An Innovative Method of Automatic Smart Bin using Lora Technology

N.Kumareshan[1] R.Preena[2] R.Priya Dharshini[3] R.Priyanga[4] V.Sangeetha[5]
[1]Associate Professor [2,3,4,5]UG Scholar
[1,2,3,4,5]Sri Shakthi Institute of Engineering & Technology, Coimbatore, T.N, India

Abstract— Today we see the garbage waste bins are overflowing and all garbage is split out from dust bins, which results in unhygienic condition, illness and bad smell for all people near that area. Hence, we are designing the system based on Lora for monitoring garbage from particular area to avoid pollution, unhygienic condition, bad smell, etc. The dust bin is interfaced with microcontroller based system having IR sensor for opening and closing of garbage. When garbage reaches the level of sensor, then there will be an indication by Lora that will be given to the microcontroller unit, and microcontroller sends signals to the garbage bin and it moves the bin according to the Arduino coding. Dust bin act as a robot and it moves to the programmed area based on the line path follower to dispose the waste. This will help us to keep the environment clean. This new technology helps the public to get the garbage clean without the involvement of human beings, also to know about the current status of facilities in their area. The main aim of this project is to reduce human resources and efforts along with the enhancement of a smart city vision.

Key words: Automatic Smart Bin, Lora Technology

I. INTRODUCTION

Waste management is one of the core concerns of modern age. As nations around the world are developing, their concerns and accountability for a healthier and sustainable environment is also increasing. While developed countries are investing and implementing smart solutions for waste management and bringing about huge positive impacts, waste management seems to be a play out of the league for the under developed or developing countries. There are numerous categories and each with different classifications of waste materials, like clinical to nuclear, biodegradable to non-bio-degradable and common household to industrial toxic waste. Waste management is all the activities and actions required to manage waste from its inception to its final disposal. This includes collection, transportation, treatment and disposal of waste together with monitoring and regulation. Waste collection methods vary widely among different countries and regions. Nowadays, cities with developing economies experience exhausted waste collection services, inadequately managed and uncontrolled dumpsites and the problems are worsening. Waste collection method in such countries is an on-going challenge and many struggle due to weak institutions and rapid urbanization. In this research, we proposed to design and implement an effective smart waste management system based on IoT in perspective of developing countries for smart decision making systems and decreasing time algorithm for collection and sorting of waste.

Smart waste management is a idea where we can control lots of problems which disturbs the society in pollution and diseases. The waste management has to be done instantly else it leads to irregular management which will have adverse effect on nature. The smart waste management is compatible mainly with concept of smart cities. Smart bin is an innovative community dust bin designed for efficient and reliable waste management for smarter cities. Smart bin bears easier provision for removal of bin. Everyday garbage is produced from industries, work places and houses to dispose off.

The main objectives of our proposed system is to providing a smart technology for waste system, avoiding human intervention, resulting in healthy and waste ridden environment, reducing human time and effort. The smart, sensor based dustbin will judge the level of waste in it and send the message directly to the municipal corporation. It can sense all the type of waste materials either it is in the form of solid or liquid. According to the filled level of the dustbin, the vehicles from the municipal corporation will choose the shortest path with the help of the "transportation software", which will save their time. It emphasizes on "digital India". The system is simple. If there is any problem with any equipment in the future, that part is easily replaceable with new one without any difficulty and delay.

Sensor based waste collection bin is used to identify status of waste bins if it is empty or filled so as to customize the waste collection scheduled accordingly and also save the cost. Real time waste management system by using smart dustbin to check the fill level of dustbins whether the dustbins are full or not, through this system the information of all smart dustbins can be exist from anywhere and anytime by the concern person. It will inform the status of each and every dustbin in real time so that concerned authority can send the garbage collection vehicle only when the dustbin is full. By implementing this system resource optimization, cost reduction, effective usage of smart dustbins can be done.

