



METICULOUS SEGREGATION OF DRY AND WET WASTE FROM GARBAGE USING ROBOTIC ARM

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Abstract: India is the 3rd largest garbage generator in the world and by 2050 waste is expected to rise to 436 million tons up. Around 64 million tons of solid waste is produced in our country every year, of which less than 20% or only 12 million tons are treated, remaining 52 million tons of waste are remain 'untreated' and contaminate land or make it is way into rivers, lakes, and wetlands. Effective waste management is to ensure proper segregation of waste and ensure that the waste goes through the recycling and resource recovery process. Sanitary landfills are the means of disposal for unutilized municipal solid waste from waste processing facilities and other types of inorganic waste that cannot be reused or recycled. Here the problem is solved, by designing an embedded system that will monitor each dumpster automatically by detecting the amount of waste deposited using a robotic arm. Here moisture sensors can be used for segregating wet and dry waste. For detecting the presence of any waste IR sensor is used and for detecting wet or dry waste a moisture sensor can be used. In this process, if moisture sensor output is HIGH then the robotic arm moves towards WET dumpster else it moves towards the DRY dumpster. Both the dumpster are embedded with infrared sensors at the top, to measure the level of waste in the dumpsters. If the dumpsters reach their maximum level then an alert message using the GSM module along with buzzer sound is generated.

Index Terms - Moisture sensor, Arduino Uno, Infrared Sensor, GSM module, Robotic Arm.

I INTRODUCTION

According to the press information of the bureau, about 62 million tonnes of waste is generated every year (recyclable and non-recyclable) in India along with the growth rate of 4% (PIB 2016) [4]. As the population increases the generation of waste also increases [8]. From the waste generated each year only 60% of waste is collected and only about 14% of waste is processed.

In India, the waste disposal system is basic one with unorganized, unhygienic and uncontrolled open dumping at landfills. This is very harmful to human beings, animals and plants. Mostly the waste is thrown carelessly every nook and corner which is difficult for civic workers to segregate the dry and wet manually with bare hands. Due to this manual segregation of waste, civic workers get easily affected by skin infections, respiratory, gastrointestinal tract, and other allergic infections. Segregation of waste is a basic step for recycling and reuse purposes [9].

Here waste collection, segregation and processing of waste plays an important role in global cleanliness and sustainability along with the conservation of resources and people's health. The most important reason for the proper collection and segregation of waste is to minimize the spreading of infections, stagnant odors, mixing of toxic elements and to improve the internal safety and hygiene.

So we are introducing a meticulous segregation of dry and wet waste from garbage using a robotic arm which acts as a 24X7 monitoring system to keep cities clean. In this system, we are using an infrared sensor to detect the presence of waste and Advanced Virtual Reduced (AVR) microcontroller ATmega328p is used for controlling the entire system [3]. Moisture sensor embedded in the robotic arm is used for segregating dry and wet waste and another set of infrared sensors is used to detect the level of waste when it reaches its maximum level then the alert message is provided with help of GSM module. This is an efficient and hygienic method for disposal of waste [7].

II LITERATURE SURVEY

A. Smart Management System Using the Internet of Things (IoT) For Urban Area [3]

In this system, the internet of things is used for the waste management system. smart garbage management is used only for detecting the level of garbage. If the garbage bin is full the system displays the bin is full and updates the information into a website designed for a garbage management system. This system consists of SIM 800(GSM/GPRS), LCD, FTDI based UART module and Ultrasonic sensor HC-SR04. The main drawback of the system is it only monitors the level of the bin.

B. IoT Enabled Dustbins [6]

This system measures the level of the dustbin and updates the status to the municipal server. Here, notify the dustbin is full and select the shortest path to empty all the dustbin. The capacity of the truck is calculated and update each time. This system does not concentrate on the segregation of waste.

C. Garbage Management Using IoT [1]

This system detects the level of waste by using a different module. There are four modules is used. They are the Bin module, WIFI module, Admin module, and Driver module. The bin module consists of an ultrasonic sensor that detects the level of dustbin. Through the WIFI model, the message is sent to the Apache server. The admin module controls the entire system and updates the entire status. The driver module notifies the information about the bin current status. Here only monitor the status of the bin and it does not deal with segregation purposes.

D. Smart Garbage Maintenance System Using the Internet of Things [5]

In this system, the dustbin is connected via mesh network. The overflow of the bin is monitor using the wireless network. The sensor used to detect the level of the bin and sent a message to the server. Then the server passes a message into a truck driver using the NS2 simulator. This system mainly concentrates on detect the level and alert message that is sent.

E. Smart Bin- Automatic Waste Segregation And Collection [2]

Here, a simple waste segregation process is carried out and monitor the level of the bin. In this system, the waste is placed on the moisture sensor and detects whether it is dry or wet. This system uses the dual motor system, Arduino, GSM module and moisture sensor. After segregation, if the bin is full an alert message is sent to the corresponding person. Here more employee is required for a waste management system.

