cable or power it with AC-to-DC adapter or battery to get use. The arduino UNO can be programmed with arduino software IDE. Select "Arduino UNO from tools -> Board menu". The arduino UNO becomes a default programs with about header that allow to upload new code to it without the use of external hardware program.

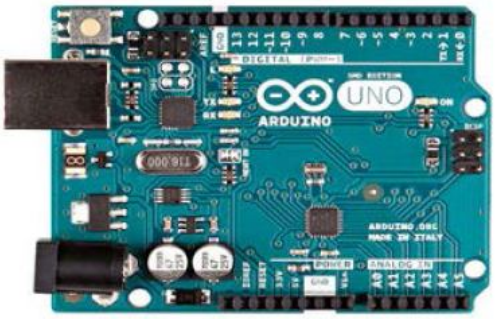


Fig1: Arduino UNO

B. POWER

The external power supply is via USB cable to the arduino. Either AC-to-Dc adapter can be used as an external supply. The 2.1mm centered positive plug issued in the board's power jack.

C. REQUIRED POWER SUPPLY

The board can operate in between 6-20 volts on an external. The board becomes unstable if supply is less than 7v and if supply is higher than 12v it may overheat and damage the board. So 7-12v is recommended to use.

D. ULTRASONIC SENSOR

The object distance is determined by calculating the duration of ultrasound that reflects back to sensor. They send pulsed ultrasonic waves of a certain frequency and determine the objects distance from the duration of ultrasound that it reflects. Ultrasonic sensor ranges from 2cm-400cm measurement function of non-contact. The connecting wires such as 5v power supply trigger pulse input, echo pulse output, 0v ground.

Fig 2: HC-SR04 Ultrasonic Sensor

E. GSM

A GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection.A GSM modem can also be a standard GSM mobile phone with the appropriate cable and software driver to connect toa serial port or USB port on your computer. GSM modem is usually preferable to a GSM mobile phone. The GSM modem has wide range of applications in transaction terminals, supply chain management, security applications, weather stations and GPRS mode remote data logging.

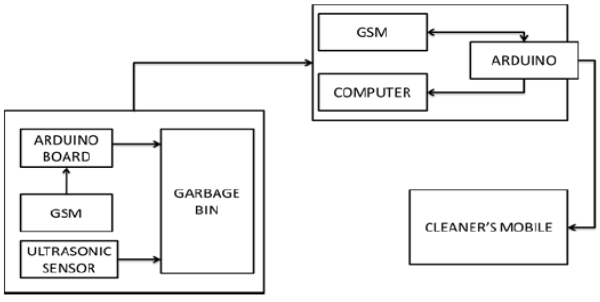
Fig 3: GSM Module SIM 900A

F.ANDROID APPLICATION

The application is notified the status of the bins if the bin reaches 90% it alerts the authorized person or control room

IV. IMPLEMENTATION

The Implementation of "SMARTBIN MONITORING" system uses the sensors, Arduino UNO and GSM module to assure the cleanness of garbage bin as soon it reaches the maximum level. The message is triggered once the garbage reaches the threshold level and communicates to the specific or concerned authority, which can clean. It triggers the message to the higher authority, if it is not cleaned on time. The pollution and imitation report can be controlled. Outlay such as time, fuel, cost and manual power can be reduced. The Goal is to keep "cleanness" in the society. Smart Bin works with the sensors and will demonstrate the various level of garbage in the bin. Once the sensor gets activated it sends the output when it's show time level is reached.



V. EXISTING METHODOLOGY

The manual method of tracking out the trash bins is tedious because sometimes a few bins will fill fast and some other late. There are many steps being taken to avoid the excessive fill of dustbins. Waste management beaming tougher and tougher these days.

ISSUES IN EXISTING METHODOLOGY

• Excessive dump of waste on the garbage bin.
• Disposal unit may increase load of organic carbon that reaches the water plant, which in turn increases the consumption of oxygen.
• Environment pollution is happened due to improper disposal and improper maintenance of waste.

VI. PROPOSED METHODOLOGY

In “Garbage management system” system, the level of garbage in the dustbins is detected with the help of sensor system and communicates to the authorized control room. GSM and sensor uses Arduino as interface

VII. ADVANTAGES

• The garbage is collected only from the filled containers.
• Only the real time information of filled level is provided by the sensor.
• Our SMART operating system enables two-way communication between the dustbins deployed in the city and service operator.
• Reduces the cost and maintenance up to 30% (Trucks, Containers, Fuel).
• Applying this technology to the city optimizes management, resources and costs, and makes it a “SMART CITY”.Reducing manpower required to handle the garbage collection.

VIII. CONCLUSION

This make our environment clean and ensures hygienic surrounding. Improper disposal and improper maintenance of the domestic waste creates issues in public health and environmental pollution. This paper attempts to provide practical solutions to help the local municipal administration in waste management system. i.e., monitoring of domestic wastage clearance at proper time to avoid damage to the public health.

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