Smart Waste Management System
Sunitha. S¹, Mahantesh. K², Sharan Kumar. R³, Shivaraj. B. M⁴, Veeresh⁵
Assistant Professor¹, B.E Student², 3, 4, 5
Department of CSE
RYMEC, India

Abstract:
Due to increasing population, modernization, people move from one place to a different and way of life are expanding well. The present garbage collection system available in India is fully done by humans. But now in our project we have reduced the work of humans compare to the present situation. The waste which is produced across the planet is innumerable if we attempt to reuse with the person power it's going to consume much time and which needs a way energy. so as to save lots of energy and human work we will for the technology that's available in our projects. If we concentrate power savings on the rubbish issue which could save energy which will be useful for a few other purposes... supported research of WHO 22 sorts of diseases are often controlled by improving solid waste management in India. Hence, people that sleep in India and native municipal bodies should change their casual attitude to waste management. So, waste management may be a mandatory process so as to face the challenges in day to day life. The entire management includes three parts: 1) Users who can generate waste, 2) Waste collector bins 3) stack holders. Existing waste management systems are more difficult to handle it and it is not user friendly. This project is very attractive in nature and aids in many effective ways to make environmental friendly. The waste collector bins are equipped with some sensors and connected to the cloud with push the mechanism. Hence the stack holders are able to get the all data from the cloud.

1. INTRODUCTION:
The rising population of India poses serious threats with regard to the availability of living space, utilization of natural resources and raw materials, education and employment. But another serious issue is the dumping the amount of waste generated each minute by an individual. Every city is grappling with the menace of ever increasing waste. An approximate 0.1 Million tons of waste is generated each day in our country. Sadly, only 5% of this disposed amount of waste is recycled.

In India, the collection, transportation and disposal of MSW are unscientific and chaotic. Uncontrolled dumping of waste on outskirts of towns and cities has created overflowing landfills which are not only impossible to reclaim because of the haphazard manner of dumping but also has serious environmental implications. When viewed on a larger scale, the poor recovery rate has impeded the growth of the nation as well as the economy of the nation. One possible solution for this problem could be segregating the waste at the disposal level itself.

We have thus come up with an Automatic waste segregator that categorizes the waste as wet, dry. This project IOT Garbage Monitoring system may be a very innovative system which can help to stay the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via android app. Admin should monitor the dustbin. There should be send message to worker when garbage is reached to certain threshold. In existing garbage monitoring system, local governments manage garbage by deploying garbage bins and employing multiple pickup businesses for garbage collection. To deal with these problems in existing garbage monitoring, IOT based garbage monitoring system has been introduced.

2. LITERATURE SURVEY:
2.1 Smart garbage collection system in residential area:
This project mainly Solid waste management is a big challenge in urban areas for most of the countries throughout the world. An efficient waste management may be a pre requisition to maintain a secure and green environment as there are increasing all types of waste disposal. The main concept is that a Camera are going to be placed at every garbage pickup point alongside load cell sensor at heart of the rubbish can. The camera will take continuous snapshots of the rubbish can. A intensity is about which compares the output of camera and cargo sensor.

2.2 Intelligent Waste Separator:
This paper proposes a prototype of the Intelligent Waste Separator (IWS) that consists of a standard ashcan , with more containers inside it, using multimedia technology. People can throw their waste, regardless of what kind, into the system. The latter is in a position to make a decision what quite waste it belongs to and to deposit it within the correct container. Garbage may be a global problem that affects all living beings. A study from Grow NYC shows that 80% of the world's solid waste is produced in the United States of America. Also, 70% of its trash is employed once and 45% is buried or burnt, such waste is paper, plastic.

2.3 Waste segregation using smart dustbin:
Thus aim of our project is to form a municipal waste management system useful at domestic level. Dry, wet, metallic are the categories during which waste is compartmentalized. Continuous increase in populace is increasing waste generation. Waste generated in India is within the range of 200-870 grams per day and its rate is rising by about 1.3% per capita per annum
in India. In addition to the present, some portion of waste is burnt openly on dumpsites or streets. As the production and consumption is proliferating, extensive amount of solid materials are generated also as rejected by people on regular basis. Garbage Mountains are a commonly seen today.

