Innovative Waste Management Technique Via Garbage Collecting Robotruck

Akshaya B, Selvakumar K

Abstract: The main problem in any developing country is the management with waste. How to handle the huge amount of waste efficiently which consist of wet, dry, electronic waste is quite a challenge. For which we have done comparison study for the developed and developing country and extracting their efficiency towards the waste management and try to create a garbage collecting robotruck model where we use sensors to track the path , for the efficient waste disposal using arduino .

Keywords: Garbage Collection, Waste Monitoring , Comparison, Development , Model , Component

I. INTRODUCTION

 The issue concerned with waste management are plenty such as public littering, surface water trash, wetlands, resulting toxic air pollution. In order to reduce such waste production, we need to come up with certain efficient techniques. We will study about the current projects in India, from various states, that's needs such attention, compare it with the techniques that the foreign countries use to maintain their waste. And then coming up with the idea about what can be done in India for the current situation. In a way supporting the mission of "Swachh Bharat Abhiyaan", a national campaign initiated by the Government of India, which covers 4,041 cities and towns, to clean the streets, roads and infrastructure of the country , we shall analyse the ways to keep the country clean using technology .The main motto of the Swachh Bharat Abhiyaan is to cover all the rural and urban areas of the country. This working model implements a robot garbage car , which moves along a line detector , to reach at its destination – the garbage for collection .

II. COMPARISION

A. *Singapore*

Singapore's main challenge in solid waste management is the setting aside of land for waste disposal in view of the limited land stock in Singapore. Sustainable solid waste management involves the people, private and public sectors. Working hand in hand with these key stakeholders, NEA has developed a range of initiatives and programs to curb waste growth. At source where the waste is generated, recyclables are sorted and retrieved for processing to conserve resources. The remaining waste is collected and sent to waste-to-energy plants for incineration. **Incineration** reduces the waste by up to 90 per cent, saving landfill space, and the heat is recovered to produce steam that propels turbine-generators to generate electricity, providing up to 3 per cent of the island's electricity needs.The incineration ash and other non-incinerable wastes are then transported to the Tuas Marine Transfer Station (TMTS) from where they are barged to Semakau Landfill for final disposal.[1]

B. *The Umbria Region(Italy)[Europe]*

The amount of municipal solid waste (MSW) generated in the 2015 was of 519 kg/per capita,48.9% of which were collected separately at source, slightly higher than the National average figure of 47.5%.The amount of waste disposed of in the 3 sanitary landfills results of about 260,000 mg/year (2015) indicating that there is about 5% of MSW that is disposed directly without any MBT or other pre-treatments.According to national and European legislation municipalities were charged to perform the MSW collection. They can operate by their own or can proceed to entrust private companies after public calls. In general the most diffused option is represented by the constitution of private companies participated usually not less than 50% by municipalities. The MSW fee includes the whole service from collection, to recycling and disposal. It is also important to indicate that there is an important goal imposed by the latest EU waste framework directive (WFD) 2008/98/EC for waste management consisting in achieving not less than 50% of recycling and/or preparation for reuse within 2020. So, the current MSW management is strongly oriented for recycling aim.

1 . Users who delivers waste to the collection centres were credited by economic incentives. Depending both on

the amount and type of waste. Furthermore,
city amenities play an important role for the amount of waste separately collected. In fact, more than > 40% of the waste collected separately arises from these areas.

2 . Waste delivered for recycling aim arises mainly from the separated collection. In the year 2015 the amount of waste material collected separately for recycling aim were: organic fraction and green, 104.500 mg; paper 54.890 mg; glass, 26,900 mg; glass 26,000 mg; plastics, 17,965 mg; metals, 5,143 mg; wood, 8,220; WEEE, 4,090; textile, 1.680; others 3,200 mg. these materials were successively delivered to the national consortiums for their recycling.

