Smart Dustbin for Waste Segregation.

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Abstract : In the recent decades, Urbanization has increased tremendously. At the same phase there is an increase in waste production. Keeping in focus the crucial issue of Waste management and recycling, a smart dustbin is built on a micro controller based platform Arduino Uno board which is interfaced with embedded systems, which enables us to segregate wet and dry waste automatically and collecting both types of waste in individual containers. In this paper, a system has been proposed which reduces the collection of wet waste and dry waste altogether in household as well as in public which is non -recyclable. The dry waste that will be collected separately can be recycled efficiently and lessen the chances of air and soil pollution.

Index Terms **- Waste Management, segregate, wet waste, dry waste, recyclable, non-recyclable.**

I. INTRODUCTION

In recent times, garbage disposal has become a huge cause for concern in the world. A voluminous amount of waste that is generated is disposed by means which have an adverse effect on the environment. The common method of disposal of the waste is by unplanned and uncontrolled open dumping at the landfill sites. This method is injurious to human health, plant and animal life. This harmful method of waste disposal can generate liquid leachate which contaminate surface and ground waters can harbor disease vectors which spread harmful diseases and can degrade aesthetic value of the natural environment and it is an unavailing use of land resources. In India, rag pickers play an important role in the recycling of urban solid waste. Rag pickers and conservancy staff have higher morbidity due to infections of skin, respiratory, gastrointestinal tract and multisystem allergic disorders, in addition to a high prevalence of bites of rodents, dogs and other vermin.

In human life, trash is a problem that has not been handled properly. There are so many processes in human activities that generate trash so the number continues to increase every time. In his everyday life, every human being produces a number of garbage in the solid form of 1-3 kg. Untreated trash can cause problems and should be overcome. The amount of waste can be overcome by recycling.

To recycle, trash must be sorted first. The sorting process is useful for separating trash by type. To distinguish the type of trash, often the sorting process is done manually by using human power. Humans will sort the type of trash as with a predetermined category. That way, the waste can be reprocessed into useful goods and have economic value. But along with the development of the age and the growing rate of increasing trash, the sorting of waste by manual method becomes not optimal. Lack of human resources in the process of sorting waste and the amount of waste that must be sorted, making a lot of trash that should be recycled ends directly in the final disposal.

Dependency on the rag-pickers can be diminished if segregation takes place at the source of municipal waste generation. When the waste is segregated into basic streams such as wet and dry, the waste has a higher potential of recovery, and consequently, recycled and reused. The wet waste fraction is often converted either into compost or methane-gas or both. Compost can replace demand for chemical fertilizers, and biogas can be used as a source of energy. The metallic waste could be reused or recycled. Even though there are large scale industrial waste segregators present, it is always much better to segregate the waste at the source itself. The benefits of doing so are that a higher quality of the material is retained for recycling which means that more value could be recovered from the waste. The occupational hazard for waste workers is reduced. Also, the segregated waste could be directly sent to the recycling and processing plant instead of sending it to the segregation plant then to the recycling plant.

Therefore, the problem of the excess amount of trash cannot be resolved by applying the manual sorting method. To overcome the problem, has been investigated tool to shrink the type of trash. Sorting trash can be done by destroying trash prior. The method of sorting trash by destroying trash first, there is another method that is by utilizing the sensor to distinguish the type of trash . The sorting of large amounts of trash is easier to use by using sensors. We are implementing a smart dustbin which is a cheap, easy to use solution for a segregation system at households as well as in public, so that it can be sent directly for processing. It is designed to sort the refuse into wet waste and dry waste. Based on the moisture value of the refuse the type of waste is decided by the system and sends the waste to a container accordingly.

II. LITERATURE REVIEW

Most smart dustbin techniques so far only used IR sensors, Ultrasonic sensors and RFID tags and only concentrated on waste management. A technique was first used which was divided into three stages: Garbage bin: The sensor node attached to the bin helps in the collection and transmission of data. Remote gateway: This uses X-Bee Pro that acts as a transmitter to send the collected data to the next stage. Monitoring system: A web based control system which is used to interface the system [5]. Waste collection and transportation, is the maximum price level in waste management software. In this paper, usually used answers to enhance waste collection structures had been mentioned and an IOT based technique has been proposed as a new answer. The methodology proposes

use of infrared sensors to acquire actual time facts from the waste bins and that of raspberry pi2 improvement board to speak these facts to the waste managers. The waste managers can efficaciously use this data to optimize the scheduling and routing of series manner [7].

