Global Scientific JOURNALS

GSJ: Volume 10, Issue 9, September 2022, Online: ISSN 2320-9186

www.globalscientificjournal.com

SMARTBIN WITH IoT Notification using Blynk App

[1]*Luke Odoemena Ijeoma*
Computer Science Department
Federal Polytechnic Nekede, Owerri,
Imo State
violetodoemena@gmail.com

[2]*Prof Okeke Ogochukwu*
Chukwuemeka Odimegwu Ojukwu University, Uli (COOU), Anambra State

[3]***Omenka Ugochukwu Enyinnaya***
Computer Science Department
Federal Polythecnic Nekede, Owerri, ImoState
uomenka@gmail.com

[4]***Chile- Agada***[3]
Department of Computer Robotics.
Alvan Ikoku College of Education
bobagada@gmail.com

Abstract: Owerri City in Imo State of Nigeria is usually tormented by wastes littering the streets, especially with the migration of more people into the city, the waste bins provided by the state government gets filled quickly and the trashes in them begins to overflows, littering the surrounding and this situations forms a haven for harmful animals like rodents, birds, etc. The rotten trashes also emit very foul smell all of which are very unhealthy to humans'. This situation could last from several days and into months, sometimes it takes the intervention of the media house to inform the Waste Agency of such scenario before they will come and evacuate this waste. It then becomes imperative to go into this project which is Smart bin with Internet of Things (IoT) notification using Blynk app. It is a new system which consists of network of wireless sensors on an Arduino board which automatically opens the lid of the waste bin on sensing a nearby presence, and also monitors the trash level in the waste bin such that once the trash gets to the preset fill level it will trigger a reaction via the Arduino microcontroller with an Internet connection to the blynk IoT Cloud then to the blynk app which will then invoke a notification to alert the Agency at real time, that the waste is full and it should be evacuated. The researchers employed the Object Oriented Analysis and Design methodology (OOADM). This new system will ensure that wastes are evacuated once it is due thus leading to clean, rodent and disease free environment

Keywords:, *Smartbin, Adruino, Blynk App, microcontroller, waste, notification,*

1. INTRODUCTION

The internet has helped people to connect and interact with one another through smart phones and other computer devices which has been a limitation because access to the internet was restricted to devices like desktops, tablets and smart phones,. But with IoT practically all appliances can be connected to the internet remotely be it animate or inanimate things, having the ability to sense the surrounding and collaborate with one another that is they talk to one another via the internet. Internet of things (IoT) is a system of interrelated devices connected to the internet so that they can transfer and receive data with one another. In IoT sensors are connected to objects and help these objects to share their 'digital voice' with the external world over internet connection.

So being quite cognizance of this new technology the researchers embarked on the application of IoT to bring an extreme solution to the issue of waste management challenge faced in Owerri Urban, the capital city Imo State, in Nigeria, West Africa, where the issue of waste management has become a very huge task for both the State Government and individuals, as most human activities generate waste (Brunner and Rechbecker, 2014). The Government of a truth has put up some effort to overcome this situation by providing waste containers or waste points along the Streets, roads and other designated centers in open environment so that people can easily have access to these waste points within the State, however, there arose another challenge that sets in, which has become a trend in most cities, these waste containers designated at various waste point gets filled up, and begins to overflow and thus litters the environment, generating irritating and very offensive smell around the environ and of course creates a conducive ground for the spread of diseases that can be very harmful to human health. This menace is because the Government or individual Agency who has the responsibility of evacuating these wastes do not know that these wastes are filled and even overflowing, sometimes, it might need the media to announce it on air so that the agency will be notified, and this media intervention is always done when it has gotten to a very bad state, there then arose the need for a better waste management solution that will help in providing the general wellbeing of the community and build up a better neighborhood.

Waste management involves all the activities one takes right from the time waste is manufactured, (be it industrial, domestic etc all kinds of waste) until it is taken to its final

place of disposition. This includes gathering of these wastes, transporting them and finally disposing them. Waste management aims at curbing the bad effects of waste on health; rather the reverse is the case with the current waste management practice in Owerri Municipal. The waste containers are dropped in the different parts of the streets in the city, but these containers are always left open, so when these waste bins/containers gets filed with trashes, because its open, people still dump their waste in the already filled container to the extent that it overflows and begins to litter the surrounding environment..

