

# Automated Food Waste Management System using Arduino: A Smart Solution for Effective Waste Reduction

Abhishek Edens<sup>1</sup>, Ridhu Jil Saji<sup>2</sup>, Gopu G Krishnan<sup>3</sup>, Netha Merin Mathew<sup>4</sup>

<sup>1</sup>Abhishek Edens Mount Zion College of Engineering

<sup>2</sup>Ridhu Jil Saji Mount Zion College of Engineering

<sup>3</sup>Gopu G Krishnan Mount Zion College of Engineering

<sup>4</sup>Assistant Professor Netha Merin Mathew, Dept. of Electronics and Communication Engineering, Mount Zion college of Engineering, Kerala, India

\*\*\*

**Abstract** - These days, squandering food is normal among the understudies in schools, lodgings, and working environments. This outcomes in an overwhelming interest in food items later, which might prompt food shortage for people in the future. In this paper we have principally centered around estimating the food squander and giving fines to the clients who squanders more food, where it shows the constant food wastage of each person on a screen and in a site for future reference. This exploration mostly centers around checking the food wastage of everybody. Our model proposed over and makes an equal outcome to give a point-by-point report to the overseeing and the client about their measure of food abundance each time. We can do this either physically or robotizing the interaction involving Web of Things as a key device. We utilize a QR code to screen the wastage of people. They can be opened exclusively by utilizing the QR Code given by the administration. Fundamentally, we are mechanizing the most common way of recognizing how much food squander in regions where we are certain that how much food waste can be decreased. This is finished by breaking down individual food squander and creating reports that decide how much fine every individual should pay.

**Key Words:** Internet of Things (IOT); Weight Sensors; Arduino; QR Code; BLYNK App; Stepper Motor; Motor Driver; Food waste management.

## 1. INTRODUCTION

Food the board is dependably a troublesome errand for the administration as it includes a ton of work and persistent investigation of food wastage by each person. This dreary cycle can be supported utilizing the Web of Things (IOT). Food wastage influences the climate as well as makes an adverse consequence on the economy of a country and provokes extraordinary interest for food items. In places like lodgings, school bottles, office cafeteria how much food squander is very high in light of the heedlessness of the workers and understudies. As a matter of fact, that measure of food can take care of a many individuals who couldn't bear the cost of their food. If food wastage is checked separately and giving fines to

the clients who squanders more food, there is a high possibility decreasing how much food wastage in those public regions. The answer for this issue can be accomplished by utilizing the Web of Things and Distributed computing. Security has turned into the main issue with the advancement of the Web of Things. The gathered data in the fundamental server has been examined and handled by the need of the client. In this framework utilizes the distributed computing virtual organization to store all the constant data and examination of information in a flash. The report is created right away and really of every item in each person for future reference. Presently, distributed storage is turning into a moving stage for putting away and recovering the administrations through the web. Distributed computing grants the association to begin free of charge and charges just when we demand for additional administrations. All information caught utilizing IOT sensors will be taken care of into the data set for additional examination.

## 1.1 NEED FOR FOOD WASTE MANAGEMENT SYSTEM

In fostering the extras are a stressing concern. School, lodgings, school inns, flasks, working environment cafeterias and services lead to a colossal measure of food wastage. This squandered food makes contamination the climate and causes numerous financial upsets. In many non-industrial nations, the public authority is in battle to discard the food wastage in a legitimate manner not making any damage to the general public by executing creative thoughts and ventures utilizing trend setting innovations. This food wastage is not just an issue in non-industrial nations, yet many created nations are additionally impacted by the issue. In many created nations the extra food is unloaded in the open regions, which influences the climate. Likewise, individuals in the general public ought to.

## 2. LITERATURE SURVEY

In [1] the fundamental idea of this task named "IoT Based Food Management System" is to gather the

overabundance/extra food from givers like lodgings, eateries, marriage corridors, and so on and circulate to the destitute individuals through NGOs. NGOs will gather the extra or abundance food from previously mentioned settings for the circulation to the penniless individuals. This electronic application for food squander the executives can help with gathering the extra food from lodgings, eateries, marriage lobbies, social, political functions & strict occasions to disseminate among the people who are out of luck. NGOs, that are assisting unfortunate networks with engaging against starvation and hunger, can raise a solicitation for supply of abundance/left-over food from cafés through this application. When the solicitation is acknowledged, the NGOs can gather the food from the setting for conveyance.

