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Location Based Garbage Management System

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Abstract: *The rapid growth in the population has also led to a surge in the volume of waste being generated daily. This increase in the generation of waste due to continuous growth in urbanization and industrialization has become a severe problem for local and national governments. It is also posing a serious problem for the local authorities to manage the wastes being dumped everywhere as a landfill. To ensure minimal risk to the environment and human health, it is necessary to take meticulous measures when segregating and transporting waste. Segregation of waste in a proper manner brings to the limelight the actual economic value of the waste. The traditional method used for segregating waste in India is through rag pickers which are time- consuming and can have adverse effects on the health of the people who are exposed to such waste. Here we propose the use of an Auto Waste Segregator (AWS) which is cheap and also an easy-to-use solution for the segregation of household waste. It is designed to segregate the waste into two categories viz. dry and wet waste. The system makes use of a Wet sensor for the segregation of wet and dry waste and Moisture sensor for the detection of dry waste and an LCD for displaying the result of segregation.*

Keywords: Waste Segregation, Arduino, Garbage Monitoring, Ultrasonic Sensor, IR sensor, Rain sensor

I. INTRODUCTION

Today's world is very concerned about waste disposal. The method used to dispose of a large amount of created waste has had a negative impact on the environment. Unplanned open dumping at landfill locations created by municipalities is typical practice for trash disposal. This strategy has an impact on both plant and animal life as well as human health. The toxic waste disposal technique produces hazardous substances that contaminate both the surface and groundwater. It may result in the development of pathogens that spread dangerous diseases. Moreover, this wastes the resources available from the land and lowers the aesthetic value of the surrounding natural environment. In India, rag pickers are crucial to the recycling process. We are in a time where systems and tasks are combining with the power of IOT to provide a more effective way to work and complete chores swiftly! This is the result of using all the power at our disposal. The Internet of Things (IoT) will be able to integrate a wide range

Identify applicable funding agency here. If none, delete this of various systems transparently and without any noticeable hiccups while supplying data for millions of users to consume and profit from. As a result, creating a general architecture for the IoT is highly difficult, primarily because such a system may include a very wide range of devices, connection layer technologies, and services. Solid waste management, which has an impact on the environment, has been one of the key issues. Hence, we communicate information to the concerned parties using new technology, and notice boards are set up in the offices of the concerned parties. The progress of waste across the entire city can be tracked and thus can be monitored by a single system efficiently and concretely. This system can prove to be a revolution for the whole waste management system for future smart cities.

1.1 Motivation

Swachh Bharat Abhiyan:- is a national campaign by the Government of India, covering cities and- towns, to clean the streets, roads, and infrastructure of the country. The aim of choosing this topic is to contribute to this mission with our engineering knowledge for the benefit of our society.

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1.2 Objective

The idea of this project came into existence because of the increase in garbage in the city area. the objective of the project is :

- To manage the dry and wet garbage present in surrounding
- Effective waste management to protect the environment
- To protect the health of people by providing an affordable waste collection system service.
- utilizes the sensor network and builds effective garbage segregation and monitoring system
- Providing a waste management system to the city
- Promoting and ensuring the effective delivery of waste services Achieving integrated waste management planning
- The main need of the system is to intimate an instant location through an Android app

II. LITERATURE SURVEY

IoT BASED SMART GARBAGE MONITORING SYS- TEM USING ZIG-BEE
Author:-V.ASWIN RAAJU, J.MAPPILLLAI MEERAN, M.SASIDHARAN, MR.K.PREMKUMAR.
Abstract:-The future IOT-based smart waste management system checks the waste altitude over the dustbins present in urban areas by using Sensor systems. To check and join together, an android application is developed with desired information which is related to the various level of waste dustbins which is in different locations. The waste bins send notifications with their location details to the drivers for the truck once it is filled up. The higher official will be notified and they can track the respective employees. This system is powered by a solar panel which is also a means of renewable energy resources. We present an intelligent garbage collection management solution based on giving that intelligence using an IoT with the help of Zig-Bee, with sensors. It can read, collect, and transmit huge amounts of data over the ad-hoc network. When put into a cloud, such data can be used to dynamically supervise waste garbage collection mechanisms.

