

# Smart Bin - Smart Waste Management System

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## ABSTRACT

A Smart bin-Smart waste management system based on IOT is proposed for waste management in our surroundings. This paper helps us to monitor the dustbin and maintain cleanliness in our cities and rural areas. In recent decades urbanization has increased tremendously. At the same time there is increase in waste production. Waste management has been important and a crucial issue to be considered. Without proper maintenance these disposal items can create dreadful epidemic diseases that are caused by disease spreading insects among people and make pollution to our environment. It is necessary to clean the waste dustbin at regular intervals once it filled. Hence we proposed a smart dustbin based on the Arduino based monitoring system. Here we designed a smart garbage system with the Arduino mega 2560 microcontroller board based on the ATmega 2560, a substitution for older Arduino mega board which helps to monitor and read the dustbin level with the help of ultrasonic sensor. This smart dust bin collects the data about the garbage level and sends notifications or messages to respective municipal corporation or authorities updating the present status of the dustbin level with the help of IOT concept. Arduino will be programmed in such a way that when dustbin is filled it gives alert to the respective authority and clean the waste so that, we can avoid unnecessary dumping of wastes in our areas and our surroundings. Surveillance system which helps the people to detect the misplacing of the garbage around the bin as well as rain sensor helps us to detect the rain water and close the bin lid to avoid rotten smell around us are also implemented in this paper.

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## I. INTRODUCTION

### 1.1 Smart bin

- In this paper, we present the Smart bin system that identifies fullness of wastage bin using embedded system and the information is transferred through IOT.
- 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.
- The Internet of things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet
- Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things.
- In this paper, we present the Smart bin system that identifies fullness of wastage 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 bed, we collected data and applied sense-making methods to obtain litter bin utilization and litter bin daily seasonality information. With such information, wastage binproviders and cleaning contractors are able to make quick and required bins need to clean immediately. This paper prevents peoples from unwanted diseases caused due to wastage bins.

## **1.2 CHARACTERISTICS OF EMBEDDED SYSTEM**

Embedded systems are designed to do some specific task, rather than to be a general purpose computer for multiple tasks. Some also have real time performance constraints that must be met, for reasons such as safety and usability others may have low or no performance requirements allowing the system hardware to be simplified to reduce costs.

Embedded systems are not always standalone devices. Many embedded systems consist of small computerized parts within a large device that serves a more general purpose. Embedded systems have wide variety of applications in almost all fields.

The program instructions are written for embedded systems are referred to as firmware and are stored in read only memory or flash memory chips. They run with limited computer hardware resources little memory, small or non-existent keyboard or screen. Real time systems based on embedded systems plays a key role in all advanced automated machineries and large scale industries.

### **1.2.1 CLASSIFICATION OF EMBEDDED SYSTEM**

Hardware real time systems have very narrow respond time. The correctness of respond includes a description of timelines. Deadlines are specified as points in time interval following an event.

Software real time systems have reduced constraints on lateness but still must operate quickly and repeatable. Soft timelines requirements are specified as time constraints that may be violated.

Firm real time system is combination of both hard and soft timelines requirements.

### **1.2.2 APPLICATIONS OF EMBEDDED SYSTEMS**

- Communication devices like mobile phones, pager, PDA.
- Medical diagnostics devices such as dialysis machines, blood analyzers, protein analyzers, etc.
- Household appliances, home control systems, microwave ovens, automatic washing machines, digital watch, video game player etc.

## **1.3 IOT -INTERNET OF THINGS**

The Internet of things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the interne

Internet of things used in this project because of the ease of result and advancement from previous projects and the efficiency of passing the message faster and stores data for future reference

### **1.3.1 Blynk App**

- Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things
- It allows to you create amazing interfaces for your projects using various widgets we provide.
- Blink app does not require any laptop to be used only while programming it requires other wise only mobile device is needed to check the info of thee setup
- Blink provides Realtime notification and warning signal so that the need full action is not delayed

### **1.3.2 Application of IOT and Blynk**

- Smart appliances (stoves, refrigerators, washers and dryers, coffee machines, slow cookers)
- Smart security systems, smart locks, and smart doorbells
- Smart home hubs (that control lighting, home heating and cooling, etc.)
- Smart assistants (like Amazon Alexa or Apple's Siri)
- Fitness trackers, sleep trackers, and smart scales

## **EXISTING MODEL**

The most advancement over the problem was only the warning system over the waste manage meant . Where has whenever the collecting is filled the warning is sent to authorities . more advanced from this there where only monitoring system where iot based monitoring was done it only collects data and make report for further improvement in future.

