IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 7, Issue 3, March 2018

Smart Waste Management using IOT

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Abstract: An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a Personal Computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today. Modern embedded systems are often based on microcontrollers (i.e. CPUs with integrated memory and/or peripheral interfaces) but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also still common, especially in more complex systems. In either case, the processor(s) used may be types ranging from rather general purpose to very specialized in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the Digital Signal Processor (DSP).In this project, we present the Smart bin system that identifies hazardous gases of bin. The system is designed to collect data and to deliver the data through wireless mesh network. The system also employs duty cycle technique to reduce power consumption and to maximize operational time. The Smart bin system was tested in an outdoor environment. Through the test, we collected data and applied sense-making methods to obtain litter bin utilization and litter bin daily seasonality information. With such information, wastage bin providers and cleaning contractors are able to make better decision to increase productivity.

Keywords: IoT, BigData Analytics, Application Program Interface (API), Ultrasonic Sensor, Gas Sensor.

1. INTRODUCTION

Swachh Bharat Abhiyan (English: Clean India Mission and abbreviated as SBA or SBM for "Swachh Bharat Mission") is a national campaign by the Government of India, covering 4,041 statutory cities and towns, to clean the streets, roads and infrastructure of the country. In our system, the Smart dustbins are connected to the internet to get the real time information of the smart dustbins. In the recent years, there was a rapid growth in population which leads to more waste disposal. So a proper waste management system is necessary to avoid spreading some deadly diseases. Managing the smart bins by monitoring the status of it and accordingly taking the decision. There are number of dustbins are located throughout the city or the Campus (Educational Institutions, Companies, Hospitals etc.). The aim of the mission is to cover all the rural and urban areas of the country to present this country as an ideal country before the world. With the proliferation of Mobile network devices such as smart phones, sensors, cameras.

It is possible to collect massive amount of garbage. In the metropolitan cities it is not possible to check each and every place where the garbage dump yard is full or not. So we have introduced a new Concept using ultrasonic sensor. This is a sensor which intimates about the load placed on it. So that the garbage can also be checked in this way. Many times, in our city we see that the garbage bins or dustbins placed at public places are overloaded. It creates unhygienic conditions for people as well as ugliness to that place leaving bad smell. During rainfall the bin automatically closed, to prevent the environment from pollution. It is done by using Rain detecting Sensor. To avoid all such situations we are going to implement a project called IoT Based Smart Garbage and Waste Collection bins. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. 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 reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimate helps to keep cleanness in the society. In household level Sensor are connected near conveyor belt to detect different types of waste. First sensor connected is Proximity sensor to detect metal waste and which is having highest priority among the two sensor connected. This sensor gives accurate results even for smaller objects. The Proximity sensor continuously emits electromagnetic waves and if any metallic object is passing over the belt within the range of proximity sensor. If the waste is not metallic then it passes through moisture sensor which is connected to the belt. Arduino continuously checks the status of moisture sensor if it detects the Wet waste then waste move to wet waste bin otherwise it moves to Dry waste bin. Therefore, the smart garbage management system makes the garbage collection more efficient the use of solar panels in such systems may reduce the energy consumption. These dust bin model can be applied to any of the smart cities around the world. A waste

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collecting and monitoring team which is deployed for collection of garbage from the city can be guided in a well manner for collection.

2. OBJECTIVES

Provide basic infrastructure, Quality of life, Clean and sustainable environment. Apply Smart Solutions. Set examples to be replicated both within and outside the Smart City and catalyse the creation of similar Smart Cities. **Sensor Based Waste Collection Bins** is used to identify status of waste bins if it is empty or filled so as to customize the waste collection schedule accordingly and also save the cost. Real time waste management system by using smart dustbins to check the fill level of dustbins whether the dustbins are full or not, through this system the information of all smart dustbins can be accessed from anywhere and anytime by the concern person. It will inform the status of each and every dustbin in real time so that concerned authority can send the garbage collection vehicle only when the dustbin is full. By implementing this system resource optimization, cost reduction, effective usage of smart dustbins can be done.

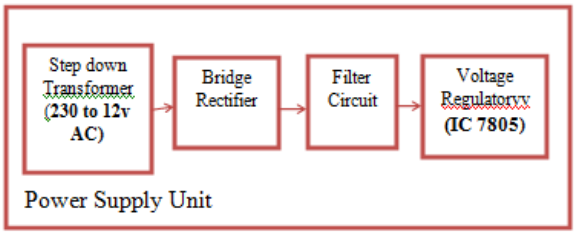
3. ARCHITECHTURE DESIGN

3.1 ARDUINO

Arduino is an opensourceelectronic platform based on easy to use hardware and software. For Processing and Wiring Arduino software(IDE) and Arduino programming language are used.Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit board to products for IoT Applications.

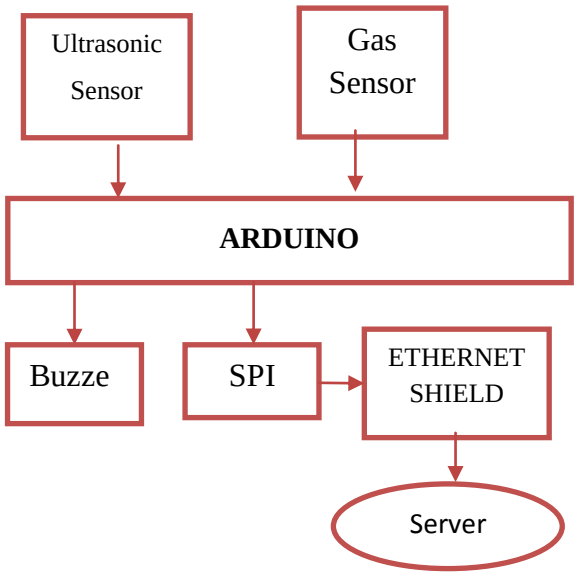
3.2. TRANSMITTER UNIT

Power supply circuits are used to regulate the high voltage ADC from battery power source to low voltage ADC suitable for the microcontroller system. Here power supply of 12v is been given to the controller. It keeps the flow of power in the equal form. Here we are using 7805IC for regulation purpose. Where it converts the 230v supply in to 12v as our system requirement is only 12v. Processing of bio-signals includes pre-processing to eliminate noise from signals and extract useful features for further interpretation. A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signalling device.