III PROPOSED SYSTEM

Here, we are introducing a 24X7 monitoring system that is used for segregating dry and wet waste from garbage. The presence of any waste material in the dumpster is identified using an Infrared sensor and then the robotic arm embedded with moisture sensor picks up the waste and detects whether the waste is a dry or wet waste by measuring the resistance value.

If the moisture sensor output is HIGH then the arm moves towards the DRY dumpster and if the output is LOW then the arm moves towards the WET dumpster. After segregation, to detect the level of waste an infrared sensor is placed at the top of both the dumpsters. If any of the dumpsters reach their maximum level then an alert message along with buzzer sound is generated.



Fig. 1. Block diagram of proposed

IV HARDWARE USED

A. General purpose board of ATmega328p

The ATmega328p is a low power CMOS 8-bit microcontroller based on AVR (Advance Virtual RISC). It has 32KB internal in-built memory with read-while-write capabilities, 1KB EEPROM, 2KB of internal SRAM. It has 14 digital i/o pins, out of which 6 can be used as PWM output and 6 analog input pins. Since it is a low-power chip it requires 1.8-5.5V of power to operate.

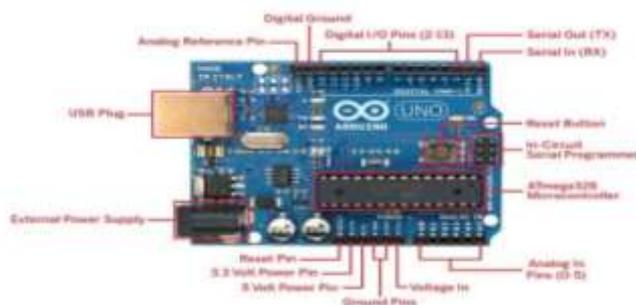


Fig. 2. Arduino Uno

B. Moisture Sensor

A moisture sensor senses, measures and reports both moisture and air temperature [10]. It has two probes for measuring volumetric content of water. It is used to find the moisture content by measuring the resistance value. This sensor has 4 pins and also contains a potentiometer which is used to set threshold value and compared by the LM393 comparator.

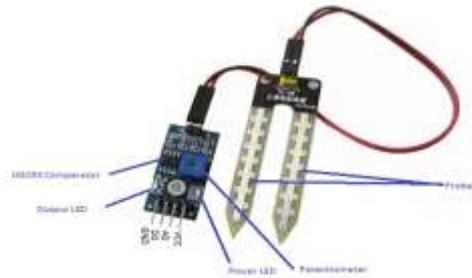


Fig.3. moisture sensor

C. Infrared Sensor

An infrared sensor is an electronic device that is used for detecting the presence of an object. It usually operates at voltage of 3.0V- 5.0V and works on the principle of reflection. It is used to detect the presence of obstacle within in the range of 2-30cm.

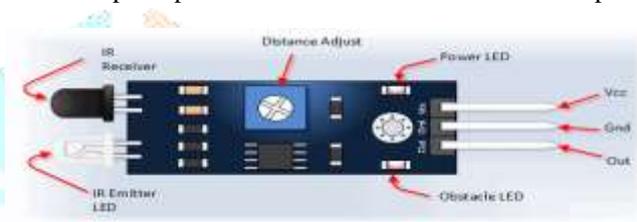


Fig..4. infrared sensor

D. Robotic Arm

It is a mechanical arm, usually programmable with similar functions to human arm. The microcontroller controls the arm by rotating individual servo motor connecting to each joint. It can perform tasks like welding, gripping, spinning etc.



Fig.5. robotic arm

E. SIM 900A/GSM Module

GSM is a digital cellular technology used for transmission of mobile voice and data services. The SIM900 is used to deliver GSM/GPRS 900/1800 MHZ performance for voice SMS, data and fax in a small factor with low power consumption



Fig.6. GSM module

V METHODOLOGY

The methodology for the proposed system is shown in fig.2. All sensors and servomotor interfaces with the Arduino Uno. This system uses an infrared sensor to detect the presence of waste and Advanced Virtual Reduced (AVR) microcontroller ATmega328p is used for controlling the entire system. Moisture sensor embedded in the robotic arm is used for segregating dry and wet waste and another set of infrared sensors is used to detect the level of waste when it reaches its maximum level then the alert message is provided with help of GSM module.

