International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-9 Issue-2, December, 2019

Smart Trash Can

V. Sellam, R. Pushkala, V. Akshita, R. Nivetha

Abstract: ***In the city being over populated, the excess amount of waste produced should be eliminated periodically. These wastes are being laid down, creating unhygienic conditions. Since the people available for these works are very less, the available workers need to be used efficiently. To make efficient use of employees an IOT (Internet of Things) based solution is proposed in the project where it indicates whether the trash can to be emptied in that area. When the trash can is full, an indication from sensor to micro controller is given. A cloud website is used to know the status of the trash can by the people living around. This network of systems works dynamically. Thus, this system puts an end to the overflowing of trash cans. It also reduces unwanted fuel consumption, avoids traffic and prevents diseases. This makes our city smart and clean.***

Index terms-- Arduino, cloud, garbage management, IOT, Smart Trash can, servo motor, wifi-esp8266

I. INTRODUCTION

As population grows there is a change in lifestyle in the present era, which leads to the increment of different types of garbage. This garbage is the disposal from office or home in a particular area. The trash cans are regularly emptied and cleaned by the authorities. The overflowing of garbage materials are not treated properly. The disposal method is made automatic, with IOT. The sensors are placed to calculate the level of the garbage. As calculated, the action need to done at this status is specified. The wi-fi module send status to cloud website by a local host and immediate solution is given by a cloud website that notifies the authorities. The interaction is provided between the users and the organization with this cloud website. Thus, this automatic system provides cleaner and smarter city.

II. RELATED WORKS

The project on Survey of garbage management has used IR sensors to detect the distance and the webpage module to know the status of the garbage. The only defect of the project is IR sensor by which circuit gets heated up. [1] The ultrasonic sensor can be used to detect obstacles using SONAR method. This calculates distance with elapsed time and reception of echoes. These echoes are processed to level of garbage. This method is proposed in the paper. [2] Data can be collected and stored using RFID sensors. These are command and control methods.

Revised Manuscript Received on December 30, 2019.

* Correspondence Author

Dr. V. Sellam, Assistant Professor, Department of CSE, SRM Institute of Science of Technology, Chennai (Tamil Nadu) India.

R. Pushkala, Department of CSE, SRM Institute of Science of Technology, Chennai (Tamil Nadu) India.

V. Akshita, Department of CSE, SRM Institute of Science of Technology, Chennai (Tamil Nadu) India.

R. Nivetha, Department of CSE, SRM Institute of Science of Technology, Chennai (Tamil Nadu) India.

The interaction between devices is provided with these commands. [3] Arduino board can be used to review the status of automation. The status is verified and given as output to the WI-FI module. [4] Many projects use GSM modules to transfer the generated information. These sms has taxation involved for the messages. The maintenance are difficult involving high cost. [5]

The Raspberry pi 3 can be used for coding instead of Arduino. The board has an Ethernet surface. It runs as simple web data server with python in coding.[6]

The stepper motors and sensors can be used to detect and separate based on the type of waste. This increases efficiency. The trash can also be sent with the location to make available for the user. [7]

The cloud and IOT need to be integrated to reduce taxation issues. Another paper uses the cloud website as an intermediate between applications and user. The cloud also hides all the complexities and functionalities necessary for running applications.[8] Arduino powers code and uses microcontrollers to process data and connect different modules for control. The arduino uno board that has ATmega328p processor is used for this purpose. It operates in 5v from USB plug. [9]

