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IoT based solid waste management for the smart city

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ABSTRACT

In the present day scenario, many times we see that the garbage beans or Dust beans 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 creates bad smell around the surroundings this leads in spreading some deadly diseases & human illness; to avoid such a situation we are planning to design "IOT Based Solid Waste Management for Smart Cities".

In this proposed System there are multiple dustbins located throughout the city or the Campus, these dustbins are provided with ultrasonic level sensors which helps in tracking the level of the garbage beans and an unique ID will be provided for every dustbins in the city so that it is easy to identify which garbage beans is full. When the level reaches the extreme level, the device will send the information of the level along with the specified ID provided. The status of the garbage in the dustbins is displayed on the web page. These details can be accessed by the concern authorities from their place with the help of Internet and an immediate action can be made to clean the dustbins.

Keywords: Internet of Things, ARM Microcontroller, Ultrasonic sensors, GSM, Solid Waste Management.

1. INTRODUCTION

Internet and its applications have become an integral part of today's human lifestyle. It has become an essential tool in every aspect. Due to the tremendous demand and necessity, researchers went beyond connecting just computers into the web. These researches led to the birth of Internet of Things (IOT). Internet has become the crucial part of each individual. Most of the people are reliable on internet. The IOT concepts were proposed years back but still it's in the initial stage of commercial and industrial deployment.

This project IOT solid waste management system is a very innovative system which will help to keep the cities clean. This system monitors the garbage beans and informs about the level of garbage collected in the garbage beans via a web page. For this the system uses ultrasonic sensors placed on the top of beans to sense the garbage level and continuously compare it with the garbage beans depth. The system makes use of ARM microcontroller, LCD screen, GSM module for sending data and a buzzer. The system is powered by a 12V transformer. The LCD is used to display the level of garbage collected in the beans in the form of percentage.

Whereas a web page is built to show the status to the user monitoring it. The web page gives a percentile view of the garbage beans and highlights the garbage collected in color in order to show the level of garbage collected. LCD shows the status of the garbage level to the controlling or administrative unit. The system puts on the buzzer when the level of garbage collected crosses the set limit. In this way system helps to keep the city clean by sending the real time information about the garbage levels of the bean by displaying it on a web page.

2. AIM OF PROPOSED SYSTEM

The aim of this project is to avoid the overloading of garbage beans in the city using real time system for its disposal which will maintain the city clean and avoid pollution.

3. DETAILED DESCRIPTION

A. Block Diagram of System

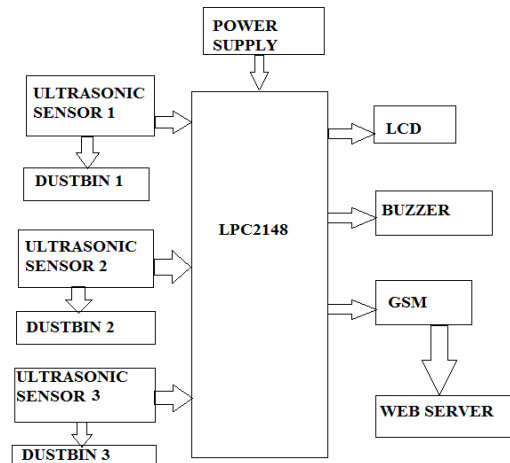


Figure1. Block Diagram of system

B. ARM Microcontroller



The μC is the final decision making body on the system. The logic is developed and then the program is burned inside the microcontroller and the other peripherals are accessed via microcontroller only. The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high-performance and very low power consumption. In this system controller is the most important part.

C. ULTRASONIC SENSORS

Ultrasonic Sensor provides range from 2 cm to 5m for applications in detection and ranging. The sensor provides precise and stable non-contact distance measurements from about 2 cm to 5 meters with very high accuracy. The ultrasonic sensor can easily be interfaced to microcontrollers. The sensor sends ultrasonic sensed value and produces an output pulse. By measuring the pulse, the distance to target or object can easily be sensed. This Ultrasonic Sensor is perfect for number of applications as it provides a preferable range that is required to detect moving or constant objects.

