

# Debris Monitoring And Clearance System Using IoT

P.Vinoth Kumar<sup>1</sup>, P.Kiruthika<sup>2</sup>, S.Manisankar<sup>3</sup>, A,Karthikeyan<sup>4</sup>, K.Jagadeeshwaran<sup>5</sup>  
<sup>12345</sup>(Electronics and Communication Engineering, Nandha College Of Technology/Anna University, India)

## Abstract

*Internet of Things (IoT) is a system, which interconnects multiple devices. Every mechanical and digital device are having unique identifiers (UIDs) and able to transfer data over a network by using an IoT system, which can also be used to monitor and control. Example - Home Appliances. Waste management has become a major crisis due to peaking population limits. The wastes have been disposed of in random places due to a lack of awareness and time. In this paper, we propose a system to come over this daily problem using the MQ125 sensor module and rain sensor by connecting the system through an IoT network. This model proves a better solution among the already implemented ideas, implementing the system in various conditions. The efficiency of this system is also more promising in removing the household wastes without human resources.*

**Index Terms** – Trash, IoT, Sensor, Debris, Monitor, Cleaning.

## I. INTRODUCTION

A survey of the World Health Organization (WHO) states that India is the second most populated country. In India, around 1400 million peoples were lived during the 2001-2019 period. Accordingly, about 285 million peoples are lived in urban areas, and 742 million peoples were lived in rural areas. So it gets polluted easily in many ways. Air pollution, water pollution, noise pollution, soil pollution, light pollution, marine pollution, nuclear pollution, thermal pollution are types. Among these types, soil pollution is one of the major problems.

Soil pollution means the chemicals affect the nature of the soil. The major causes of soil pollution are deforestation, agriculture activities, mining process, population, household wastes, nuclear waste, and sewage remedy.

Deforestation is the biggest threat to our environment, caused by cutting down trees in the forest. An increase in the human population leads to deforestation. It affects animal habitats, and also it is the biggest cause of climate change in the world. Some effects of deforestation are soil erosion, global warming.

The radioactive wastes from nuclear power plants, which are dumped in the land, will cause harmful effects to be human and animal habitats. The land with radioactive material cannot be used for any other purpose.

Mining is the process of extracting metal and minerals from the earth. It will adversely affect the land and leads the greenhouse production.

The improper way of disposing the chemical waste from the industry will contaminate the soil and reduce the soil's quality. It causes chronic health issues to the people.

Household waste consisting of garbage, rubbish waste like bottles, clothes, cans, food scraps, yard trimmings—these residential wastes to contaminate the soil.

Nowadays, debris is one of the biggest problems in our society. It leads to unhealthy environments and affects the lives of people. These days, it is difficult to dispose of the garbage. It plays a major part in metropolitan cities like Delhi, Mumbai.

The current system can only able to monitor and indicate the level of waste in the trash can. To overcome this problem, we introduce a technique that monitors and disposes of the waste when not only it gets filled but also whenever the foul smell comes out of the trashcan.

## II.OBJECTIVES

This task is to design and build a prototype for an automatic open dustbin that can robotically open the lid while detecting the people who need to throw out their trash. It additionally can stumble on the level of the trash in the dustbin. If the dustbin is complete trash at the sure level, the lid will no longer open even if there are humans who want to throw out their trash. Dustbins are provided with a sensor which allows in tracking the level and weight of the garbage boxes, and a unique ID will be furnished for each dustbin inside the metropolis so that it is straightforward to discover which rubbish bin is complete. To keep away from the decaying smell around the bin harmless chemical sprinkler is used so that it will sprinkle the chemical as soon as the smell sensors stumble on the decaying odor. Waste management is all the sports and actions required to manipulate waste from inception to its very last disposal. So this may be done by imposing IoT primarily based on waste management using a clever dustbin.

## III. METHODOLOGY

The main methodology of this system is a wireless sensor network, embedded system, IoT cloud, and robotics. The main component of this system is a microcontroller and various type of sensors.

The wireless sensor network that can be used to monitor all kind of physical parameters. It may include a gas sensor,



an IR sensor, and also a rain sensor. The embedded system can use in this system in the way of controlling all the activities of the system in a programming manner. The IoT cloud that will be used transfers data from one system to another system via the internet. In these systems, the data will be transferred module to the smartphone through the internet. The robotics form of these systems is a dustbin because it moves automatically and disposes of the waste in the desired place.

The microcontroller can control all the activities of these systems. Then all the activities of the system will be displayed in Liquid Crystal Display(LCD) and also in smartphones through a wireless sensor network.

Due to the microcontroller commands, the driver(motor) Moves forward and reverse. In these systems, there are six motors used for moving purpose actions. The microcontroller also controls the lid.

