

## IOT BASED WASTE MANAGEMENT SYSTEM USING NODE MCU

Mr.K.Vishwak Sena Reddy<sup>1</sup>, P. Manoj Kumar<sup>2</sup>, M. Seenu<sup>2</sup>, T. Srinivasulu<sup>2</sup>, T.Kiran Kumar<sup>2</sup>.

<sup>1</sup>Professor, Department of ECE, Narayana Engineering College, Gudur, AP, 524101.

<sup>2</sup>UG Student, Department of ECE, Narayana Engineering College, Gudur, AP, 524101.

[manojthalapathy29@gmail.com](mailto:manojthalapathy29@gmail.com)

\*\*\*

**Abstract** – This project presents a novel approach to provide illustrative model of the Waste Management systems using IoT Waste Management System. Garbage segregation and monitoring is an essential issue for most of the cities in India. The current garbage monitoring and management system are highly ineffective contributing to high transportation and collection costs. Due to poor monitoring and collection, garbage bins are seen overflowing in certain areas which can lead to long-term problems such as bad odor and harmful diseases. To overcome these problems “NodeMcu based smart garbage monitoring system” can be introduced as an effective solution. This smart garbage monitoring system employs NodeMcu as its main microcontroller. It uses the ultrasonic sensor as a level detector to detect the amount of garbage in the bin. And also moisture sensor is used to segregate dry and wet waste.

### Software Tools:

- Arduino IDE
- C-Language

**Key Words:** Waste Management segregation, Node MCU, Segregation.

## 1. INTRODUCTION

Internet of Things (IOT) built embedded system is the technology where an integrated developer connects various embedded devices to the internet. IOT for embedded system includes of multiple things like collect large amount of data and analyze it from different perception and brief them in useful data to improve the way devices and services are used today and making way for the embedded device smarter than before. Architecture, which suits for real-time operation, is needed by smart embedded systems. With billions of gadgets expected to take part in the coming years, experts expect IOT to have a significant impact on device design. In today's age as the population is increasing day by day, in many towns, unhygienic environment resulted due to the overflowed bins which further increases different types of unknown illnesses and degrades the standard of living. One of the main issue in the urban cities is

waste management, implementation of the smart dustbin is therefore major requirement for eliminating this problem or at least bring this issue to minimum point. Recently program of the implementation of 100 smart cities in India is announced by our Prime Minister Sri Narendra Modi, also “Swachh Bharat Abhiyan” is one of the key initiative which is helping to guarantee clean and healthy environment. The paper aims to, propose a model for smart garbage system based on IOT for urban areas acts as one of the innovative systems to keep the cities clean. The system monitors the dustbins in different locations and updates the status of each dustbin on a server. For this, the system uses ultrasonic sensor placed over the bins to detect the garbage level, selected the espresso chip for this purpose which is a node MCU ESP8266 platform, Global system for mobile communication to send a message to the garbage collector. Besides, the shortest path to reach the dustbin will be given via link. collection and disposal costs constitute 75-80% of a city's solid waste management budget. Therefore, In the current garbage management and disposal system, the litter bins allotted for each locality or each street are emptied by cleaners at regular intervals of time. This system has several disadvantages such as: In certain areas the garbage bins fill at a faster rate than the other and are thus seen overflowing in streets. Such garbage bins pollute the surrounding environment and also form breeding grounds for several harmful pathogens. The overflowing garbage bins also release the foul smell. In certain other areas, the waste production rate is slow and bins are semi filled when the collectors arrive to empty the bin. This causes excess use of fuel and adds on to waste transportation and collection costs. Moreover, the production of household garbage and municipal solid waste is increasing at a rapid pace each passing day. According to research conducted, solid waste even a small improvement in waste collection and transfer operations can lead to significant savings in costs. In order to eliminate all these existing problems, proper garbage monitoring is essential. Thus, NodeMcu based smart garbage monitoring and disposal system has been proposed as a potential system to the existing problem.

