A Review Paper on IoT Based Smart Garbage Alert System

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Abstract: *In this paper we proposed, the technique of smart Garbage Alert system which checks the waste level over the dustbin with the help of Ultrasonic Sensor system. By using sensor the system measure weight of waste and level of waste inside the dustbin. System is adopted by Network Environment, to manage all information from waste. To overcome such issues Garbage Alert system is proposed for smart cities based on Internet of Things (IoT). In this system there are different types of waste and waste bins situated all over the city. IoT Technology is a probable solution for waste management alert that we have proposed in our system. We must implement smart garbage level monitoring system, which will alert the municipal corporation or workers about, the status of garbage in different zones of cities. These dustbins are interfaced with microcontroller ATSAM3X8E Board having Ultrasonic sensor along with central system which displays the current trash condition. Important part of our project depends on working of the GUI module, which plays major role.*

Keywords: Internet of Things (IoT), Graphical user Interface (GUI), Radio Frequency (RF), Signal to Noise Ratio (SNR), Global System for Mobile Communication (GSM), Liquid Crystal Display (LCD), Radio Frequency Identification (RFID)

1. Introduction

Today we are experiencing a fast development of smear cities where cities around the world are on the run to become smarter, but due to the rapid development the quantity of waste and garbage increase day by day. Garbage Management is now a global problem. Due to the Lack of care and attention by the authorities the waste bins are completely filled. So it is our responsibility to think what method can be followed to overcome this. The future India is going to be digitalized, everything will be based on internet. Internet usage is a part of our life. IoT and Evolution of Cloud Computing is increasing day by day. Here the communication takes place between machine to man. The devices we are using in our day to day life is interconnect with IoT. The IoT Technique allows object to sense and control remotely. Now a days garbage management is becoming a global problem, because it faces rapid population growth, disorganization of city governments, a lack of public awareness and limited funding for programs. In the present day scenario, every times we see that the garbage bins or Dust bins are placed at public places in the cities are overflowing due to increase in the waste every day. It creates unhygienic condition for the people and also creates bad smell around the surroundings which leads in spreading some deadly diseases & human illness; to overcome such a situation we are planning to design "IoT based Smart Garbage Alert System". In our system we are using microcontroller which is interfaced with ultrasonic sensor and the central system. The ultrasonic sensor is used to detect the level of the garbage.

2. Literature Review

The common dustbins placed by the municipal corporation are leading no. of health, environmental and social issues. Various causes are there like improper dustbin placement in city, improper system of collecting waste by City Corporation, and more specifically people are not aware enough to use dustbins in proper way. These various major causes are leading serious problems like, an unhygienic condition, air pollution, and unhealthy environment creating health disease. Up till now, research has been carried out by developing a Software Applications for indicating dustbin status, another by Shortest path method for garbage collecting vehicles by integrating RFID, GSM, GIS system; but no any active efforts has been taken paying attention towards managing such waste in atomized way. Considering all these major factors, a smart solid waste management system is designed that will check status and give alert of dustbin fullness and more significantly system has a feature to literate people to use dustbin properly and to automatically sense and clean garbage present outside the dustbin.[1]

We also put forward the concept of a network of smart garbage bins based on the Stack Based Front End approach of integrating Wireless Sensor Network with the Cloud computing and discuss how Machine Learning techniques like Decision Forest Regression can be applied to the sensor data leveraged by the system to gain useful insights to improve the efficiency of the garbage monitoring.[2]

Paper proposes a smart alert system for garbage clearance by giving an alert signal to the municipal web server for instant cleaning of dustbin with proper verification based on level of garbage filling. This process is aided by the ultrasonic sensor which is interfaced with Arduino UNO to check the level of garbage filled in the dustbin and sends the alert to the municipal web server once if garbage is filled . After cleaning the dustbin, the driver confirms

the task of emptying the garbage with the aid of RFID Tag. RFID is a computing technology that is used for verification process and in addition, it also enhances the smart garbage alert system by providing automatic identification of garbage filled in the dustbin and sends the status of clean-up to the server affirming that the work is done. The whole process is upheld by an embedded module integrated with RF ID and IOT Facilitation.[3]

One of the most challenging issues -municipal waste-collection within the Smart City. To optimize the logistic procedure of waste collection, we use own genetic algorithm implementation. The presented solution provides calculation of more efficient garbage-truck routes. As an output, we provide a set of simulations focused on mentioned area. All our algorithms are implemented within the integrated simulation framework which is developed as an open source solution with respect to future modifications.[4]