In [2] this paper presents the clever approach to doing a coordinated detecting framework which computerizes the strong waste administration process. The proposed savvy squander canister depends on ultrasonic-level sensor and different gas sensors which naturally sense the dangerous gases and the greatest furthest reaches of waste. The methodology is exceptional and utilizes cloud and portable application-based checking. Two significant highlights of work are it not just actually looks at the greatest waste level of the container yet additionally looks at different stinky gases. The other piece of the work is passing the data on to the capable power. This exceptional methodology takes the help of cloud cut off due for its potential benefits in field of ease of use, availability, and calamity recuperation. The data can relate to district web server for guaranteed activity. The waste receptacles are followed by a remarkable number which addresses its area. The capricious method gives all data connected with state of being of a specific receptacle and can undoubtedly arrive at the relating authority. The entire data is interconnected with a cloud-based web-data framework at the host server.

In [3] squander assortment and the executives are a coordinated piece of both city and town life. Absence of enhanced and productive waste assortment framework incomprehensibly influence general wellbeing and costs more. The predominant customary waste assortment framework is neither streamlined nor proficient. Web of Things (IoT) has been assuming an extraordinary part in making human existence more straightforward by making frameworks shrewd, satisfactory, and independent. Hence, this paper proposes an IoT based productive waste assortment framework with brilliant receptacles. It does continuous observing of the waste receptacles and figures out which canisters are to purged in each pattern of waste assortment. The framework additionally presents an improved route framework that shows the best course to gather squanders from the chose receptacles. Four waste receptacles are accepted in the city of Mount Lovely,

Michigan aimlessly area. The proposed framework diminishes the movement distance by 30.76% on a normal in the expected situation, contrasted with the customary waste assortment framework. Accordingly, it decreases the fuel cost and human work making the framework improved and effective by empowering constant checking and upgraded route.

In [4] the public receptacles which are utilized for gathering this waste are spilling over, the territory is muddled of junk, causing foul roads as well as an adverse consequence on the wellbeing and climate. We isolate the loss at our homes for ease at handling and reusing. We noticed junk vans come sporadic to homes making a plunder of families. Because of these numerous regular citizens void their over-burden dustbins in open spaces. This thus increments natural contamination. The waste is an extraordinary problem for our wellbeing and the climate it has many impacts which are unpleasant. Rubbish is favorable place for microbes, bugs, flies these flies are the very that wander around the palatable and drop the off springs. In this way, they increment the gamble with food contamination, typhoid, gastroenteritis, salmonella, the bugs cause jungle fever dengue and so on. Here a waste administration framework is presented in which every dumpster is implanted in a checking framework which will tell the relating individual if the dumpster is full. In this framework, isolating wet and dry waste into two separate containers is additionally conceivable. This framework gives a successful answer for squander the board issue.

In [5] the paper is featuring the upsides of coordinating advancements and computerized principles in open governmental issues for safeguarding customer freedoms. The present globalization of food creation chains, their broad intricacy and limits emerging from manual addition and information handling of items data make it unthinkable for shoppers the errand of being educated progressively. This deterrent can be survived, and the ongoing degree of innovation and low execution costs permit full mechanization of this cycle. We propose a sensors network engineering considering Web of Things (IoT) parts, which is utilizing independent implanted modules and radio distinguishing proof labels (RFID) that will naturally gather information, covering the whole life pattern of the food item and every one of the elements that impact its compound synthesis. This design offers purchasers complete information about their food items and how their parts were gotten.

### 3. BLOCK DIAGRAM

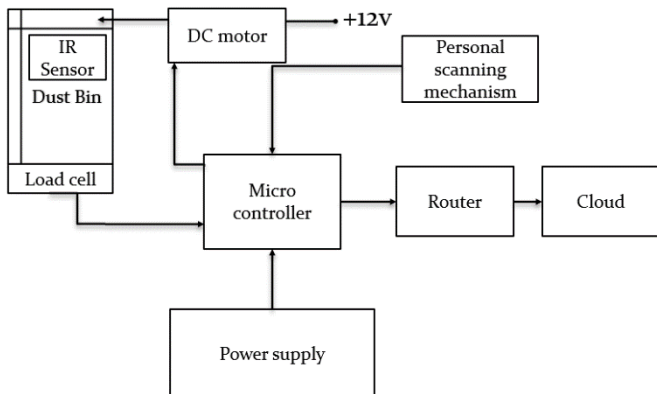


Fig 3.1 Proposed System

**Node MCU:** Node MCU is an open-source LUA based firmware produced for the ESP8266 Wi-Fi chip. By investigating usefulness with the ESP8266 chip, Node MCU firmware accompanies the ESP8266 Advancement board/unit i.e., Node MCU Improvement board. Since Node MCU is an open-source stage, its equipment configuration is open for alter/adjust/assemble. Better Processor and Memory, Hub MCU accompanies a 80MHz of clock speed and 4MB of blaze memory. Inherent TCP/IP Stack - IoT Prepared: The Node MCU contains a Wi fi association and can interface with the web through Wi fi. It is the most appropriate for IoT applications.