## 2. AIM AND OBJECTIVE

Our Ultimate aim is to detect the waste and segregate or Separate Wet and Dry Waste and detect the level of Bin. In this project, we proposed a Novel approach For Managing and

Segregation of waste ,Based on its form i.e, whether Dry Waste or Wet Waste and percentage of Waste present in the particular Bin

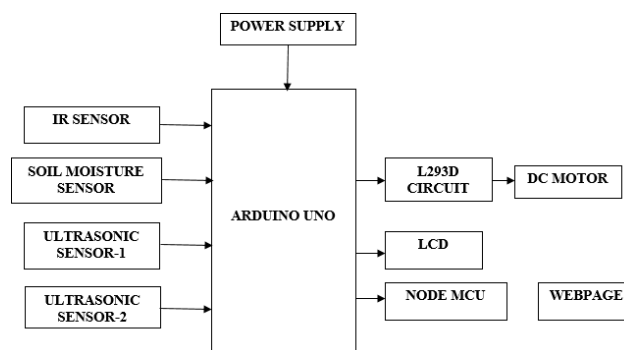
### 3.LITERATURE SURVEY

The paper on Smart Garbage Monitoring and Clearance System using the Internet of Things by S. Vinoth Kumar, T. Senthil Kumaran, A. Krishna Kumar and Mahantesh Mathapati proposed IOT based smart waste clean management system which checks the waste level over the dustbins by using Sensor systems. Once it detected immediately this system alerts concern authority through GSM/GPRS. Arduino-based Smart Garbage Monitoring System Analysis Requirement and Implementation by Namakambo Muyunda and Muhammad Ibrahim proposed a system which can monitor the state of a garbage bin and relay the monitored state to a central database, collect Sensor data from each bin and display it on a webpage to alert the relevant authorities of the states of the various garbage bins in a given area, store sensor data for each of the garbage bins to provide analytical information for each of the garbage collection areas and provide route planning for the collection based on the selected fill level and priorities of each bin. The paper “IoT based smart garbage alert system using Arduino UNO” by Dr. N. Sathish Kumar, B. Vijayalakshmi, R. Jenifer Prarthana, A. Shankar proposes a smart alert system for garbage clearance aided by the ultrasonic sensor which is interfaced with Arduino Uno to check the level of garbage filled in the dustbin and sends the alert to the municipal web serv garbage is filled. After cleaning the dustbin, the driver confirms the task of emptying the garbage with the aid of the RFID tag.the whole process is upheld by an embedded module intergrated with rfid and IOT facilitation an android application is developed and linked to a wed server and the notifications are sent to the android application using wifi module

### 4.PROPOSED METHOD

The proposed system detects the waste on board and classifies them based on the moisture content as dry or wet waste. It is then being placed in the appropriate bins and the levels of the bins are continuously monitored. In case the level on the bins exceeds 80 or 90% fill stage, there is an automatic notification sent to the civil authorities, intimating that the bin would be 100% filled soon, thus enabling the possibilities of them clearing the bin asap. The whole process is completely automated and the data is stored on the cloud, so as to avoid delay in time and involvement of human labor.The Proposed system constitutes the NodeMCU[fig6] Controller, Ultrasonic Sensor[fig5], IR Sensor, Moisture Sensor and deploys MQTT Protocol for sending alert to the authorities. Prior to initializing the Data Sending Process, a Segregation setup in used to detect the wet and dry wastes and classify them and sort them accordingly.The system comprises of three sections viz a viz ,

Waste Segregation System , Cloud Server System, and the Data Process System



### 5.HARDWARE COMPONENTS

#### A.AURDINO UNO:

1. The Aurdino Uno is a microcontroller board based on the ATmega328.it has 14 digital input/outputpins (of which 6 can be used as PWM output),6 analog inputs, a 16 MHZ cermaic resonator, a USB connection, a power jack, an ICSP header, and a reset button.
2. It contains everrthing needed to support the microcontroller;simply connect it to a computer witha USB cable or power it with a AC to DC adapter or battery to get started
3. The uno differs from all preceding boards in that it does not use the FTDI USB-toSerial driver chip . Instead, it features the Atemga 16U2(Atmega8U2 up to version R2) programmed as a USB - to-Serial converter

#### B.NODE MCU :

1. Node MCU is open source LUA based firm ware developed fot ESP8266 wifi chip . By exploring functionality with ESP8266 chip .Node MCU Development board
2. Since Node MCU is open soruce plat form, their hardware design is open for edit /modify/build
3. Node MCU DEV Kit/ board consist of ESP8266 wifi enabled chip
4. The ESP8266 is low cost WI-FI chip developed by Espreess if system with TCP/IP protocol
5. ESP8266 is WI-FI enabled system on chip (SoC)module developed by ESpress if system .it ismostly used for development of IOT (Internet of things ) embedded application

### C. LCD :

1. A Liquid Crystal Display (LCD) is a thin, flat display device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector.
2. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystal between them, light passing through one would be blocked by the other.
3. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.
4. A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to a controller is an LCD display.

