



## Smart Garbage Monitoring System

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### ABSTRACT

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 over populated 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. 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. The data from sensors than will be sent to Firebase from where android App will fetch it and will inform the corresponding authority to collect the waste when the garbage. 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

**Keywords:** Arduino UNO, Ultrasonic Sensor, Servo Motor, Jumper Wires, Bread Board, Arduino IDE, Firebase Database, Android SDK, Java, Extensible Markup Language

### 1. INTRODUCTION

The ultimate need of the hour for a developing nation is the key for "Smart City". The influential ecological factors that pose to be a threat to this may include: hazardous pollution and its subsequent effects on health of humanity, alarming global warming and depletion of ozone layer etc. Mostly Environmental pollution may be owing to the Municipal Solid Leftovers (MSL). A Proper maintenance becomes mandatory for an efficient and effective removal of the generated Municipal Solid Leftover. It is perceived that often the waste space gets too much occupied due to irregular removal of garbage occupancy in the dustbin. This exposition proposes an e-monitoring system that puts forth an e-monitoring system to eradicate or minimize the garbage disposal problem using Iota Technology. The Internet of Things (IoT) is a recent communication paradigm that envisions near future, in which the objects of everyday life will be equipped with microcontrollers, transceivers for digital communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet. This design designates a technique in which the garbage level could be checked at regular intervals which would prevent the undesirable overflow of the bin. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins. For this, the system uses ultrasonic sensor splaced over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of Arduino family microcontroller. Programming in the Adriano UNO is done in such a way that once a particular level of filling is sensed information message is sent requesting a clean-up. The ultimate need of the hour for a developing nation is the key for "Smart City". The influential ecological factors that pose to be a threat to this may include: hazardous pollution and its subsequent effects on health of humanity, alarming global warming and depletion of ozone layer etc. Mostly Environmental pollution may be owing to the Municipal Solid Leftovers (MSL). A Proper maintenance becomes mandatory for an efficient and effective removal of the generated Municipal Solid Leftover. It is perceived that often the waste space gets too much occupied due to irregular removal of garbage occupancy in the dustbin. This exposition proposes an e-monitoring system that puts forth an e-monitoring system to eradicate or minimize the garbage disposal problem using Iota Technology. The Internet of Things (IoT) is a recent communication paradigm that envisions near future, in which the objects of everyday life will be equipped with microcontrollers, transceivers for digital communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet. This design designates a technique in which the garbage level could be checked at regular intervals which would prevent the undesirable overflow of the bin. This system monitors the garbage bins and informs about the level of garbage collected

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Objectives of the project:

1. Monitoring the waste management.
2. Providing a smart technology for waste system.
3. Avoiding human intervention.
4. Reducing human time and effort.
5. Resulting in healthy and waste ridden environment. This project falls under the category of embedded systems and android Applications.

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## 2. LITERATURE REVIEW

Existing systems with functionalities and limitations

1. Padma et al [1] recommended a smart waste management system to notify the waste level in the dumpster. This system was composed of an ultrasonic sensor, micro controller and GPRS module. The dumpster's status will be notified regularly using the sensors in the system. The sensor data is also stored in the database for future analysis.
2. Shilan et al [2] from Iraq developed a smart solid waste monitoring and collection system. Ultrasonic Sensor, Arduino Uno and Radio Frequency (RF) transmit term were installed on the top of the waste box for the monitoring task. A message (SMS) will be sent to the cell phone of the truck driver about the location and ID of the dustbin whenever the waste box is full and needs for disposing the garbage.
3. Andréa's et al [3] accomplished a comparative analysis on solid household waste and its impact on environment in seven European countries such as Germany, Denmark, France, UK, Italy, Poland and Greece. Different Countries are adapting different technologies for management, collection, reuse, recovery of waste. All countries need to update their technology periodically to meet the current challenges in the waste management process.

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## 3. Requirement Analysis

### 3.1 Hardware Used

- Arduino UNO

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the micro-controller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without working too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again

- Ultrasonic Sensor

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emissions of the sound by the transmitter to its contact with the receiver. The formula for this calculation is  $D = \frac{1}{2} T \times C$  (where D is the distance, T is the time, and C is the speed of sound 343meters/second)

- Servo Motor

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. A servo motor is a general term for a specific type of linear or rotary actuator. Basically, the name servo motor refers to the term servo mechanism, which means that the motor is constantly monitored to control its motion

- Jumper Wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

- Bread Board

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an early version of) an electronic circuit, like this one with a battery, switch, resistor, and an LED (light-emitting diode). The connections are not permanent, so it is easy to remove a component if you make a mistake, or just start over and do a new project. This makes breadboards great for beginners who are new to electronics

### 3.2 Software Used

- Arduino IDE

Arduino IDE (Integrated Development Environment) is the software for Arduino. It is a text editor like a notepad with different features. It is used for writing code, compiling the code to check if any errors are there and uploading the code to the Arduino. It is cross-platform software which is available for every Operating System like Windows, Linux, mac OS. It supports C/C++ language. It is open-source software, where the user can use the software as they want it to. They can also make their own modules/functions and add them to the software. It supports every available Arduino board including Arduino mega, Arduino Leonardo, Arduino Ethernet and more. Word file is called a Document similarly, Arduino file is called a Sketch where the user writes code. The format of Arduino is saved as ino

- Firebase Database

Firebase is an app development platform that includes integrated tools for creating, growing, and monetizing apps. On a variety of platforms, the Firebase SDK allows for more accurate and efficient access to Firebase services. Many Firebase components are open source, high-quality content sources that aid in community growth on Git Hub. Google Firebase is a Google-supported app development platform that allows developers to improve apps for iOS, Android, and the web. Firebase has capabilities for keeping track of data, reporting and correcting app problems, as well as marketing and product testing. Firebase Real-time Database is a cloud-based No SQL site that allows for real-time data storage and synchronization across users. Data is transferred in real time to all clients and is accessible even when the app is turned off.

