IoT Enabled Smart Garbage Monitoring System

Jyoti Verma[1,*], Dr. Pallavi Goel[2], Dr. Pratima Manhas[3] , Dr. Shaveta Thakral[4, 5]Dr. Abhiruchi Passi
[1,2,3,5]*Manav Rachna International Institute of Research & Studies, Faridabad*
[4] *Zeal College of Engineering and Research, Pune*

Abstract – The Internet of Things (IoT) is a commonly used technology because of its various advantages. Building an overall architecture for the IoT is subsequently an unpredictable task, essentially due to the very large variety of gadgets and interface layer advancements. These days many steps are made to provide cleanliness in the country and to make the climate ecofriendly. One of the principle worries with our current scenario has been solid waste management which not only impacts the wellbeing as well as climate. The indication, observation and management of garbage dustbins are one of the fundamental issues of the ongoing time frame.. The traditionally used techniques of physically monitoring the garbage in bins is an awkward cycle and uses more human exertion, time and cost which can undoubtedly be stayed away from with our current innovations. Therefore objective of this paper is to design automated garbage Monitoring System. By using this proposed model people don't have to screen all of the systems actually and warning will be issued if the container will get filled.

Keywords: Internet of Things (IoT), Garbage, Cleanliness, Ecofriendly, Spotless, Innovations

1. INTRODUCTION

IOT is a technology which can communicate between devises and clouds. This paper deals with the quick cleaning of the dustbins. As dustbin is used to provide cleanliness so, when it is filled it should be indicated [1,2]. Ultrasonic sensors are used to provide the indication. he sensor which is a significant unit is placed on top of canisters which will send the data to the trash collector that the degree of waste containers has shown up at its most prominent level. After this the containers should be cleansed as fast as far as possible. By using this proposed work, number of bins can be used around the whole city and that helps the city with regards to neatness [3,4].
The weaknesses of the Existing framework are that the garbage man needs to keep an eye on the bins day by day if they are filled, which can lead to significant expense. The proposed model will help in eliminating these issues [5-8]. The ongoing data can be acquired with respect to the level of the dustbin filled on the actual framework. It will likewise help in decreasing fuel utilization and the cost as the garbage man should go only when the bins are full [9]. The urban communities will turn out to be cleaner and the scents of the waste bins will be significantly less and consequently that provides an ecofriendly

*Corresponding Authour:jyotiverma.fet@mriu.edu.in

climate which will be exceptionally sterile for our wellbeing [10].

2. LITERATURE REVIEW

Before proposing automated garbage monitoring system, extensive literature survey is done. The recent prominent works in this area are discussed below.

In **2017,Akhil and Valarmathie** proposed a model to make the city clean and neat. In this extensive algorithms are used to control and arrange the waste administration framework [11].

In 2019, Jaid Jim et al. designed a garbage control gadget. In this techniques of waste management and the IOT innovation are combined together. In this work focus is on find a space for the trash containers [12]. A employee based checking framework was also designed to control a self-sufficient automobile that gathers the waste whilst required [13].

In 2020, the authors Pardini et al. proposed a Smart Waste Management model. The proposed method was introduced for the benefit of Citizens. This method utilized IOT technology to track and detect the status of trash containers continuously. The IOT middleware handled the tracked information and gives genuine information concerning what is going on with the misfortune in the trash bins.. In this way mobile application enables access of tracked information about waste bins [14].

In 2020, the authors You,Z etal. proposed a new and advanced scheme to handle Waste Management in China. The motivation of proposing this research was to screen illicit conduct in garbage removal and removing them continuously from the society [15].

In year 2020, Shi, Yet al. developed a design that is primarily based on multi- warehouse automobile directing and beneficial for gathering waste from the collection habitats to decrease the methods for transportation [16].

PROPOSED METHODOLOGY

In the proposed system, a sensor enabled waste-bins will identify the level of garbage. This monitoring and observation will be done as soon as top level is reached and finally a notification will be provided to garbage collector authority via mobile application installed in smart phone and thereafter waste management can be smarty handled. With the help of proposed automated garbage monitoring system, garbage collectors don't need to check the garbage level physically and repeatedly yet they will directly get a notification about the status of waste-bin [1]. In this way proposed system will be helpful and purposeful in keeping our country in a hygienic and neat environment. It will be a great help to society where living in eco-friendly surroundings is possible [2].

The proposed system will monitor the level of wastes collected in the waste-bins through ultrasonic Sensor and NodeMCU by real time monitoring. Figure 1 shows the hardware architecture of Proposed system. It mainly consists of Arduino mini, ultrasonic sensor, NodeMCU, voltage regulator and a capacitor.