3 . Currently are in operation 3 MBT able to sort the MSW in two main streams, a dry stream rich mainly in plastics, paper, cardboard and textile, and a wet stream rich mainly in organic fraction, together with metals (both ferrous and aluminium) extraction for recycling. For these facilites the wet stream is then successively processed in aerobic biostabilization section[2]

C. *Trade Garbage For Health Care In Indonesia*

Dr. Gamala Albinsaid saw a association between general health and therefore the incontrovertible fact that but1/2 the fifty five thousand heaps of garbage gets collected in Malang town, Indonesia. In Malang town, Indonesia, over fift five thousand heaps of garbage is created daily. Of that, solely 50-60% gets collected. These insanitary conditions result in health problems, and for Dr. Gamal Albinsaid, the association between trash and health care triggered an inventive plan - taking garbage as payment for health care services. Dr. Albin said created Garbage Clinical Insurance to produce locals with sound medical services and medicines. The organization makes trash into money by changing organic waste into fertilizers and compost and nonorganic trash into reusable merchandise. The profits are then wired into the health care services, that helps the voluminous Indonesians living without correct health care. The corporate runs a health clinic of its own, works with four others, and has helped three, 500 uninsurable Indonesians get health care. The brilliance of the Garbage Clinical Insurance works on several levels - reducing waste, spreading awareness concerning the virtues of use and most significantly, serving to people to folks live healthy lives. [3]

D. *Converting Garbage Into Usable Energy In Sweden*

Sweden, the Scandinavian country is well-known for its progressive environmental strides - the Scandinavian country's waste-to-energy system expeditiously provides direct heating to 950,000 Swedish households and electricity to 260,000 homes. Scandinavian country recycles and types its trash that effectively less than 1 percent goes to landfills. Seeing garbage as goods, Scandinavian country imports trash from different European countries to fuel its power wants, with 700 metric weight unit (1543 lbs) of rubbish translating into up to 250 metric weight unit (551 lbs) of energy and fuel.[4]

E. *An Eco Art Amusement Park Made From Rubbish In Uganda*

Artist and reformist Ruganzu Bruno is introducing ecological art to the slums of capital of Uganda. Eco Art African country could be a collective of artists dedicated to promoting environmental awareness, and therefore the cluster created associate commons for kids from discarded materials. Recycled swings and life-size board games made up of plastic bottles are just a few of the attractions at the Eco Art commons. The artistic initiative works on several levels - beautifying the community, empowering and educating children and effectively utilising trash and managing waste.[5]

III. EXISTING METHOD

Real-time monitoring of waste management
The following Figure illustrates the overview of the system prototype. The process of the system will repeat continuously until the power supply is shut down. Based on the circuit operation, an Echo pin will send a signal to determine whether the full or not. If there is a signal that returns back, it indicates that the garbage is full. Then, the triggered pin will send a pulse for the sensor to go into the range mode for the object detection. The data will be sent to the microcontroller which is Wemos D1 Mini in order to interpret it to the digital signal. Then, the digital signal will be sent to the Ubidots platform through ESP 8266 to visualize it through a graph. The ESP 8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) capability. Meanwhile, Ubidots is a codeless IoT Platform which provides a friendly, customizable Application Enablement Platform that provides users with real-time data and visualization of sensor inputs using a secure cloud. Journal of Advanced Research in Computing and Applications Volume 8, Issue 1 (2017) 1-7 .This real-time waste management will visualize the output in two different approaches. First, the system uses a wireless module to monitor the garbage based on the IoT cloud database in a real-time system. The online concept will enable the responsible authorities to monitor the garbage level themselves. By using an Ubidots platform, an alert message will be sent through an email and messages. On the other hand, this system also used LED indicator to alert the user when the garbage is full.

IV. PROPOSED METHOD

1. Components
➢ Arduino Nano
(Atmega 328P)

➤ Ultrasonic Sensor(HC-SR04)
➤ Infrared Sensor
➤ RF Module (433MHz)

The approach of this model , is directed a knowledge based system , or an expert system , where the computer program [here being the arduino code] embodying knowledge about the domain[waste management] for solving problems related to that domain. The two main elements, a knowledge base – the arduino code and an inference mechanism. The knowledge base contains domain knowledge which may be expressed as a combination of 'if–then' rules, factual statements, frames, objects, procedures, and cases. Here , the if then rule is implemented , where the robot car starts moving if it finds the path to move along . The future scope , would be the inference mechanism manipulating the stored knowledge to produce solutions to problems. Knowledge manipulation methods include using the application of inference rules (in rule-based systems), according to some control procedure (forward or backward chaining) and search strategy (depth or breadth first).

2. Interfacing

Microcontroller is mainly used so as to interface the ultrasonic sensor with the RF module. This is a fully automated system in which the garbage car moves automatically when it gets a signal via RF Module from the Garbage bin, when it gets completely filled.