Voice Controlled Automatic Dustbin with Garbage Level Sensing
Author:-Abhishek Ayush, Abhishek Kumar, Aditi Jha, Nilotpal Sarkar, Suresh Chandra Moharana, and Himansu Das
Abstract:-Voice Controlled Automatic Dustbin (VCAD) is a robotic dustbin that is controlled by providing specific voice commands by the user. The speech is received by the microphone of the android device and is processed by the voice module. When the instruction is recognized by the robot, the voice module sends a command message to the robot's microcontroller. The microcontroller analyses the message and takes appropriate actions. When garbage is detected by the sensor applied to the dustbin, it sends a command message to the dustbin's microcontroller. The microcontroller analyses the message and sends the command to the servo motor to open the lid of the dustbin. The objective of this paper is to design a mobile dustbin that is controlled through a smartphone.

AUTOMATION OF SMART WASTE MANAGEMENT USING IoT TO SUPPORT "SWACHH BHARAT AB- HIYAN" – A PRACTICAL APPROACH
Author:-1Bharadwaj B, 2M Kumudha, 3Gowri Chandra N, 4Chaithra G
Abstract:-"Swachh Bharat Abhiyaan" is a national cam- paign initiated by the Government of India, which covers around 4,041 cities and towns, to clean the streets, roads, and infrastructure of the country. The main purpose of the mission is to cover all the rural and urban areas of the country. The application's primary goal is to collect dry and wet garbage separately. The two types of waste are placed on a conveyor belt, with wet waste collection bins positioned on the right side and dry waste collected in dust bins on the left side. The system will get the input through the dust-collecting person through switches and sends a signal to the Microcontroller unit using RF technology. When the belt starts rotating clockwise the dust bin's lid is automatic will get closed, and simultane- ously the waste is dumped into the underground garbage container placed on the ground floor. Here, an IoT module is utilized to manage and keep an eye on the waste, and the data is provided to the relevant organization and the appropriate individual. The mobile app shows the collection of waste and the particular date, day, and arrival time of the vehicle.

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Application of Convolutional Neural Network Based on Transfer Learning for Garbage Classification
Author:-Li Caoa, Wei Xiangb
Abstract:-In order to effectively utilize garbage resources, and reduce environmental pollution and the burden of people sorting garbage, this paper proposes a method of garbage classification and recognition based on transfer learning, which migrates the existing InceptionV3 model recognition task on the Imagenet dataset to garbage identification. First, increase the data set through data augmentation. Then build a convolutional neural net- work based on the source model and adjust the neural network parameters based on the training effect. The training results show that the training accuracy is 99.3test accuracy is 93.2collected in real life for recognition. The recognition results show that the model has good performance and high accuracy, can correctly identify common garbage in life and has reference significance for intelligent garbage classification, which proves the feasibility of this method.

IoT Based Garbage Management (Monitor and Acknowl- edgment) System: A Review
Author:-Sudharani Ashok Ghadage, Dr. Mrs. Neeta Anilkumar Doshi
Abstract:-Solid waste management is one of the primary problems that India faces irrespective of the case of developed or developing states. It is seen that most of the garbage across the roadside is overloaded because the waste is not collected periodically. It creates an unhygienic condition for the people and creates bad odors around the surroundings. This leads to the spreading of some deadly diseases and human illnesses. Most of the time wet and dry wastes are not separately collected so proper processing like composting, recycling and incin- eration cannot be applied to different kinds of waste. This paper reviews the system for garbage management and proposes a system that will take care of the proper processing of garbage. The reviewed systems use the ultrasonic sensor, infrared sensor for detecting the level of waste, Arduino UNO, microcontroller, and Raspberry Pi2 as controlling boards. The proposed system uses ultrasonic sensors (as they are precise and have a large range) to sense the level of garbage in the bin, a flame sensor to detect fire, and a moisture sensor to separate wet and dry garbage. By using a global system for mobile (GSM) the concerned persons (drivers of garbage collecting vehicles as well as concerned authorities) shall be informed through SMS. The officials shall monitor the status of waste bins through the web page. As huge data are to be transmitted and processed fast Raspberry Pi3 is preferred as the controlling board.

