International Journal of Advanced Technology in Engineering and Science
Vol. No. 10, Issue No. 04, April 2022
www.ijates.com
ijates
ISSN 2348 - 7550

Solid Waste Management using Image Detection and Sensor

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Abstract

In cities today, garbage bins or dustbins are common, and located at a particular distance around every corner of the city. The volume of garbage produced often causes the bins to overflow due to the constant flow of garbage. As a result, it creates an unhealthy situation for people by spreading some deadly diseases and spreading solid smells; in order to prevent spreading of garbage on the streets, locals will be responsible for putting spreaded garbage in the bins. void such occurrences we intend to design smart bins, which contain some sensors, such as IR sensors, photoelectric sensor, loRa and radio frequency identification (RFID) card reader as well as an image detection system and GPS module As soon as garbage is detected around a bin, the sensor starts beeping, which creates some noise. In order to prevent spreading of garbage on the streets, locals will be responsible for putting spreaded garbage in the bins. With IR sensors, the message of bin overflow will be sent to the appropriate authorities, who will take action to remove the trash.

Keywords: - Solid waste, Sensor, Image detection, IR Sensor, LoRa, RFID.

I. INTRODUCTION

Automatic garbage detection system based on deep learning and Internet of things. The image detection and sensor main role for unique identification. There are arranging frameworks dependent on picture preparing which recognize waste or other uncommon waste. Be that as it may, these become if there should arise an occurrence of paper and plastic items. In addition, there are not many existing frameworks which are independent. The system detects garbage image and identify the object. The image does not match with data storage image. The sensor senses the image and start beeping, as the sensor sounds the people in the near by area will take the garbage to the bin, so there will be more cleanliness. So one of the critical issues that is becoming difficult to lead hygienic life in an efficient waste management system. So Automatic garbage detection system are most useful the human beings. With a joined methodology comprising of the equipment gadgets, for example, an automaton, Arduino, GSM module and picture preparing programming calculations.

The predefined dataset would include pictures for example, squander metal jars, bottles, folded paper, plastic packs and so on. Image processing is one of the main parts of a structure of signal processing, where the input is in the form of an image. Image processing, either as an improvement for the human viewer or autonomous analysis software offers the advantages of flexibility, speed.Improve the details of the image with

an end goal to eliminate undesirable distortions and upgrade a few qualities of the input picture. The image is detected by the camera the sensor senses the image.As the sensor sounds the people in the near by area will take the garbage to the bin,so there will be more cleanliness. So Automatic garbage detection system are most useful the human beings. By this way the society area will be clean.

Specifically, the paper looks at how streets can be handled and cleaned on-site, with the main focus being the development of a smart solid waste management system that reduces costs and improves quality at the same time. The monitoring and management system of solid wastes has been developed in an innovative manner to enhance the efficiency of their collection and transfer on-site. Wireless Sensor Networks (WSNs) have been developed to monitor garbage bins more efficiently. As part of smart cities, the key infrastructure incorporates IoT systems, sensor networks, cameras, data centers, etc. This enables the city authorities to provide essential services to their clients efficiently. Furthermore, smart cities make use of technological advancements as a means of managing their transportation systems, providing advanced health care services, and developing robust, reliable wireless networks to connect all businesses, people, and things.

II. LITURATURE SURVEY

1. SMART CITY- GARBAGE MONITORING SYSTEM USING IOT

   In this project, the 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 helps to collect the garbage from the garbage bins on time before the garbage overflows from that bin which can possess threat to the health of the people leaving in nearby area. This project can avoid such situations of overflowed dustbin and the message can be sent directly to the cleaning vehicle instead of the contractor's office (Authority). In Smart system design main is Development of web portal and applications for city administration, municipal staff and public.

2. An Internet of Things Based Smart Waste Management System Using LoRa and Tensorflow Deep Learning Model

   This article presents a smart waste management system by implementing sensors to monitor the status of the bin, LoRa communication protocol for low power and long-range data transmission, and TensorFlow-based object detection to perform waste identification and classification. The model was able to detect and classify waste according to classes such as metal, plastic, and paper. This automated segregation and monitoring system implementation in the bin aims to reduce the operating cost and improve the waste management system. At the same time, we are eager to develop the city into a smart city.

3. IoT-Based Solid Waste Management Solutions

   To achieve the transformation of traditional cities into smart cities, waste management becomes a critical element in achieving sustainability, efficiency in public spending, improving urban mobility, and preserving natural resources. Using IoT, it is possible to track the location of waste containers, monitoring the level of garbage deposited, identify locations with the highest demand,suggest the shortest route for collection optimization of solid waste, or even interface with citizens to encourage

disposal at times when the container can receive waste, which promotes citizenship and avoids significant problems resulting from the accumulation of garbage outside garbage collectors.

4. Solid Waste Collection as a Service using IoT-Solution for Smart Cities

Garbage collection in recent years was treated in a rather stagnant way. The propagation of sensors and actuators enable dynamic models as well. They have developed an application based on android platform,in which real time information about garbage bin is shown in graphical form on map so garbage collector truck driver can go directly to the place where there is need to empty the bin. Also, driver can have active participation in whole system which isn't seen in current waste management system. We have used Google Map API for finding efficient path to reach the desired bin in quick time.

III. METHODOLOGY

1) Arduino board

The Arduino Uno is a microcontroller board based on the ATmega328. The Atmel Pico Power ATmega328/P/PU is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. The Arduino Uno can be powered via the USB connection or with an external power supply.