PROBLEM OF EXISTING SYSTEM

Waste bins gets filled, and begins to overflow, littering and spreading out trashes immensely to surrounding environment to the extent that people will also start throwing the rubbish they came with on the ground, because the wastes on the ground has pilled hugely. The Municipal Waste Agency responsible for evacuating wastes will not know that the waste bins are filled and is already pouring on the ground. This situation could last for days to weeks even running into months. When Waste Evacuation Trucks are sent out, there is the high possibility that they will go to places where the dustbin containers are not yet filled, meanwhile in another location the waste bin is so full and rubbish even piling on the ground, while the situation stays the environment in these areas become highly hazardous and unsafe for humans because it will make the place comfortably habitable for rodents and other harmful pest not to mention diseases such as cholera circulating in the atmosphere, which are all very unhealthy situation for living.

AIM AND OBLECTIVE

This work aims at designing and constructing a prototype of an intelligent Waste bin management system using the Internet of things Technology (IoT) via the blynk app to send alert at real time to the relevant Agency with the objectives that waste will no longer fill the Containers to the brim and to the point of littering the surrounding and causing foul smell. The Municipal Waste Agency responsible for evacuating wastes will now be informed at real time once the waste container get to the pre-set level. The Waste Evacuation Trucks are directed to the exact places because the alert system also notifies the Agency the address of the Waste bin and lastly It will give a green clean and safe environment

2. LITTERATURE SURVEY

Internet of Things (IoT) has spread to a lot of human daily life activities; which includes smart cities and communities, water, agriculture, smart homes, fuel management, even in health and so on. The technology has indeed created a high impact in our daily life. In the perspective of waste management, several different IoT-enable solutions have been proffered with each having its own strengths and weaknesses that require improvement. Likotiko et al (2018) in their work, proposed a smart bin solution with a three-layered architecture for IoT real time solid waste monitoring. The lower layer is installed with sensors for measuring waste levels in smart bins; the middle layer is comprised with both Wi-Fi and GSM technologies for data transmission to a central system. A cloud service for receiving and storing data from the sensors is on the upper layer. In order to collect waste, the corresponding cleaning service is notified whenever a smart bin level threshold is reached. Ultrasonic ranger sensor and laser distance sensors were implemented and tested. A web based system to store user's information necessary for monitoring was also developed. Folianto *et al.* (2015) proposed a system where information on waste fill up is collected and passed through wireless mesh network. Moreover, to reduce the amount of power consumed and maximize the time efficiency of the operations, the system employs duty cycle technique. However, the technology employed uses short range connection for the system such as WiFi and Ethernet Internet connections. Also, the use of ultrasonic sensors used affected the optimum performance of the system, because these sensors are sensitive to certain temperature variation. Zavare *et al.*(2017) proposed a system for the identification and collection of wastes in a garbage bin. In this system, the dustbins transmit signals to the appropriate authority indicating that it is over 80% or 90% full and requires to be emptied. This signal or notification is sent via a mobile communication network used by the waste management authorities and the garbage collecting vehicle. By using the GSM technology, a unique id is assigned to every bin and it will send its location coordinates to the vehicle. The entire system is made up of ultrasonic sensors, the GSM module and a power supply. Nonetheless, the drawbacks of this solution are that: the GSM is prone to bandwidth lag and that the fill level is considered too high (80 to 90%), meaning that, if for any reason the dustbin is not evacuated at the right time, the garbage will overflow and before you know it, it begins to overflow and litter the surrounding, which will pose a big health challenge to the neighborhood. Prajakta *et*

al. (2015) proposed a garbage collection system that is automatic having information collection system based on GSM module and the processing of images taken and; the system employs a camera which is placed at every position where garbage is collected alongside a load cell sensor positioned at the base of the garbage bin, the camera constantly takes snapshots of the garbage bin while the load cell sensor takes the weight to determine if full or not. Moreover, a threshold level is set which is used to compare the result of the camera and load sensor. Once the threshold is reached, the controller transmit a message via the GSM module to the appropriate authority notifying them that the garbage bin is full and should be disposed. Accordingly, the garbage bin collection vehicle is dispatched to collect the garbage using a robot mechanism. However, pitfall is that the camera takes pictures throughout even though its threshold is reached but only considers the most recent to determine collection. Thus, the use of camera is unnecessary or unimportant.