Fig 3.2 Node MCU

**IR SENSOR:** IR sensor is an electronic gadget, that emanates the light to detect some object of the environmental factors. An IR sensor can gauge the intensity of an item as well as distinguishes the movement. Typically, in the infrared range, every one of the articles emanate some type of warm radiation. These sorts of radiations are undetectable to our eyes, yet infrared sensor can identify these radiations. An infrared sensor (IR sensor) is a radiation-delicate optoelectronic part with a ghastly responsiveness in the infrared frequency range 780 nm ... 50 μm. IR sensors are currently broadly utilized

moving finders, which are utilized in building administrations to turn on lights or in caution frameworks to distinguish unwanted visitors.

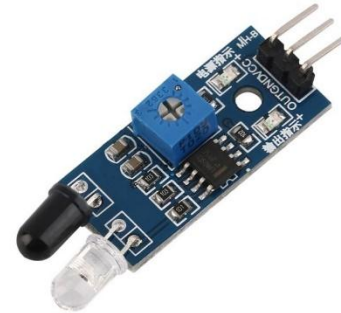


Fig 3.3 IR Sensor

**LOAD CELL:** A heap cell changes over a power like strain, pressure, tension, or force into an electrical sign that can be estimated and normalized. It is a power transducer. As the power applied to the heap cell builds, the electrical sign changes relatively. A heap cell estimates mechanical power, chiefly the heaviness of items. Today, practically all electronic weighing scales use load cells for the estimation of weight. They are broadly utilized in light of the precision with which they can quantify the weight.



Fig 3.4 Load Cell

### 4. BLOCK DIAGRAM EXPLANATION

UI comprises of an Examining framework by BLYNK Application and LCD shows. A servomotor is a revolving actuator or direct actuator that considers exact control of precise or straight position, speed, and speed increase. Client cooperates with the item utilizing QR Code provided by the BLYNK Application. A framework gives QR code by the container and sweep the QR Code to open the canister. When the client filters the QR code in the application, the LCD show shows the subtleties of every individual. Then, at that point, the LCD show shows the data to the client to

dump the loss into the receptacle. After the receptacle gets opened and the client needs to put the loss inside the canister. LCD show how much waste that is tossed in the canister by the specific client at that specific time. The weight subtleties are transferred to the data set arrangement of the individual consequently. UI comprises of a Filtering framework by BLYNK Application and LCD shows. A servomotor is a rotating actuator or straight actuator that takes into consideration exact control of rakish or direct position, speed, and speed increase. Client collaborates with the item utilizing QR Code provided by the BLYNK Application. A framework gives QR code by the canister and output the QR Code to open the receptacle. When the client filters the QR code in the application, the LCD show shows the subtleties of every individual. Then, at that point, the LCD show shows the data to the client to dump the loss into the container. After the receptacle gets opened and the client needs to put the loss inside the canister. LCD show how much waste that is tossed in the container by the specific client at that specific time. The weight subtleties are transferred to the data set arrangement of the individual consequently.

## 5. WORKING

Food squander is put in a container introduced with a heap cell sensor. The heaviness of the food squander is estimated by the sensor and shipped off the Arduino board. An IR sensor is introduced in the receptacle to identify the presence of food squander. At the point when the food squander is recognized by the IR sensor, it sets off the Arduino board to turn on the stepper engine. The stepper engine is associated with a food garbage removal unit and drudgeries the food squander into little pieces. When the food squander has been ground, the stepper engine switches off consequently. Every person who utilizes the framework is doled out an individual QR code. Prior to discarding their food squander, they check their QR code utilizing a QR code scanner. This information is shipped off the Arduino board and afterward to the cloud-based Blynk application. The Blynk application records how much food squander produced by every person, which can be seen by the clients and the administration. This data can be utilized to urge clients to lessen their food squander. A Drove is introduced on the canister, which demonstrates the degree of food squander in the receptacle. This can assist the administration with knowing when to purge the receptacle. The framework can be associated with an IoT stage for additional investigation of the information. The stage can utilize AI calculations to give experiences into the examples of food squander age.

By carrying out this framework, the administration can really deal with the food squander produced and lessen how much waste that goes to landfills. The framework can

likewise urge people to decrease their food burn through by giving them constant input on their waste age.

