# "A Smart IoT System for Waste Management"

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**Abstract-**To make the cities greener, safer, and more efficient, Internet of Things (IoT) can play an important role. Improvement in safety and quality of life can be achieved by connecting devices, vehicles and infrastructure all around in a city. Best technological solutions can be achieved in smart cities by making different stakeholders to work together. System integrators, network operators and technology providers have a role to play in working with governments to enable smart solutions. But, building such solutions on an open, standardsbased communications platform that can be continuously used is a challenge.

*Key Words***:Interenet of Things,smart waste management**

## I.INTRODUCTION

In India waste collectors play a crucial role in recycling process in many cities. Many waste collectors have chances of getting prone to various diseases. The job of rag pickers (waste collectors) is a hectic task, also to eliminate the process of rag picking; it can be automated at the waste disposal zone by segregating at early stage. Until the waste is completely recycled its economic value is not realized. There are several advancements in technology which has allowed reusing and recycle the waste[1]. Generation of biogas for use of household works is possible due to waste management at small level. To increase the potential of recovery and recycling, the waste can be separated into various types such as wet, dry, metallic waste, etc. Metal detectors can also be used for detection of metallic waste. The collected waste is the source of different useful gases and fertilizers. The dry waste can be segregated further and can be reused and recycled[2,3]. At present there are waste separation plants present on large scale, it is better to separate waste at collection level. By separating the waste during collection level, the quality of waste would be higher for recycling process. Hence the job of human waste collectors is reduced. Internet of Things (IoT) is among the technologies by means of which one can transfer data from one device to another using any type of network, at anytime and anywhere. Separation of waste is difficult task to do[8,9]. It has to be cost efficient and easy to implement. This project proposes a system which segregates wet and dry waste and manages it.

## II.METHODOLOGY

In this we propose a smart waste collection system on the basis of level of wastes present in the wastebins. The data obtained through sensors is transmitted over the Internet to a server for storage and processing mechanisms. It is used for monitoring the daily selection of wastebins, based on which the routes to pick several of the wastebins from different locations are decided. Every day, the workers receive the updated optimized routes in their navigational devices. The significant feature of this system is that it is designed to update from the previous experience and decide not only on the daily waste level status but also the predict future state with respect to factors like traffic congestion in an area where the wastebins are placed, cost-efficiency balance, and other factors that is difficult for humans to observe and analyze. Based on this historical data, the rate at which wastebins gets filled is easily analyzed. As a result, it can be predicted before the overflow of wastes occurs in the wastebins that are placed in a specific location. Depending on economic requirements specified at early stages, the optimized selection of waste bins to be collected is expectedto improve collection efficiency.

## III. LITERATURE SURVEY

The waste management is one of the challenges in the smart cities. The waste containers are typically placed in the public areas. Without well management, the waste containers may be overflowed or give off unpleasant smell, which affect the public health. This paper proposes a smart waste management system, by using the IoT (Internet of Things)technology[1].Garbage collection is one of the most critical problems faced by Municipal Corporation. While implementing the waste management in cities the biggest challenge is the management of waste in cost optimal way with high performance. The current process of collecting the waste, separating it and transporting the containers everyday which is a complicated process. This paper deals with the concept of waste management and the smart system for waste management with higher benefits to the society. The proposed system for waste management will use various sensors for sensing the type of waste and separate the waste in different categories and actuator to inform the management to collect the waste container. This system will save money and time compared to the already available process of waste management and also improves the society cleanliness[2].Addressing environmentally safe management of waste is becoming increasingly a challenging task. The predicament of the rate at which waste is generated due to increasing populations is alsocontributing to this challenge. One possible approach for effectively handling waste can be achieved by source reduction and recycling. The problem, however, improving the collection of waste can be costly particularly during the source separation process after waste is collected[3].Waste accumulation and disposing become main problem facing populated cities, due to the way of managing thewaste containers. The recent technologies provide radical solutionand effective way to handle these problems. In this work wirelesssensor network (WSN) and internet of things (IOT) technologiesare used to manage the usage of the waste containers. This paperpresents real time monitoring of the container contents usingsensors, displaying the result in the website and the sensed contents are analyzed to determine the optimized distribution of the containers[6].Waste management is that the tactic of treating solid wastes and offers reasonably solutions for usage things that don't belong to trash. It's

regarding but trash bin be used as a valuable resource. Waste management disposes of the merchandise and substances that we simply have use throughout a secure andeconomical manner.Researchers are finding out waste management for over a century, and for over forty yearswaste utilization analysis. There are eight major ways ofwaste management strategies, every of them divided into various classes. Those are- reduction and employ, animal fee ding, recycling, composting, fermentation, landfills, burning and land application. We will begin exploitation several techniques right reception, like reduction and employ, that works to cut back the number of disposable material used. Fortunately, IoT has the answer to assist the utilization method at each stage of the waste management[7].Proper waste management is one of the major problems for densely populated urban areas. It is getting difficult day by day to lead a healthy, sustainable living in urban areas because of environmental contamination. Due to the lack of proper waste management approach, problems like an overflow of waste occurs that badly harm our environment. Polluted surroundings result in the spread of various kinds of diseases in an epidemic form. For developed and developing countries, waste management is a challenge to long-term development. Proper management of waste is getting tougher because of increasing population, urbanization, and industrialization. In this modern era of technology, we need to apply technology-based solutions to handle large amounts of waste for overpopulated urban areas. We have reviewed several recent research articles related to the smart waste management system, and almost all of them have some major limitations as well as progress. To ensure environmental hygiene and sustainable urban life, we have presented a smart IoT based integrated system consists of an identification system, an automated lid system, a display system, and a communication system[9]. Arduino Uno is used as a microcontroller to synchronize all of the four systems. Sensors are used for identification and measuring the garbage level. The system provides the facility of continuous monitoring of the status of waste inside the garbage bin and shows the percentage filled up on liquid crystal display (LCD). The communication system uses a global system for mobile communications (GSM) module that will inform the corresponding authority to collect the waste when the garbage

bin is filled up. The proposed waste management system is much more efficient than any other conventional waste management system as it reduces the use of manpower, avoids spillover of waste, saves time, more economical, and most importantly it is a completely automated system[11].The paper is based on the concept of Automation used in waste management system under the domain of Cleanliness and Hygiene. Dumping garbage onto the streets and in public areas is a common synopsis found in all developing countries and this mainly end up affecting the environment and creating several unhygienic conditions. In order to deal with these problems Smart netbin is an ideology put forward which is a combination of hardware and software technologies i.e. connecting The paper is based on the concept of Automation used in waste management system under the domain of Cleanliness and Hygiene. [12]Dumping garbage onto the streets and in public areas is a common synopsis found in all developing countries and this mainly end up affecting the environment and creating several unhygienic conditions. In order to deal with these problems Smart netbin is an ideology put forward which is a combination of hardware and software technologies i.e. connecting Wi-Fi system to the normal dustbin in order to provide free internet facilities to the user for a particular period of time[13].The technology awards the user for keeping the surrounding clean and thus work hand in hand for the proper waste management in a locality. Smart netbin uses multiple technologies firstly the technology for measuring the amount of trash dumped secondly the movement of the waste and lastly sending necessary signals and connecting the user to the Wi-Fi system. The proposed system will function on client server model, a cause that will assure clean environment, good health, and pollution free society.

## IV.BLOCK DIAGRAM AND EXPLANATION
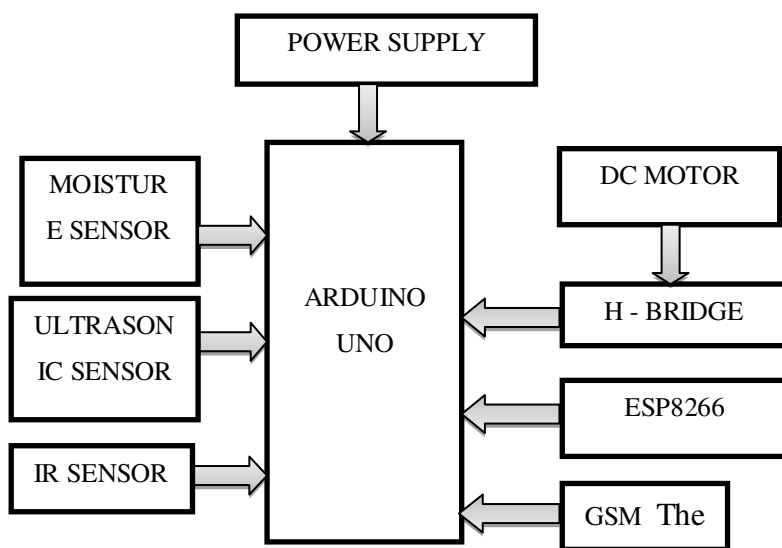


The above block diagram shows the blocks of waste management system. Power supply plays a very important role in any device, the power supply what we get is 230V AC supply. Now as per the hardware requirements each hardware consists of different voltages i.e. 5V, 3.3V and few have 12V so dividing the voltages is done using this power supply by using an IC called 7805 i.e. voltage regulator. And then comes the microcontroller, the microcontroller used here is Arduino uno, this was the suitable and which had very less complexity in coding. All the hardware components used here is interfaced with the Arduino board for the functionality of the device to work properly. Each hardware is programmed as per the flow of the project. Ultrasonic sensor is used to detect the level of the dustbin i.e. how much it is filled. Moisture sensor used to detect whether the waste put is a dry waste or the wet waste. Dc motor is used to segregate the waste i.e. dry and the wet. ESP8266 it is a Wi-Fi module which connects to the cloud and the project for the updates of the dustbin. Also ametal proximity sensor is also used to detect meal waste and gets dumped into the metal waste bin. Also a metal proximity sensor is also used to detect meal waste and gets dumped into the

metal waste bin. With the GSM module a message is been sent if the dustbin is full, to the control room with the location of the dustbin so that it makes easy to the waste collector to easily pick it up in a shortest path.