DISCUSSIONS

The above works shows that there are different solutions to waste management using IoT technologies with each having its approach, strengths and weaknesses. All the approaches seem similar but there are differences with the communication IoT technologies employed. For instance, all the studies considered in this paper developed a waste collection system using IoT devices which operates by automatically opening the waste container cover, sensing the threshold level of the waste bin and send notification or alerts to the appropriate authorities when the bin and communication to the Waste Management Agency achieved using SMS text messages, mobile applications and so on.

FNDINGS

However, none of the above technologies provides for the controlling and monitoring of the dustbin from whatever location the individual maybe. The software tool used to send the bin status should be able to state the location and unique ID of the bin as well as give an optimized route for waste collection, thus the communication tools used from the bin to the receiver side is of importance when implementing such solution. The introduction of blynk app on the systems was not found and this negatively impacts the communication performances. The blynk app allows users to monitor the dustbin level at real time no matter wherever they are. Therefore, it is important that improvement be made on the management

of waste in our cities by using blynk app so that waste bin can be monitored at real time from anywhere in order words ensuring a healthy environment devoid of diseases and infections. Consequently, as a future work we recommend the use of blynk Application

3. PROPOSED SYSTEM

The proposed system is to design and implement a SmartBin with IoT Technology using Blynk App. It is a system that will ensure waste are monitored at real time from wherever the user may be and evacuated from time to time at when due by alerting the user at real time whenever, the rubbish container fills up to the given level. The software development methodology employed in the design of the proposed system is Object Oriented Analysis and Design Methodology (OOADM); a technical approach for analyzing and designing an application system by applying object oriented programming as well as using visual modeling throughout the software development process to guide stakeholder communication and product quality.

ARCHITECTURE OF THE SYSTEM

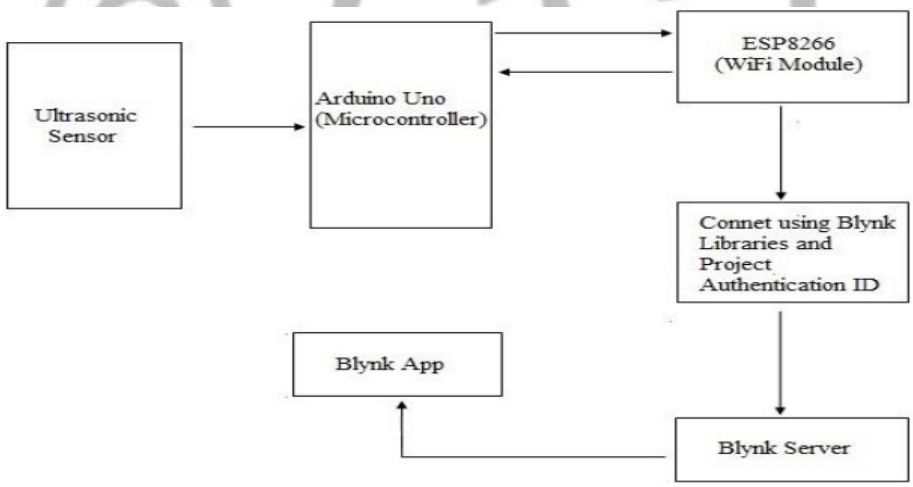


fig1: Architecture of the new system

WORKING PROCESS

The fig 1 above shows the architecture of the new the system, which also describes the working process. The ultrasonic sensor on detecting a nearby presence passes the data to the adruino microcontroller, then the microcontroller to the Servo motor to open so that waste can be thrown inside the bin, that is, if it satisfies the preset value of distance data. Then as trash is thrown into the dustbin, another sensor, this time, placed inside the dustbin, most times preferably on the bin cover, continues to detect bin level and

sends data via the adruino microcontroller to the ESP8266 wifi module , that will then communicate with the blynk Server from thence to the blynk app which displays the level of the waste inside the bin. Same way if the waste in the bin gets to the preset value of waste full, it displays same on the blynk lcd screen that the Dustbin is full

HARDWARE REQUIREMENT: The hardware components includes :
Plastic container, Arduino, ESP8266, Ultrasonic sensor, Servo Motor.