#### IV. EXISTING SYSTEM

In the existing system, the garbage will be monitor and also indicate the authorized person through the internet cloud. However, it has lower efficiency. The garbage is filled; it could not be cleared until the arrival of an authorized person. The next level system is the level of garbage in the dustbin shown in the head of municipals. Moreover, clear the waste by municipal workers. Nevertheless, this method also not efficient for in trend generations because the population will be increased and also waste increases.

#### V. PROPOSED SYSTEM

In the proposed system, IR sensor, Rain sensor, and gas sensors are used to detect the respective parameters, and garbage level is monitored by using IOT system and take necessary steps. This system automatically opens the lid when it detects the people who want to throw out their trash. Once the bins are full, the user will not be able to access the bins. Then the user gets the intimation from the dustbin via mobile application. If people throw any bad smell and wet objects, it will automatically close with a detector's help.

Due to the sensor characteristics, our performance will be performed successfully. The rain sensor will be used to detect the water level. In rain flow in suddenly, the dustbin will automatically close. So, we avoid the unnecessary smell.

The gas sensor is mainly used to detect the unwanted smell in the dustbin because vegetable waste is one of the main sewage in the household dustbin. If more than two days the vegetable waste present in the dustbin, automatically it creates an unwanted smell and also human health issues.

The following block diagram will explain our proposed system.

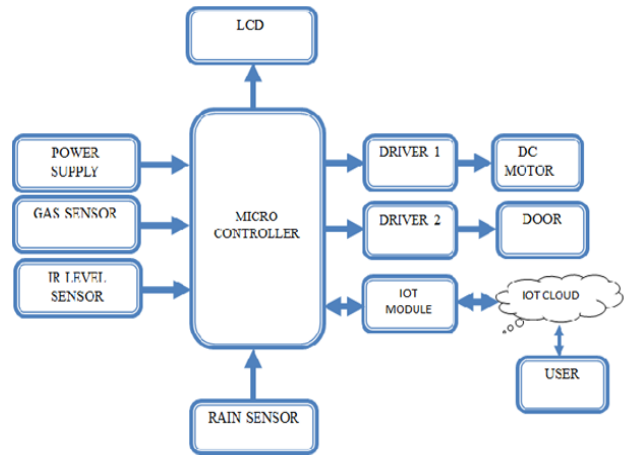


Fig: Block Diagram

The level sensor monitors the level of dust, and in case it is filled, intimation is sent to the respective person. After a particular time spell, it will automatically move to the desired location. The rain sensor is a switching device activated by rainfall. If rain or wet objects are detected at the door of the garbage bin is automatically closed. The gas sensor is used to identify the toxic material. If it detects any toxic material inside the garbage, it will automatically move to the desired area and automatically disposed of it. The microcontroller processes the sensor's data, and it sends information to the authorized person via IoT. This system automatically opens the door when it detects the people who want to throw out their trash. The LCDs the status of the garbage. The Internet of Things (IoT) intimates the garbage bin's status to the registered mobile application.

#### VI. IMPLEMENTATION SETUP

##### A. HARDWARE DESCRIPTION MICROCONTROLLER



Fig 1: Microcontroller

PIC16F877 belongs to a class of 8-bit microcontrollers of RISC architecture. It has an 8kb flash reminiscence for storing a written program. Since memory made in FLASH technology can be programmed and cleared greater than once, it makes this microcontroller appropriate for tool development. It has data memory that needs to be stored when there may be no delivery.

It is typically used for storing important facts that must no longer be misplaced if the power supply all of a sudden

stops. For instance, one such fact is an assigned temperature in temperature regulators. If in the course of a loss of energy supply this information was misplaced, we would adjust over again upon return of supply.

### IR SENSOR



Fig 2: IR sensor

An infrared sensor is a digital device that emits which will feel some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These sorts of sensors measure the handiest infrared radiation, emitting it that is called a passive IR sensor. The infrared sensor (IR sensor) is a light-sensitive optoelectronic thing with spectral sensitivity in the infrared wavelength range (850 nm ... 50  $\mu$ m).

### GAS SENSOR



Fig 3: Gas sensor

Gas detectors can be used to detect combustible, flammable, and toxic gases and oxygen depletion. This kind of device is used broadly in industry and may be found in locations, along with on oil rigs, to reveal manufacturing approaches and emerging technologies, including photovoltaic. They may be utilized in fire fighting.

### RAIN SENSOR



Fig 4: Rain sensor

A rain sensor or rain switch is a switching tool activated through rainfall. There are two major applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to close down in the event of rainfall.