Garbage Monitoring and Warning System
Author:-1Nyayu Latifah Husni, 2Robi, 3Ekawati Priha- tini, 4Nurhaida, 5Ade Silvia,6Firdaus
Abstract:-—This paper discusses monitoring the garbage capacity through mobile phones. The overflow of garbage from the container as the result of the fullness of the container gives a bad effect on the environment. The stinging smell disturbs the comfort of the human. In addition, the spilled garbage of course will consist of lots of germs and bacteria that are not good for human health. Hence, a waste capacity monitoring system that can alert a human when a garbage container is full is built up in this research. There are three garbage robots: G-Bot 1, G- Bot 2, and G-Bot 3. Each of the robots sends its data to the mobile phones. Each of the robots can be monitored through mobile phones using the Blynk application. The user can know the condition of the garbage although they are far from the robot. Also, the G-Bot will notify you through notification when it has reached its garbage capacity.

IOT BASED GARBAGE MONITORING SYSTEM
Author:-Dr. K. Alice Mary 1, Perreddy Monica 2, A. Apsurrunisa 3, Chathala Sreekanth 4, G. Pavan Kumar 5.
Abstract:-In the current scenario where the population is increasing day by day, the environment must be clean and hygienic. In most cities, overflowing trash cans create an unsanitary environment. This further leads to the emergence of various kinds of unnamed diseases. This will lower your standard of living. To avoid all such situations, this document presents a clear picture of an IoT-based garbage monitoring system to keep the environment clean and safe. This project's IOT-based garbage monitoring system is a highly innovative system that helps keep cities clean. This system monitors trash cans and provides information on the status of trash collected in trash cans through a website. It also displays not only the weight of the container but also the status of toxic gas generation in the container. To do this, the

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system uses an ultrasonic sensor placed above the bin to detect the level of debris and compares it to the depth level of the bin. The system makes use of an Advanced Virtual Reduced (AVR) Instruction Set microcontroller, an Organic Light Emitting Diode (OLED) screen, a Global system for mobile communication (GSM) modem for sending data, and a buzzer. The system is powered by solar cells and batteries. It uses an OLED (Organic Light Emitting Diode) screen to display the status of the trash collected in the bin and creates a web page to display the status to the monitoring user. The website provides a graphical view of the bins. The display shows trash level status and other sensor information. A buzzer sounds when the amount of dust exceeds the set value or when toxic gas is generated. Thus, the scheme helps keep cities alive by informing the number of garbage dumps by providing a graphical representation of garbage bins via webpages.

III. PROBLEM STATEMENT

Hence our problem statement is to design smart dustbins based on the internet of things(IoT) which will help to manage the garbage bins before they get overflow with the help of Zig-bee methodology based on a microcontroller. This is an advanced methodology in which garbage management is automated.

IV. METHODOLOGY

The methodology and the working of the proposed system follow the mentioned three brief steps-
label=. Data Collection lbbel=. Data Analysis
lcbel=. Optimal Route Generation

4.1 Data Collection

Data collection forms the first phase of the methodology. Here, the focus is on accumulating two kinds of data the amount of trash in the garbage bin and the timestamp of each collection. These two data form the fundamentals of the criteria which helps one to determine if a garbage bin needs to be emptied or not. This section introduces the relevance of the hardware components and other concepts used to achieve the same.

A. Arduino Uno:

Arduino UNO is a standard Arduino board. here in Italian UNO is ”one”. Named UNO to denote the first version of the Arduino software. It was the first Arduino- released USB board. It is considered a powerful board used in various projects. The Arduino UNO board is developed by Arduino .cc.

