International Journal of Research in Engineering, Science and Management
Volume-3, Issue-2, February-2020
www.ijresm.com | ISSN (Online): 2581-5792

Smart Waste Segregator

S. S. Akhil[1], A. S. Akhiljith[2], S. Aswin[3], V. Amal[4]
[1,2,3,4]*UG Student, Department of Electronics and Communication Engineering, Marian Engineering College, Thiruvananthapuram, India*

***Abstract*: Waste management and segregation is a much-needed process in metro cities and urban areas due to spreading of diseases. Waste lying littered in the surrounding, dumped on open lands, becomes a major problem for various types of disease-causing bacteria and viruses hence, segregation, transport, handling and disposal of waste must be managed properly to minimize the risks of the public and environment. When mixed dry and wet waste breaks down in lowland, it creates nasty greenhouse gases. Segregation makes it attainable to utilize and recycle the waste effectively. This project aims to provide a way to easily segregate waste.**

***Keywords*: Smart bin, Internet of Things, Metal sensor, Moisture sensor.**

1. Introduction

Solid waste management is one of major aspect which has to be considered in terms of making urban area environment healthier. An environment will be polluted and dirty if the waste material is not been manage and collected in time. A better waste management solution can helps improving the general wellbeing of a community and built up a better neighborhood. Nowadays, numerous IoT based solution for waste management are implemented to improve the collection of garbage which would ensure healthy environment for life on this green planet, with greater efficiency.

In India the segregation of domestic waste is done at the municipal factories, where huge machinery are used for separating recyclable materials. Implementation of separate bins for collection of waste materials is done, but it does not yield its purpose due to lack of awareness, ignorance and negligence. The existing system for collection of municipal solid waste does have any means to verify the proper disposal or its timely maintenance. Paper contaminated with food cannot be recycled, since the paper is mixed with water in a large churner, the oil eventually separates from the paper. The oil does not dissolve in water, instead it mixes in with the paper during the production, leading to formation of an oily layer over the paper, making unusable. The present recovery and utilization of waste in paper mills in India is pretty low, at 20 percent of the total paper and paper board consumed. India currently imports waste paper as raw materials for paper production. The solution needed for increasing the utilizable resources is through setting up automated bins which can identify the type of garbage dumped into the bin. This helps negate the effects of human negligence and also reduce the chances of available recyclable materials getting contaminated.

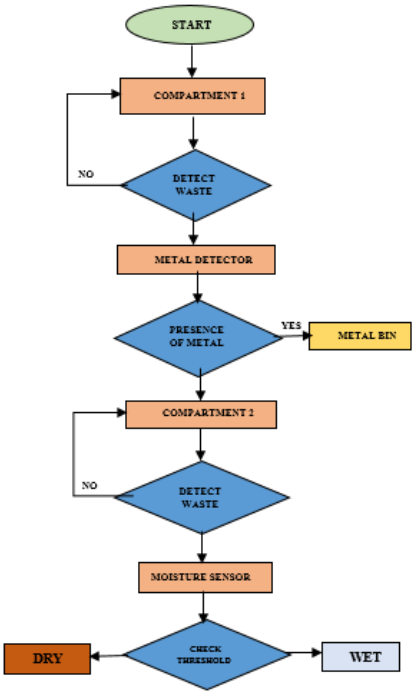

Fig. 1. Flowchart

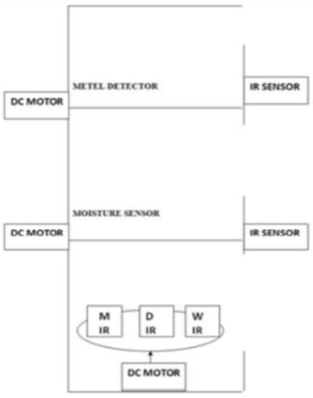

Fig. 2. System structure

2. Approach

A. Design

The smart waste segregator bin is divided into three parts or compartments. Each part has their own functions. The first

compartment consists of an IR sensor and a metal detector. The second compartment consists of another IR sensor and a moisture sensor for detecting dry and wet waste. The last compartment is again subdivided into three bins for the collection of segregated waste respectively. The whole system is controlled by ARDUINO MEGA Board. Each and every component is interfaced to the arduino board. The necessary code for controlling the sensors and the motors is coded using embedded-C language, in which the inputs and the output ports can be defined easily. In this project we have used IDE compiler to compile the code and upload it to the board using an A-B wire. To provide details of every decision we have used a Liquid Crystal Display device to display the decisions made by the Arduino processor. NodeMCU is a component which can be used to connect to a wifi hotspot using the 802.11 protocol. NodeMCU when interfaced with ARDUINO MEGA can be used for providing real time updates, through updating the decisions made by the device on to the specific server, from where the status of the device can be monitored.