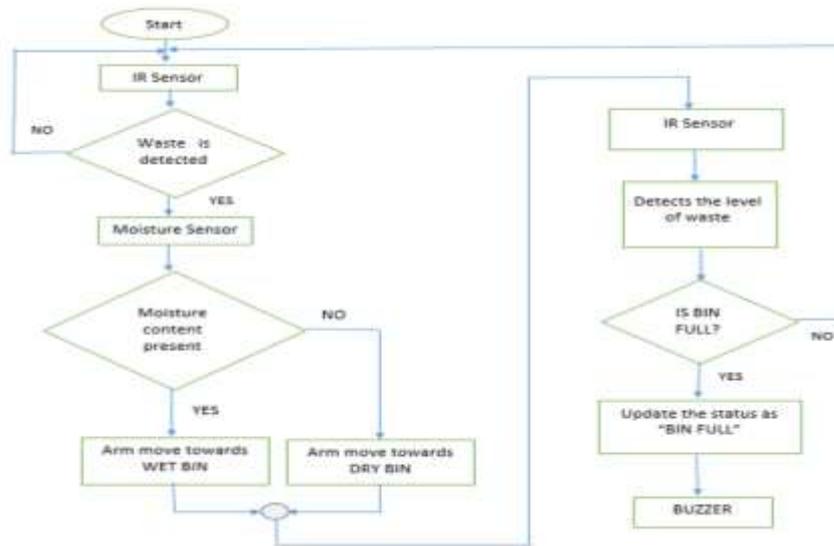


Fig. 7. flowchart of proposed system.

VI HARDWARE IMPLEMENTATION

Our proposed system is implemented for a 24x7 segregation and monitoring system as depicted in the figure given below,

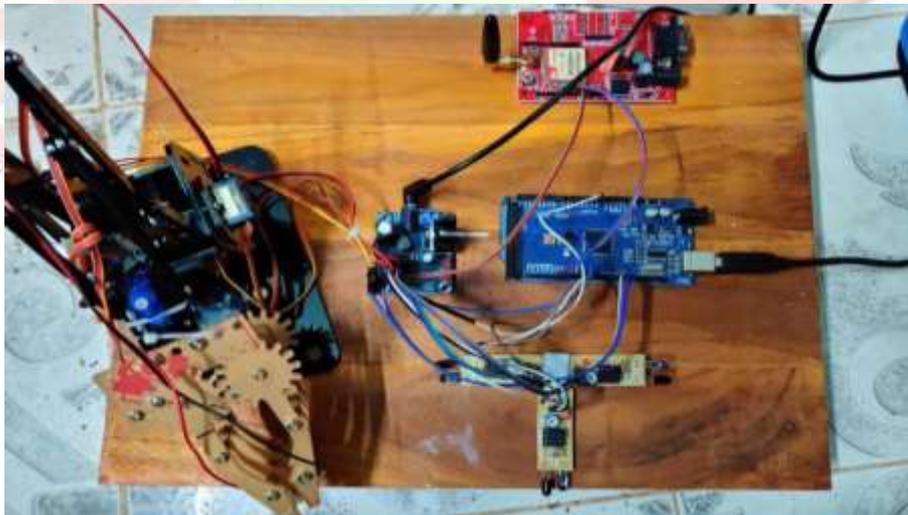


Fig.8. hardware implementation of proposed system

VII OUTPUT

The output of our system is given as, The system

- i) Should detect the presence of any waste material.
- ii) Should segregate dry and wet waste from the dumpster.
- iii) After segregation, the buzzer sound is generated when the level of the dumpster is full.
- iv) Send an alert message to the corresponding person.

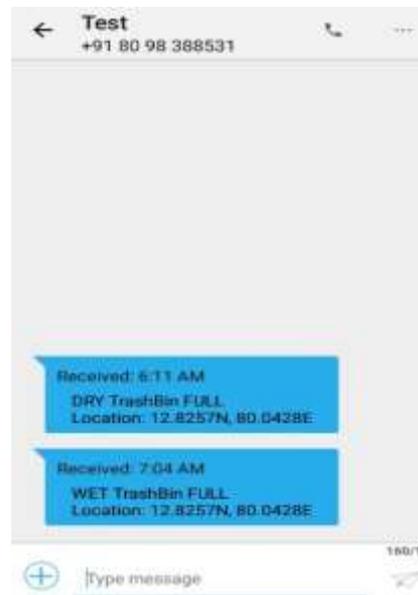


Fig.9. SMS alert sent to user's phone

VIII CONCLUSION

Increasing population and growing urbanization have resulted in the production of a large amount of waste. This waste should be disposed of effectively. We have implemented a 24/7 segregation and monitoring waste management system using robotic arm. The main function of this is to separate dry and wet waste. The significant advantage of our proposed system is the recycling of dry waste and making fertilizer from wet waste.

This system can be used to maintain a clean environment in cities and industries. The system is made advanced by using robotic technology. In this system, the status of the garbage bin is monitored continuously. An alert message is sent to the concerned person when the garbage dumpster is full. It is really helpful in improving the cleanliness of the surrounding environment.

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