3. Working

➤ Set up the garbage pin in the places needed , with proper cover .
➤ Fix the RF module to measure the level of the garbage fill .
➤ Fix infrared sensor , to detect the garbage collector robot
➤ Ultrasonic sensor is set to detect the level of fill in garbage bin
➤ Servo motor , the steering actuator of a large robot vehicle
➤ Arduino Nano Atmega 328 with 32KB flash memory and an A/D convertor , using a programmable watchdog timer , to replace the work of a computer system
➤ Give the power supply

For the arduino code of the smart bin , refer
https://github.com/Aksha-1811/GarbageCollection_RoboCar

V. INFERENCE

Just like in Hong Kong , there are five such countries [Israel , England , Usa (Virgina) , China , Australia] where landfill has been converted into pleasant greeneries , which has not been implemented in India as of now . They are taking the baby steps towards the same , in New Delhi which is far behind the actual , due to the varied kinds of garbage waste disposed at the landfills.

In our project , we have demonstrated how a garbage collecting robot car , can move along a said path and reach the destination , to pick up the waste , when the garbage is full . Though not implemented in this project , the robot car can move along the shortest path to the first garbage collection point , then carry on to the next point, so on till the waste disposal spot through djikstra's algorithm .
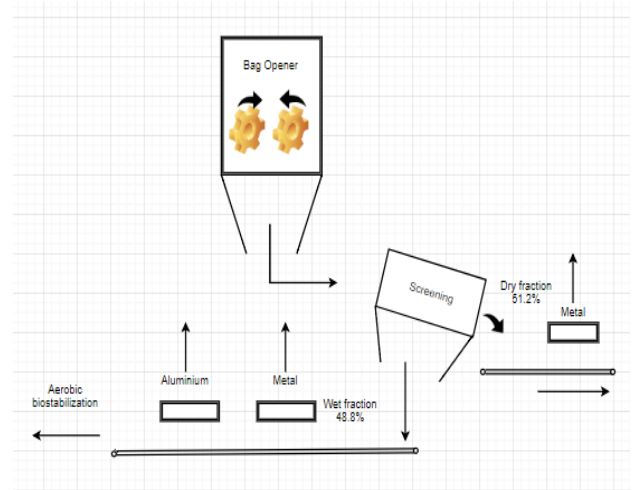
VI. CONCLUSION

This garbage collection robot car , moves along a line detector to reach the garbage for waste disposal , once the ultrasonic sensor placed at the top, inside of the garbage once it senses any obstacle   .

Reaching the node points (the different garbage points) can be tedious , if there is no shortest path route deployed .Thus , to reach the garbage points , we can use the djikstra's algorithm for moving along shortest path. Collection of garbage and disposal of the waste are the further steps in the process.