## V. HARDWARE AND SOFTWARE REQUIREMENTS

### HARDWARE REQUIREMENTS

- ARDUINO UNO
- POWER SUPPLY
- ESP8266
- ULTRASONIC SENSOR
- DC MOTOR
- H-BRIDGE
- MOISTURE SENSOR
- METALPROXIMITSENSOR
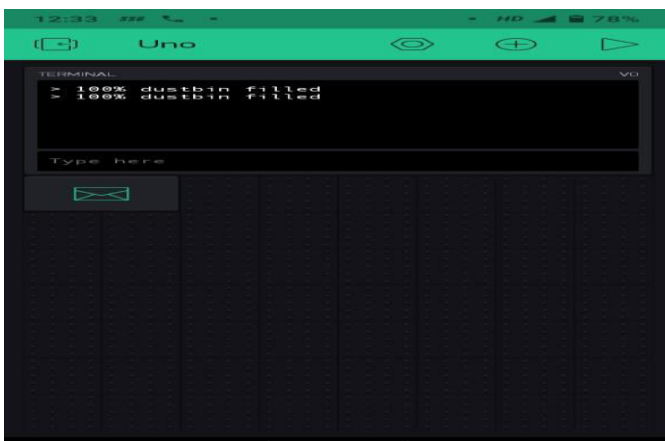- IR SENSOR

### SOFTWARE REQUIREMENTS

- ARDUINO IDE
- EMBEDDED C
- BLYNK

## VI.EXPERIMENTAL RESULTS



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 will send the notifications regarding the full fillement of dustbin and level of the bin to the authorized person. If the bin is filled in particular place it will show the direct map to the particular bin which notification sent by the bin.
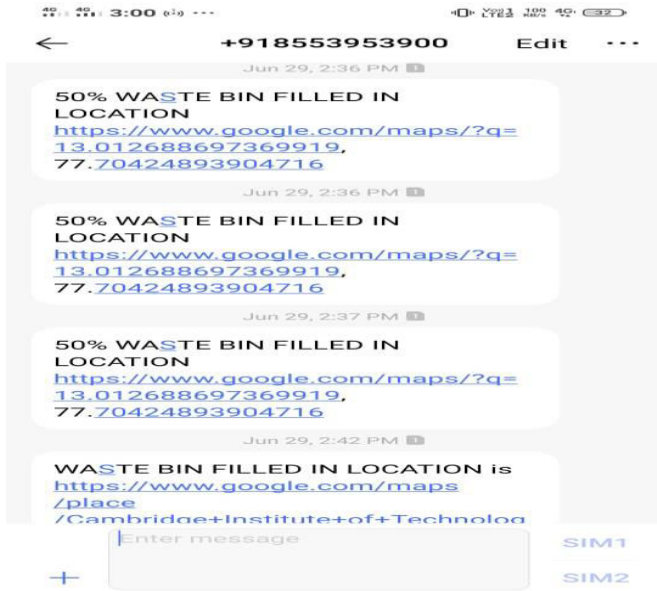


The project is construted with sensors and 3 bins where it will detect the type of waste and it will segregate the waste in the particular bin. Here it will work on the three types of waste i.e wet waste,dry waste and metal waste. For every waste separate bin is created and segregated separately.Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits. Sometimes, upto 60%of waste is not being collected, it is often simply burned by the road side. It can

pollute drinking water, it can spread disease to people living nearby.



Here we get the messages from particular bin to authorized persons .That the dust bin is filled in the particular place and it will directs to route map so that person can easily make a way to dust bin faster.

## VII.CONCLUSION

The proposed smart waste management not only detects the amount of waste but also detects the metal waste too. Since the waste in the containers is non-smooth, in this system infrared instead of ultrasonic is suggested to adopt for waste detection. Based on the sensing data, the waste collection company can efficiently obtain the waste status and automatically schedule the waste collection. In this way, the daily waste collection becomes an active service. Through the effective waste collection route, the operational costs such as the fuel and the manpower can be saved.

## VIII .FUTURE SCOPE

Future work will include the path optimization technique to reduce fuel consumptions and provide better transition system in metropolitan cities. Also segregation of different types of wastes such as e-waste, plastic, metal, etc. can be included in our system. Peripheral work of project is based upon on the future for development of smart cities and overall development of our country in terms of hygiene issues.

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