In another framework, the paper proposed to design an electronic machine, which allows you to offer a way to abnormal waste disposal gadget. The designed gadget uses biosensor sensor, weight sensor and height sensor to locate overflow of the waste within the dust bin and the quantity of pollution caused by unwanted toxic gases from the bin. It included a GSM module to alert municipality about the overflow of the waste [10]. The main theme of the work was to create a smart intelligent garbage alert system for garbage management[6] .This paper proposed an alert system for garbage collection by giving an alert signal users for instant cleaning of dustbin with proper verification based on level of garbage filling[6]. This process is done by the ultrasonic sensor which is interfaced with Arduino UNO to check the level of garbage filled in the dustbin and sends the alert to the user through LED once if garbage is filled [6].Thus we can device an extra feature so that it can automate the process of waste segregation at initial level itself, as proposed in this paper.

III. PROPOSED SYSTEM

Segregation is the initiative to complete waste management. Studies show that majority of the population in urban and rural areas don't segregate wastes being a reason that they notice it inconvenient. Management or assortment of waste is secondary. Here we propose a project that makes use of different sensors and actuators to manage the waste in a locality and also segregate it in the initial stages itself. The main components that will be used for implementation is as listed below and as shown in the System Architecture (figure 1) below.

A. Arduino Uno microcontroller

A simple Arduino Uno microcontroller forms the heart of the system [14]. The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet)[16]. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button[16][13].

B. Moisture sensor

The Moisture Sensor uses capacitance to measure dielectric permittivity of the surrounding medium. In wet waste, dielectric permittivity is a function of the water content [9]. The sensor creates a voltage corresponding to the dielectric permittivity, and hence the water content of the waste [9]. Thus it helps to differentiate between wet waste and dry waste.[12] IR sensor for level detection- An IR sensor will detect the presence of waste and detects the level of waste. This detects the level and communicates to the microcontroller if the level crosses a particular threshold. When the value obtained from the moisture sensor is high it indicates that the substance is dry and vice versa for wet.

C. IR sensor

This is used to detect whether there is any kind of waste present in the dustbin. IR Sensor works using a particular light sensor to detect a single light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is expects, the intensity of the received light is recorded. When waste is put near the IR sensor, it means waste is present and it is ready for segregation. The light from the LED reflects from the object and into the light sensor. A huge change in the intensity is created, which denotes that an object is present. This sensor gives a logical 1 output which denotes that there 97 is a presence of an object and logical 0 output in the absence of the object. This is fed as input to the microcontroller.

