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IOT BASED SMART WASTE MANAGEMENT SYSTEMFOR SMART CITY

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ABSTRACT
In the present day scenario, many times we see that the garbage bins or Dust bin 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 aroundthe surroundings this leads in spreading some deadly diseases & human illness, to avoid such a situation we are planning to design "IoT Based 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 low- cost embedded device which helps in tracking the level of the garbage bins and an unique ID will be provided for every dustbin in thecity so that it is easy to identify which garbage bin is full. When the level reaches the threshold limit, the device will transmit the level along with the unique ID provided. These details can be accessed by theconcern authorities from their place withthe help of Internet and an immediate action can be made to clean the dustbins.

1. INTRODUCTION

An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost-conscious market.

An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Personal Digital Assistant and Mobile phones etc. Lower end embedded systems - Generally 8,16 Bit Controllers used with an minimal operating systems and hardware layout designed for the specific purpose.

An embedded system is a special-purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Unlike a general-purpose computer, such as personal computer, an

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embedded system performs one or a few pre- defined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded systems are often mass-produced, benefiting from economies of scale.

Personal Digital Associates (PDAs) or handheld computers are generally considered embedded devices because of the nature of their hardware design, even though they are more expandable I in in software terms. This line of definition continues to blur as devices expand.

Physically, embedded systems range from portable devices such as digital watches andMP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants.

In terms of complexity embedded systems can range from very simple with a single microcontroller chip, to very complex with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

2. RELATED WORK

Improper waste discharge, lack ofsystematic waste collection and management schemes, and ineffective waste managementpractices have all resulted in severe environmentalissues and high waste disposal costs . Because of the positive outcomes of IoT services, variouswaste management studies focused on IoT technologies have been undertaken by researchers to address the aforementioned issues involved in solid waste management. Construction industries,food processing industries, etc. consistently produce a portion of waste that has notable residue enhancing the significance of the application of waste management practices and sustainability principles. .

Several works have been published that cover various aspects of waste management technology. A basic framework that recognizes the saturation of trash bins is presented in , in which the gathered data are transmitted via a wireless mesh network to conserve power andincrease operating time. Besides, the smart bin employs a duty cycle strategy to cut down on power demand and increase operating time. For experiment validation, this approach was tested in an outdoor environment, which demonstrated the feasibility of the system. However, the system still has some unclear issues with the implementation.In a food waste collection system in which data were gathered using radio-frequency identification (RFID) technology and distributed through a wireless mesh network is presented.

However, the system fails to address the data gathering possibilities from the trash bins which are located in far places as cities cover a wide area. An automated line-following automobile with a robotic hand for waste collection is proposed in , but it lacks any algorithms to make the waste assemblage more efficient.

An intelligent bin emphasized system is proposed. To prevent waste disposal outside the bin, this work recommended a method in which monitoring happens not only within the bin but also in the immediate area around it. Infrared sensors are mounted in the bins, which sense discarded garbage from a bin as well as to measure the bin's filled level. A waste treatment and management system based on Lora WAN technology is proposed in , a path optimization for the waste collection trucks is also mentioned in this work. Furthermore, an IoT-based network framework is proposed, but it did not offer lucidity about coordination and optimization for all garbage bins in the system. Another work in developed a working prototype of smart trashbins.

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The proposed work focuses on segregating different forms of waste for better treatment and recycling. An integrated GPS module provides geotagging to the bins, a gas detector that senses hazardous gases, an infrared sensor that determines the filled level of the bin, a sound sensor for noise emission control, and a temperature and humidity sensor are all used witheach bin. Sensors are linked to a microcontroller, which collect data and send it to a gateway through a LoRa transceiver module. The sensor data from multiple garbage bins will be received using a gateway module with a LoRa transceiver.

3. EXISTED WORK

In the existing system there is no indication whether the dustbin is full or empty. Thecorporation has to collect the garbage by weekly once or by 2 days once, though the garbage shrinks or overflows the bin and pollutes the environment. This will cause severe consequences. The rain water gets filled in the bin along with the waste which creates a bad smell.

4. PROBLEM DEFINITION

As we have seen number of times the dustbins are getting overflown and concern person don't get the information within a time and due to which unsanitary condition formed in the surroundings, at the same time bad smell spread out due to waste, badlook of the city which paves the way for air pollutionand to some harmful diseases around the locality which is easily spreadable.