3.3. SENSORS USED

Ultrasonic Sensor is a sensor which intimates about the load placed on it. So that the garbage can also be checked in this way. Gas sensor sense the change in the exhaust smell and smoke and that signal is in analog form. As microcontroller has in build ADC, it will convert that signal in digital form and proceed further. Gas sensor is used to recognize amount of fire emitted smoke.



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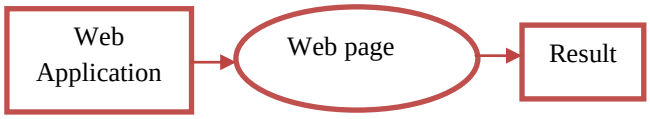
3.4. DATA TRANSCEIVING

The Serial Peripheral Interface (SPI) bus is a synchronous serial communication interface specification used for short distance communication, primarily in embedded systems. An Arduino is actually a microcontroller based kit which is basically used in communications and in controlling or operating many devices. The Arduino Ethernet Shield R3 (assembled) allows an Arduino board to connect to the internet. It is based on the Wiz net W5100 Ethernet chip (datasheet).The processed data is sent to SERVER via Ethernet Accordingly, real-time data can be stored and monitored at Cloud servers.

3.5. RECEIVER UNIT

Concisely, a web server is run at the gateway for hosting a web-page which is user-friendly and able to represent both raw and processed data in text and graphical forms. The web-page provides functions such as a log-in form with a username and a password, or a searching tool.



4. SECURITY MODEL

Monitors the garbage bins and informs about the level of garbage collected in the garbage bins. To keep our Environment clean & green. The cost & effort are less in this system

- Waste collection in past years was treated in a rather static way.
- The proliferation of sensors and actuators enable dynamic models as well.
- Proactive routing is based on the construction of shortest paths and their maintenance during a routing period.
- The garbage may overflow at any time which cannot be monitored automatically in the existing system.
- The obtained results, has behaved as expected, being a good solution for a lowcost, low power and wireless monitoring system.
- It can be used in all the existing recycling bins in the market and it can be integrated with the existing monitoring platform.
- From the Smart bin daily seasonality information, cleaning operators are able to better plan when they should send their cleaners to empty the bins.

This project can also be used in the" SMART CITY" and also helpful in the government project of "SWACHH BHARAT ABHIYAN".

5. RESULT

Municipal Solid Waste Management (MSWM) is one of the major environmental problems of Indian cities. Improper Management Solid Waste (MSW) causes hazards to in habitants. Various studies reveal that about 90% of MSW is disposed of un scientifically in open dumps and landfills, creating problems to public health and the environment. In the present study, an attempt has been made to provide a comprehensive review of the characteristics, generation, collection and transportation, disposal and treatment technologies of MSW practiced in India. The proposed system would be able to monitor the solid waste collection process and management the overall collection process. It would provide in time solid waste collection and also overcome the disadvantages such as usage of minimum route, low fuel cost, clean environment and available vehicle. Smart bin indicates the level and gas presents in the trash bin. It indicates the alarm and sends the information to the corporation office. Then the corporation office passes the information to the truck. Once the truck driver removes the trash the alarm stops and continuous to corporation office and truck also ends. Ultrasonic Sensor is introduced for efficient and economic garbage collection. The developed system provides improved database for garbage collection time and waste amount at each location. We analyzed the solutions currently available for the implementation of IoT. By implementing this project we will avoid over flowing of garbage from the container in residential area which is previously either loaded manually or with the help of loaders in traditional trucks. It can automatically monitor the garbage level & send the information to collection truck. The technologies which are used in the proposed system are good enough to ensure the practical and perfect for solid garbage collection process monitoring and management for green environment.

6. CONCLUSION AND FUTURE WORK

Advancements in latest technology in different sector of life and with the increasing population and changes in the lifestyle, Waste management is another sector need to be maintained properly. So monitoring of the Trash bins with the

use of sensors, it's a possible way to monitor and clean the dustbin and more efficient system than the current existing. Our idea of "Smart Waste Management System" mainly focuses on monitoring the waste management, providing a smart technology for waste management system, by this reducing human time and effort, cost and which results in healthy environment. The smart trash receptacle, gives a solution for unsanitary environmental condition in a city. This prevents many diseases caused due the toxic gases emanating from the overflowing trash can. Thus this project holds the belief that overflows of the trash can on the streets could be avoided. It helps to maintain a clean and healthy environment throughout the country. Database of every trash bin can be maintained in municipality. The communication between trash bin, municipality and truck member is also easily maintained. The smart trash receptacle finds to be cost effective. The system is designed to collect data and to deliver the data through wireless mesh network. The system also employs duty cycle technique to reduce power consumption and to maximize operational time. The Smart bin system was tested in an outdoor environment. In our system, the Smart dustbins are connected to the internet to get the real time information of the smart dustbins.

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