3. PROBLEM STATEMENT:

The greatest problem regarding waste management in developing countries begins at the very starting point of the process. Due to lack of proper systems for disposal and collections, wastes and garbage’s end up in the roads and surrounding. Nowadays, Houses in the city level, are manually doing separation of degradable & non degradable wastage, it is burden for human to do this. So, our idea to develop a product which segregates the degradable and non degradable wastes automatically. Upon separating, if it is a degradable it will be used for vermicompost production that in turn used for terrace gardening.

4. SYSTEM ARCHITECTURE:

5. HARDWARE COMPONENTS:

POWER SUPPLY:
• Frame and stand

AURDINO UNO:

A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another.

AURDINO UNO:

Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller.

SERVO MOTOR:

Servomotor can be called as a rotary actuator or linear actuator. It is used for the precise control of linear or angular position, velocity and acceleration. It has of a suitable motor connected to a sensor for position feedback.

IoT ESP8266 WiFi MODULE:

ESP8266 comes with capabilities of 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2) general-purpose input/output (16 GPIO), analog-to-digital conversion (10-bit ADC) Serial Peripheral Interface (SPI) serial communication protocol, Inter-Integrated Circuit (PC) serial communication protocol, PS (Inter-IC Sound) interfaces with DMA(Direct Memory Access) (sharing pins with GPIO), UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2), and pulse-width modulation (PWM).
PROXIMITY SENSOR:
A proximity sensor is a sensor used to detect the near by objects without any physical contact. A proximity sensor often emits a beam of electromagnetic radiation or an electromagnetic field and looks for changes in the field. The object which is sensed is often referred to as the proximity sensor's target. Different proximity sensor target demands different sensors.

ULTRASONIC SENSOR:
Ultrasonic sensor is basically used to check the level or length of the object. It emits a sound waves at a very high frequency which could not be heard by human. And it measures the distance of the object from the frequency, hits and comes back as an echo. It basically works as a radar.

MOISTURE SENSOR:
The Wet sensor module is an easy tool for wet or moisture detection. It can be used as a switch when raindrop falls through the rain sensor. The analog output is used in detection of drops in the amount of rainfall. With the help of WET sensor we stop the motor running condition during raining or when WET comes.

DC MOTOR:
A DC motor is rotary electrical machine which converts the electrical current into mechanical movement. It requires dc voltage source for its operation. They can be of any type as electrical and electromagnetically.

IR SENSOR:
An IR sensor circuit is one of the popular and basic sensor module in an electronic devices. This sensor is analogous to human’s visionary, which is used to detect obstacles and it is one of the common applications in real time.

CONVEYOR BELT:
A conveyor belt is used to as a carrying mechanism. It generally contains two or more pulleys and the endless loop of carrying mechanism and a conveyor belt rotates around them. Here one of the pulley or both may be powered. Powered pulley is called drive pulley and unpowered is called as idler pulley.

4. METHODOLOGY:
For garbage segregating:

The two conveyor roller is fixed to the two ends of the frame stand with the help of end bearing with bearing cap. The conveyor roller shaft is coupled to the D.C. permanent magnet motor with the help of spur gear mechanism. This total arrangement is used to transfer the material from one place to another place with the help of conveyor. The IR transmitter and
IR receiver circuit is used to sense the length of the material. It is fixed to the frame stand with a suitable arrangement. The motor is fixed to the frame stand by right angles to the limit sensor frame stand. This dc motor arrangement is used to remove the dimensionless material from the conveyor. The dc motor is controlled by the control unit.

**Monitoring the garbage level:**

When the dustbins are about to get full, the level of garbage in the bin is detected by the ultrasonic sensors. As shown in the fig 1, these two sensors are set in both the dustbins to sense and send the details to the microcontroller. If the bin is full, the message is sent to the municipal waste department with the location of dustbins using gsm module.