As the population is increasing day by day, the environment should be clean and hygienic. In most of the cities the overflowed garbage bins are creating an unhygienic environment. This will further lead to the arise of different types of diseases. This will degrade the standard of living. To overcome these situations an efficient smart waste collection system has to be developed. As the scope of IoT is developing day by day effective methods can be found out easily.[5]

Proposed waste collection system is based on waste level data from trashcans in a metropolitan area. The data collected by sensors is sent over the Internet to a server where it is stored and processed.[6]
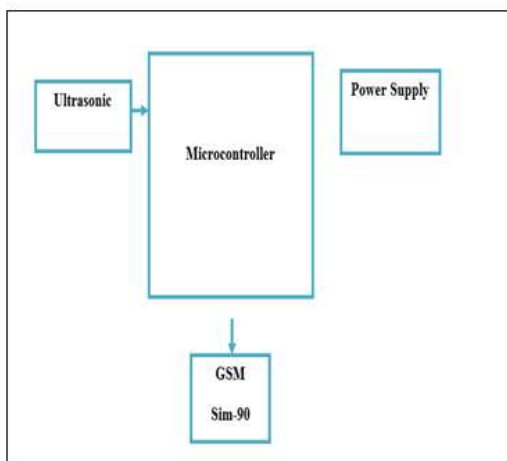
3. Garbage Collection Dustbin Module

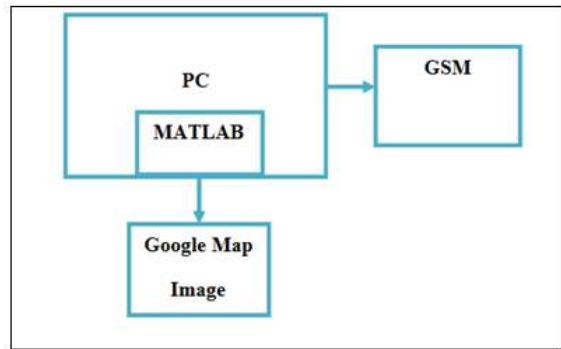**Figure 1:** Block Diagram of Garbage Collection Dustbin.

Figure 2: Block Diagram of Receiver Side.

Proposed Garbage Alert System:

The Project Title Name is called "IoT Based Smart Garbage Alert System."In this project we are using Microcontroller ATSAM3X8E Board. This System monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. For this system uses ultrasonic sensors placed over the bins to detect the garbage bins depth. The system makes use of LCD Screen, Wi-Fi modem for sending data. The system is powered by Transformer or Adapter. The LCD screen is used to display the status of the level of garbage collected in the bins. Whereas a web page is built to show the status of the user monitoring it. The web page gives the graphical view of the garbage bins and highlights the garbage collected in colour in order to show the level of garbage collected. The LCD screen shows the status of the garbage level. Thus this system helps to keep the city clean by informing about the garbage levels of the bins by providing graphical image of the bins via IOT web development platform.

4. Working Process Structure

In this project we are using Microcontroller ATSAM3X8E Board, one GSM module, GSM by GPRS Modem. here we are enabling the internet on the SIM card, so we are using the Internet with the help of SIM card. Here we are using one GPS module and one IoT webpage in that a PHP code and Google map integration and my SQL database and after that if the garbage box is full it will send the message to the particular mobile number that is Truck driver. We are also providing link to the particular mobile number.

When Google map image is open, it will tell you that Garbage box is full. Figure 1, 2 shows the block diagram which consist of Microcontroller ATSAM3X8E Board, GSM, GPS module, HC-SR04 ultrasonic sensor and one LCD display. Whatever the process is going on will displayed on the LCD Board and we have a four LED A0, A1, A2 and A3 shows full, mid, low and empty status respectively. We attach ultrasonic sensor on the garbage box also four LED's attached on it. Firstly we need to give the power to GSM Module, in that board one network LED is there, so when it is blinking we can insert our SIM card.GSM module consist of bridge rectifier, filter capacitor, LM317 adjustable voltage Regulator so it is getting the 4.5v output. Whereas GPS module consist of

bridge rectifier, filter capacitor, 7805 voltage regulator, one LED, 5v power supply to the board, and one LCD display board.