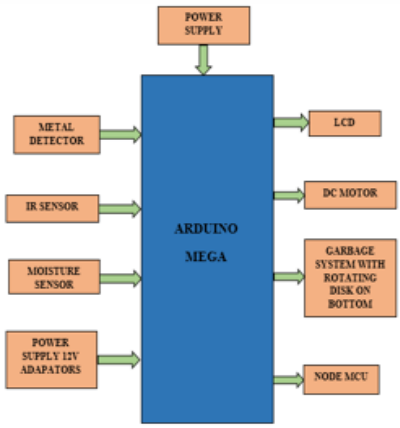

Fig. 3. Block diagram

3. System flow

The process of segregation begins with the detection of waste in the first compartment, where an IR sensor and a metal detector are placed. The IR sensor is used for the detecting the presence of waste in the compartment and the process of separation begins. Once the waste is detected by the IR sensor the metal detector becomes active and verifies if the garbage is of metal wastes.

If any metal object is present near the metal sensor, the magnetic field around it induces current in the metal object, hence creating a loss and change in the electric field. When metal is detected, the contents in the first compartment are sent directly to the storage compartment, where three separate bins are used for metal, dry and wet waste. When the contents of the first compartment are found to be non-metallic, they are sent to the second compartment, where an IR sensor is used to verify the presence of the garbage. Depending on the output given by the IR sensor, the moisture sensor gets activated or stays inactive. When the garbage is detected in the second compartment, the moisture sensor becomes active and is used to decide if the contents to be dry or wet waste. The decision is made using the change in the dielectric constant. Higher permittivity suggests that the garbage contains water content and hence is deemed to be wet waste.

Depending on the decision made by the moisture sensor the contents are sent to their respective bin. The storage compartment consists of a rotating table with three bins namely dry, wet and metal. The rotating table rotates according to the type of garbage detected in the previous compartments, for collecting the respective waste and after collection of garbage resets to a default position. The placement of the bin for collection is programmed using delay/time taken for the table to rotate. We have interfaced a NODEMCU module which gives us a feedback on the filling of bins. This module also helps us to send information about the filling of bins to municipal corporation so that they can come and collect the waste.

4. Output and screenshots

Here we have simulated the practical situations in which the smart bin is to be operated. The results show the functioning of the bin undergoing the segregation process.

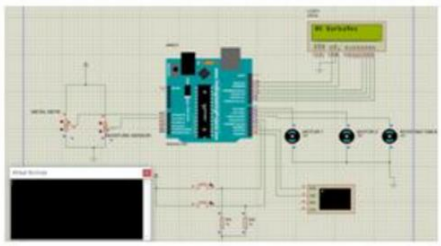

Fig. 4. No garbage

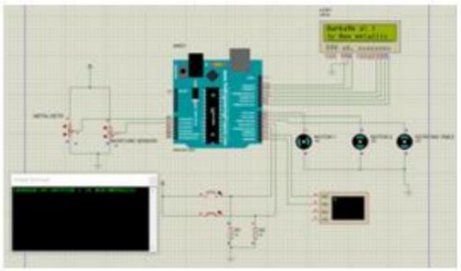

Fig. 5. Nonmetallic Waste

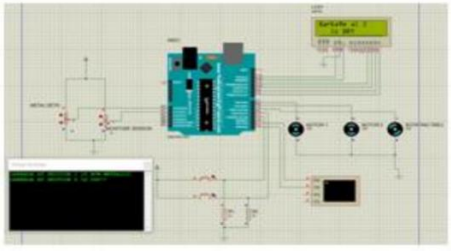

Fig. 6. Dry waste

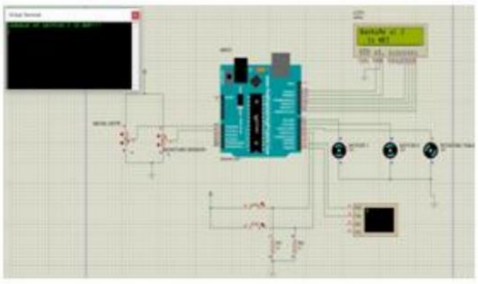

Fig. 7. Wet waste

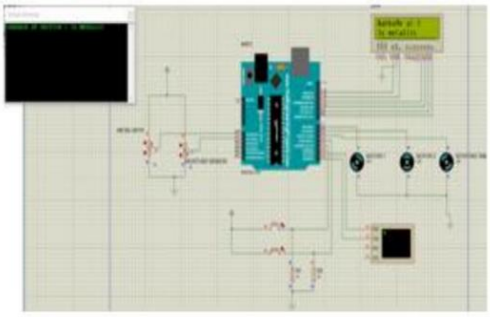

Fig. 8. Metallic waste

5. Conclusion

The project when executed will help create more resources for recycling as it decreases the probability of contamination, hence increasing the resources usable for recycling.