To manage waste collection through sensor based smart dustbins It will stop overflowing of dustbins along roadsides and localities as smart bins are managed at real time. The filling and cleaning time of smart bin will also be reduced thus making empty and clean dustbins available to common people. It also aims at creating a clean as well as a green environment. By using the route algorithm it will smartly find the shortest route thus it will reduce the number of vehicles used for garbage collection. Send optimized routes directly to drivers. It will reduce fuel consumption' Less amount of fuel consumed by vehicles thus can save a large amount of money as well.

The arduino project started at the interaction design institute Ivera (IDII) in Ivera, Italy. In 2003 Hernando Barragan created the development platform wiring as the master's thesis project at IDII, under the supervision of Massimo Banzi and Casey Reas, who are known for work on the processing language.The goal was to create simple, low cost tools for creating digital projects by non-engineers. The wiring platform consisted of a printed circuit board (PCB) with an ATmega168 microcontroller, an IDE based on processing and library functions to easily program the microcontroller. In 2003, Massimo Banzi, with David Millis, another IDII student, and David Cuartielles, added support

for the cheaper ATmega8 microcontroller to wiring. But instead of continuing the work on wiring, they forked the project and renamed it Arduino. Arduino is open source computer hardware and software company, project and user community that designs and manufactures single- board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Pubic License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself.

II. RELATED WORK

Given the twofold objective of this work, this section reviews the related work in the two noted aspects of waste management, namely route planning and collection scheduling, and bin design enhancement efforts.

A. Route Planning for Waste Collection

Waste collection relies on dedicated vehicles departing and returning to preset locations (waste sites) that are fuel-intensive and limited in the roads they can traverse due to their sheer size. Meanwhile, general route planning emphasizes point-to-point shortest path of travel, with considerations recently expanded to avoid congestion. However, these schemes overlook incorporating other information sources such as the surrounding area environment, time of day, and/or special events.

The solution is specifically aimed at large-containers dedicated to large waste removal, e.g. utilizing containers at construction sites and shopping districts. A rollon-roll off routing scheme is used that is based on a. Vehicle Routing Problem (VRP) variant with the objective of minimizing the number of waste collection vehicles. The solution employs a large-neighborhood search using an iterative heuristic. Nuortio et al. propose a guided-variable neighborhood thresholding metaheuristic approach in to address both the route planning and collection scheduling. The scheme incorporates variables that capture neighborhood status and is designed to be lightweight in terms of storage and computational requirements. The results of the scheme implementation show that the scheme outperforms other classical routing techniques. Bing et al. modeled waste collection routing as a graph-based problem, with curbside-pickup and facility drop-off modeled as a node-routing problem. The authors propose aggregating nearby nodes through clusters in order to identify the most economically efficient routes that exploit the trade-off between collection cost and environmental impact of waste collection. Collection trucks are then grouped based on the material to be collected, with the ACS utilized to include data about current bin status to improve the waste collection efficiency. While the scheme is reported to perform favorably, considerations for scaling the ACS for large cities were not clearly pronounced.

III. LIMITATIONS OF EXISTING WORK

There are numerous technologies in today's world that is used in IOT applications. Every technology has its own features, merits and demerits. One technology cannot serve all the application of IOT. Different applications will have different requirements. No technology can be said as the best technology. Application also differ from their usage .some of the existing technologies are Wi-Fi, Cellular Networks, LAN, ZigBee, NB-IOT.

WIFI is the most popular technology that has been recently evolved and is used in long distance communication. We have Bluetooth and ZigBee for short distance as well and these can and are being used in various applications. But in all of this battery is more concern.

CELLULAR NETWORK the traditional cellular network consisting of GSM, 2G, 3G and 4G are very popular and widespread. These are one of the well-established networks. But these were traditionally built for high data throughput and so these do not optimize the power consumption .these technologies consume too much power and are not a good option when small amount of data is to be transmitted less frequently. The total cost of ownership is very high. With the adverts of 5G technology many of cellular providers are discontinuing 2G services orphaning the IOT devices running.