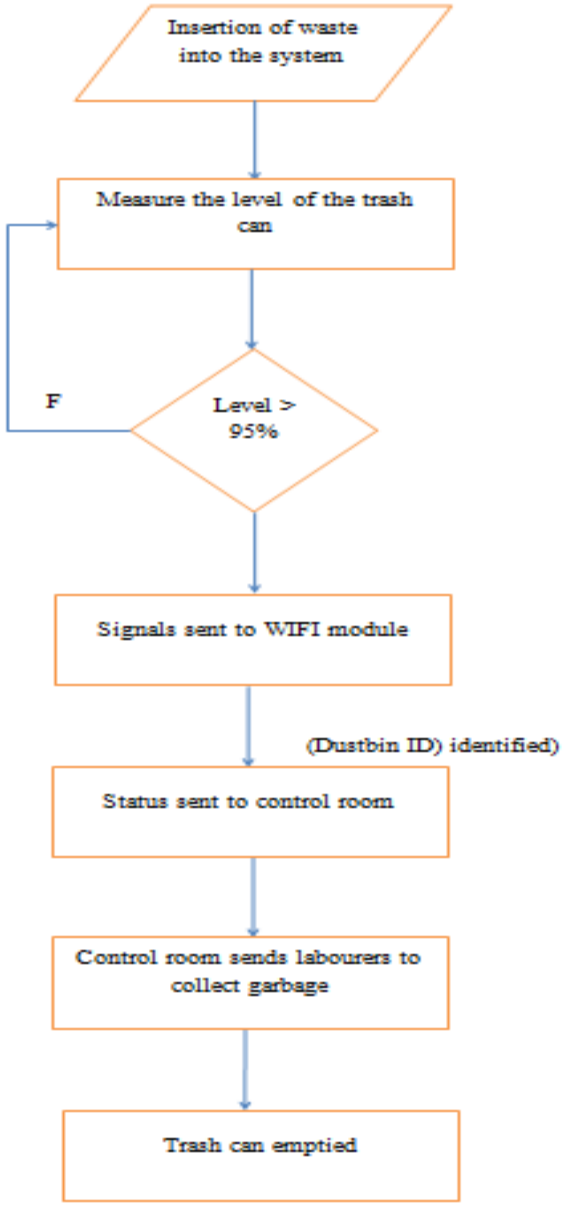
The author in [10] states that smart waste management is needed to clear the unhygienic conditions caused by the increased population. The interface is needed between the users to make the system regular. The system has android application that continuously notifies the changes and responses happening in the system. A project is developed using ESP8266 wifi module and ultrasonic sensor that creates cost effective IOT waste management system. This system eliminates the unknown resources to enter the network. The wifi module allows only specific local host network, hence the system is more secured. [11]

A work is proposed with RFID tag indicating that the garbage is emptied. In this system1, notification is sent once the garbage is filled. When the authorities cleared the garbage, the status is updated only when the RFID tag is swiped with the pinned RFID sensor. [12]

The general Arduino boards are replaced with the cheaper ATmega8 hardware component. The paper uses this board to make the system cost efficient. The platform Arduino used is also a open-source platform. It is mainly designed for artists and non professionals to use electronic iot chips efficiently. [13]

The zigbee technology is employed in a system. An ultrasonic sensor is attached to the lid. The ultrasonic sensor is used to detect when the trash can becomes full and sends signal using zigbee technology. A mobile application is developed, which receives message via GSM module. The application is installed in the drivers's phone. Immediate status notification is made. [14]

III. SYSTEM ARCHITECTURE



IV. MODULES

A. ULTRASONIC SENSOR MODULE (HC-SR04)

The basic purpose of an ultrasonic sensor in our proposed system is to monitor the level of the garbage continuously and to send analog signals to the Arduino UNO Nano board.

Figure 4.1.Ultrasonic sensor

Ultrasonic ranging module HC-SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit.

The basic principle of work:

Using IO trigger(pin) for at least 10us high level signal, The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. If the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning. With velocity of sound (340m/s) v and time t, test distance d is

$$d = (v \times t)/2 \qquad (1)$$

B. ARUDINO UNO NANO

Arduino Nano is a micro-controller board. The micro-controller used in the Arduino Nano is Atmega328. Due to its small size and flexibility, it can be used in various devices and can be used in various fields.

Figure 4.2.Arduino Uno Nano

Arduino Uno Nano has 22 input/output pins in total. Out of these 14 pins are digital pins. Among the digital pins, 6 pins are PWM pins. The remaining 8 pins are analogue pins. It has a crystal oscillator of 16MHz. It's operating voltage varies from 5V to 12V.

It also supports different ways of communication, which are: Serial Protocol. I2C Protocol, SPI Protocol. It has a mini USB Pin which is used to upload code. It also has a Reset button on it.

Arduino Nano has a flash memory of 32Kb. It has preinstalled bootloader on it, which takes a flash memory of 2kb. SRAM memory of this Microcontroller board is 8kb. It has an EEPROM memory of 1kb. **Arduino Nano** is used in embedded Systems, automation, robotics, control Systems, instrumentation and in many more fields.

C. WI-FI MODULE ESP8266

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network.