Arduino UNO is based on the ATmega328P microcontroller. It is easy to use compared to other boards such as Arduino

Mega Board. The board consists of digital and analog input/output (I/O) pins, shields, and other electric circuit collections.

The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is a programmed- based Integrated Development Environment (IDE). It can run on both online and offline platforms.

Why Arduino Uno?

The Arduino UNO board has a list of several hardware components and has the capability to interact with those devices. The device includes Bluetooth, internet, motor control, and many more. The main use of the Arduino UNO board over other Arduino boards is the price factor.

Advantages of Arduino Uno :

- Really open-source software and hardware
- Low-cost boards and peripherals
- It’s simple

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B. Ultrasonic Sensor:

The ultrasonic sensor (Fig. 2) is present on the lid of the bin facing into it and is used to calculate the garbage level. The threshold values are set according to the height of the bin used. The sensor is used for receiving the ultrasonic signal, and transmitting the ultrasonic pulse, and also has an integrated control circuit in it. This 4-pin sensor thus enables one to measure an object's distance without any contact using the formula once the echo signal has been obtained. 2x Distance (Echo Duration) x (Ultrasonic Velocity). The sensor offers non-contact range detection with high accuracy from 2 am to 400 cm. Therefore, the height of the dustbin must lie within that range. The measuring angle of the sensor is 30 degrees. where is the height of the dustbin and is the measuring angle of the sensor in degrees. This area varies approximately from 1.047 cm3 to 418.879 cm. Area of detection technologies like

36. It also interferes with other electronic components such as hearing aids owing to their pulse-transmission technology.

C. Garbage Bin:

One must manually go around the city or town and take down the GPS location of each garbage bin and save the same on Google Maps. Each garbage bin is given a unique ID as well. Therefore, data about the level of trash in each bin is collected for a particular collection area. When the truck driver opens his App interface, the geolocation of the garbage bins that need attention is retrieved from Google Maps and the shortest and the most cost- efficient route is generated for the truck driver to follow (fig. 3).

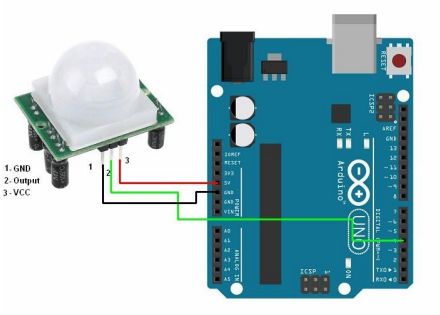

Fig. 1. Arduion Sensor

Fig. 2. Ultrasonic Sensor

Fig. 3. Garbage Bin

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4.2 Data Analysis

Data Analysis begins with the formation of a database, in the municipality servers, with all the data collected from various garbage bins in a particular area. The Database comprises the following data fields:

- The serial no (ID) of each garbage bin
- The geolocation of the garbage bin
- The locality (Cluster)
- The current time-stamp reading
- The current waste level indicator

The waste level indicator is the major component of the analysis and has the most significance for the basis of route generation. The level of waste in a particular garbage bin has been categorized into three parts: Safe, Average, and Toxic. The basis for the classification of the real-time waste levels is the distance from the lid of the garbage bin (measured by the ultrasonic sensor). Waste Levels up to 25

These have been shown (only for visual repre- sentation purposes) using the Blynk app. The infor- mation that is pictorially represented on the Blynk app or any other appropriate app interface can be viewed by the municipal authorities. The data for the various fields of the database are then used for optimal route generation. The parameters for the optimal route generation are based on the following criteria:

- Timestamp
- Waste-level indicator

The garbage bins with waste levels above 65 % of their capacity (Toxic levels) have to be assigned to the particular route with the highest priority. This ensures timely collection of garbage, actively preventing the chances of overflowing. This scheme, however, fails to take into consideration the case of lower levels of garbage in a bin which need to be collected before reaching hazardous levels of toxicity.

The threshold time limit, before the garbage starts decaying, was found to be 48 hours. Thus, every garbage bin must be collected after at most 48 hours. To ensure this, the garbage bin is assigned a priority 1 after 48 hours since its last collection, even if the waste in the garbage bin has not reached its maximum capacity. Fig. 4 is a flowchart of the selection criteria.

