

MODELLING E-WASTE MANAGEMENT DATA IN SMART CITIES

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Abstract:

Rapid increase in population, has led to the improper waste management in cities resulting in increased pests and spreading of diseases. Nowadays, the Garbage Collecting Vehicle (GCV) collects the waste twice or thrice in a week. So, the problem is over flowing of wastages on the roads. Garbage bins are manually managed and it needs human effort to check every time. Monitoring and management of wastes is one of the primary issues in the cities. To overcome this issues Modelling E-waste management system using ultrasonic sensors is to be implemented. When waste is filled in the bins the distance will be decreased between the waste and sensors. Every time it will check the level and calculates the distance. This live data is sent to Controller. The controller will process the data and send to the cloud server through GPRS. Through this webpage the user can access the data and plan accordingly for which bin needs attention and certain action will be taken to clean the bins.

Keywords: ARM7 Microcontroller, Ultrasonic sensor, E-waste.

1.Introduction

The world causes a huge problem of waste management. It is very difficult in our nature. Today number of employers being appointed to attend the cleaning process in our locality but the improper collection of waste will cause uncleanness in our society. Here a waste management system is introduced in which each bin connected with a monitoring system which will notify the corresponding bin waste level. In this system it will also store the live

data of bin filling in cloud and also system will notify to the garbage collecting employee or to the authorities when bin is full with a message and live bin location. This system provides an effective solution to solid waste management problem. The main aim of the project is to is to avoid over flowing of wastage in garbage bins and to remove wastage in bins only when they are filled completely, reduce people effort and save their time, to alert the people when garbage bin is full through

mobile and to provide garbage bin location through GPS module. The main components include ultrasonic sensor and ARM7 microcontroller where the ARM7 microcontroller is programmed using KEIL software and Ultrasonic sensor is used to measure the distance between the waste and the garbage bin. In order to provide the live location of the bin GPS module is used. ARM7 microcontroller is the brain of the system. Ultrasonic sensor and GPS are connected to the controller input pins and GSM module, LCD, Wi-Fi module are connected to the output pins. when the bin is full controller will send the sensor data to the LCD and GSM module to alert the authorities or employee to clean the garbage bin and this sensor data is also store in the cloud using thing speak software. From this work, solid waste generated at the road sides of cities or towns can be cleaned in an efficient manner and waste generated in the garbage bins can be controlled and removed in a regular interval of time by using ultrasonic sensor and GSM module. By using this E-waste Management, the spilling of waste on to the streets can be reduced, traffic can be controlled and developing of infectious diseases, Harmful gases due to the waste generated at the garbage bin can be reduced.

2.Literaturesurvey

Garbage may consist of the municipal solid waste construction waste, commercial Garbage may consist of the municipal solid waste construction waste, and commercial waste, industrial waste etc... left over the city. In existing system garbage is through in garbage bins. Garbage bins are manually workers will clean the garbage, managed and it needs human effort to check every time. This waste management is one of the major environmental problems of India. Solid waste management is the collection, transport, disposal, managing and monitoring of waste material. The overflowing of garbage bin, which indicates how the solid waste management is happening in the world. To avoid this problem E-waste management is proposed. As we see many times the dustbins are get over flown and concern person do not get the information on a time and due to which unconscious condition form in the surroundings, at the same time bad smell come out from waste and spread out in surrounding. Due to the unclean environment some harmful diseases easily spreadable in given locality. The existing system used for cleaning the dustbin is not effective and which has some disadvantages that include Less effectiveness and time consuming, high cost, unhygienic Environment that

include bad smell of garbage by which human beings may cause illness. More traffic and noise due to truck used to clean the dustbin and no monitoring system.

3.Methodology

The components used in this system are ultrasonic sensor, GPS module, GSM module, ARM7 microcontroller, LCD and Wi-Fi module. When the power supply is given to the ARM7 microcontroller, ultrasonic sensor connected at the input of the controller starts measuring the distance between the waste and the bin. When the sensor value is less than the threshold value (based on the bin height, for example if bin height is 20cm then threshold value is 3cm) then message will be sent to respective mobile number using GSM module with GPS location and the level of waste filled is displayed in LCD. When the bin is full then that data will be updated in thing speak web page through wi-fi module.

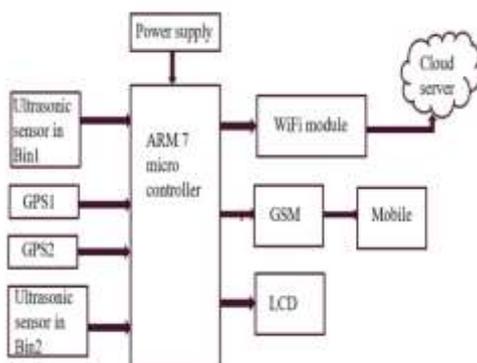


Fig. 1Block diagram of proposed system

ThingSpeak is an IoT analytics platform service that allows to aggregate, visualize and analyse live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by the devices to ThingSpeak. It is often used for prototyping and proof of concept IoT systems that require analytics. Internet of Things (IoT) describes an emerging trend where a large number of embedded devices (things) are connected to the Internet. These connected devices communicate with people and other things and often provide sensor data to cloud storage and cloud computing resources where the data is processed and analysed to gain important insights. IoT solutions are built for many vertical applications such as environmental monitoring and control, health monitoring, vehicle fleet monitoring, industrial monitoring and control, and home automation The flow chart of modelling e-waste management in smart cities is as shown in figure 2.

