

# A SURVEY ON SMART CITY- GARBAGE MONITORING SYSTEM USING IOT

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## ABSTRACT

One of the main concerns with our environment has been solid waste management which is disturbing the balance of the environment and also has adverse effects on the health of the society. The recognition, monitoring and administration of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a complicated, unmanageable process and utilizes more human effort, time and cost which is not congruous with the present day technologies in any way. This project Garbage Monitoring using IOT is a very innovative system which will help to keep the cities clean. IOT is the network of physical devices embedded with software and sensors and network connectivity which enables these objects to collect and exchange data. This system will monitor the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. This web page also sends all information to garbage collection vehicles. If the Garbage Collector is filled up to its threshold value then the message is displayed on web portal and the responsible authority take proper action also all the information regarding to the level of Garbage present within the Smart Bin is displayed on to the Smart Bin Application on the users mobile phone. This is an advanced method in which waste management is automated.

**Keywords:** Internet of Things(IOT), Wireless Communication, Arduino, Ultrasonic sensor, WIFI module, GUI, Webpage, Database, Android app.

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## I. INTRODUCTION

Though the world is in a stage of up gradation, there is yet another problem that has to be dealt with Garbage! Pictures of garbage bins being overfull and the garbage being spilled out from the bins can be seen all around. This leads to various diseases as large number of insects and mosquitoes breed on it. A big challenge in the urban cities is solid waste management.

Hence, smart dustbin is a system which can eradicate this problem or at least reduce it to the minimum level. Majority of the public environment seems to be polluted with the waste material. Safeguarding the environment using technology sources is needed at present.



Fig1: Present Scenario

People those who work in this garbage collection job are totally disappointed by the residents improper waste management scenario. Now-a-days Municipal Corporation

itself has provided two separate dust bins for wet and dry garbage. But still people don't even take the efforts for separation. Plastic bags are banned to be used but still we can find dozens of plastic bags in the garbage containing waste food material etc. This has to be stopped. Our present Prime Minister of India, Sri Narendra Modi has introduced the concept of implementing 100 smart cities in India. "Swachh Bharat Abhiyan" was initiated to ensure a clean environment. Majority of viruses and bacterial infections develop in polluted environment. So, modernization of the restaurants is needed by imparting the smart technology. Amounts of waste are largely determined by two factors: first, the population in any given area, and second, its consumption patterns. According to the UN, between now and 2025, the world population will increase by 20% to reach 8 billion inhabitants (from 6.5 today). With this increase in population, the responsibilities towards waste management also increases. Our waste administration frameworks and our economic situations, even taking care of business, are unequipped for taking care of the developing measures of waste universally. So unless a new paradigm of global cooperation and governance is adopted, a tidal wave of uncontrolled dumpsites will be the principal waste management method, especially in Asia.

On the west coast of America, San Francisco leads the way with a landfill disposal diversion rate of 72% and the city has set itself a target of zero waste to landfill by 2020. This paper gives us one of the most efficient ways to keep our environment clean and green. Dustbin is a common means and a basic need everywhere. It is observed that often the garbage get collected due to irregular removal of garbage present in the dustbin. In the proposed paper, a new model for the municipal dustbins which intimates the center of municipality for immediate cleaning of dustbin has been proposed.

## II. PROBLEM STATEMENT

Instead of using plenty of bins in an unordered fashion around the city, minimal number of smart bins can be used. Using only one sensor at the surface level instead of three to four not only makes it affordable but also achieves the same result. We see many times the dustbins which are in bad conditions. Garbage in dustbin all overflowed as well as spelled out the garbage from dustbin. People throw garbage on that dustbin which already overflowed. Sometimes due to this garbage bad smell created, toxic, unhygienic gases are produced due to unclean garbage bins. It is very bad look of the city which is way to support to the air pollution and to some harmful diseases which are easily spreadable.

## III. LITERATURE REVIEW

The major incapability's of present waste bin collection systems are:

1. Lack of information about the collecting time and area.
2. Lack of proper system for monitoring, tracking the trucks and trash bin that have been collected in real time.

3. There is no estimation to the amount of solid waste present inside the bin and the surrounding area due to the scattering of waste.
4. Lack of quick response to urgent cases like truck accident, breakdown and long time idling.

The review explores the existing systems that function using different sensors/technologies. And also chapter explains the current research related to garbage monitoring system and its working method. Lastly, the chapter concludes with a comparison of the existing systems to extract the problem identification. To remove these problems many system has been developed. Some of such researches is summarised below:

The system makes use of Load sensors, IR proximity sensor, RF module and web support. Web page gives a graphical view of the garbage bins in colour in order to show the level of collected garbage[1]. This paper show use of metal sensor, IR sensor(IR diode, photo diode), ultrasonic sensor, RF module, radio frequency (RFID) tags, controller (ATMEGA 16) and GSM. It gave us the concept of dynamic scheduling required for the cleaning of dustbin and led us to priority based cleaning of dustbins when the garbage level reaches its maximum[2]. The bin is equipped with Ultrasonic sensor (HC-SR04) to find the height of garbage filled at different intervals of time., Moisture sensor, Gas sensors, PIC controller, GSM and ZIGBEE. It provided us with additional details and designs needed for flow and management of garbage while collection. It provided the details about the hardware required for detecting the level of garbage[3]. Smart bin is built on Aurdino board platform and is interfaced with a Ultrasonic sensor and GSM/GPRS modem which enables standard communication interfaces like RS-232 (Serial Port), USB, so that it can be easily connected to the other devices. Arduino best described as a single-board computer hardware and software are open source and extensible[4]. In this system, ARM 7-LPC 2138 micro-controller is used to initiate all the operations through it, GSM module and a camera is placed near the garbage bin to take the snapshots of the bin along with a load cell sensor under the bin. This paper making use of Image Processing to improve the waste management. It can prevent pollution and also prevent the consumption of the spread out garbage by the street animals[5]. This paper gave the overview working of the IOT based smart garbage bin and the waste management. It includes the information about all the ways to manage the collection of the garbage. This is, however an original plan for designing a smart garbage in with ultrasonic sensor and Wi-Fi module for transmission of data[6]. The advancement of wireless technology provides a wide range of options. Electronic devices employed in container terminals reduce the manual effort, facilitating timely information flow and enhancing control and quality of service and decision made which technology of integrated logistics can be implemented and what remains to be addressed in the future[7].

After the IoT field finding its grip in our lives. This is, however an original plan for designing a smart garbage bin with ultrasonic sensor, arduino and Wi-Fi module for transmission of data.

#### IV. PROPOSED MODEL

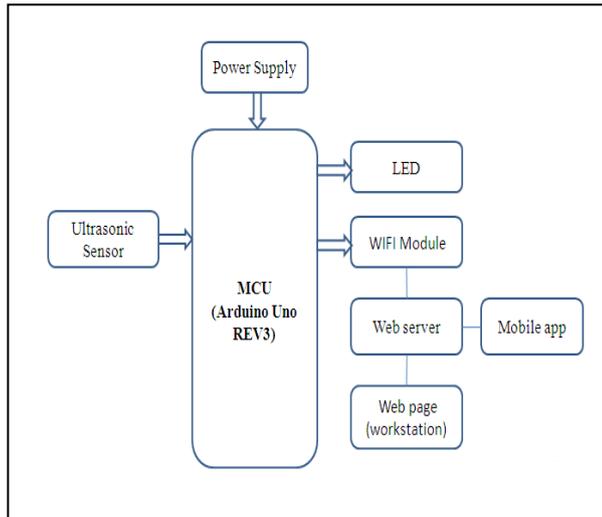


Fig 2: Block diagram of smart bin with control unit

The block diagram shows the complete system which contains the bins installed with sensor unit. The arduino will get the level of the garbage from the ultrasonic sensor, send the information to the server through wireless communication using Wi-Fi module ESP 8266. In the service section, residents throw away the waste in a bin and that information with the sensors is collected and transferred to the administration section. The server (Android) will check for the threshold level and if the level is high it will send the notification to collect the garbage. The web Server displays the details of sensor value, at real time. The same information is transferred to concerned authority so that accordingly the filled bins are timely evacuated.

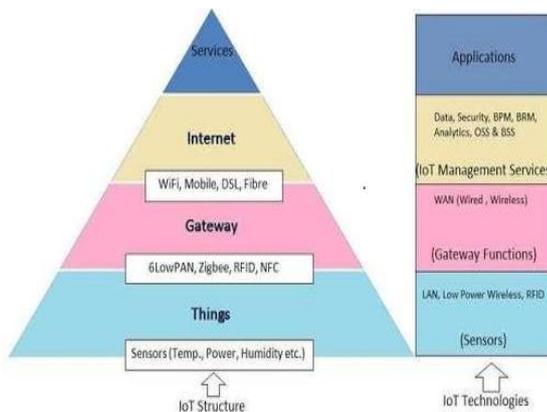


Fig2: IOT Architecture

#### WORKPLAN AND SELECTION OF TOOLS

- Arduino board(ATMEGA328P-PU)
- Ultrasonic Sensors(HCSR04)
- WIFI Module(ESP8266)
- LED
- Power supply

#### Arduino board

The Atmel picoPower ATmega328/P/PU is a low-power CMOS 8-bit microcontroller based on the AVR

enhanced RISC architecture. The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs, 1 byte-oriented 2-wire Serial Interface (I2C), a 6-channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages), a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes.

#### Ultrasonic Sensors

The human ear can hear sound frequency around 20HZ ~ 20KHZ, and ultrasonic is the sound wave beyond the human ability of 20KHZ. An ultrasonic sensor transmit ultrasonic waves into the air and detects reflected waves from an object. There are many applications for ultrasonic sensors, such as in intrusion alarm systems, automatic door openers and backup sensors for automobiles.

#### WIFI Module (ESP8266)

WiFi stands for **Wireless Fidelity**. WiFi It is based on the IEEE 802.11 family of standards and is primarily a local area networking (LAN) technology designed to provide in-building broadband coverage Current WiFi systems support a peak physical-layer data rate of 54 Mbps. The ESP8266 requires 3.3V power supply. ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network.

#### LED

Light emitting diodes(LED) are semiconductor pn-junctions. When the led is forward biased electrons are able to recombine with holes within the device, releasing energy in term of photons.

#### V. CONCLUSION

This proposed system, integrates different sensing and communication technologies to monitor real time bin information. This system is good enough to carry out practically as it has advantages that 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. In Smart system design main is Development of web portal and applications for city administration, municipal staff and public.

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