The developed IoT Based Smart Garbage Monitoring System, in which dustbins are interfaced with microcontroller based system having Ultra sonic sensors with wireless systems. These wireless systems central system showing current status of garbage, on mobile web application with connected via Wi-Fi. This proposed system implemented using ultrasonic sensor also known as transceivers when they both send and receive, also work on a principle similar to radar or sonar, which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively, microcontroller AT89S52 was used and designed with static logic for

operation down to zero frequency and supports two software selectable power saving modes and Wi-Fi module Express if Systems' Smart Connectivity Platform is used, which provides a set of high performance, high integration wireless SOCs, designed for space and power constrained mobile platform designers.

### 2.1 Summary

The system uses the wifi to send the report where the collecting vehicle must be in receiver radiation and thus the message is passed and then the collection of the dust bin is possible and the collecting frequency on work hour and rush hour can be predict and prepare for the pick up of the collection of waste.

### 2.2 Disadvantage

- The problem with the existing system is many while the IoT based system provides a minimal solution of real time collecting the waste but there are several disadvantages
- When the collecting msg is sent through WIFI it cannot be reached the receiver end as the receiver may be far away from the signals reach
- There is no remedy while high collecting time as there is only data available the studying must be done in order to understand the filling rate
- There is no problem solving if the bin is exposed to water as happens in rainy season
- There is no much advancement is done from the previous embedded based smart bin lid is closed automatically so than no more deposits is taken as the people can put their waste nearest waste bin available.

### 3.1 Block diagram of proposed model

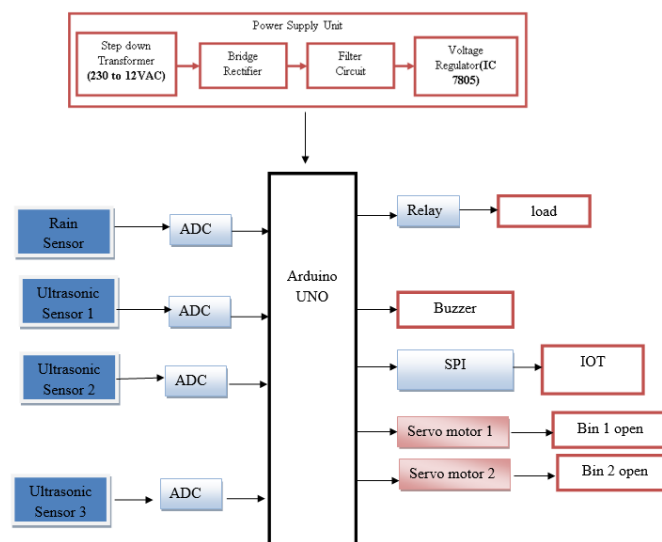


Fig 3.1 Block diagram smart bin

As the above mentioned operations are elaborated in the form of block diagram here and further understanding the operation the flow chart is given