LAN or Local Area Network is a widely adopted standard. It is used within a limited area such as in buildings, schools, office, laboratories etc. LAN can be wired or wireless. Ethernet and WIFI are the commonly used technologies in LAN. The wireless technology used in LAN is WIFI. They provide a wireless link for communication. The WIFI is usually confined within a small area such as a building, home office. It can span over a limited range that is 1km in radius.

ZIGBEE is based on high level communication protocol used to create personal area networks. It consists of small power digital radios. These are best suited of small scale projects that need to transfer data over small distances. Its range is 10-100m.these are based on mesh networks that transmit data over long distances by Transmitting data to many intermediate devices. This consumes power and thus is not suitable for application with low power requirements.

NB-IOT stands for narrow band IOT.NB-IOT is based on FDMA. It needs infrequent synchronization which leads to higher battery consumption. But the latency and data rates good.NB-IOT is suited for IOT personal and IOT public.To overcome this type of technology drawback we go for LORA technology which consumes low battery power and small of data transmission over long distances.

IV. PROPOSED METHODOLOGY

The developed systems make use of the waste management control in the environment. This system is to find the overfilled bin in the streets and send messages to the web server. The proposed system will contain smart bin, webserver and Lora technology. Each smart bin contains sensors, microcontroller, Lora gateway, and Lora transmitter and receiver. The sensors are placed at the top middle and bottom of the bin so that it will detect the level of the waste in the bin. The sensed information is send to the

microcontroller which is connected to the Lora gateway. Lora gateway is a form of the bridge between devices and the things of network. Devices use low power networks like Lora wan to connect to the gateway while the gateway uses high bandwidth networks like WIFI, Ethernet to connect the things of networks. The information from the Lora receiver is been send to the centralized server. And that server contains the database of filled bin in the streets. The message of filled bin is send to the vehicle. The benefits of using the Lora technology are to reduce the power consumption and the battery life will be efficiently used.Lora is a new wireless IOT connectivity family that has recently evolved and is gaining popularity in low powered battery operated embedded systems that need to transfer small amount of data at short intervals overlong range.

The block diagram of a Smart bin, the components avail for the system is:

1) Sensors
2) Motors
3) Microcontroller
4) Lora gateway

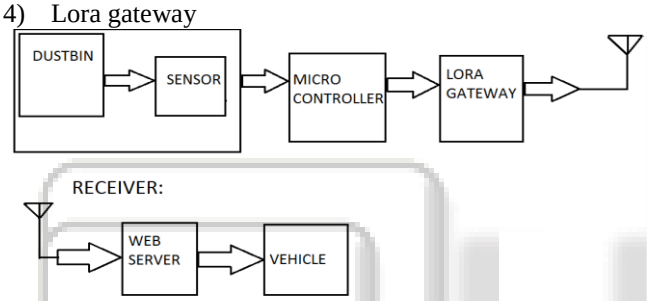

Fig. 4: 1Block diagram

Sensors are used to measure physical quantities such as temperature, light, pressure, sound and humidity. Transmitter is a set of equipment used to generate and transmit electromagnetic waves carrying messages or signals. The function of memory in a microcontroller is the same as a microprocessor. It is used to store data and program. It has a certain amount of RAM and ROM or flash memories for storing program source codes. LORAWAN is a protocol designed for creating large scale public networks, the technology allows for sensors to talk to the internet without 3G or WIFI.A Web server is a program that uses Hyper Text Transfer Protocol to serve the files that form web pages to users. Receiver is a device which decodes the signal and then conditions or transforms into something which a computer can understand.

An infrared sensor is an electronic device, which emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, which can be detected by an infrared sensor. The emitter is simply an IR LED and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

A. LORA Technology

Lora uses license-free sub-gigahertz radio frequency bands like 169 MHz, 433 MHz, 868 MHz (Europe) and 915 MHz (North America). Lora enables long-range transmissions (more than 10 km in rural areas) with low power consumption. The technology is presented in two parts: Lora, the physical layer and Lora WAN (Long Range Wide Area Network), the upper layers. Lora is a spread spectrum modulation technique derived from chirp spread spectrum (CSS) technology, and is the first low-cost implementation of chirp spread spectrum for commercial usage. In January 2018, new Lora chipsets were announced, with reduced power consumption, increased transmission power, and reduced size compared to older generation. Lora devices have geo location capabilities used for triangulating positions of devices via timestamps from gateways. Lora and Lora WAN permit long-range connectivity for Internet of Things (IOT) devices in different types of industries.

1) Advantages

1) Very compact, thin and light, especially in comparison with bulky, heavy CRT displays.
2) Low power consumption. Depending on the set display brightness and content being displayed, the older CCFT backlit models typically use less than half of the power a CRT monitor of the same size viewing area would use, and the modern LED backlit models typically use 10–25% of the power a CRT monitor would use. Little heat emitted during operation, due to low power consumption.
3) The possible ability to have little or no flicker depending on backlight technology.

2) Disadvantages

1) Limited viewing angle in some older or cheaper monitors, causing colour, saturation, contrast and brightness to vary with user position, even within the intended viewing angle.
2) Uneven backlighting in some monitors (more common in IPS-types and older TNs), causing brightness distortion, especially toward the edges ("backlight bleed").
3) Black levels may not be as dark as required because individual liquid crystals cannot completely block all of the backlight from passing through.
4) Display motion blur on moving objects caused by slow response times (>8 ms) and eye-tracking on a sample-and-hold display, unless a stroking backlight is used. However, this stroking can cause eye strain, as is noted next.

B. APPLICATIONS

1) No constant mixing or turning.
2) Lifetime support.
3) Long lasting.
4) Compost all kind of waste.
5) Give organic drain
6) Completely safe to handle

V. CONCLUSION

By implementing this project we can able to monitor the level of garbage in the dustbin placed at public places, according

to that we can collect garbage waste of particular which will avoid overflow conditions and help to reduce pollution as well as different hazards of health. This system will reduce the wastage of fuel. The disposal of garbage is done effectively in the system. The IR sensor is used to open the garbage. Once the threshold level is reached, it will immediately move to the disposal area. By using V2V protocol the nearby garbage occupies the programmed area. The message is sent to the centralized server. Garbage bin1 act as a robot which follows the line path follower algorithm to dispose the waste. Once the waste is thrown immediately the garbage bin 1 comes back to the original position and garbage bin 2 will return back to its position. This involves Lora technology used for long distance communication for transmitting and receiving the radio waves. This is an effective technology when compared to WIFI, LAN, Cellular network and Zigbee. This creates a user friendly environment without the involvement of human being.

REFERENCES

[1] M. H. A. Wahab, etal., "Smart Recycle Bin: A Conceptual Approach of Smart Waste Management with Integrated Web Based System, "International Conference on IT Convergence and Security (ICITCS), 2014, Beijing, 2014, pp.1-4. doi: 10.1109/ICITCS.2014.7021812.
[2] Prakash, Prabhu, "IOT based management system for smart cities", International journal of Innovative research in science, Engineering and
[3] Technology, Vol 4, Issue 2, February 2016.
[4] P.C.Stem, Toward a coherent theory of environmentally significant behavior,journal of social issues,Vol 56:3,pp. 407-424, 2000
[5] Raghumani Singh,C.Dey,M. Solid Waste Management of Thoubal Municipality,Manipur-a case study Green Technology and environment conservation(GTEC 2011),2011 International Conference Chennai 21-24.
[6] Vikrant Bhor,Smart Garbage Management System International Journal of Engineering Research and technology(IJERT), Vol 4 Issue 03,March 201552000. Ieeexplore.ieee.org/docment/6914431/