### D. MOISTURE SENSOR :

1. Moisture sensor is used to detect the water/moisture content in the waste.
2. If the moisture content is high, it detects as wet waste, and if low, it detects as dry waste.

### E. ULTRASONIC SENSOR :

1. Ultrasonic sensor can measure the distance to a wide range of an object regardless of shape, color, or surface texture.
2. Ultrasonic sensors work by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to be reflected back, calculating distance based on the time required.

### F. IR SENSOR:

1. IR sensor is called as Infrared sensor.
2. It is used to detect the presence of any waste, whether it is wet waste or dry waste.

## 4. RESULT



## 6. CONCLUSION

The main aim of the project is to obtain real time data of percentage of garbage from garbage bins placed in various parts of the city. Along with the fill level data other important parameters such as pollution in ppm, humidity, and temperature of the bin are monitored and sent to ThingSpeak channel and Blynk interface. When the garbage level in particular dustbin has reached the maximum level then the employees can be informed and they can immediately take certain actions to empty it as soon as possible. It will reduce the wastage of time, cost and energy of the human. It will also prevent the occurrence of any disease. The truck drivers easily get information about the clearing process and do their work immediately. Thus this method of monitoring garbage level enhances the overall efficiency of the whole process.

## REFERENCES

1. Smart Waste Management System using IoT Prof. S.A. Mahajan, Akshay byKokane,Apoorva Shewale, MrunayaShinde , Shivani Ingale, [Vol-4, Issue-4, Apr- 2017],ISSN: 2349-6495(P) | 2456-1908(O).
2. Smart Waste Segregation and Monitoring System using IoT by V.Sowndharya, P.Savitha S.Hebziba JebaRani,IRJMT(2019).
3. Waste management improvement in cities using IOT, International conference on electronics and IOT, 2020.
4. Segregation of Waste using IOT by Amit Kumar Mittal, International journal of Advancedcomputer research, January 2020.
5. IoT Based University Garbage Monitoring System for Healthy Environment for Students, February 2020, DOI: 10.1109/ICSC.2020.00071.
6. Garbage Monitoring System Using Internet of Things: Methods and Protocols, January 2019, DOI: 10.1007/978-981-13-3600-3\_28.
7. Waste Management System Using IoT-Based Machine Learning in University , Volume 2020 |Article ID 6138637 | <https://doi.org/10.1155/2020/6138637>.
8. C. Vinothini , Tharini M , Saranya Sasikumar G , Ikash K, Karthick R, 2020, IoT based Smart Garbage System Powered with Solar Cell, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 09, Issue 01 (January 2020),
9. An IoT enabled Smart Garbage Management System for Smart Cities – Indian Scenario, IJITEE, ISSN: 2278-3075, Volume-9 Issue-4, February 2020.
10. IOT BASED GARBAGE MONITORING SYSTEM, July2020, <http://www.jetir.org/papers/JETIR2007133.pdf>.
11. IoT Based Garbage Monitoring System Using Arduino Microcontroller, October-2020, <http://www.jetir.org/papers/JETIR2010120.pdf>.
12. A Survey on Waste Management Monitoring System Based on IoT, IJIRTS, May 2020.
13. Development of IoT Based Smart Dustbin Monitoring System, IJEAT, ISSN: 2249 – 8958, Volume-9 Issue-5, June 2020.
14. Household waste management system using IOT and Machine learning by Sonali Dubey,Pushpa Singh, Krishna kant singh, January 2020.
15. Tejashree Kadus , Pawankumar Nirmal , Kartikee Kulkarni, 2020, Smart Waste Management System using IOT, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 09, Issue 04 (April 2020).
16. P Hindusri, P Lehasree, p Venkata Naveen, S Vishnu, P Rajasekar (2021), “Density Based Traffic Controlling System Using Raspberry Pi”, Dogo Rangsang Research Journal, ISSN : 2347-7180
17. B Poojitha, N Nandini, C Yeseswi, B SaiKiran, P Rajasekar (2021), “Smart Agriculture Based On IoT”, Dogo Rangsang Research Journal, ISSN : 2347-7180