1. Disadvantages of the existing system

- Time consuming and less effective: trucksgo and empty containers whether they arefull or not.
- High costs.
- Unhygienic Environment and look of thecity.
- Bad smell spreads and may cause illness tohuman beings.
- More traffic and Noise.

2. Advantages of the proposed system

- Real time information on the fill levelof the dustbin.
- Deployment of dustbin based on theactual needs.
- Cost Reduction and resourceoptimization.
- Improves Environment quality
- Fewer smells
- Cleaner cities
- Intelligent management of theservices in the city.
- Effective usage of dustbins.

6. PROPOSED WORK

The proposed method for the management of waste is efficient and time saving process. The ultrasonic sensor

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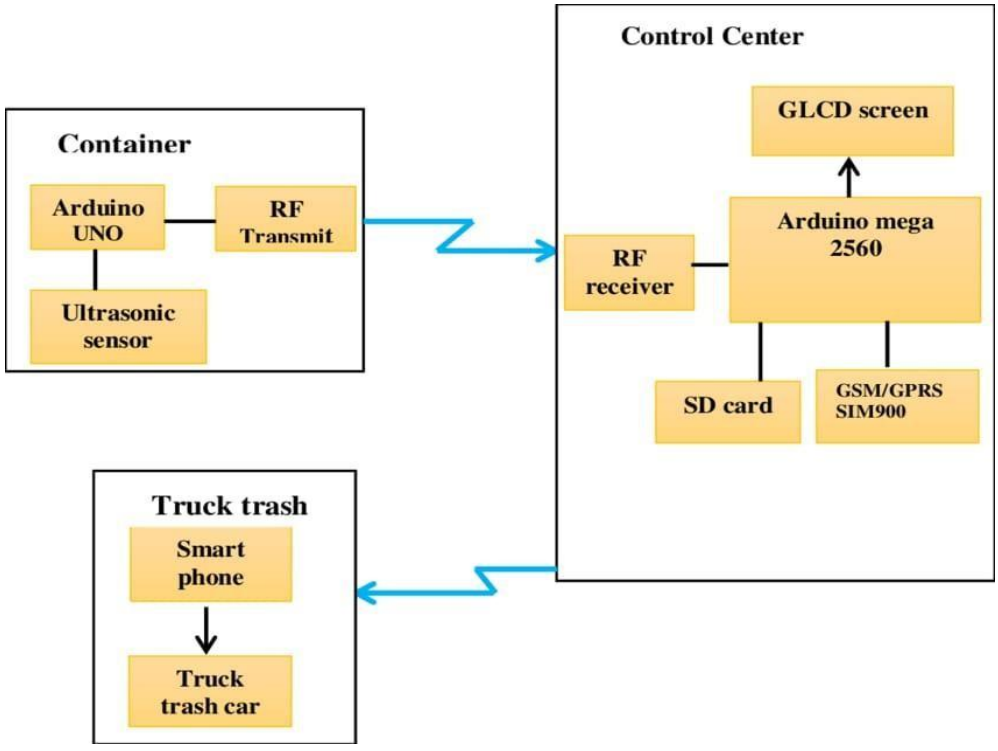
which is placed in the dustbin will detect the depth of the waste and the data will be stored in the microcontroller and displayed in the webpage. The water sensor will be placed on the top of the bin which will sense the raining water and closes the bin automatically and maintains dry waste and wet waste separately. This can be implemented at any place with ease and withinreasonable amount of time and reliable with long distance coverage.

Implementation in the Proposed system:

- Real time information on the fill level ofthe dustbin.
- Deployment of dustbin based on theactual needs.
- Intelligent management of the services inthe city.
- Effective usage of dustbins.
- Cost Reduction and resourceoptimization.
- Working uses of the Proposed system:
- System can be accessed anytime and fromanywhere.
- Avoids the overflows of garbage bins.
- This system has no individual use, but canbe used by a city, state or a country.