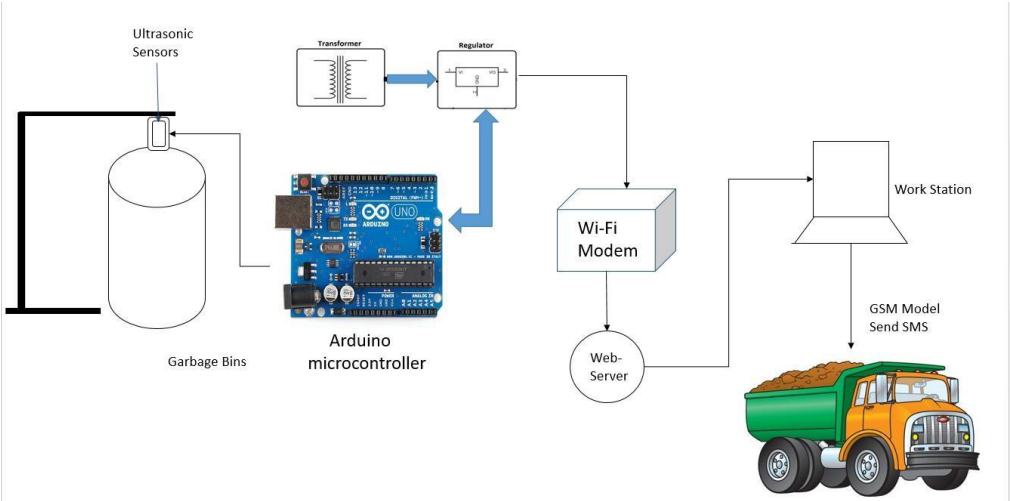

Figure 1. Smart Garbage Monitoring System

a. The Arduino Mini is a little microcontroller board initially dependent on the ATmega328P expected for use on breadboards and when space is at a higher cost than normal. As a result of its little size, interfacing the Arduino Mini is a smidgen more confounded than a customary Arduino board.

b. A prebuilt Blynk application app is used to interface it with mobile phones. Also a record has to be maintained on Blynk application to control its all management.

c. Ultrasonic Sensor can measure a distance from range 2 cm to 400 cm or from 1 inch to13 feet. It works on the principle of transmitting sound waves to the item surface and receiving returned with excessive exactness and stable readings. It discharges a sound wave on the Frequency of 40 KHz to the item surface which after striking the surface will reflect back the sensor. So through measuring the time lag between strike the surface and returns the distance can be obtained. Distance can be envisioned by means of circumstance.

d. NodeMCU contains ESP8266 i.e. Wi-Fi module. This is a modest gadget as it can speak with any microcontroller and make the function performed.

e. LM7805 Voltage regulator is a 3-pin IC, input pin for getting incoming DC voltage, output pin supplies the + 5 volts and ground pin for establishing ground for the regulator.