D. GSM MODULE (SIM800)

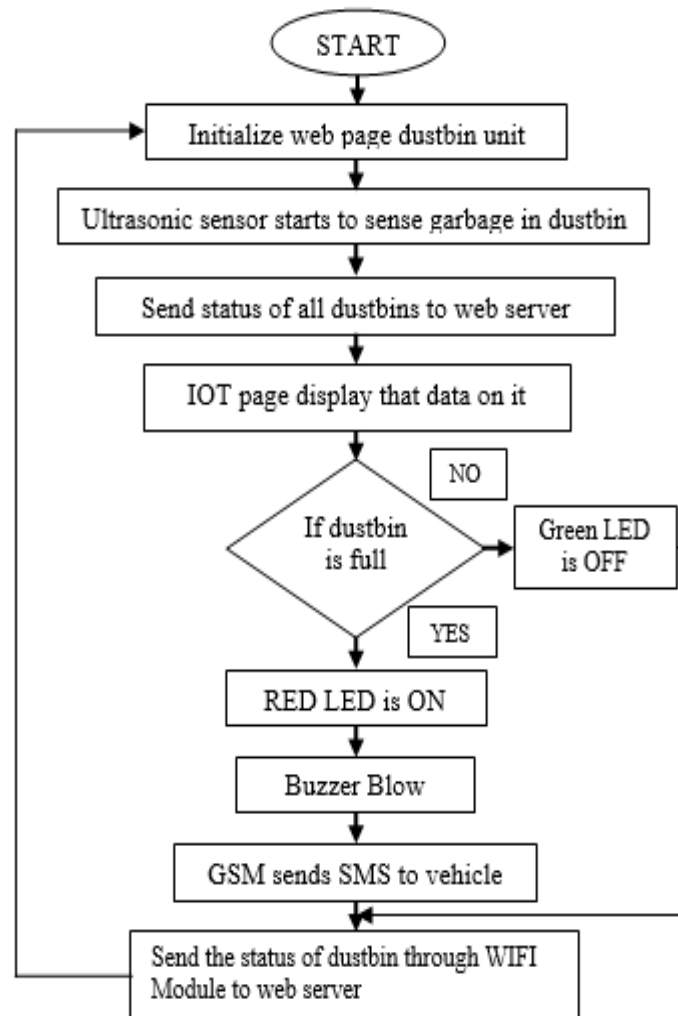


GSM plays an important role in this system. With the help of GSM module we can send messages to the required authorities as per the application. GSM unit is provided by SIM uses the mobile service provider and send SMS to the respective authorities as per programmed and requirement. This technology enables the system a wireless system with no specified range limits. We can display the same data on the web page using GSM without making use of Wi-Fi module.

E. BUZZER

Buzzer is an audio signaling device. It may be mechanical, electromechanical etc. Buzzer is mostly used to indicate alarm devices, timers, and confirmation of user input such as a mouse click or key stroke. Buzzer is used as an indicator in the proposed system.

4. FLOWCHART



A. Implementation Methodology

- **Hardware requirement**
 - ARM Microcontroller
 - Power supply
 - 3 -Ultrasonic sensors
 - GSM
 - 3-Dustbins
 - Server PC
- **Software requirement**
 - Kiel Micro vision
 - Flash magic
 - Embedded C Program

B. Advantages

- Real time information on the fill level of the dustbin.
- Deployment of dustbin based on the actual needs.
- Cost Reduction and resource optimization.
- Intelligent management of the services in the city.
- Effective usage of dust beans

C. Hardware Implementation



Figure3. Hardware of proposed system

This is an advance system which can be used by municipal bodies, city cleanliness team or government authorities or any system responsible for emptying the garbage in the dustbins. For this purpose system has three ultrasonic sensors to detect the garbage in the dustbins, where in each dustbins need not to be of same size. Whenever the system starts it automatically checks the depth of an empty garbage beans.

When garbage level in the bean increases it automatically matches to the total depth. Based on that it estimates how much garbage has been filled in that particular bean. It senses the data remotely to a web system which has a web page. The web page displays the status of each garbage beans which can be viewed on the PC by the authority. For achieving that we have used ultrasonic level sensors attached to dustbins. These are further connected to the microcontroller.

Microcontroller intern is interfaced to LCD display for displaying the status of garbage beans. . GSM Module is main part of this system. GSM Module is used to transmit data to the web based application. GSM Module is used to send message to the vehicle when the dustbins is full.

D. Experimental result

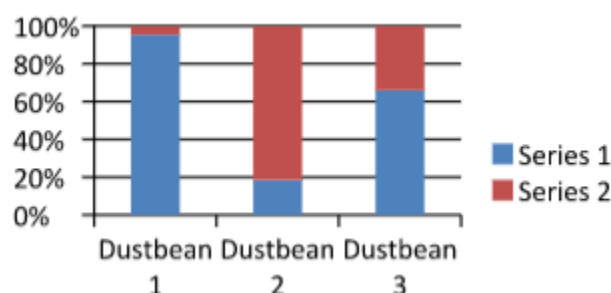


Table-1: Result

Sr no	Dust bean ID	Level
1	Dust bean 1	95% -Full
2	Dust bean 2	18%0 -Full
3	Dust bean 3	66% - Full

5. CONCLUSION

The proposed system is implemented using IOT which access data anywhere. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. System helps in decreasing the total number of trips of garbage collection vehicle and hence reduces the overall economy associated with the garbage collection. It ultimately maintain cleanliness in the society and surrounding. Thus in a smart way solid waste management system works using IOT.

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