D. Servo Motor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.

E. Ultrasonic Sensor

Ultrasonic sensors are based on the measurement of the properties of acoustic waves with frequencies above the human audible range, often at roughly 40 kHz. They typically operate by generating a high-frequency pulse of sound, and then receiving and evaluating the properties of the echo pulse. Ultrasonic sensor module SRF-04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The module includes ultrasonic transmitters, receiver and control circuit in a single package.
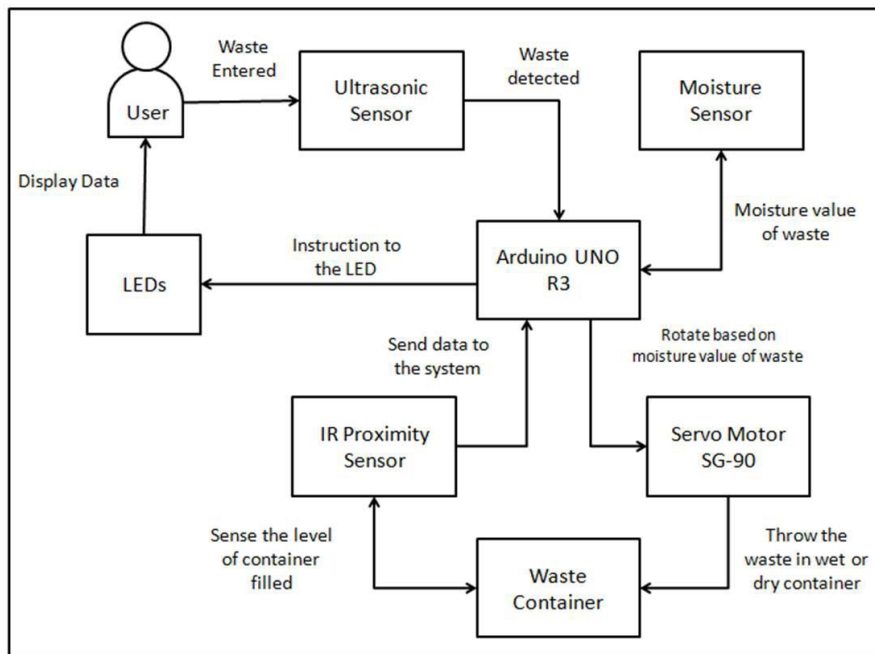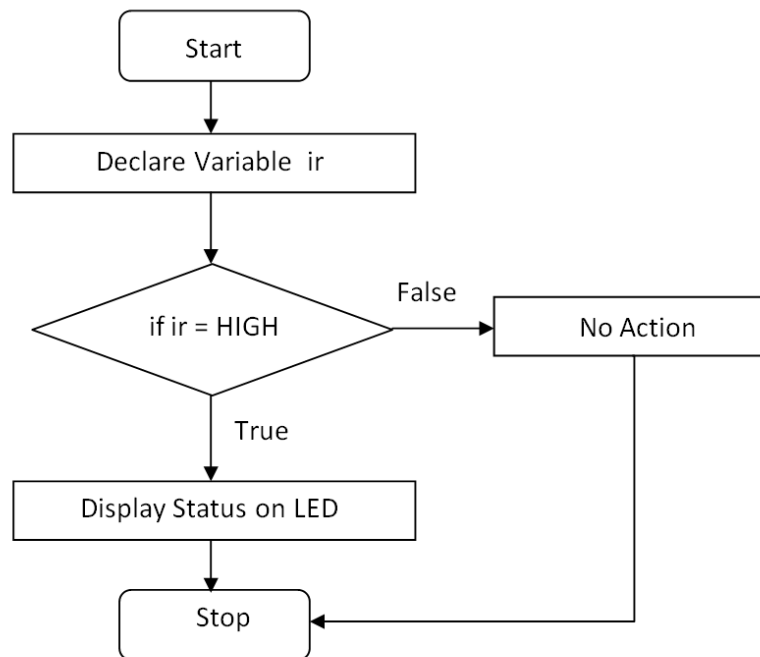
Figure.1 System Architecture

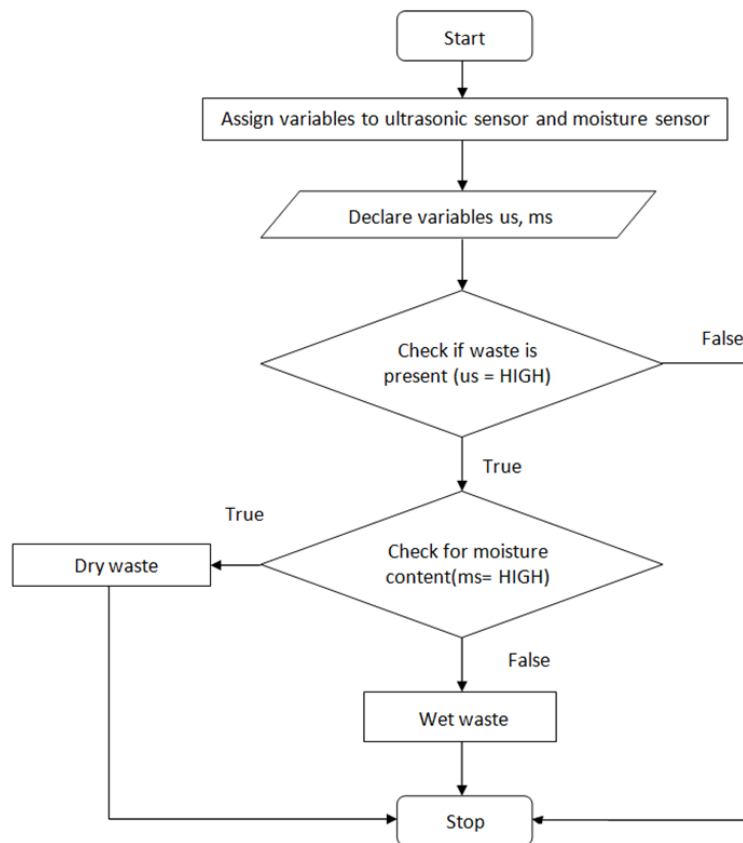Figure.2 Flowchart representation for waste management