### LCD

LCD (Liquid Crystal Display) screen is an electronic show module and finds a wide variety of applications. A 16x2 LCD may be very simple and maybe very commonly utilized in various gadgets and circuits. These modules are favored over seven segments and different multi-phase LEDs.



Fig 5: LCD

A 16x2 LCD can display 16 characters according to the line, and there are two such lines. In this LCD, each man or woman is displayed in a 5x7 pixel matrix. This LCD has two registers, namely command, and data

The command register stores the command instruction given to the LCD. A command is the LCD training to do a predefined mission like initializing it, clearing its screen, setting the cursor position, controlling the display.

The statistics register stores the facts to be displaced at the LCD. The statistics are the ASCII fee of the man or

women to be displayed at the LCD. Click to learn greater about the inner structure of LCD.

Advantages are:

- LCD are economical and easily programmable
- No limitation of displaying unique characters.

### INTERNET OF THINGS (IoT)

An IoT system consists of sensors/devices which “talk” to the cloud through some connectivity. Once the data gets to the cloud, software processes it and then might decide to act, such as sending an alert or automatically adjusting the sensors/devices without the need for the user.

### SOFTWARE DESCRIPTION EMBEDDED C

Embedded C Programming is the soul of the processor functioning inside each embedded machine used in our daily life, such as mobile phones, washing machines, and the virtual camera. Embedded C language is most often used in the software of the microcontroller.

It consists of an 8051 based Microcontroller along with its basic components (like RESET Circuit, Oscillator Circuit) and components for blinking LEDs and Resistors. In order to down the Embedded C Program for the above circuit.

### VII. SCOPE OF FUTURE WORK

In the future, the robot will navigate any places such as the staircase and slanting places. Then it will be modified to segregate the wastes. Moreover, it will be used in metropolitan cities.

### VIII. CONCLUSION

The proposed solution is cost-efficient in terms of other solutions compared to CCTV cameras or RFID tags being used for garbage monitoring. Cameras are expensive and require very high data rates to shoot good quality videos.



Fig 6: LCD Initial Display



Fig 7: Initial intimation

Moreover, along with video shooting, there should be efficient image or video processing algorithms to find out the status of garbage bin.

Figure 6 shows the initial display of the LCD. If the power button is on, then LCDs “DEBRIS MONITORING AND CLEARANCE SYSTEM”.

Figure 7 shows that the initial setup of our system. It shows “PLS USE BIN” and also gives awareness to people about smart garbage disposal.

The simulation results have been monitored at smartphone showing gas sensor threshold value in figure 9.



Fig 9: Threshold level of gas sensor

If the gas sensor reached the sensor threshold value, the dustbin door would be closed, and automatically dust bin will be reached the desired location, and then the door will be opened dispose of the waste.

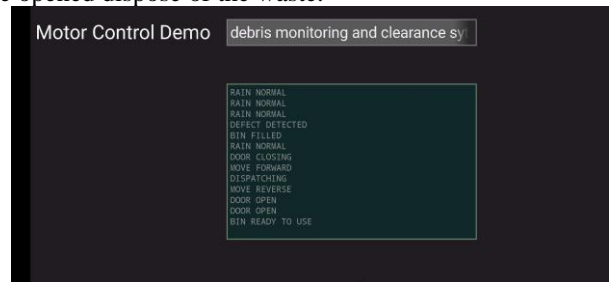


Fig 10: Monitoring results are shown in a smartphone

Figure 10 shows the output results in a smartphone about the rain sensor. If the rain sensor senses any water content, the dustbin will be automatically closed, and dispose of the waste in the desired location.

If any abnormal condition of the dustbin gets to feel like wet or filled, the intimation will be given to the authorized person’s phone and shown in the system’s display unit.

After that, the dustbin moves towards the desired location via the desired path. Figure 10 explains the following action.



Fig 11: Initial step of disposing of the waste

If the dustbin feels abnormal conditions such as wet or filled, the dustbin moves towards the desired location via the desired path. This is shown in figure 11, such as “**DOOR OPEN**”.



**Fig 12: Dispatching the waste**

Suppose the door will be open, the dustbin ready to dispose of the waste. It is shown in figure 12, such as “**DISPATCHING**”. Furthermore, after that, the dustbin door will be closed.



**Fig 13: Reverse action of dustbin**

The dustbin door will be closed; after that, the dustbin again goes to the desired location(starting point). The dustbin moves reversed, and it is displayed in figure 13, such as “**MOVE REVERSE**”.



**Fig 14: Recycle process of our system**

Once the dustbin disposes the waste and also reaches the desired location, that LCDs “**BIN READY**”. It is shown in figure 14. Furthermore, it also recycles the process again and again.

The bin gets filled and automatically navigated the desired path, and dispose of the garbage at a specific place by using motors. The prototype model is shown in figure 15.