**WORKING OPERATION:**

The process of garbage segregation is implemented in three ways, based on the type and condition of the waste, recycling process may be recommended for the effective sorting system. This system depends on proximity sensors for the presence of the object in the system and plastic material sensor. The plastic sensor identifies the levels of plastic based on the resonant frequency of every material of plastic. The molecules of the different plastic material are excited by tuning laser diodes for various resonant frequencies of the plastic and are thus detected. With the combination of proximity sensors and plastic sensors, the wastest get separated based on their degradability. This gives us the choice of disposing the non-degradable wastes as recyclable and degradable as manure for plants. This is also considerably affordable and stable, it also reduces the spreading of germs via garbage because the water is recycled to plants regularly and the setup is closed. Once any of the small bin is full, the larger bin won’t open until the waste is cleared, thus ensuring no overflow of garbage. The Challenges faced is that the setup is bigger than the usual trash bins and the implementation of all the sensors and motors connected to a single. The prototype proposed is designed to increase the efficiency of waste segregation by implementing the concept of IoT and automation while keeping it cost effective and sustainable to use. The suggested prototype consists of an open source IoT platform based microcontroller called Node-MCU with an ESP8266 Wi-Fi module. An IR sensor is mounted to detect whenever an object is placed in the setup. A moisture sensor, TE215 Hygrometer Module, is interfaced with the Node-MCU to differentiate between wet and dry waste. A metal detector is further interfaced to detect metallic waste. Each category of waste has a dedicated bin to collect the segregated waste in it. Various mechanical approaches can be used to facilitate the segregation of waste out of which the approach of a tilting platform is used for the dumping of waste material into dedicated bins after triggering the required sensors. An ultrasonic sensor is placed in each bin to monitor the waste level in the bin thus preventing overflow of garbage. Each bin will also have a temperature sensor placed in it to detect fire in the bins. The ultrasonic and temperature sensors will continuously monitor the bins. Ultrasonic sensor sends an alert in the form of an email when the dustbin is full. Similarly when a fire is detected the temperature sensor sends an email alert. This helps in taking appropriate action effectively. The alert system utilizes the Wi-Fi module via which such alerts are sent. The alert from IR sensor is used to inform the respective garbage truck to empty the bin and take it to respective waste processing unit. The alerts from Humidity sensor go to the station so that immediate action to douse the can be taken indicating that a has been detected allowing for timely action. Thus, the possible stopped and the plastic due to, the graphs show the level of the waste in the garbage bin at the time of testing. The two graphs belong to the two bins used while testing the working prototype of the project.

5. ADVANTAGES AND LIMITATIONS:

**ADVANTAGES**

- The Conveyor is more efficient in the technical field
- Quick response is achieved
- Simple in construction
- Easy to maintain and repair
- Cost of the unit is less when compared to other
- No fire hazard problem due to over loading and unloading
- Comparatively the operation cost is high
- Continuous operation is possible without stopping

**LIMITATIONS**

The constant need for internet connectivity in order to make the data readily available to the control system might be a challenge in countries where data on-the-go services are not very established and thus, may add to the initial setup cost of the system. The lack of a proper security framework and the strengthening of the security protocols of the system is necessary for the implementation so as to ensure the data sent from either end is secure and reaches the intended receiver only. The minimal, though existent need for human intervention for constant monitoring, may lead to a decreased efficiency and may leave a scope for error. Also, the costs involved with systems requiring human intervention are generally much higher than those associated with a completely automated system. This is because the costs associated with human-involving systems involve constant and recurring costs such as wages, which need to be paid.

6. CONCLUSION:

With the help of a practical circuit implementation the procedure of waste collection is optimized. The system proposed in this paper provides an efficient method to collect and segregate waste, while minimizing overall cost and maximizing efficiency. This system segregates the waste into separate dedicated garbage bins and provides real-time information about the garbage bin status, i.e., whether the bin is full or not and if there is a fire. The system summarizes the information collected, generates reports and sends alerts via e-mail for the sorting out
the wastes in to metals, plastic and vegetable peels. etc. The entire sensing process for the segregation the waste is controlled and monitored by MY RIO in single platform for the effective operation. This method of implementation saves time in segregation by human and affordability in domestic applications. This Smart Dustbin prototype will contribute a lot to the society to provide a clean and hygienic environment. GSM module intimates the bin status to the concerned authority for continual clearing of waste. GPS module interface to the bin will update the location for the dump. The garbage collector receives message thorough GSM module and identifies the location for garbage collection and dumps it into a segregator. This would lessen the stray trash on the streets.

7. REFERENCES:


