Segregated waste management using Smart Dust Bin

Dr.A.Jayachitra
Department Electronics & communication Engineering,
Sri Manakula Vinayakar Engineering college,
Puducherry, India
E-mail: jayachitra98@gmail.com

Dr.Ramya Jothi Kumar
Department Electronics & communication Engineering,
Sri Manakula Vinayakar Engineering college,
Puducherry, India
E-mail: mithulramya@gmail.com

Abstract: Waste management is a major issue. There are several recycling methods for waste management. Waste Management involves several steps to manage waste and to convert it to its final disposal. So this can be done by implementing this Smart Dust Bin. The proposed project is to design and build a prototype for an automatic open dustbin that can automatically open the lid when it reads RFID tag of the people who want to throw out their segregated trash. It also can detect the level of the trash that get filled inside the dustbin. The lid will not open if it is already filled. The level and weight of the garbage bins are tracked using sensors. To check the filling of garbage, a separate ID is allotted for every dustbin. Based on the weight of segregated waste, every person is rewarded by the concerned recycling industries and the total rewards will be displayed on the LCD. Using GSM the message with the information like weight of the disposed waste and its rewards are sent to the user.

Keywords: GSM module, RFID, moisture sensor

I. INTRODUCTION

Waste Management involves monitoring, collection, transportation, processing, disposal or recycle. Thermal Technologies like gasification, pyrolysis, thermal depolymerization, plasma arc gasification, and non–thermal technologies like anaerobic digestion, fermentation and more are a number of new and emerging technologies to extract energy from waste and other fuels without direct combustion. Recycling of materials like plastics, paper and metals should be done for future use. There is a clear need for the current approach of waste disposal in India that is focused on municipalities and uses high technology to move more towards waste processing and waste recycling.

The Existing System monitors the garbage level and sends information to the server when the level crosses the limited level. By each time monitoring the action takes place only when the SMS is received. It is waste of time and no useful product is obtained after collecting this garbage waste. The economic value of waste is best realized when it is segregated and also the improper disposal of the waste (without segregation) can cause major impact on environment.

The proposed project is to design and build a prototype for an automatic open dustbin that can automatically open the lid when it reads RFID tag of the people who want to throw out their segregated trash. It also can detect the level of the trash that get filled inside the dustbin. The lid will not open

if it is already filled. The level and weight of the garbage bins are tracked using sensors. To check the filling of garbage, a separate ID is allotted for every dustbin. Based on the weight of segregated waste, every person is rewarded by the concerned recycling industries and the total rewards will be displayed on the LCD. Using GSM the message with the information like weight of the disposed waste and its rewards are sent to the user. The status of the bin sent to the industries which use this waste as resources. Waste Management involves several steps to manage waste and to convert it to its final disposal. So this can be done by implementing this Smart Trash Bin.
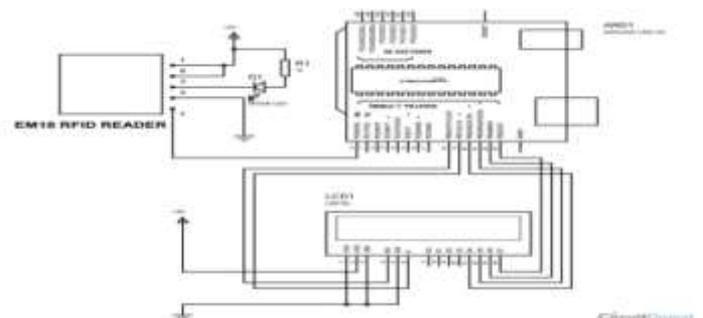

Figure 1. Circuit Diagram to Read RFID and To Display User ID

The smart dustbin hardware contains motor-driver, 16*2 LCD Display, EM18 RFID reader, Load cell, IR Sensors, moisture Sensors, MC ATMEGA328, Bread Board, Power Supply. the status of the bin is monitored continuously using IR sensors. If the bin reaches more than certain weight, the weight sensors will trigger the message to the concerned authority.

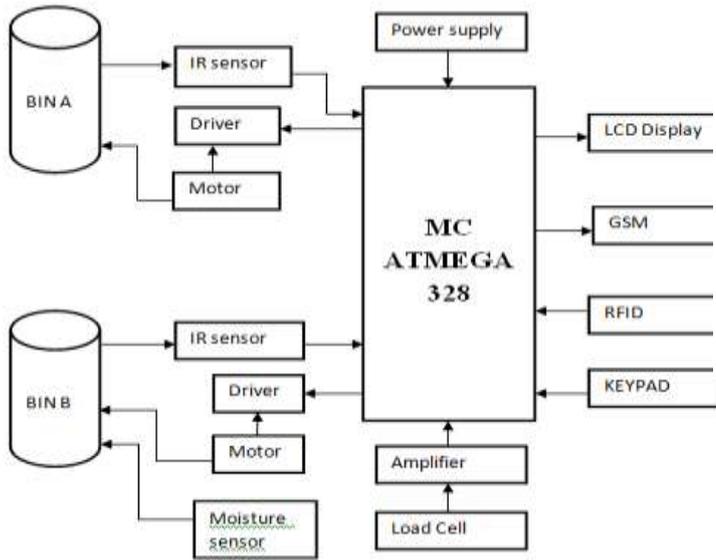## II. DESIGN AND IMPLEMENTATION OF AUTOMATED SMART DUST BIN:

Figure 2. Block Diagram of The Proposed System

A. LOAD CELL

It is placed below the garbage to sense the weight of the waste disposed. The LOAD cell will continuously give the weight readings in voltage format, which is then given to a signal conditioning unit which amplifies the voltage and is then given to the arduino. The Arduino then converts the analog signal to digital format. A load cell is a transponder that is used to sense and convert a force into an electrical signal.

B. IR SENSOR

When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. It is used to detect the level filled in garbage bin.

C. LCD (Liquid Crystal Display)

LCD is used in a project to visualize the output of the application. It uses 16x2 LCD. Thus LCD plays a vital role to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

D. MOISTURE SENSOR

Measurement of the water content of soil is done using moisture sensor. Water demand is identified and accordingly output changes.

E. PIEZO BUZZER

The buzzer produces a same noisy sound irrespective of the voltage variation applied to it. It consists of piezo crystals between two conductors. When a potential is applied across these crystals, they push on one conductor and pull on the other. This, push and pull action, results in a sound wave in the range of 2 to 4 kHz.

F. GSM MODULE

It is used to send messages to the garbage depot if the Garbage can exceed the set threshold level. With the help of GSM module interfaced, we can send short text messages to the required authorities. GSM module is provided by SIM uses the mobile service provider and send SMS to the respective authorities as per programmed. It operates at either the 900MHz or 1800 MHz frequency band.

III. RESULTS AND DISCUSSION

A. HARDWARE SETUP

When the RFID tag is shown near RFID the reader, the unique ID of the tag is shown in the LCD display. The user can access the bin only through their tag in order to dispose their segregated waste. The users are rewarded by the concerned recycling industries for disposing the segregated waste which is used as raw material in the recycling industries.
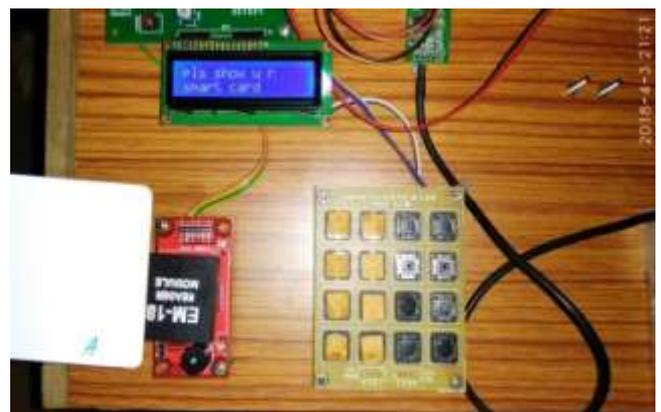

Figure 3 RFID to Access the bin

The rewards provided are based on the weight, the segregated wastes are disposed. Load cell is used to measure the weight of the disposed materials. After this step the weight measured and the cost rewarded for the disposed weight is displayed on the LCD display.

Figure 4. 4X4 Keypad Matrix to Enter Pin

The user needs to enter their pin number in order to dispose their segregated waste and also the type of waste to be disposed is selected using the keypad after measuring the weight.

Figure 5 Weight Measurement Using Load Cell

The user is provided with options in LCD display inorder to select the type of waste to be disposed. The selected bin opens automatically for certain duration to dispose Waste and close automatically using DC motor and driver IC as shown in Fig.5

Figure 6 Automatic Open/Close

The Rewards are displayed in the LCD display and also information about the total reward points are send to the user using GSM after disposing the waste. The GSM also used to update current status of the bin in database of the concerned recycling industries inorder to collect their souces. The IR sensor is used to detect the status of the bin. If the select bin is full then status will be displayed and SMS is sent to the waste collector using GSM. This will avoid the overflow of the bin.

Figure 7. Detection of the Bin Level

Here Wet bin and Dry Bin is used. The Wet bin is to dispose the decomposable waste and the Dry bin for non-decomposable waste. There is a moisture sensor in dry bin which is used to detect the type of waste disposed. If the user disposed the decomposable waste in dry bin then the buzzer alerts the user for disposing in wrong bin.

Figure 8 Moisture Sensor in Dry Bin

Information about the total reward points are send to the user using GSM after disposing the waste. The GSM also used to update current status of the bin in database of the concerned recycling industries inorder to collect their souces.