**Fig 15: Prototype model**

Our proposed system more efficient compared to the previous system. Our system saves people time. Our system is mainly applicable to urban city houses.

In the entire world, waste control is a major difficult one. If it is not well disposed or cleaned, you can reason many deceases and wreck the green surroundings. There is a want for the latest mechanism to dispose of the waste properly. In our project, we have an advanced, efficient waste management device. Technology has been used to provide better rubbish disposal strategies in urban areas. We have used sensors to indicate if the containers are filled door empty. When crammed, a truck driver gets a message to clean the bin. This system eliminates the contemporary day status about the bins, which might be the most of the time laying in a pathetic situation regarding full of garbage without being cleaned. We have additionally advanced an android application throw which the user can find a bin close to him to throw the trash. This creates a right away connection where every citizen is doing his element to hold smooth surroundings around him. A net server has also been set up through which the municipal authorities also get information approximately the packing containers in their area. This venture came in comfortable, which a worthy elucidation for preserving a green environment. This model is providing IOT possibilities for improvement and future development. In our assignment, the subsequent enhancement can be made.

## REFERENCES

- [1] Belalchowdhury, Morshed U Chowdhury., *RFID BASED REAL-TIME SMART WASTE MANAGEMENT SYSTEM*, in Australian telecommunication networks and applications conference ,Christchurch, New Zealand.(2007).
- [2] Saurolonghi, Davidemarzionit, Emanuelealider, Gianluca Di bu' o, Mario prist, Massimo grisostomi and matteopirro., *SOLID WASTE MANAGEMENT ARCHITECTURE USING WIRELESS SENSOR NETWORK TECHNOLOGY*, in universit'a politecnicadelle marche, Dipartimento di ingegneriadell' informazione via brecebianche, Snc.
- [3] S. Vinoth Kumar, T. Senthil Kumaran, A. Krishna Kumar and Mahantesh Mathapati ., *Smart Garbage Monitoring and Clearance System using Internet of Things* IEEE international conference on smart technologies and management for computing, communication, controls, energy and materials.(2017).
- [4] Saadia Kulsoom Memon, Faisal Karim Shaikh, Naeem Ahmed Mahoto, Abdul Aziz Memon., *proposed IoT based smart garbage monitoring and collection System using WeMos and ultrasonic sensors*.
- [5] Abhay Shankar Bharadwaj Rainer Rego, Anirban Chowdhury., *IoT Based Solid Waste Management System*, in Frugal Labs Tech Solutions Private Limited, Bengaluru, Karnataka, India .(2016).
- [6] Jetendra Joshi, Joshitha Reddy, Praneeth Reddy, Akshay Agarwal, Rahul Agarwal, Amrit Bagga, and Abhinandan Bhargava., *Cloud Computing Based Smart Garbage Monitoring System*.(2016).
- [7] S. Sivaranjani, V. Ashok and P.Vinoth Kumar., *Data scheduling for an Enhanced Cognitive Radio System in Healthcare Environment*, Bioscience Biotechnology Research Communications. 11(2) (2018) 147-157.
- [8] Sivaranjani S, Kaarthik K ., *IOT based Intelligent parking system at airport*, International Journal of Recent Technology and Engineering. 7(6) (2017) 513-516.
- [9] Kaarthik K, Sivaranjani S., *A Novel PDA Technique with Flying Capacitor for Buck Boost Converter*,International Journal of Innovative Technology and Exploring Engineering.8(5) (2019) 445-451.
- [10] Pradeep.S, Vinoth Kumar. P, Sivaranjani.S., *LOW COMPLEXITY EDGE DETECTION AND IMPULSE NOISE REMOVAL IN VARIOUS IMAGES*, International Journal of Future Generation Communication and Networking.12(5) (2019) 89-101.
- [11] Vinothkumar. P, Jayanthi.R, Mohankumar. G. B, Rathanasabhpathy. G., *DEFENDED AND EFFECTIVE RELEVANCE PROTOCOL FOR NEAR FIELD COMMUNICATION APPLICATIONS*", JOURNAL OF MECHANICS OF CONTINUA AND MATHEMATICAL SCIENCES, Special issue.(2020) 131-138.
- [12] P.Jaswanth, K.Lalith Kishore, S.B.T.Abhyuday, YJayasairam., *Thrash Deplorer System using IOT through Web Application*, SSRG International Journal of Computer Science and Engineering 5(11) (2018) 9-12.
- [13] R. Selva Kumar, R.S. Reshma, K. Mahima., *Real Time Implementation of Smart Bin using IOT*, SSRG International Journal of Electronics and Communication Engineering.6(3) (2019) 10-14.