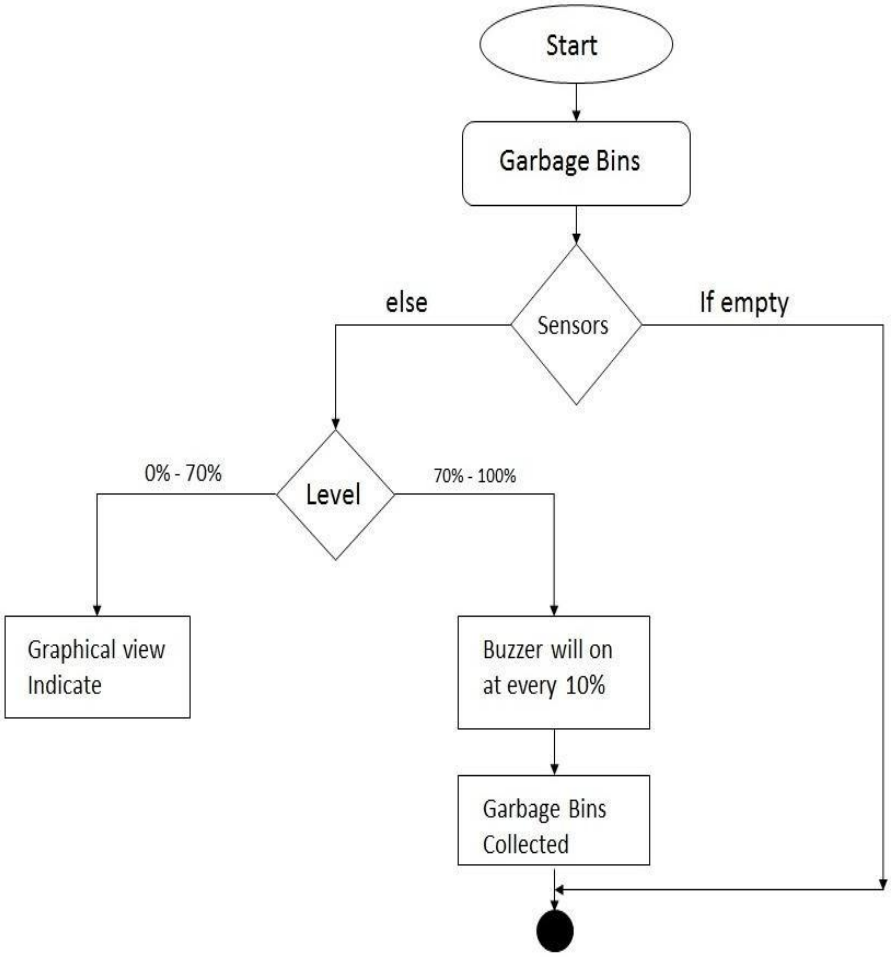

Figure 2 IOT enabled garbage monitoring system

Working:

The ultrasonic sensor is connected to the NodeMCU via arduino mini microcontroller as shown in figure 2. Then the sensor transmits the data signal to the NodeMCU with in-built Wi-Fi module i.e. ESP8266 which communicates to the Blynk server about the waste-bin level and then NodeMCU ESP8266 Wi-Fi module stimulates the data and send it to the Blynk application in which indication of the garbage level via LED's i.e. LOW, MEDIUM, HIGH is notified to the garbage collector and the collector then manage his route for the garbage collection accordingly.

3.1 SOFTWARE IMPLEMENTATION

3.1.1 Configuration of blink app

Prebuilt application (Blynk app) is used to interface with the web. Once the Blynk application is downloaded on the mobile phone, a record to be made in the application to get to its administrations. The administrations are enabled for the noticeable clients. New records can be easily included in the existing one. With the help of program and blink application the user can speak up with the administrators and get the continuous updates

also. The simulation results of the proposed model are shown in figure from 3 to 8.
Step 1: Create new account by signing up with your email id and password.

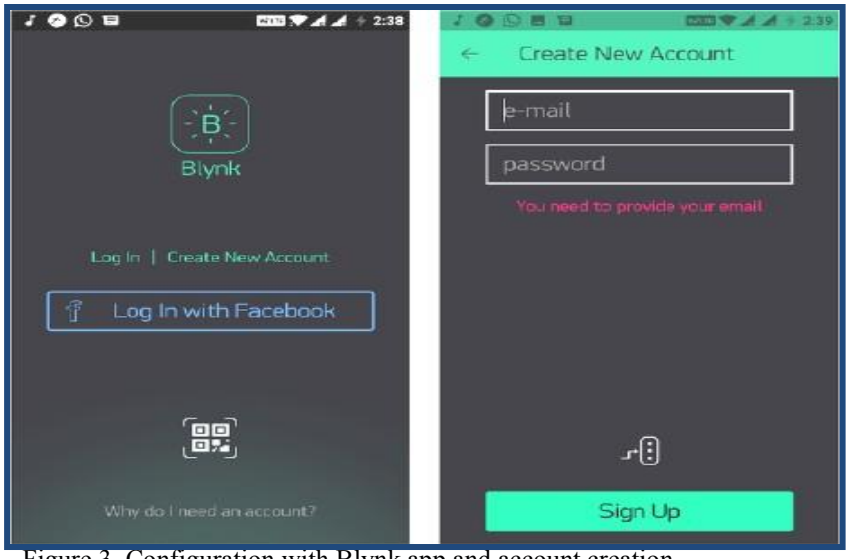

Figure 3. Configuration with Blynk app and account creation.

Step 2: Then Click on New project, give name to your project and choose device ESP8266 Then click on create option at bottom..

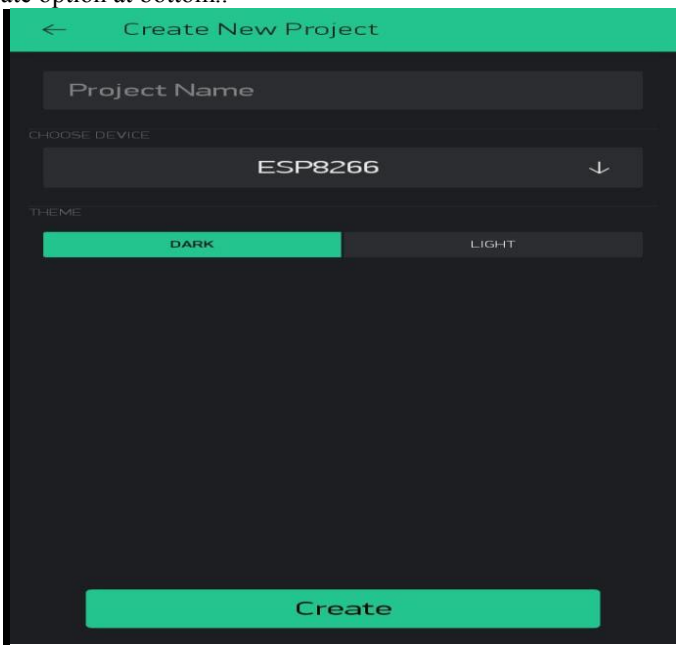

Figure 4. Create new project

Step 3: Click on plus sign on top to add 3 LED's for level indications.

Step 4: Connect LED 1 for LOW to D0 pin
Connect LED 2 for MEDIUM to D1 p**in**
Connect LED 3 for FULL to D2 pin

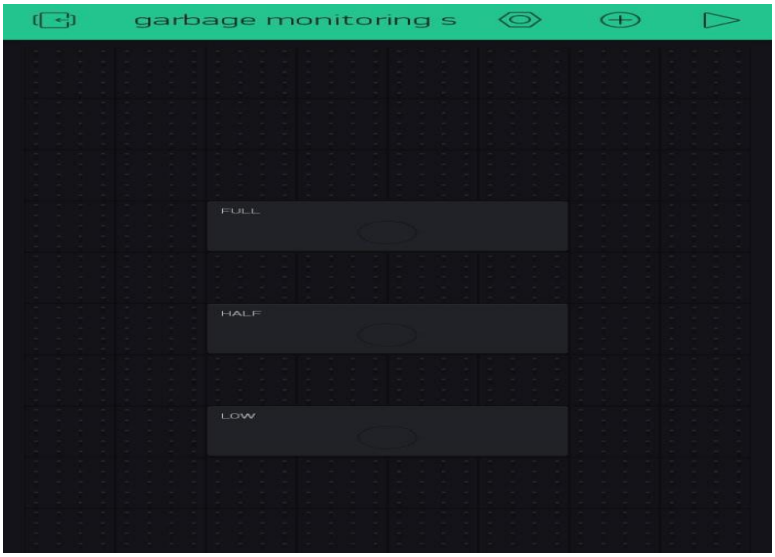

Figure 5. LED's for Level indication.

Step 5: Now your LED's will glow with the levels.

3.1.2 Working process

Step 1: Open File and click New for creating new project.

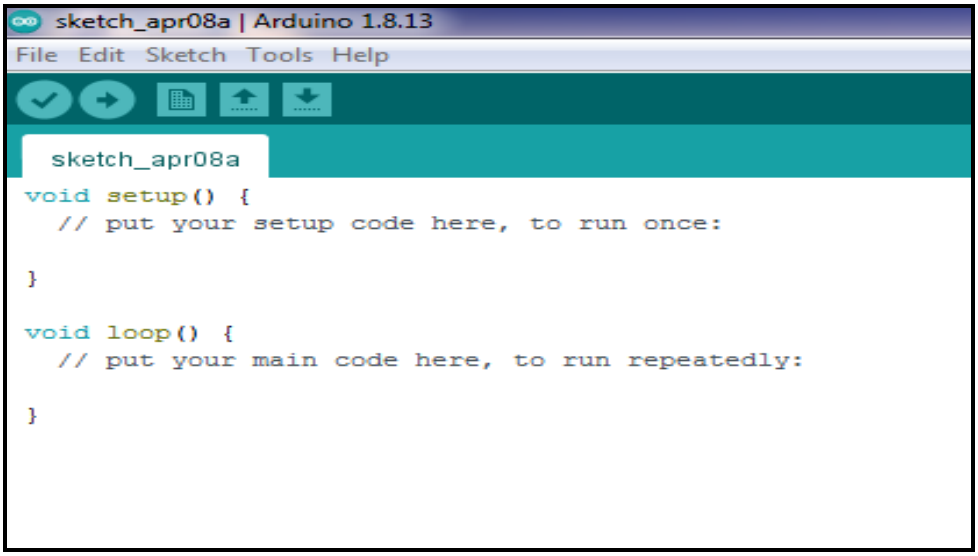

Figure 6. New project window

Step 2: Enter the code as shown in figure below .

Step 3: Now click on verify button to compile the above code.

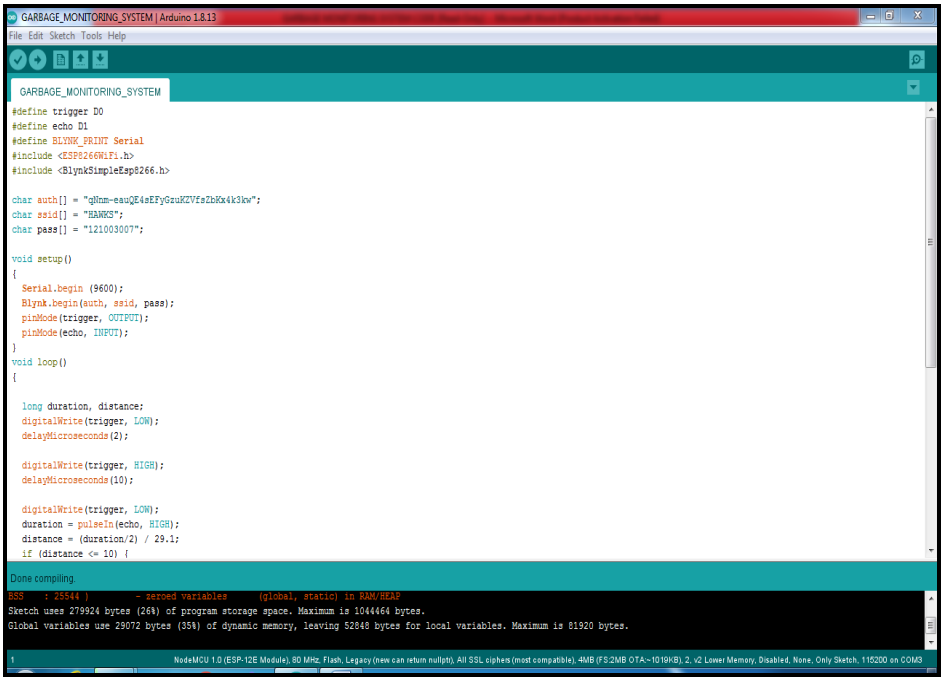

Figure 7. Compilation

Step 4: After compiling the code, uploaded the code on NodeMCU by connecting it to the computer using a mini USB cable. When the code starts running, ESP8266 tries to connect with the access point. Once the ESP8266 connects, a ping message is sent via the Blynk server. The interfacing of ESP8266 with the Blynk app is shown in Figure 8.

Step 5: Open the blynk application

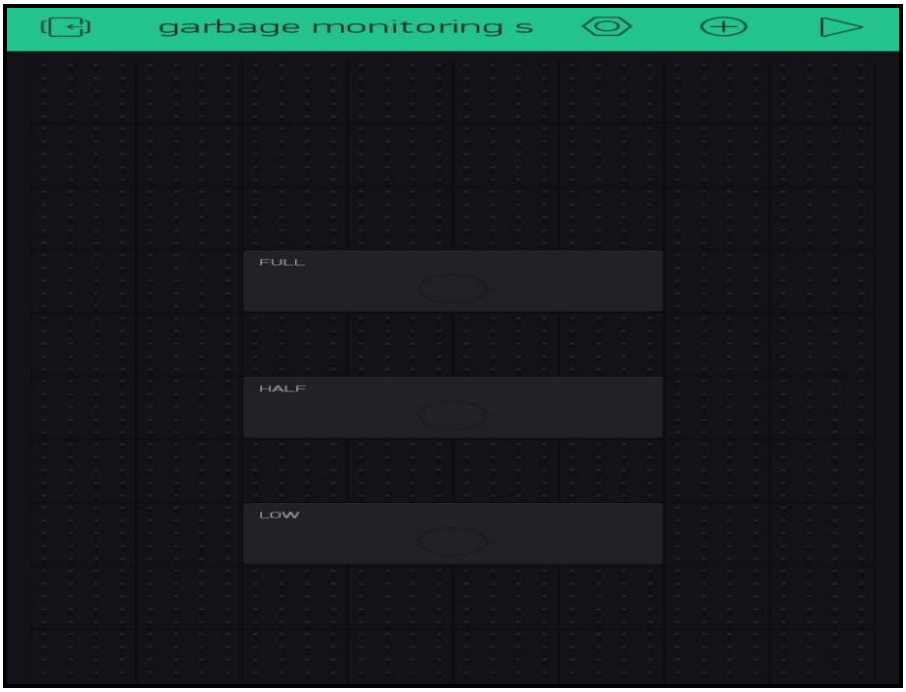

Figure 8. LED's for Level indication.