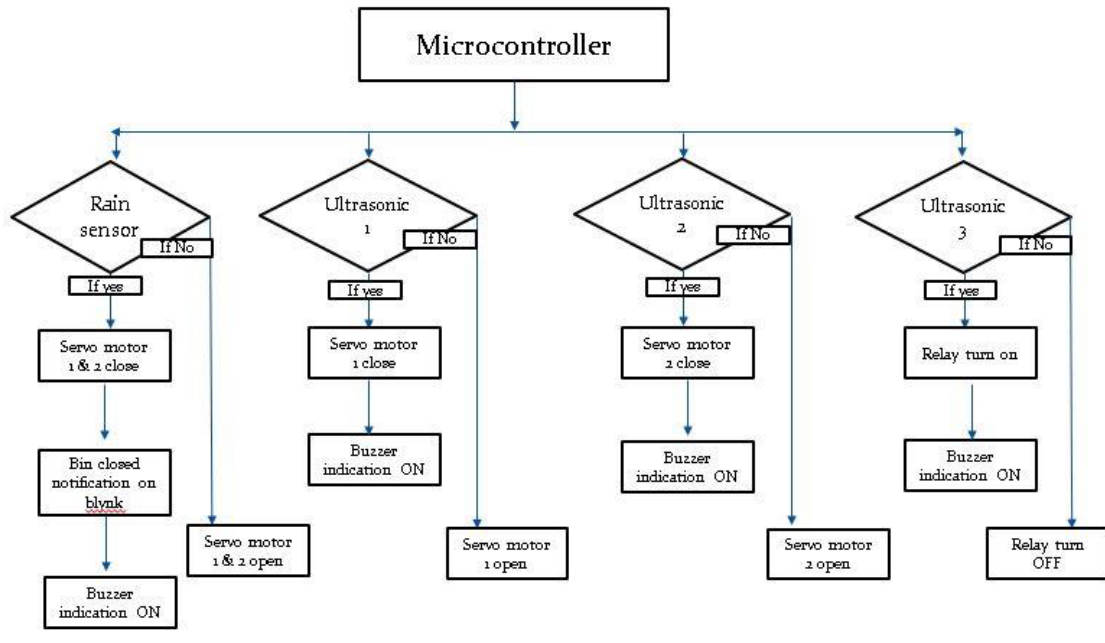


Fig 3.2 flow chart of the operations

The flow chart explains each operations according to the situations demands how the bin operates is elaborated through the help of the above flow chart as the rain drop fall on rain drop sensor the bin lid is closed by help of servo motor and the message is sent to the authorities through blynk app if there if no water drop is fell on servo motor are stayed ideal condition (lid open)

- If the level of bin is exceeding the ultra sonic 1 will activate the servo motor 1 and close the lid as no further waste is dumped over and the notification is send through the blynk app if not the servo moter1 will be ideal and the lid will be in open stage.
- If the ultra sonic 2 is activated as the bin is filled up the servo motor 2 get activated and close the lid and the message is passed through blynk app
- If the ultrasonic 3 is activated as nearby person is passed along the relay is turned on as that power is given to the output as it can operate cctv , light source etc as it only activate a person is coming it saves data storage and energy and also keep data of who is miss using the service of dumping waste outside ,putting bio waste in e waste bin or other wise

### 3.2 Advantages of our model

The data is available in real time so that even for study purpose or to prediction the real time data are much more useful

As we use Arduino mega we can connect more option as the development of optimized surveillance is implemented here as that many options are available to be connected

The bin is of two types present here one is for organic waste collection and other fore plastic or e waste collection where as the 1 bin is faster filling the lid is closed so that no more filling is done and only after completing the collection the message is passed in rural areas so that the work force and the reduction of fuel cost can be obtained

The above mention is programable as so the city based bins can be changed so that even filling of 80% of the bin triggers the notification so that the driver can act faster before attaining 100% it should be emptied

The prevention of water decaying the waste is prevented with the use of rain drop sensor whereas the rain starts the lid of the bin is closed and the notification to the authorities is send so that they can take need full actions.