Acknowledgement

The project we had simulated on our academic life would be incomplete without the advice and help from certain people. Firstly, we are thankful to Ms. Vinitha B. Elza, Head of the Department, Electronics and Communication Engineering, Marian Engineering College; then certain valuable staff advisors namely Mr. G Evan Kumar and Mrs. Dhanya Mathew, Assistant Professor for their constant encouragement in finishing the project. Lastly, we would like to thank our friends and families enabling us with the right resource which lead to a successful journey in completion.

References

[1] Santhosh Kumar B R, Rohit K, Manjunath, Varalakshmi N, Sondarya S Lokeshwari, Sahana D N,"Eco-friendly IOT based Waste segrega-tion and management", 2017 International Conference on Electrical, Electronics, Communication, Computer, and Optimization Techniques, (ICEECCOT), 15-16 Dec. 2017.

[2] Marloun, Joseph Bryan, Anrol Sarah, Lyra, Dianne Claudinne, John Phillip, "Standalone frequency based automated trash bin and segregator of plastic bottles and tin cans", 2016 IEEE Region 10 Conference (TENCON), 22-25 Nov. 2016.

[3] Fachmin Folianto, Yong Sheng Low, Wai Leong Yeow, "Smartbin: Smart waste management system", 2015 (ISSNIP), 7-9 April 2015.

[4] Sharanya.A, U. Harika, N. Sriya, Sreeja Kochuvila, "Automatic waste segregator", 2017 ICACCI, 13-16 Sept. 2017.

[5] Krishna Nirde, Prashant S. Mulay, Uttam M. Chaskar, "IoT based solid waste management system for smart city", (ICICCS) 2017, 15-16 June 2017.

[6] Jia-Wei Lu, Ni-Bin Chang, Li Liao, and Meng-Ying Liao,"Smart and Green Urban Solid Waste Collection Systems: Advances", Challenges, and Perspectives, IEEE systems journal, VOL. 11, NO. 4, December 2017.

[7] J. Belin, L. De Boeck, and J. Van Ackere, Municipal solid waste collection and management problems: A literature review, Transp. Sci., vol. 48, no. 1, pp. 78102, Feb. 2014.

[8] G. Ghiani, D. Lagana, E. Manni, R. Musmanno, and D. Vigo, Operations research in solid waste management: A survey of strategic and tactical issues, Comput. Oper. Res., vol. 44, pp. 2232, Apr. 2014.

[9] J. Teixeira, A. P. Antunes, and J. P. de Sousa, Recyclable waste collection planning A case study, Eur. J. Oper. Res., vol. 158, no. 3, pp. 543-554, Nov. 2004.

[10] M. K. Pushpa, Aayushi Gupta, Shariq Mohammed Shaikh, Stuti Jha, Suchitra.V, Microcontroller Based Automatic Waste Segregator, International journal of innovative research in Electrical, Electronics, Instrumentation and Control Engineering Vol. 3, issue 5, May 2015.

[11] Yann Glouche, Arnab Sinha, and Paul Couderc, A Smart Waste Management with Self-Describing Complex Objects, International Journalon Advances in Intelligent Systems, Vol. 8, no. 12, 2015.

[12] Marloun Sejera, Joesph Bryan Ibarra, Anrol Sarah Canare, Lyra Escano, Dianne Claudinne Mapanoo,John Phillip Suaviso, Standalone Frequency Based Automated Trash Bin and Segregator of Plastic Bottles and Tin Cans, 2016 IEEE Region 10 Conference (TENCON).

[13] Balaji Masanamuthu, Chinnathurai, Ramakrishna Sivakumar, Sushuruth Sadagopan, James M. Conrad, Design and Implementation of a Semi-Autonomous Waste Segregation Robert, 2016 IEEE.

[14] Saurabh Dugdhe1, Pooja Shelar, Sajuli Jire and Anuja Apte, Efficient Waste Collection System, 2016 International Conference on Internet of Things and Applications (IOTA) Maharashtra Institute of Technology, Pune, India, Jan. 2016.