Figure.3 Flowchart representation for segregation

As we have explained earlier, the proposed system is divided into two categories. The methodology that we have followed is as shown in figure 2 and figure 3.The figure 2 as shown below represents the flowchart of waste management process. We have declared a variable ir which represents IR sensor output. If ir variable is found to be high, it indicates that the dustbin is full and send instruction to the LED to light up to indicate the user. If it is low, then no action is taken.

Similarly, flowchart representation for waste segregation process is as shown in figure 3. According to the flowchart, variables us and ms are declared which represent Ultrasonic sensor and moisture sensor input respectively. If us and ms variables are high, it indicates that waste is detected and the detected waste is wet. If us variable is high and ms variable is low, it indicates that waste is detected and the detected waste is dry. If both variables are low, then it indicates that there is no waste present for segregation.

IV. RESULT AND DISCUSSION

Every component as explained earlier is interfaced with Arduino UNO microcontroller. The representation of the whole setup is as shown in the figure 4. We use Arduino IDE software to program this system and results are found to be accurate. i.e., accurately detecting the type of waste as it is thrown in the dustbin and dumping it into corresponding container.
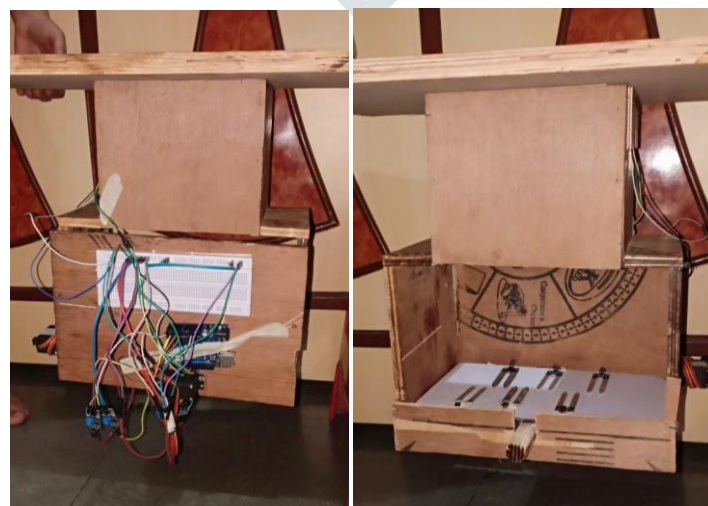

Figure.4 Circuit setup of the whole system

- *Waste segregation*

In this, we try to differentiate between different types of waste such as dry waste and wet waste. We use moisture sensor along with IR sensor to differentiate between the type of waste present and a gear motor to segregate into respective dustbin. IR sensor detects the presence of an object and moisture sensor detects the type of waste by the amount of moisture content present in that object. As soon as the moisture senor detects the type of waste, gear motor turns clockwise or anticlockwise for wet waste and dry waste respectively. In figure 5, dry waste dumping is depicted as the motor turns in anticlockwise direction. In figure 6, wet waste dumping is depicted as the motor turns in clockwise direction. In figure 7, rest position is depicted indicating that waste is not detected by the Ultrasonic sensor on the top right of the model indicating no waste is present for segregation.
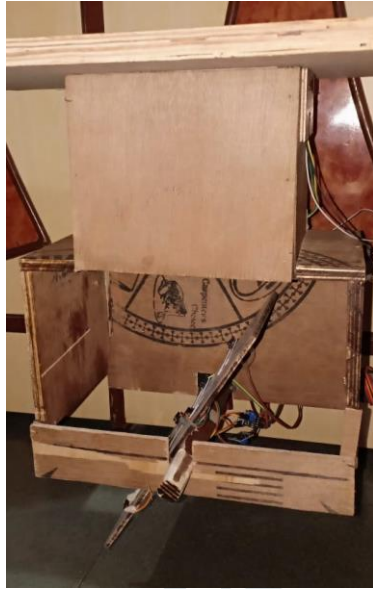
Figure.5. Dry waste dumping   Figure.6. Wet waste dumping