Now we are giving power source to the main module, "IoT Based Smart Grbagr Alert System. "text will be displayed on the board. It is also taking the latitude and longitude value from the satellite. When it is not come those should be empty then we should keep this modem at least 5 to 10 minutes outside. One's the internet should be established it shows the status of the dustbin whether it is empty or full and it send data to webpage. Here in our webpage e can see the status of the bin. If we put some garbage to the box when it is come to level 1, here we can send the information parallel in our web page. We can see the status at level 1.same procedure is carried out with mid, low and full. We are going to use Ultrasonic sensors which are getting information of the garbage value will be collected with the help of this sensors and that information we will be passing to the Microcontroller ATSAM3X8E Board, which is acting as a gateway here. So what this board is doing will push this data that is sensor data on to the internet with the help of Wi-Fi dongle.

The term "IoT" is nothing but to watch and to monitor all the sensor information, real devices information on the internet.
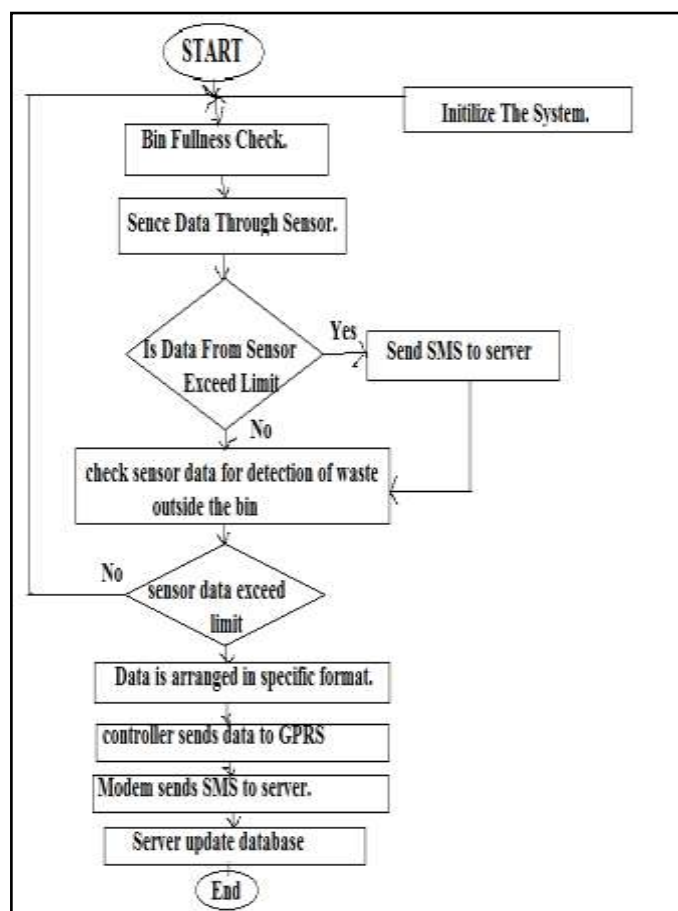

Figure 3: Flowchart of Prototype wastebin

Table 1: Composition of MSW in India and Regional Variation

Region/City	MSW (TPD)	Compostables (%)	Recyclables (%)	Inerts (%)	Moisture (%)	Cal. Value (MJ/kg)	Cal. Value (kcal/kg)
Metros	51,402	50.89	16.28	32.82	46	6.4	1,523
Other cities	2,723	51.91	19.23	28.86	49	8.7	2,084
East India	380	50.41	21.44	28.15	46	9.8	2,341
North India	6,835	52.38	16.78	30.85	49	6.8	1,623
South India	2,343	53.41	17.02	29.57	51	7.6	1,827
West India	380	50.41	21.44	28.15	46	9.8	2,341
Overall Urban India	130,000	51.3	17.48	31.21	47	7.3	1,751

According to a survey 130, 000 tons of waste is produced per day in urban areas of India which have a potential to produce 1, 751 kcal/kg of energy. The statistics indicated can be tabulated as:

5. Conclusion

Waste management is a major challenging one. The system is based on IoT. We have used sensors to indicate if the bins are filled or empty. The smart garbage bin will automatically send a message when the bin is fill using GSM technology. The system can collect accurate data on real time which can be used further as an input to a management system. In future, we would like to enhance the system for different kind of wastes, namely solid and liquid wastes. paper presents highly advanced and fully automatic system to collect and manage waste efficiently.

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