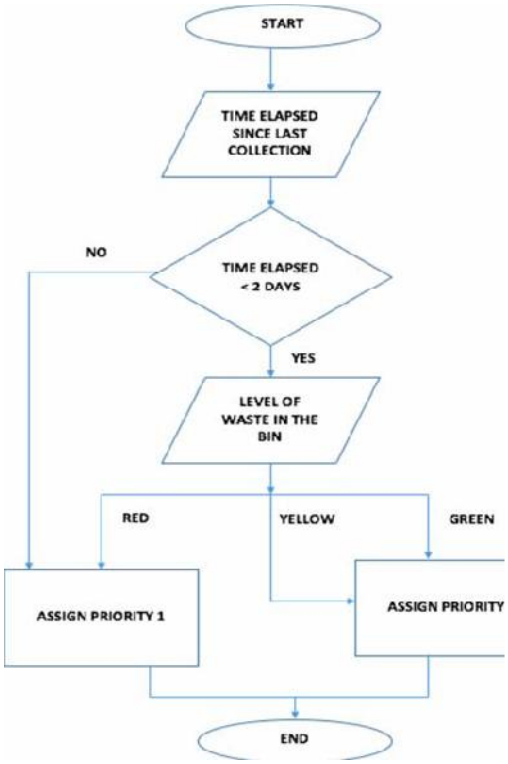

Fig. 4. Flowchart of selection criteria

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4.3 Optimal Route Generation

A huge factor that would make the system stand out is the final step in order to be able to predict and generate an optimal route that would enable garbage trucks to collect and empty out trash cans keeping in mind to minimize the cost and reduce the time spent traveling, which would maximize the efficiency of the collection process. It would be futile to directly jump into the process of determining the best possible routes by trial and error, since it turns out to be both manually tedious and impractical, leading to an aimless conclusion.

Therefore, route optimization has now gone dig- ital to allow routing problems to be solved by groups of computer permutations making it sufficient and thorough. The conventional constraints for typical delivery services are substandard for the proposed system hence the need to devise a custom, hybrid algorithm for route optimization attempting to solve the required leverage.

There exist different Vehicle Routing Problem (VRP) algorithms depending on the type of routing problem in consideration out of which the Capaci- tated Vehicle Routing Problem (CVRP) is of prime importance and forms the basis for the custom algorithm. It is concerned with how vehicles can be loaded with a certain amount of goods in quantity, no more no less [8]. Simply written, the weight and volume of what is being collected are considered since each vehicle has a certain maximum load capacity.

V. BACKGROUND

In the present world of digitizing everything in our surroundings has been equipped with modern technology and the internet to ease our work and gain more efficiency. But the systems existing today for waste management are the same as they were before in most countries. Currently, for the collection of waste in some countries, we have a door to door collection systems that require a lot of effort and money. A waste collector has to visit everybody's place, knock on the doors, and has to wait until each resident brings the waste to them. Moreover, residents have to be available in order to get their waste collected at that particular time which brings in a major disadvantage of this system. There are lots of systems present today to collect garbage and monitor garbage. But that systems have low accuracy. There are lots of reasons that some systems use low efficient controllers, and some don't use sensors for monitoring the dustbin level. Monitoring the dustbin level and sending the message to the mu- nicipal office should be the main motive but there are very less systems available for that and the available systems are not cost-effective. In this project sensors and controller interface in an effective manner. The system uses an ultrasonic sensor, Bluetooth module, and Arduino Uno.