Brief Description of the Component

Arduino: It is a microcontroller board where other components such as Servo Motor and Ultrasonic Sensor are connected to

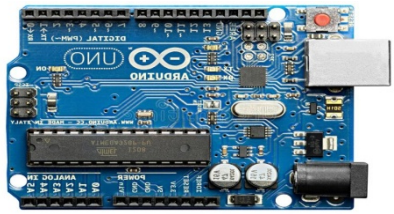


Fig 5 Adruino

ESP8266 : is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to wifi network

Fig 6: ESP8266

Ultrasonic Sensor: is an instrument which measures the distance from the lid or preset level to the waste.

Fig 7: Ultrasonic Sensor

Servo Motor: helps in opening the lid of the dustbin.

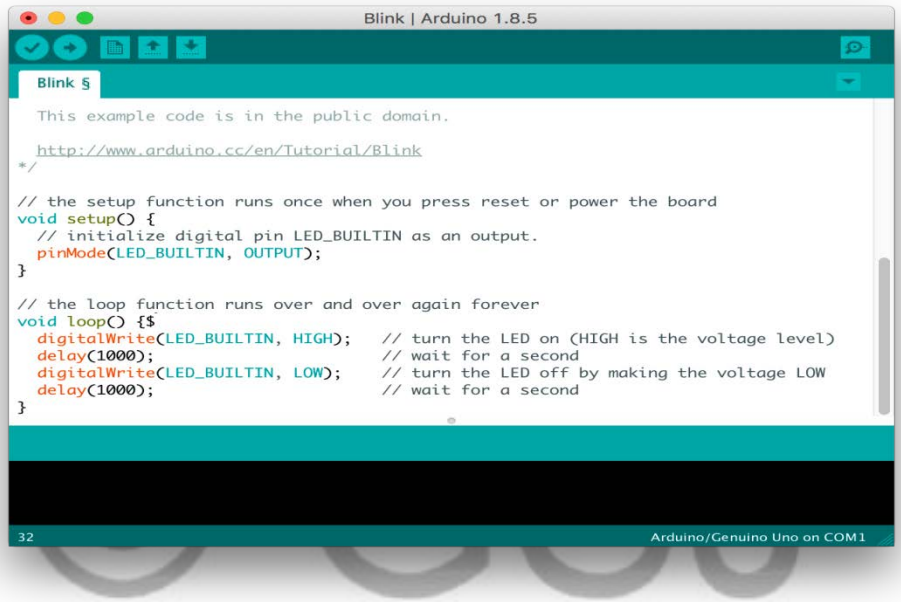
Servo motor

SOFTWARE REQUIREMENT

The software requirements for this project are

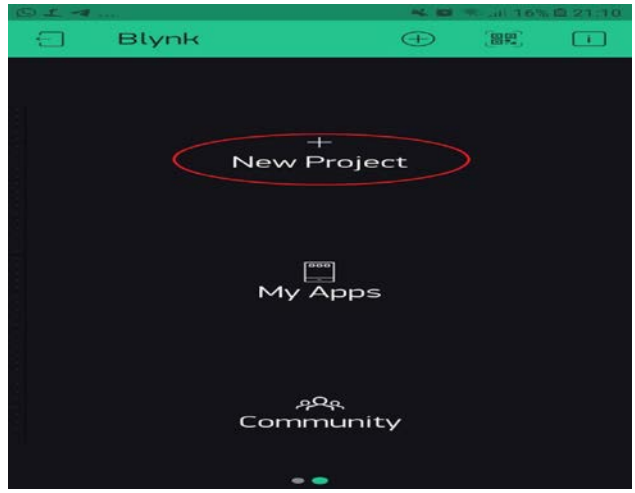
1. **Arduino IDE:**

   The Arduino Integrated Development Environment is a cross platform application that is used to upload programs into Arduino Compatible boards, its supports C and C++ using special rules of code structuring.



2. **Blynk App**

   Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It is a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets



CONSTRUCTION OF THE PROTOTYPE

The prototype is constructed as follows: Taking a plastic container or a dustbin, placing an ultrasonic sensor at the front part of the dustbin. The lid of the dustbin is taken as a hard cardboard and a servo motor is placed on the lid. Another ultrasonic sensor is placed inside the dustbin. The code of this project is divided into two parts. The first part code indicates the working of the dustbin i.e. mainly opening the lid of the dustbin. The second part code indicates the notification part which is received on the mobile using the Blynk app. The first part is constructed as follows: The ultrasonic sensor placed at the front part has four pins named Vcc, GND, ECHO and TRIG. The pin TRIG, pin ECHO is connected to digital pin numbers two and three on the Arduino Board. The servo motor has three pins named Vcc, GND, and servo pin. The servo pin of Servo motor is connected to digital pin number nine on the Arduino board. The Vcc of ultrasonic sensor is connected to 5V of Arduino board and the Vcc of servo motor is connected to 3.3V of Arduino board. The GND pins are connected to ground on the Arduino board. After the connections are made, the Arduino is connected to the system and using the Arduino IDE the code is dumped inside the Arduino. This ends the connection and code dump for the first part. The second part is constructed as follows: The ultrasonic sensor which is placed inside the dustbin also has the same four pins named Vcc, GND, ECHO and TRIG. In the Arduino IDE the board has to be changed from Arduino UNO to NodeMCU, if the board is not available in the list then we need to install the board from the Boards Manager. In this part the TRIG and ECHO pins of ultrasonic sensor is connected to digital pins D5 and D6 of NodeMCU. The V_{cc} is connected to V_{in} of NodeMCU and GND to ground of NodeMCU. This is the connection that is required and now the code should be dumped into NodeMCU. This ends the connection and code dump for the second part.

CONCLUSION AND FUTURE ENHANCEMENT

The main objective is to maintain the level of cleanliness in the city of Owerri and form an environment which is better for living. By using this system we can constantly check the level of the garbage in the dustbins which are placed in various parts of the city. If a 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. The employees can check the status of these bins anytime on their mobile phones. This can prove to be a very useful system if used properly.

The system can be used as a benchmark by the people who are willing to take one step further for increasing the cleanliness in their respected areas. Ultrasonic sensor is being used in this system to check the level of garbage in the dustbins but in future various other types of sensors can be used with the ultrasonic sensor to get more precise output and to take this system to another level. Now this system can be used in certain areas but as soon as it proves its credibility it can be used in all the big areas. As this system also reduces manual work certain changes can be done in the system to take it to another level and make it more useful for the employees and people who are using it. In future, a team can be made which will be in charge for handling and maintaining this system and also to take care of its maintenances.

REFERENCES

1. Brunner, P.H & Rechberger, H (2014). Waste to energy – Key elements for sustainable waste management. pages ,7, 3-12. https://doi.org/10.10106/j.wasman.2014.02.003
2. Al Jabi M & Mohammad D. (2017). IoT Enabled Citizen Attractive Waste Management System. https://www.researcghgate.net/publication/322879870
3. Likotiko, E., Petrov, D., Mwangoka, J., & Hilleringmann, U. (2018). Real time solid waste monitoring using cloud and sensors technologies. *The Online Journal of Science and Technology-January*, *8*(1).
4. Folianto, F. Y.S.L., Wai Leong Yeow: 'Smart bin: Smart Waste Management System', 2015 IEEE Tenth International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP)
5. Telugu M. & Harish K. (2020) Iot Based Smart Dustbin. International Journal of Scientific & Technology Research Volume 9, Issue 02, February 2020 ISSN 2277-8616
6. Zavare, S, . Patil R.P., S, Rathod P., and Babanne, P.V.: 'Smart City waste management system using GSM', International Journal of Computer Science Trends and Technology (IJCST), May – Jun 2017, 5, (3) Prajakta, G., , J.K., and , M.S.: 'Smart garbage collection system in residential area', IJRET: International Journal of Research in Engineering and Technology 2015, 4, (3)