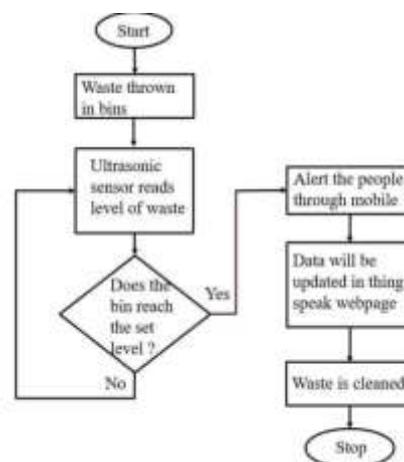


Fig2 Flowchart of E-Waste management

Initially when the power supply is given to the ARM7 microcontroller then ultrasonic sensor starts measuring the distance between the waste and the garbage bin. The measured value is given as input to the microcontroller. Controller will compare with the threshold value placed in the arm7 microcontroller for example 4cm. When the bin reach to the certain predefined level then controller will alert the garbage collecting people by sending an alert message as **“BIN IS FULL at LtLG:(location number)”** Sensor data and bin location based on which bin is full are displayed on LCD. These data is also updated in ThingSpeak webpage as 1 when bin is full otherwise 0 in webpage.

Results

Hardware circuit of modelling of E-Waste management in smart cities is as shown in figure 3. In this Hardware circuit, Hardware tools used are ARM7 Microcontroller, Ultrasonic sensors for two bins, LCD, GSM module, GPS module and Wi-Fi module. This all are connected using Jumper wires.

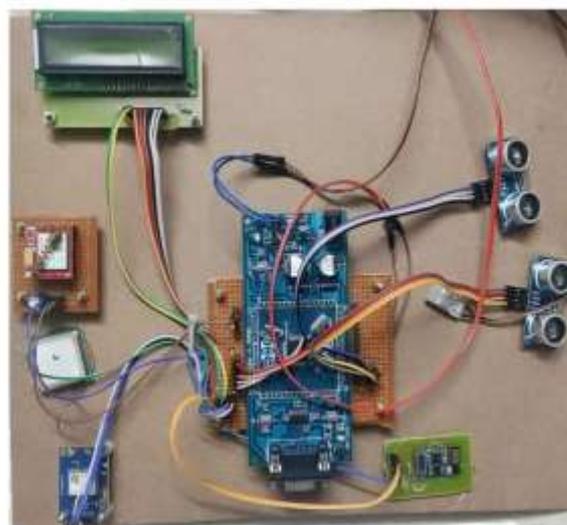


Fig 3 Hardware Circuit

After all the connections are made and completing of code dumping power supply is given to the ARM7 through laptop and sensor is placed at the top of bin to measure distance. Based on sensor output data controller will operate the LCD, GSM and Wi-Fi module Initially when the circuit is powered then lcd will displays welcome message as shown in figure 4 and the distance between waste and bin measured for two bins are displayed on LCD as shown in figure 5 and when bin is full then it will display the location of respective bin as shown in figure 6



Fig. 4 welcome message



Fig. 5 Ultrasonic sensor output



Fig. 6 Filled bin location

Here in this circuit LCD is used mainly to observe the distance measured by the ultrasonic sensor between waste and bin. Based on bin filling an alert message is send to the mobile as shown in figure 7 and 8



Fig. 7 when bin1 is full



Fig. 8 when bin2 is full

Through this alert message garbage bin cleaning persons will easily go to the

particular bin location through the location data provided by the GPS and clean the bin without any delay. When bin is full then ARM7 microcontroller will send the data to the ThingSpeak webpage through Wi-Fi module. The data updated in webpage when respective bin is full is as shown in figure 9.

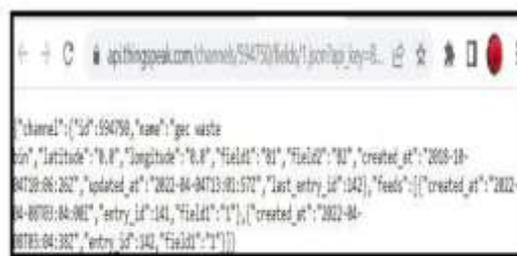


Fig. 9 ThingSpeak Webpage output

Here in the figure 9, bin1 is indicated as field1 and bin2 as field2 when bin1 is full field1 is indicated as “1” as shown in figure 9. Similarly, for bin2 also.

Conclusion

Thus, this work clearly focuses on cleaning the garbage bins automatically when a specific level is reached. This approach paves a great way to build a smart city with proper hygiene mechanisms involved. Automation can easily help in reduction of manual effort and reduce the hectic process involved in cleaning the dumped wastes. By this method, the number of vehicles that are utilized everyday for the process can be minimized, thereby saving fuel, cost and manpower. By employing such smart technologies in our daily activities,

maximum cleanliness in the city can be obtained and it extends the life span of the living species. Further the research could be focused on Integration of many bins each with a unique ID can be done by implementing the principles of IOT. Differentiation can be made between dry trash bin and wet trash bin collecting plastic dry waste and biodegradable waste respectively. To enhance it further, an automated system can be developed which is able to pick up waste in and around the bin, segregate and put them in respective bins.

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