## II. CONCLUSION AND FUTURE WORK

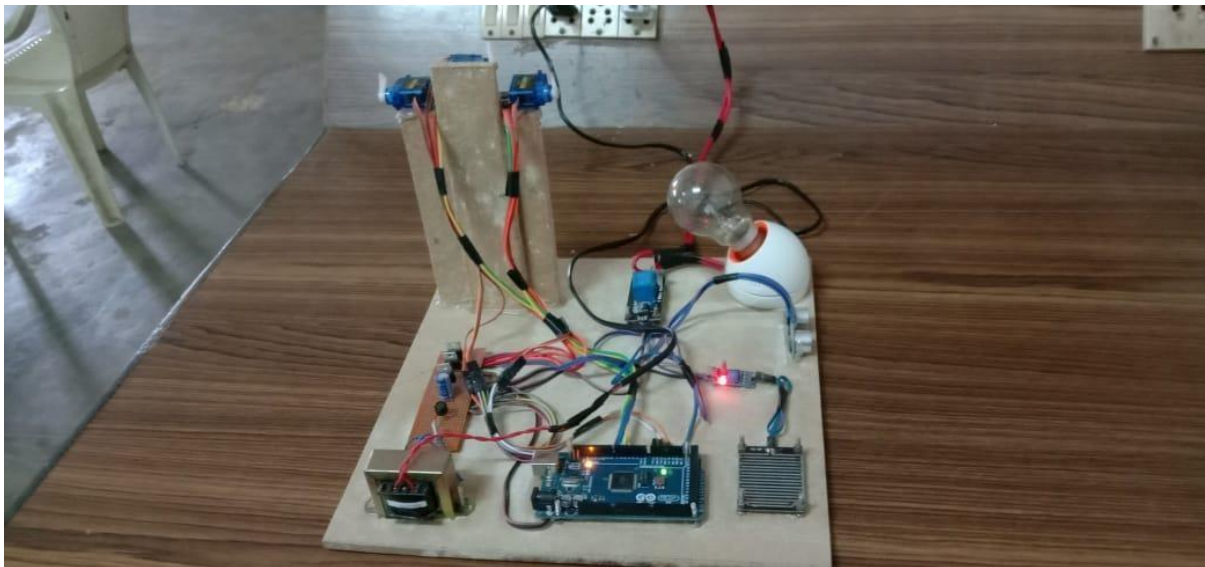
In recent years there was rapid growth in population which leads to more waste disposal and makes more environmental pollution .This proposed project gives a solution for unsanitary environmental conditions .This project enables the use of smart dustbin which is implemented by using IoT concept .This project is completely eco-friendly as it avoid the unnecessary dumping of wastes in our surroundings .The innovative ideas of the project assures to check the level of garbage in dustbin at regular intervals and gives the notification to the correspondent authority when the garbage level reaches maximum . It also help us to reduce the number

of turns of garbage collection vehicle as it indicates when the garbage filled the bin completely . This smart dust bin helps to check constantly the level of garbage which are placed in various cities and rural areas.

This developed system provides improved database for garbage collection time and waste amount at each location . This technology helps the people to manage the waste properly and helps them to reduce the wastage of time since it gives regular alertness about the waste level . This project is implemented mainly using ATmega 2560 microcontroller ,ultrasonic sensor and rain sensor.

This proposed model integrates different sensing and communication technologies to monitor real time bin information that can enrich the efficiency of waste collection and ensure the timely removal of waste resulting in green and pleasant environment using IoT .The proposed model can be worked by using battery or power supply . By implementing this project we will avoid over flowing of garbage in residential areas which is previously loaded either manually or with the help of loaders in traditional trucks .The system gives indication of proper separation of biodegradable and non biodegradable wastes. Surveillance system is also introduced in this model to ensure monitoring the activities related to waste disposal . Rain sensor is also included to give signals to close the lid automatically during unfavourable conditions. The overall system is cost effective ,user friendly and helps in resource optimization .The status of these bins can be checked anytime on their respective mobile phones.

The main objective is used to maintain the level of cleanliness by proper disposal of waste and form an environment which is better for living . This smart bin system can be used for developing smart city and helpful in keening the society clean under the SwachhBharath mission . Since this technology is an eco-friendly project, government is taking initiative to make use of the project for social welfare.



**Fig:Experimental Setup**

#### **FUTURE WORK:**

The future scope of this project will be followed by suggesting the following ways

- Recycling of wastes can be included by providing additional facilities like wet garbage system which helps to segregate organic waste and recycle them
- Artificial intelligence system can be provided to reduce the manpower for collection of wastes.
- Coloure sensor and food detection can be implement to separate waste materials
- Solar panel can be implemented to save the energy and make our environment free from pollution.
- Radio sensing technology can be also included to detect the dangerous substance for safety of public.
- Optimised surveillance system is implemented but not fully developed

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