The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

Wi-Fi Key Features:

The key features are, it has 802.11 b/g/n support 802.11n. It support (2.4 GHz), up to 72.2 Mbps Defragmentation It has 2 x virtual Wi-Fi interface Automatic beacon monitoring (hardware TSF) Support Infrastructure BSS Station mode/SoftAP mode/Promiscuous mode.
And an Antenna diversity

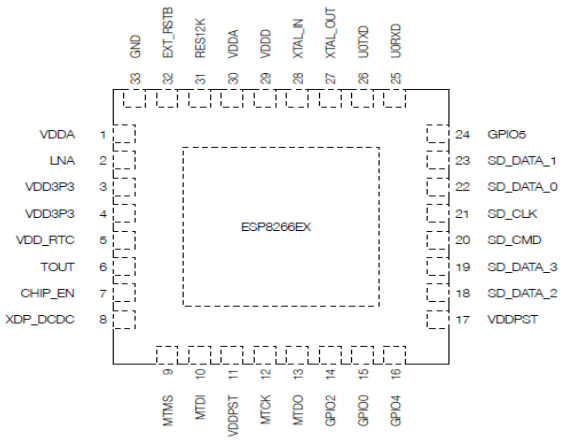


Figure 4.3. Top view of ESP 8266 Wi-fi Module

D. CLOUD

Cloud website is the software component used as a webhosting services. The website adafruit.com enables this service for Arduino and ESP8266 wifi module. The website has a trigger system that continuously notifies the user for responses in the changes of the system. The trigger monitors the data thus, it sends information when the sensor is heated or the system is offline. The data can be downloaded at any time. These data in this website is never sold as per IOT Bill of Rights.

Figure 4.4. Cloud Website

V. IMPLEMENTATION

The input in our proposed system is garbage. The level of the garbage in the trash can is continuously calculated with the help of an ultrasonic sensor (HC-SR04). This sensor maximum calculates the distance of 400cm. When the trash can is full, the analog signal is sent by the ultrasonic sensor to the Arduino UNO Nano board. The status is noted by the Arduino and it is sent to the WI-FI module.

The WI-FI module (ESP8266) is used to match the dustbin ID with the cloud website used for the purpose. Wi-fi module sends the noted information to control room with the cloud website opened in the main server there. A dustbin ID is assigned to each dustbin and it is also provided to the inhabitants, who also get notified about the dustbin status along with the authorities. If the trash can is full a status 0 is indicated. The authorities are notified to clear it.

If the trash can is not full and the status is changed to 1, the sprinkler motor works. The sprinkler motor is used to spray the pesticides to avoid unhygienic conditions due to the stagnant garbage.

VI. RESULTS AND DISCUSSION

The proposed system leads to hygienic and cleaner environment by emptying the trash cans in streets at the appropriate time unlike the existing system.

Our project also reduces fuel consumption as a garbage truck approaches a trash can only when its full or if it has not been emptied for more than a couple of days. The diseases caused by germs due to stagnant waste or garbage are prevented with the help of a pesticide sprinkler.

It puts an end to overflowing dustbin problem as dustbins are being cleared out as soon as they become almost full and also optimizes the waste collection route so that garbage trucks need to go only to specific places at a time and need not cover the entire locality at a stretch hence reduce traffic caused by garbage trucks which comes to empty the trash cans which are not even filled. The inhabitants as well as the garbage collectors are notified by the cloud website hence making the city cleaner. The cost of implementation is less as the required local network is available, but the maintenance is difficult when large amount data accumulated. When applying in the real world, the power to run motor must be given as solar power considering the regular availability and cost.

These results go beyond previous reports, showing that IoT can make the future go smart.

VII. CONCLUSION AND FUTURE WORKS

The smart trash can system is working properly and it indicates in the cloud website when the trash can is full. The system is reliable and it can be used for both wet and dry waste. The system is very economical and hence it can be implemented in the trashcans that we see on roads on day to day basis. The pest controller spray in the system makes the system livelier as it understands the problems of overflowing trashcans and thus attempts to prevent the unwanted diseases caused due to overflowing trash.
The future idea is to connect all the trash cans present in the whole city or town with the help of the cloud website. By doing this, there will be regulated trash can system present in the whole city or town, thus we can prevent the over flowing garbage problems and reduce fuel consumption and prevent unwanted diseases caused due to stagnant garbage. As an advantage, the trash can be provided with RFID tag to keep track of data and avoid confusion.

The system can be still elaborated, that the picking of garbage can be made automatic eliminating the cost of labor.

ACKNOWLEDGMENT

This work was supported in part by the CSE department of SRM Ramapuram College.

REFERENCES

1. Ruhin Mary Saji, D. G. (2016). A Survey on Smart Garbage Management in Cities using IoT. International Journal Of Engineering And Computer Science , 18749-18754 .
2. Christofer N. Yalung, C. M. (2017). Analysis of Obstacle Detection Using Ultrasonic Sensor. International Research Journal of Engineering and Technology (IRJET). , volume4, issue1.
3. Vandana Sharma, M.Tech, Ravi Tiwari, Asst. Prof, ECE, Dr. C.V. Raman University Bilaspur Chattisgarh-India. A review paper on "IOT" & It's Smart Applications. International Journal of Science, Engineering and Technology Research (IJSETR), Volume 5, Issue 2, February 2016.
4. Jaime Negrete, E. K. (2018). Arduino Board in the Automation of Agriculture in Mexico, A review. International Journal of Horticulture , Volume 8,No-6,1927-5803.
5. Reeny Zackarias, D. S. (January2018). A Survey on Smart Waste Management Systems. International Journal for Research in Applied Science & Engineering Technology (IJRASET) , ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887Volume 6Issue.
6. Manish Chetia Patra, N. M. (2018). IOT BASED GARBAGE MANAGE -MENT SYSTEM FORSMART CITY USING RASPBERRY PI . International Journal of Pure and Applied Mathematics, Volume 119 No. 15, 1767-177.
7. Omkar Matkar, S. K. (March 2018). Smart Bin. International Journal for Research in Applied Science & Engineering Technology , Volume 6 Issue III.
8. Abhirup Khana, R. A. (2016). Iot based Smart Parking System. Internatinal Conference on Internet of Things and Applications. Pune,India IEEE
9. Lalit Mohan Satapathy, S. K. (2018). Arduino based home automation using Internet of things (IoT). International Journal of Pure and Applied Mathematics , Volume 118 No. 17, 769-778
10. (Kumar, Kumaran, Kumar, & Mathapati, 2017) Kumar, S. V., Kumaran, T. S., Kumar, A. K., & Mathapati, M. (2017). Smart garbage monitoring and clearance system using internet of things. International Conference on Smart Technologies and management for Computing, Communications, Control, Energy and Materials(ICSTM) . Chennai, India : IEEE.
11. Saadia Kulsoom Memon, F. K. (2019). IoT based smart garbage monitoring & collection system using WeMos & Ultrasonic sensors. International Conference on Computing, Mathaematics and Engineering Technologies(iCoMET). Sukkur, Pakistan: IEEE.
12. N. Sathish Kumar, B. V. (2016). IOT based smart garbage alert system using Arduino UNO. Region 10 Conference(TENCON). Singapore: IEEE.
13. Girish Yadav B.Tech(CSE) IV Year, M.Sathya Devi, AP,CSE, CVR College of Engineering, Hyderabad. Arduino based Security System –An Application of IOT. International Journal of Engineering Trends and Technology (IJETT) –Special Issue –April 2017
14. Kanchan Mahajan , Prof.J.S.Chito from ECE, Bharati Vidyapeeth College of Engineering, Pune, India. Waste Bin Monitoring System Using Integrated Technologies. International Journal of Innovative Research in Science, Engineering and Technology) Vol. 3, Issue 7, July 2014.

AUTHOR'S PROFILE

Dr. V. Sellam- Assistant Professor, CSE, SRM Institute of Science of Technology. Papers published on classification of normal and pathological voice using svm and ga. Another paper on classification of normal and pathological voice using svm and rbfnn.

R. Pushkala, pursuing BE in SRM IST. Developed cloud application using Zoho creator on Employee management. Developed applications using Visual Studio C++, Created website using Tkinter.

V. Akshita, pursuing BE in SRM IST. Attended internship on Big Data at Kaashiv Infotech. Developed snake game in C++. Created a website in python Tkinter.

R. Nivetha, pursuing BE in SRM IST. Attended implant training in BSNL, Completed A2 grade in German. Completed till Rastrabhasa in Hindi. Created a website using Tkinter.