VI. TECHNICAL SPECIFICATION OF THE PROJECT

Hardware

Arduino Uno

- Microcontroller: ATmega328P Operating Voltage: 5V
- Input Voltage (recommended): 7-12V Output Voltage (limit): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- PWM Digital I/O Pins: 6
- Analog Input Pins: 6

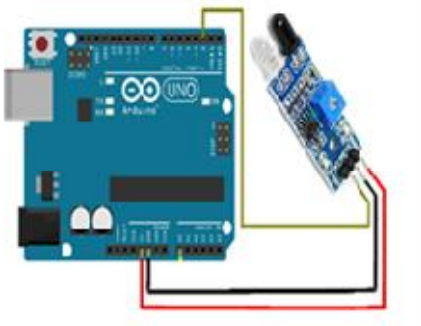

Fig. 5. IR Sensor

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DC Current per I/O Pin: 20 mA DC current for 3.3V Pin: 50 mA
Flash Memory: 32 KB (ATmega328P) of which
0.5 KB is used by
bootloader SRAM: 2 KB (ATmega328P) EEPROM: 1 KB (ATmega328P)
(fig. 1)

IR Sensor

Vcc 3.3 to 5 Vdc Supply Input GND Ground Input
Out The output that goes low when an obstacle is in
range Power LED Illuminates when power is applied
Obstacle LED Illuminates when an obstacle is detected IR Emitter Infrared emitter LED
IR Receiver The infrared receiver that receives a signal transmitted by Infrared emitter.

Rain Sensor

This sensor module uses good quality double- sided material.
Anti-conductivity oxidation with long-time use. The area of this sensor includes 5cm x 4cm and can be built with a nickel plate on the side
The sensitivity can be adjusted by a potentiometer The required voltage is 5V
The size of the small PCB is 3.2cm x 1.4cm For easy installation, it uses bolt holes
It uses an LM393 comparator with wide voltage The output of the comparator is a clean waveform and driving capacity is above 15mA

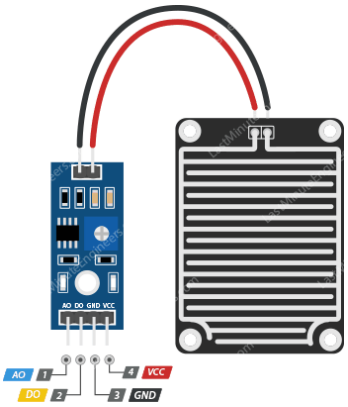

Fig. 6. Rian Sensor

Bluetooth Module

Serial Bluetooth module for Arduino and other microcontrollers Operating Voltage: 4V to 6V (Typically +5V)
Operating Current: 30mA Range: ¡100m
Works with Serial communication (USART) and TTL
compatible Follows IEEE 802.15.1 standardized protocol
Uses Frequency-Hopping Spread Spectrum (FHSS) Can operate in Master, Slave, or Master/Slave mode
Can be easily interfaced with Laptops or Mobile phones with Bluetooth
Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.

GPS module

Standalone GPS receiver Anti-jamming technology
UART Interface at the output pins (Can use SPI, I2C, and USB by soldering pins to the chip core) Under 1-second time-to-first-fix for hot and aided starts
Receiver type: 50 Channels - GPS L1 frequency

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- SBAS (WAAS, EGNOS, MSAS, GAGAN)
Time-To-First-fix: For Cold Start 32s, For Warm Start 23s, For Hot Start 1s
Maximum nav- ligation update rate: 5Hz

Fig. 7. Bluetooth

Fig. 8. GPS Module

Default baud rate: 9600bps EEPROM with battery backup Sensitivity: -160dBm
Supply voltage: 3.6V
Maximum DC current at any output: 10mA Operation limits: Gravity-4g, Altitude-50000m, Velocity- 500m/s Operating temperature range: - 40ºC TO 85°C

Ultrasonic Sensor

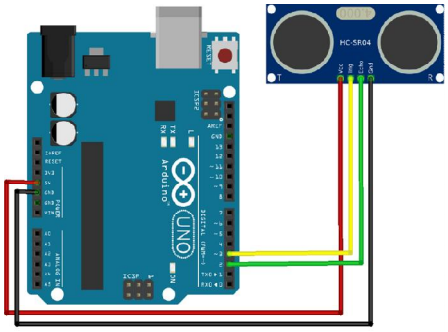

Fig. 9. Ultrasonic Sensor Connect to Arduino Uno Sensor

Fig. 10. Motor

Supply voltage: 5V
(DC). Supply current: 15mA. Modulation frequency: 40Hz.
Output: 0 – 5V (Output high when obstacle de- tected in range).