In the above-mentioned countries, we have seen certain methods of waste management such as converting a landfill into eco park hong kong or trading trash for healthcare as in Indonesia.
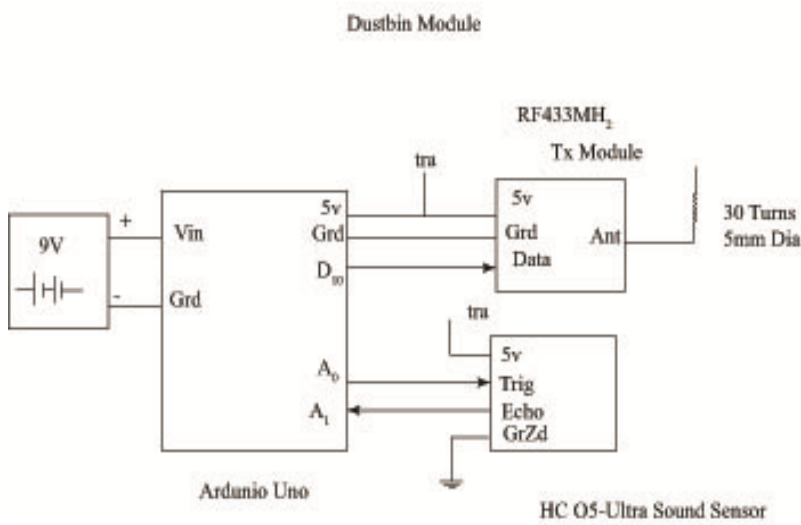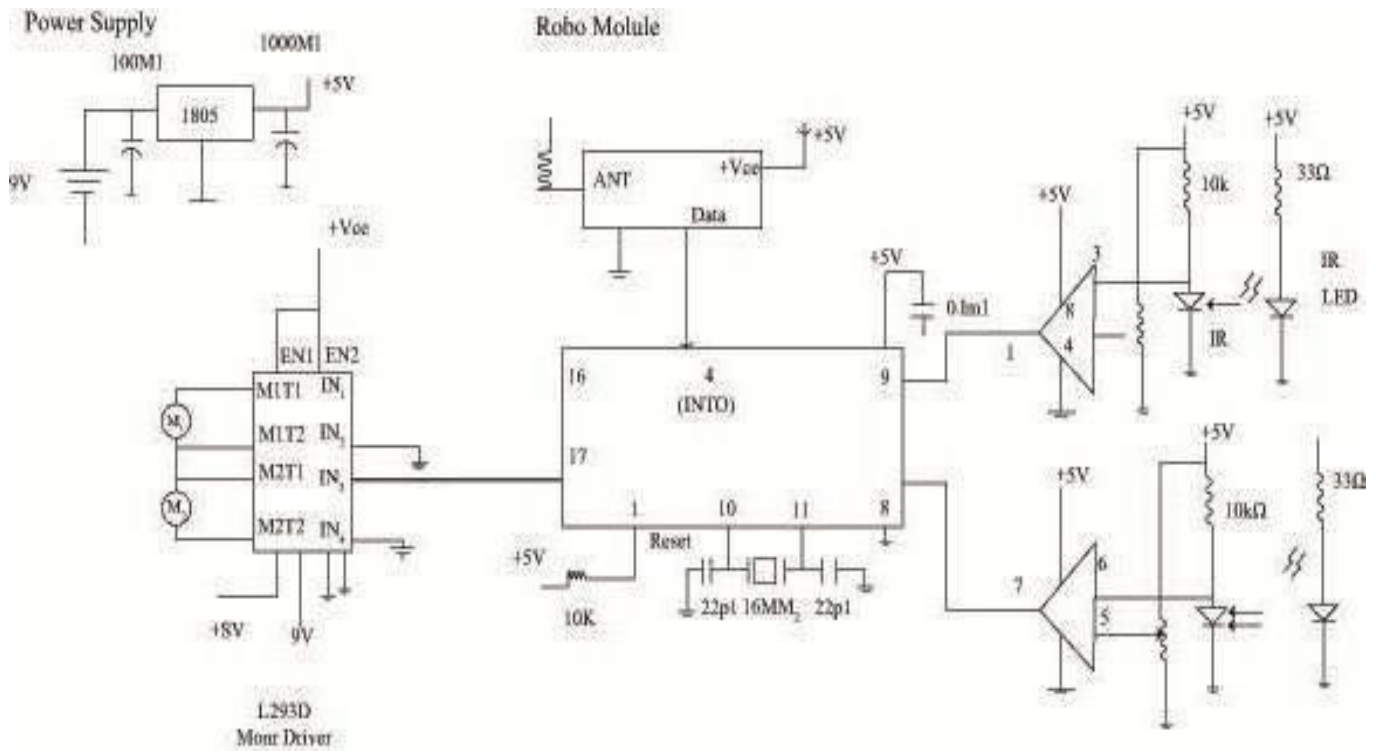
In our country , the degradable and the non-degradable wastes both are dumped into the landfills , which makes it difficult as a place to use , as the foundation will not be strong enough to bare the vehicles, buildings and heavy loads and leads to the threat of collapsing anytime , which makes it an unfit place for survival
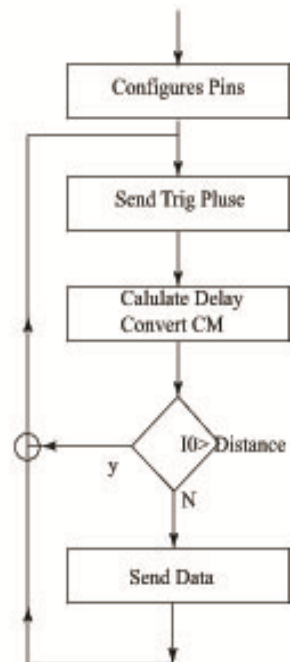

a) Scheme of the MBT sections: mechanical sorting
Scheme of the MBT sections: mechanical sorting

[1]

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VII. IMPLEMENTATION USING ARDUINO IDE SOFTWARE

SmartBinTx | Arduino 1.8.7 (Windows Store 1.8.15.0)

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SmartBinTx

```
#include <Ultrasonic.h>
#include <RCSwitch.h>

#define TRIG A0
#define ECHO A1

#define RELAY A2
#define LED LED_BUILTIN
#define RF_IN 10

Ultrasonic sensor(TRIG, ECHO); // (Trig PIN,Echo PIN)
RCSwitch mySwitch = RCSwitch();

char GROUP = 'D';

void setup() {
  pinMode(RELAY, OUTPUT);
  pinMode(LED, OUTPUT);
  Serial.begin(15200);
  mySwitch.enableTransmit(RF_IN);
}

void loop() {
  int distance;

  distance = sensor.Ranging(CM);
  if(distance > 10){
    mySwitch.switchOn(GROUP, 1);
    digitalWrite(LED, LOW);
  }else{
    mySwitch.switchOff(GROUP, 1);
    digitalWrite(LED, HIGH);
  }

  Serial.println(distance);
```

Done Saving.