Figure 7. Rest position

Thus the whole system is automated and human intervention is reduced. It is an efficient system which makes collection of waste convenient by alerting the municipal groups when required and also helps in achieving a healthier and environment.

The result of testing for waste segregation is shown in figure 8 below, through the serial monitor of Arduino IDE software using two type of waste viz. piece vof paper as dry waste and an organic solid waste for wet waste.

Figure.8. Serial Monitor output result testing

V. CONCLUSION AND FUTURE SCOPE

The Automatic waste management system may be a leap forward to create the manual assortment and segregation of wastes automatic in nature. The developed system would pioneer work for solid waste management and segregation processes. This proposal for the management of wastes is economical associate degree time saving method than the presently using methodology within which involved municipal worker 101 must seek for the crammed waste bins manually across totally different spots in an area/street for checking often whether or not the waste bin is crammed or not, that is advanced and time taking. This automation of waste conjointly reduces the human effort and consequently the price of the entire method. This technique will be enforced at anywhere with ease and among affordable quantity of your time. The implementation prices for the automation are additionally reasonable. The general methodology for the detection andmanagement of waste becomes economical and intelligent. We have shown the appliance and implementation of the above system.

This planned system wouldn't solely operate for grouping and change knowledge mechanically and timely, however conjointly it might analyze and use knowledge showing intelligence. The planned system would solve loads of downside concerning solid waste assortment, monitoring, minimizing value and accelerate the management. The Trash management system may be a leap forward to create the manual assortment and detection of wastes automatic in nature. It might pioneer work for solid waste assortment, observance and management processes. This project for the management of wastes is economical and time saving method than the presently using methodology within which involved municipal worker must seek for the stuffed waste bins manually across totally different spots in an area/street for checking often whether or not the waste bin is stuffed or not.

REFERENCES

[1] Daniel Hoornweg and PerinazBhada-Tata, "What a Waste", a global review of solid waste management,March 2012,no.15.

[2]Samir Lahiry, "India's Challenges in Waste Management", The key to efficient waste management is to ensure segregation source and resource recovery

[3] Iswar Ahluwalia, "Cities at crossroads: Recycling begins at home" chairperson of Indian Council for Research on International Economic Relations (ICRIER)

[4] Aravind E.S, "Present Status of Waste Management in India and recommendations", IIT MADRAS

[5] TarandeepSingh ,NavreetinderKaur. "Smart Waste Management: An innovative approach to waste disposal and waste collection",PEC University of Technology Sector 12, Chandigarh, India

[6] Dr.N.Sathish Kumar, B.Vijayalaksmi, R. Jenifer Prarthana , A .Shankar, "IOT Based Smart Garbage alert system using Arduino UNO"

[7] Abhimanyu Singh, PankhuriAggarwal, Rahul Arora," Iot based Waste collection system using IR sensors", sept 2016.

[8] Sofiya A, Edwina G Rodrigues, Nazim E and Alex P Johnson, " Integrated Smart Trash Bin", IJIREEICE.

[9] www.tvdsb.ca/uploads/ScienceProbeware/soilmoisture.pdf.

[10] WoikomReshmi, RamkumarSundaram, M Rajeev Kumar,"Sensor Unit for Waste Management: a Better Methodfor Frequent Data Updating System", Nov 2014.

[11] www.doityourself.com

[12] www.vernier.com

[13] digital.csic.es/bitstream/10261/127788/7/D-c-%20Arduino%20uno.pdf

[14] M.K.Pushpa , Aayushi Gupta , Shariq Mohammed Shaikh , StutiJha, 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

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[16] Openlab.com.au