Android Application and SMS Alert Based Garbage Monitoring and Navigation System

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Abstract. The treatment of waste is unsafe in city centres where residents are more involved, leading to germs that can lead to disease. How commonly these litter containers are used in different regions is different. Regular timing checks are not helpful. Often, they will overflow much faster than expected. In this article, a smart waste monitoring method is advised to prevent this and increase cleaning, to figure out where the waste is complete. The architecture of the method collects and transmits information through a wireless network. Under this technique, the dustbin’s waste level is measured by sensors and information is transmitted through the GSM and GPS module to the official mobile station. Wi-Fi Module is used to track waste levels online at the control room. Arduino Processor uses network modules to link sensor systems.

Keywords: IoT, Garbage, Security, Health, Environment

1. Introduction

Recovery and recycling of waste is an excellent service to the residential population in the area. Almost 85% of the allocation for waste disposal covers storage and transports, attributed to the lack of a viable administration approach [1]. Workers monitor the selection and transfer activity in the area. In order to periodically remove accumulated garbage, proper maintenance is needed. It is not usual to see the garbage is cleared in the local area from the garbage cans. At present, how the solid waste is collected must be improved; it is important to track dustbins' location in real time[2]. This exhibition includes a continued cloud server online management system that saves fuel and time by stopping repetitive monitoring. Furthermore, the precise position of the dustbins loaded and the shortest GPS navigation path makes the operation more efficient and convenient[3]. A survey study has extracted the simple concept of using a smart dustbin where some future waste management potential using the Internet of Things in smart cities can be introduced. It deals with many IoT technologies such as RFIDs, sensors, actuators, GPS, etc., where intelligent waste management is feasible[4-5]. Many
studies on waste control and surveillance have been done. An individual pursuing research uses a wireless sensor network, which does not provide location information to track the filled-in place of a trash can[6]. A researcher developed a GUI to show different parameters as well as trash collection information. It covers the state of the trash can, place, time gathered and date. However, the sensor used is the infrared sensor that detects the level of waste less reliably since an object or hand's movement may be perceived in such a location as a level. In a report, the exact state of a dustbin network is tracked and stored in a database, and related work has been performed[7]. For connectivity, it uses Zigbee and GSM/GPRS interfaces. However, the constraint is that when dustbins are filled, they do not have a warning notice and navigation path. In some methods, a network of wireless sensors was considered to track the location of a dustbin filled[8]. A basic GSM-based waste overflow indicator is introduced in a paper that is only an integral part of entire waste management and control. In certain analyses, trash cans were tested in real-time; those vulnerabilities limited them. These writers have been working on the communicating units of GSM/GPRS to compile information about the waste labels and send it to the server. It provides GSM/GPRS connections to each waste can, but it cost more to run[9-10].

2. Proposed System
The ultrasonic sensors feel the volume of waste in the waste bins in this document.

The Arduino is scheduled to dispatch sensing information to empty it when the amount hits a specified mark. The same is seen in fig. 1. Efficient observation on the cloud server online tracked waste collection state[11].

The ultrasonic sensor on the top of the dustbin senses the proposed device's waste volume by causing a high pulsation or transmitting a ping from the sensor's TRIG pin. The internally available clock begins ticking when the pin TRIG is high followed by the pin LOW (for a span of 10μs). 40 kHz of audio is dispatched from the transmitter for eight cycles. Moreover, the time taken to hit the pulse will start to be counted. The echo will be received on the ECHO pin[12], and this is achieved by recording the time spent and determining the distance of the object as the distance = (speed of the sound in the air x time spent) /2, where the air sound speed is 340m/s or 29 cm/μs. The Arduino UNO board uses GSM, GPS and Wi-Fi module to power the sensor[13].

By using the ESP8266 Wi-Fi module, we can transfer sensor data processed by Arduino permanently via a hotspot to a cloud server. Data are sent to the Thingspeak Cloud server every 15 seconds, which helps to track the dustbin status online continuously[14]. The global GPS module with a receiver antenna effectively determines its location based on the GPS satellites it receives. The GPS module sends data on Arduino's microcontroller's latitude and length values in real-time tracking location. There are also Dustbins with LED signs to let people know how far the bins are filled. If more than 70% of the green space is open, it is ON. In the case of half-full containers (say 25 to 70% of the space), a yellow light will glow, and a red light will glow when the threshold level is reached[15].
Figure 1. Block diagram of the system

The microcontroller sends control to the GSM Module, the time that the waste level exceeds a threshold, which sends a text message to alert the mobile customer to the dustbin. The SMS also provides a link that guides the user to Google Maps, where he can reliably see the position of the GPS module dustbin and take the fastest navigation path from his current location into the dustbin.
The specific steps involved in tracking garbage and gaining access to the dustbin position are seen in fig. 2. Initially, the sensor keeps on checks the garbage level can once if it gets filled then the GPS location of the bin gets updated to the cloud server. So that the concerned authorities can take away the garbages in the dustbin.

3. Results
According to the research protocol, the suggested device was used in the atmosphere and evaluated, as illustrated in Section III. In the following section, the findings obtained are discussed.
Figure 3. Status of dustbin

The real-time tracking of the cloud service was tracked, and findings are shown in fig. 3. The bin’s height is initially determined by an ultrasound sensor and registered in 18 cm without dumping the waste. During dumping of the waste in the bin, the bin height is also lowered to 12 cm. If the diameter is known, the volume of waste dumped in the container is well understood. The GPS module in the dust bin provides the relevant control authority with the latitude and longitude values needed to assess which bin is overflowing. The same is shown in fig. 4.

Figure 4. Dustbin location

When the threshold amount of 4 cm (< 25%) in a bin has been achieved, a warning message has been sent to a cell phone with a navigation point, which is seen in fig. 5.

When the alert message is received from the monitoring authority’s cell phone, the individual bin is cleaned automatically, and the original value is displayed on the recording device. In other words, 18 cm. Because all of these data are stored on the Cloud Server, this IoT-based waste and waste management system can be tracked efficiently. Figure 6 displays the same field.
4. Conclusion

For the proper control of waste, an advanced IoT-based device is planned. An infrastructure that uses ultrasonic sensing and IoT communications technology to track waste management device over time is clarified. Residential pollution accumulates as long as there are days. Therefore to deter environmental contamination, waste must be collected and discarded from dustbins on a timely basis. In the jurisdictions that control and handle local waste with less human interference, it will be incredibly beneficial to provide online tracking of the dustbin status with a warning when the dustbins fill up and the navigation path to the dustbin site.
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