SmartBinRobo | Arduino 1.8.7 (Windows Store 1.8.15.0)

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SmartBinRobo

```
  digitalWrite(M1, LOW);
  digitalWrite(M2, LOW);

  Serial.begin(115200);
  mySwitch.enableReceive(0);  // Receiver on interrupt 0 => that is pin #2
}

void loop() {
byte ir1, ir2;
  if (mySwitch.available()) {
    if(mySwitch.getReceivedValue() == 5755916){
      Serial.println("Empty");
    }else{
      Serial.println("Full");
      digitalWrite(LED, HIGH);
      do{
        ir1 = digitalRead(IR1);
        ir2 = digitalRead(IR2);

        if(ir1){
          digitalWrite(M1, LOW);
        }else{
          analogWrite(M1, SPEED);
        }
        if(ir2){
          digitalWrite(M2, LOW);
        }else{
          analogWrite(M2, SPEED);
        }

        Serial.print(ir1);
        Serial.print(' ');
        Serial.print(ir2);
        Serial.print(' ');
        Serial.println("Moving");
        delay(10);
      }while(!ir1 || !ir2);
      Serial.println("Stopped");
      digitalWrite(LED, LOW);
    }
    mySwitch.resetAvailable();
  }

  delay(100);
}
```
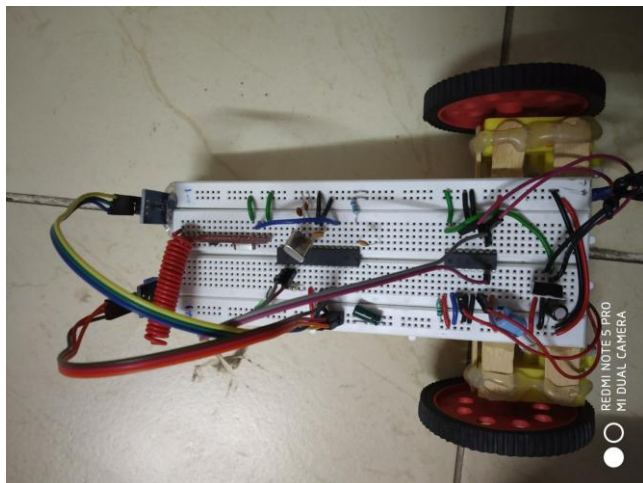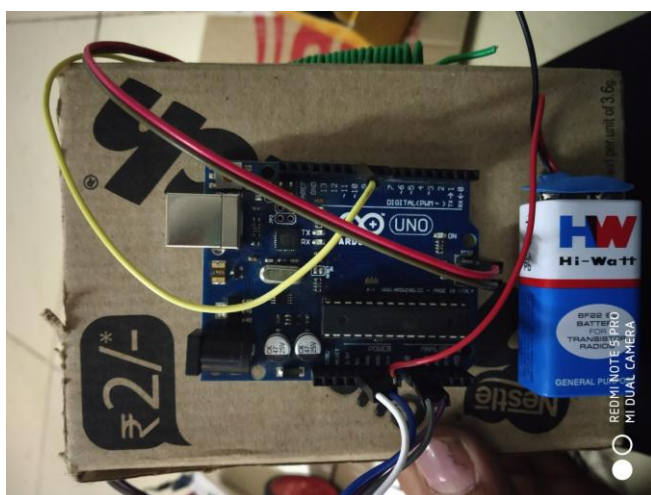
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WORKING MODEL

Selvakumar K , Associate professor , School of Computer Science, VIT , Vellore , has published around 30 papers in various national and international journals

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Akshaya B , final year student of BTech CSE , specialization in bioinformatics , VIT . Contributed to a scopus indexed journal paper , presented two research papers at International conferences at Malaysia and Dhaka ,Bangladesh . Also the board member at Mozilla Firefox club , VIT Vellore.

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