7. BLOCK DIAGRAM



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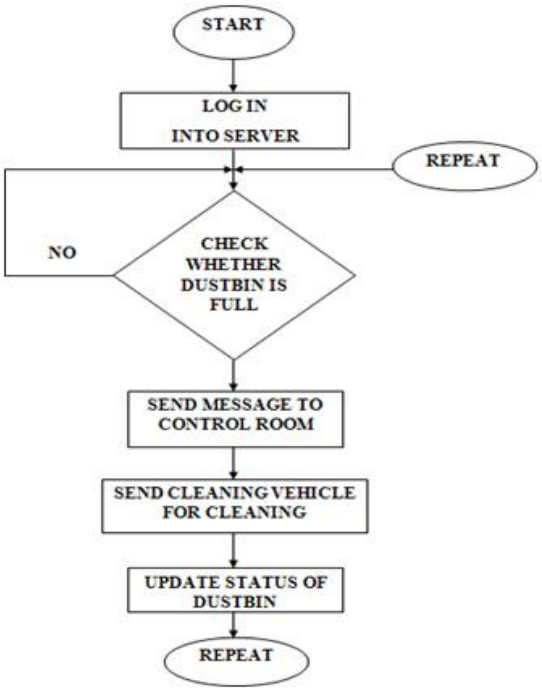
8. FLOW CHART



CONCLUSION AND FUTURE SCOPE

We have implemented real time waste management system by using smart dustbins to check the fill level of smart dustbins whetherthe dustbin are full or not . In this system the information of all smart dustbins can be accessed from anywhere and anytime by the concern person and he/she can take a decision accordingly. By implementing this proposed system the cost reduction, resource optimization, effective usage of smart dustbins can be done . This system indirectly reducing traffic in thecity. In major cities the garbage collection vehicle visit the area's everyday twice or thrice depends on the population of the particular area and sometimes these dustbins may not be full. Our System will inform the status of each and every dust bin in real time so that the concerned authority can send the garbage collection vehicle only when the dustbin is full.

This paper describes the development of garbage monitoring system, which is based on Arduino UNO. It is very useful in improvingthe efficiency of waste disposal management especially in the residential areas, by alerting the municipality for immediate collection. The proposed system can be adapted in all areas because of its reliability, reasonable cost and efficient environmental protection. In this methodit is able to achieve above 90% of efficiency. In future, this system can also be installed in the home and if the dustbin gives bad odour, we can identify that it is time to dispose the dustbin, it can be done by placing gas sensor. An app based interface and webpage based interface will be handy for the civic bodies to monitor and manage multiple bins simultaneously.

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9. RESULT

BIN OPEN

BIN CLOSE

The result is shown as the above figures.

First the dustbin is being opened. When the user came near the bin it automatically open by sensing the user. And then the User can throw the waste in the bin and then it automatically closes.

In this it shows how much percent the bin isbeing filled is shown to the user by the SIM card.

By showing the percentage of the waste it willbe easy for the user to clean the wastage.

REFERENCES

1. A. Al-Fuqaha, M. Guizani, M. Mohammadi, M. Aledhari, and M. Ayyash,"Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications," IEEE Commun. Surv. Tutorials, vol. 17, no. 4, pp. 2347–2376, 2015.
2. J. A. SHAHABDEEN, "SMART GARBAGEBIN," 24-Jun-2016.
3. "Bigbelly - Smart Solutions for Cities // World Leader in Smart Waste." [Online]. Available: http://bigbelly.com/. [Accessed: 21-Apr-2019].
4. B. Dorsemaine,J. P. Gaulier, J. P. Wary, N. Kheir, and P. Urien, "Internet of Things: A Definition and Taxonomy," Proc. - NGMAST 2015 9th Int. Conf. Next Gener. Mob. Appl. Serv. Technol., no. September, pp. 72–77, 2016.

5. F. H. Priano and C. F. Guerra, "A framework for measuring smart cities," in Proceedings of the 15th Annual International Conference on Digital Government Research -dg.o '14, 2014, pp. 44– 54.
6. F. Purnomo, . Meyliana, and H. Prabowo, "Smart City Indicators: A Systematic Literature Review," J. Telecommun. Electron. Comput. Eng., vol. 8, no. 3, pp. 161–164, 2016.
7. E. P. Trindade, M. P. F. Hinnig, E. M. da Costa, J. S. Marques, R. C. Bastos, and T. Yigitcanlar, "Sustainable development of smart cities: A systematic review of the literature," J. Open Innov. Technol. Mark. Complex., vol. 3, no. 3, 2017.
8. M. Mijac, D. Androcec, and R. Picek, "Smart City Services Driven By Iot: a Systematic Review," SMART CITY Serv. DRIVEN BY IOT A Syst. Rev. J. Econ. Soc. Dev., vol. 4, no. 2, 2017.
9. B. Kitchenham and S. Charters, "Guidelines for performing Systematic Literature Reviews in Software Engineering," Elsevier Inc., Durham, UK, 2007.