4. RESULTS & ANALYSIS

The simulation is carried out for different levels of waste in the bins. Also, a warning message was sent if the level got changed. The client used to check the warning on the Blynk application. These warning messages also shows that the framework is working properly and accurately. The developed system provides improved database for garbage collection time and waste amount at each location. We analyzed the solutions currently available for the implementation of IoT. By implementing this project we will avoid over flowing of garbage from the container in residential area which is previously either loaded manually or with the help of loaders in traditional trucks. It can automatically monitor the garbage level & send the information to collection truck. The technologies which are used in the proposed system are good enough to ensure the practical and perfect for solid garbage collection process monitoring and management for green environment.

5. CONCLUSION & FUTURE SCOPE

This system gives Real-time monitoring of the wastes and plays a beneficial role to help our local area, home or even environment clean & green which results in better way of living our life in hygienic environment. Ultrasonic sensor is used to monitor the level of waste bins in the dustbins. As the proposed work additionally decreases manual work and it can be further improved by using more ultrasonic sensors.

REFERENCES

1. World Bank Report, Washington September 20, 2018. Available online:https://www.worldbank.org/en/news/press- release/2018/09/20/global-waste-to-grow-by-
70- percent-by2050-unless-urgent-action-is-taken-world- bank-report, (accessed on 12-8-2020).
2. Giffinger, R. Smart cities Ranking of European medium sized cities. Cent. Reg. Sci. Vienna Univ. Technol. 2017, 16, 13–18.
3. Schafer G 1994 U.S. Patent No. 5,326,939. Washington DC: U.S. Patent and Trademark Office.
4. Guerrero, Lilliana Abarca, Ger Maas, and William Hogland. “Solid waste management challenges for cities in developing countries.” Waste management 33.1 (2013): 220-232.
5. Vikrant Bhor, “Smart Garbage management System”, International Journal of Engineering Research and Technology (IJERT) 2009, pp.103-110.
6. Kasliwal Manasi H and Suryawanshi Smith kumar B 2016 A Novel approach to Garbage Management
7. Using IOT for smart city International Journal of Current Trends in Engineering & Research 2 348-53.

8. Anitha A, Kalra S and Shrivastav 2016 A Cyber defense using artificial home automation system using IoT International Journal of Pharmacy and Technology 8 25358-64.
9. Kurre, Vishesh Kumar. “Smart Garbage Collection Bin overflows Indicator using IOT”(2016).
10. Kanchan Mahajan, “Waste Bin Monitoring System Using Integrated Technologies”, International Journal of Innovative Research in Science, Engineering and Technology Issue 3, Issue 7, July 2014.
11. Akhil, R.N.; Valarmathie, P.N. IoT Based Waste Management System for Smart Cities. Int. J. Adv. Res. Ideas Innov. Technol. 2017.
12. Jaid Jim, A.A.; Kadir, R.; Mamun, M.A.A.; Nahid, A.- A.; Ali, M.Y. A Noble Proposal for Internet of Garbage Bins (IoGB). Smart Cities 2019, 2, 214–229.
13. Arkady Zaslavsky, Dimitrios Georgakopoulos” Internet of Things: Challenges and State-of-the-art solutions in Internetscale Sensor Information Management and Mobile Analytics” 2015 16th IEEE International Conference on Mobile Data Management.
14. Pardini, K.; Rodrigues, J.J.; Diallo, O.; Das, A.K.; de Albuquerque, V.H.C.; Kozlov, S.A. A Smart Waste Management Solution Geared towards Citizens . Sensors 2020, 20, 2380.
15. You, Z.; Wu, C.; Zheng, L.; Feng, L. An Informatization Scheme for Construction and Demolition Waste Supervision and Management in China. Sustainability 2020, 12, 1672
16. Shi, Y.; Lv, L.; Hu, F.; Han, Q. A Heuristic Solution Method for Multi-Depot Vehicle Routing-Based Waste Collection Problems. Appl. Sci. 2020, 10, 2403.