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Beam Angle: Max 15 degree.
Theoretical measuring Distance: 2cm – 400cm. (Fig. 2)

Motor

Standard 130 Type DC motor Operating Voltage: 4.5V to 9V
Recommended/Rated Voltage: 6V Current at No load: 70mA (max) No-load Speed: 9000 rpm
Loaded current: 250mA (approx) Rated Load: 10g*cm
Motor Size: 27.5mm x 20mm x 15mm Weight: 17 grams
Hardware Requirement System Type:64-bit
Processor: Intel core i5,2GHz Storage Capacity: 512GB RAM:4GB (Min)
I/O Devices: Mouse and Keyboard

Software

Embedded C Programming Language

Embedded C is the mostly used programming language for developing electronic devices. Every processor used in an electronic system has em- bedded software associated with it.
Embedded C programming plays a key role in enabling the processor to perform specific functions. In our daily life, we use various electronic devices such as mobile phones, washing machines, and digital cameras. All of these de- vices run on microcontrollers programmed with Embedded C.

Arduino IDE

Arduino is integrated into open source De- velopment environment or Arduino software (IDE). Includes a text editor for writing code. Message area, text console, a toolbar with but- tons For general functions and a set of menus.
Write a sketch
The program is written in Arduino The software (IDE) is called Sketch. These sketches Write in a text editor and save File extension.ino. The message area provides feedback An error is displayed when saving and exporting. The console shows text output from the Arduino. Software (IDE) with a full error message and other information. the bottom right corner of the window

VII. SYSTEM ARCHITECTURE

IoT garbage management system is a very creative system to keep the city clean. The system will monitor your trash and notify you Amount of garbage collected by the net in the trash can book page. To do this, the system uses ultrasonic sensors placed In bins for identifying and comparing trash levels At the depth of the trash can. used by the system Arduino family microcontroller, LCD screen, and Wi- Fi Modem for sending data and buzzing. the system is Powered by a 12V transformer. LCD screen takes some getting used to Display the garbage collection status of garbage bins

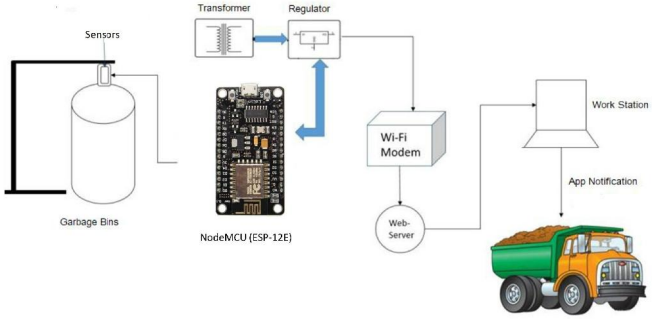

Fig. 11. System Architecture Diagram

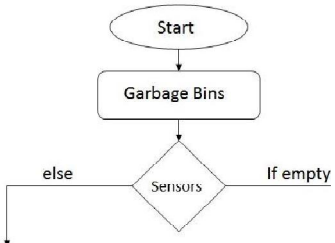

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Fig. 12. Working Flow Chart

VIII. CONCLUSION

Garbage monitoring and management systems are the needs of Smart buildings. Smart waste monitoring and management is a keen idea of smart city planners. Garbage monitoring systems are a new idea of implementation which makes a general dustbin smart using sensors for garbage bin level detection and sending a message to the authorized person updating the status of the bin. As soon as the dustbin is full it gives the information in LCD and sent the message to the corresponding officials.

IX. FUTURE SCOPE

The existing system uses sensors to segre- gate the garbage into two types wet and dry. For future work, there should be an addition of more segregation parts like metals and non- metals along with dry and wet. Also, the system of making compost from wet and recycling of dry garbage will be added.

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