## 6. RESULT

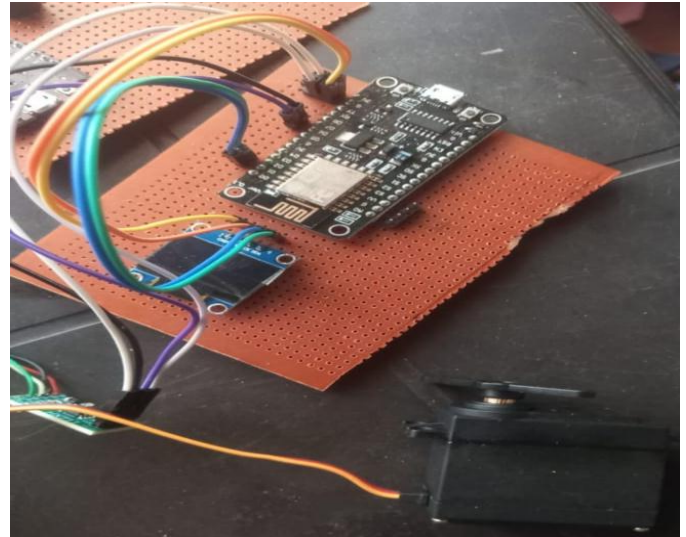


Fig 5.1 Final Product of Proposed system

## 7. CONCLUSION

This paper can urge individuals to take essential measures of food so the wastage of food can be decreased. In our proposition, with the assistance of distributed computing and IoT sensors we are executing just in premises where an Examining system is given, this will help us in saving the expense as well as the for making the singular records of the administration, and this will make a bigger effect on the singular food overabundance at the functioning environmental elements. In our proposed forthcoming upgrades, it will cover more regions like pads, manors, eateries, lodgings, schools, universities, tech parks, party spaces and so on. In our proposed framework, the district can pick the loss from a given area which is modified in the Arduino. A sum as a fine is given to the families or people which brings down the food wastage.

## REFERENCES

- [1] Pavan Manjunath, Pritam Gajkumar Shah, "IoT Based Food Management System", Web Publication, <https://ieeexplore.ieee.org/document/903253>.
- [2] D. Misra, G. Das, T. Chakraborty, and D. Das, "An IoT-based waste management system monitored by cloud," *Journal of Material Cycles and Waste Management*, vol. 20, no. 3, pp. 1574-1582, Mar. 2018.
- [3] K. F. Haque, R. Zabin, K. Yelamarthi, P. Yanambaka, and A. Abdelgawad, "An IoT Based Efficient Waste Collection

System with Smart Bins," 2020 IEEE 6th World Forum on Internet of Things (WFIoT), Jun. 2020.

[4] Tejashree Kadus, Pawankumar Nirmal, and Kartikee Kulkarni, "Smart Waste Management System using IOT," International Journal of Engineering Research and, vol. V9, no. 04, May 2020.

[5] Harith M.Z.M.Z.; Hossain M.A.; Ahmedy I.; Idris M.Y.I.; Soon T.K.; Noor R.M. "Prototype Development of IoT Based Smart Waste Management System for Smart City", IOP Conf. Ser. Mater. Sci. Eng. 2020, 884, 012051.

[6] Theodoros A." IoT-enabled tip and swap waste management models for smart cities", Int. J. Environ. Waste Manag. 2020. accepted for publication.

[7] Maria C.; Góis J.; Leitão A. "Challenges, perspectives, of, greenhouse, gases, emissions, from, municipal, solid, waste, management in Angola", Energy Rep. 2020, 6, 364–369.

[8] Venkateela L.K. "Status and challenges of solid waste management in Tirupati city", Mater. Today Proc. 2020, 33, 470–474.

[9] Suresh N.; Limbo A.; Hashiyana V.; Ujakpa M.M.; Nyirenda. C. "An internet of things (IoT) based solid waste monitoring system", In Proceedings of the 2nd International Conference on Intelligent and Innovative Computing Applications, Online, 24–25 September 2020.

[10] Sathishkumar N.; Pravinkumar M; P.M; S.R. "IoT based Dustbin Monitoring with Dumpster Alert System", 2022 8<sup>th</sup> International Conference on Advanced Computing and Communication Systems (ICACCS).

[11] H. Cheng and Y. Hu, "Municipal solid waste (MSW) as a renewable source of energy: Current and future practices in China," Bioresource technology, vol. 101, pp. 3816-3824, 2010.

[12] D. Hoornweg and P. Bhada-Tata, "What a waste: a global review of solid waste management," 2012.

[13] M. The World Bank, "What a Waste: A Global Review of Solid Waste Management, "Urban Development & Local Government Unit, 2012.

[14] O. M. Johansson, "The effect of dynamic scheduling and routing in a solid waste management system," Waste management, vol. 26, pp. 875-885, 2006.

[15] M. Faccio, A. Persona, and G. Zanin, "Waste collection multi objective model with real time traceability data," Waste Management, vol. 31, pp. 2391-2405, 2011.