IV. CONCLUSION

The proposed method is an efficient solution to the current waste management problem which effectively collects metal/glass, dry and wet waste. This system can be effectively deployed in industrial material segregation, scrap shops etc. The Sensor Based Smart Dustbin (SBSD) effectively employs moisture sensors to collect wet waste. Our proposed work aims at collection of segregated waste materials in particular metal, wet and dry waste and to provide rewards to the person disposed the segregated waste. It is the first step towards recycling. Recycling the waste materials has a huge impact on the economic condition of the country since recycling of plastic can reduce the manufacture of plastic using renewable resources and it also has an immense effect on the environment by effectively managing the solid waste.

Many up gradations can be done to our existing work. Some of which are listed below.

- Advanced processing techniques can be incorporated once the waste has been segregated.

- Methods to segregate the imperfect waste using conveyor belt or efficient detection for perfect segregation

- Image sensing can be used to collect segregated materials efficiently through Image processing technology.

REFERENCES

[1] D. Eason, B. Noble, and I.N. Sneddon, "On certain integrals of Daniel Hoornweg et al., "what a waste- A   Global Review of Solid Waste   Management", No.15,Urban Development & Local Government Unit World Bank, Washington, DC., Mar. 2012.

[2] Nishigandha Kothari , "Waste to Wealth", NSWAI, New Delhi, Jul. 2013

[3] Claudine Capel, "Innovations in Waste", Waste management-world, Volume 11, Issue 2, Mar 2010.

[4] J.S. Bajaj, "Urban Solid Waste management in India", Planning Commission Government of India, New Delhi, 1995

[5] Claudine Capel, "Waste Sorting - A Look at the Separation and Sorting Techniques in Today's European Market", Waste-managementworld, Volume 9, Issue 4, Jul 2008.

[6] LDC1000 Inductance to Digital Converter, Texas instruments, Dallas, TX,Sept 2013

[7] MSP430x2xx Family User's Guide, Texas instruments, Dallas, Tx, Dec 2004–Revised Jul 2013

[8] Endress Hauser, Weil am Rhein, Baden-Württemberg "Relative Dielectric constant Ωr(dk value) of liquids and solid materials", 2000

[9] M.S. Venkatesh et al., "An Overview of Microwave Processing and Dielectric Properties of Agri-food Materials", Biosystems Engineering (2004) 88 (1), pp 1–18

[10] "Review of Environmental and Health Effects of Waste Management: Municipal Solid Waste and Similar Wastes", Written by Enviros Consulting Ltd and University of Bir-mingham with Risk and Policy Analysts Ltd, Open University and Maggie Thurgood

[11] Twinkle Sinha,K.Mugesh Kumar, P.Saisharan "smart Dustbin" International Journal of Industrial Electronics and Electrical Engineering ISSN: 2347-6982 [16] Hartmut Lucht, Lutz Kreuchwig, Arnold Uhl "Plastic separation of automotive waste by superfast near infrared sensor".

[12] Shuchi Gupta, Krishna Mohan, Raj Kumar Prasad, sujataGupta, ArunKansal, "Solid Waste Management in India: Options and

Opportunities" in Resource, Conservation and Opportunities: Volume 24, Issue 2, November 1996, Page :137

[13] Amrutha Chandramohan, Joyal Mendonca, Nikhil Ravi Shankar, Nikhil U Baheti, Nitin Kumar Krishnan,Suma M S "Automated Waste Segregator", :Rashtreeya Vidyalaya Col-lege of Engineering (R.V.C.E.).

[14] http://electronics.forum.org/metal-metal-detector-circuit-circuit/

AUTHOR'S BIOGRAPHIES

Dr.A.Jayachitra received her B.E. Degree in Electronics and Communication Engineering from Anna University, Tamil Nadu, India, in 1998, and M.E. Degree in Process Control and Instrumentation Engineering from Annamalai University, Tamil Nadu, India, in 2006. she completed Ph.D. Degree in Process Control and Instrumentation in the same University. She has seventeen years of teaching experience. Also she is a life member in ISTE and is currently working as Professor in the Department of Electronics and Communication Engineering, Sri Manakula Vinayagar Engineering college, affiliated to Pondicherry University,Puducherry, India. Her research focuses on Artificial Intelligence and its Applications, especially in evolutionary computation for optimization, learning, simulation and modeling. She undertakes research in the following topics: Design and Analysis of Nature Inspired Algorithms for Global Optimization. She has attended and presented her Research findings in National and International journals.

Dr.R.Ramya received her B.E. Degree in Electronics and Communication Engineering from Madras University, Tamil Nadu, India, in 2000, and M.E. Degree in Communication systems Engineering from Anna University, Tamil Nadu, India, in 2016. she completed Ph.D. Degree in Electronics and Communication in the Pondicherry University. She has sixteen years of teaching experience. Also she is a life member in ISTE and is currently working as Professor in the Department of Electronics and Communication Engineering, Sri Manakula Vinayagar Engineering college, affiliated to Pondicherry University,Puducherry, India. Her research focuses on MIMO and digital communication. She has attended and presented her research work in National and International journals.
.
.