- Android SDK

The Android SDK stands for Google's Android Software Development Kit for the Android Platform. We can simply design android apps using the Android SDK. The Android SDK is a set of libraries and software development tools that are required to create Android apps. The compatible SDK is updated whenever Google releases a new version or upgrade of Android Software. Some functionality from the previous version of the SDK are absent in the upgraded or later version. The Android SDK includes some of the most critical tools for creating android apps. These technologies allow the development process to flow smoothly from development through debugging. The Android SDK is compatible with a wide range of operating systems. Android Studio is Google's official integrated development environment (IDE), based on JetBrains' IntelliJ IDEA software and tailored exclusively for Android development

- Java

Java is a high-performance, object-oriented programming language that relies on as little functionality as feasible. It's a software development platform for computers. As a result, Java is quick, secure, and dependable. On laptops, data centres, game consoles, research computers, mobile phones, and other devices, it is commonly utilized to construct Java applications. It is a general-purpose programming language that allows programmers to write once and run anywhere, allowing for the use of integrated Java code without the requirement for re-integration across all Java-based platforms. The Java operating system gives flexibility that is frequently lacking in typical integrated languages.

- Extensible Markup Language

XML (Extended Language Language) is an HTML language that is comparable to HTML but does not need the usage of predefined tags. Rather, it specifies your tags as they pertain to your unique requirements. This is a great tool to save, search, and share data in a format that can be saved and shared. The Extensible Markup Language is a simple, extensible text format based on the Standard Generalized Markup Language. XML was created to address the primary issues of electronic publication, but it now plays an essential role in wide data sharing on the web and elsewhere. Throughout the internet, the XML design principles promote simplicity, familiarity, and usability. It's a text data format that supports a wide range of human languages using Unicode. Despite the fact that XML is primarily intended to represent documents, it is also commonly used to express unsuitable data structures like as those found in online services.

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## 4. MODULES

- Waste Separator: Using Ultrasonic and Moisture Sensor to detect type of waste.
- Garbage overflow detection: Using ultrasonic sensor detect the garbage level

- Smoke Detection: Detect smoke in bin
- Home page: To view status of bins.

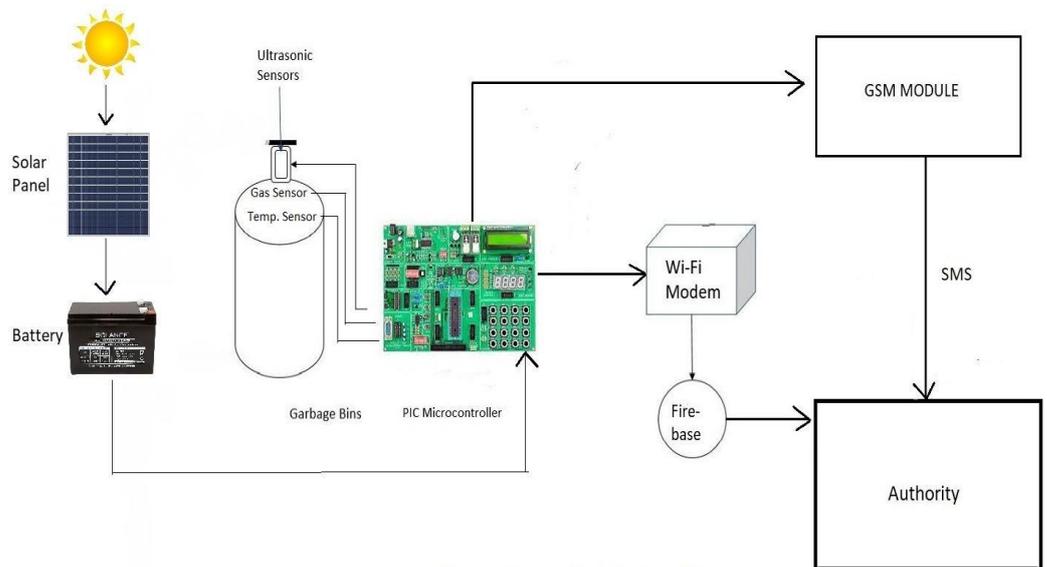


Fig. System Architecture of Smart Garbage Monitoring System

## CONCLUSIONS

In this Project our main objective of this “Task update based social question and answer platform” is to answer or solve the queries of the people they are facing in their day to day life in future our “Task update based social question and answer platform” scope will be scalable. Furthermore, this Task Update Application just needs to use mobile data or Wi-Fi. With development of the application, it will enhance the brand of company that is follow revolution industry.

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