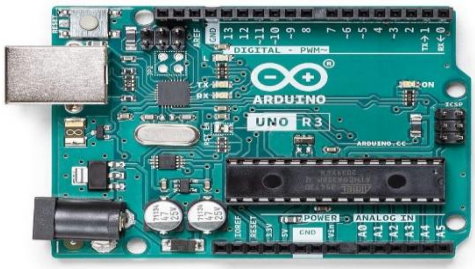

Figure 1: Arduino Board

2) Image Recognition

If the system database matches or it verified the image then it will give the sence or give access to the sensor for the other system implemention. As below I have given the flow chart fig of image recognition system how its it works and what will happens when it recognised image and what will happen when it does not recognise image. And rest of system and sensor will work.

Figure 2: Image detection

3) WSN(Wireless Sensor Network)

Wireless sensor networks (WSNs) refer to networks of spatially dispersed and dedicated sensors that monitor and record the physical conditions of the environment and forward the collected data to a central location. These are similar to wireless ad hoc networks in the sense that they rely on wireless connectivity and spontaneous formation of networks so that sensor data can be transported wirelessly. Sensing technology combines the physical with the digital world by capturing and revealing real-world phenomena and converting them into data that is processed, stored, and used in the digital domain. In addition to sensing components, wireless sensor nodes have on-board processors, radio chips, and storage modules. Due to these enhancements, a sensor node is now not only responsible for data collection, but also for analyzing its own data together with data retrieved from other nodes in the network.

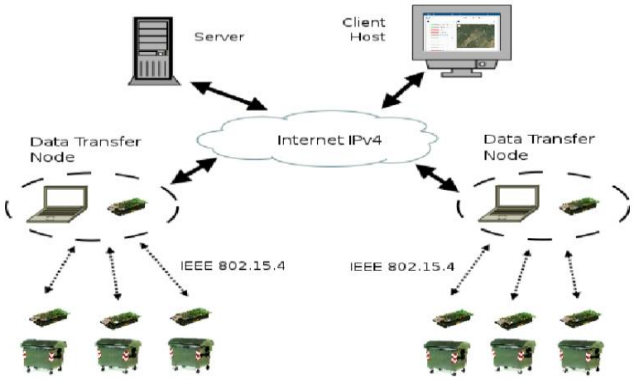

Figure 3: WSN Architecture

4) GSM model

A GSM modem or GSM module is a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network. From the view of the mobile phone network, they are essentially identical to an ordinary mobile phone, including the need for a SIM to identify themselves to the network. A customised Global System for Mobile communication (GSM) module is designed for wireless radiation monitoring through Short Messaging Service (SMS). This module is able to receive serial data from radiation monitoring devices such as survey meter or area monitor and transmit the data as text SMS to a host server.

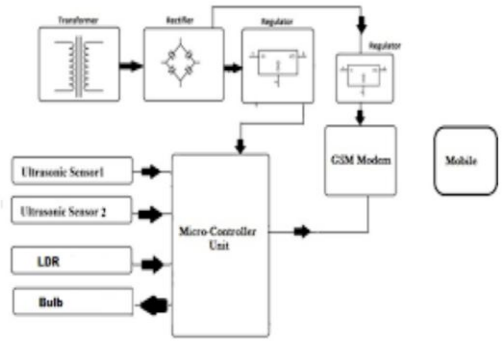

Figure 4: GSM BASED GARBAGE MANAGEMENT

5) LoRa

LoRa (short for long range) is a spread spectrum modulation technique derived from chirp spread spectrum (CSS) technology. Long range communication board has been developed in order to provide a flexible and reliable low-cost DTN. Quectel M10 GSM/GPRS module, based on the embedded OpenCPU, has been used. OpenCPU is a software layer, running on an embedded ARM processor, which provides a powerful support environment to facilitate the development of cost effective wireless machine-to-machine applications for Quectel M10 module. Using standard Clanguage, OpenCPU enables to develop innovative embedded applications. Figure 5 shows the fundamental principles of OpenCPU software architecture.

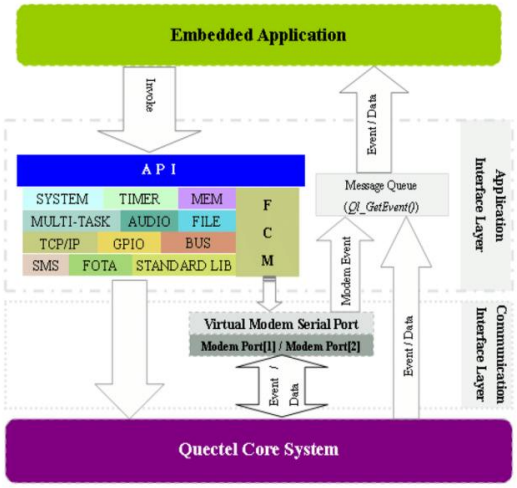

Figure 5: OpenCPU Software Architecture

IV. CONCLUSION

The project presents a smart way to collect wastage in a smart city. Based on a prototype IoT system that measures the level of waste in bins and sends it to the server via the internet, the system determines the amount of trash to be disposed of. This integrates different sensing and communication technologies to monitor real time bin information. The system is useful in the real world because it will assist in collecting the garbage from the garbage bins in time so that they will not overflow, which will pose a potential health threat to people in the neighborhood. Using this project might be able to avoid situations like overflowing dustbins, as the message can be sent directly to the cleaning vehicle rather than to the contractor's office (Authority). Using IoT, it is possible to track the location of waste containers, monitoring the level of garbage deposited, identify locations with the highest demand, suggest the shortest route for collection optimization of solid waste, or even interface with citizens to encourage disposal at times when the container can receive waste, which promotes citizenship and avoids significant problems resulting from the accumulation of garbage outside garbage collectors.

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