Automated Waste Monitoring and Segregation for Efficient Recycling

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Abstract - *In the paper, the idea of sorting the garbage according to its dry and wet nature is presented. This is an idea which can be used as an option for a municipal waste segregator, which can segregate the dumped garbage on the basic level, which helps to reduce the use of higher level equipment. So this is the smart dust bin which can distribute the garbage without using any human help. In addition to this sorting , another task this project does is sending the message of dustbin status when the bin is full. Here arduino is used to connect all the sensors together. Using arduino all the motors and sensors are programmed. The main requirement of the project is moisture sensor, gsm and ultrasonic sensor.*

Key Words: **moisture sensor, smart bin, gsm, servo motor, dc motor**

1. INTRODUCTION

Waste generated globally is increasing day by day as the economy is increasing. As the result of this the solid waste generation level is getting higher which is now about 1.3 billion tonnes per year. And it is said that it could reach 2.2 billion tonnes per year till the year 2025. This says that there will be an increase from per capita waste generation from 1.2 to 1.42kg per head in next 15 years. In India there are many segregation techniques available for sorting but they are done after collecting the garbage. In this project, the segregation of waste is done at the basic level only which avoids the extra techniques required afterwards. As this technique helps us to reuse the recyclable materials and control the unwanted garbage productions. This can also help to avoid emission of various harmful gases caused by mixing the garbage and overall reduces the garbage production.

2. LITERATURE SURVEY

The press of information bureau states that the overall waste generation of India is 62 million tonnes. And this value increases by 4% every year. Here the implementation of separate dustbin is done but is not so useful as the people here lack the awareness as well as they have ignorance and negligence towards the cleaning. Most of the times in garbage, the wet and dry waste are thrown together. Because of this even the recyclable substances could not be found.

For eg, when the paper is thrown with wet waste, it won't be recycled. Because of this, the rates recovery and utilization of waste in paper mills in India is very low. Due to these low rates, India has to import waste paper as raw material for paper production. India currently imports waste paper as raw materials for paper production. This project is one of the solutions to this problem.

The necessary thing to avoid this is sorting the paper and other garbage properly which is done by using this smart bin. As this is done without human help, the human mistakes and the ignorance is neglected.
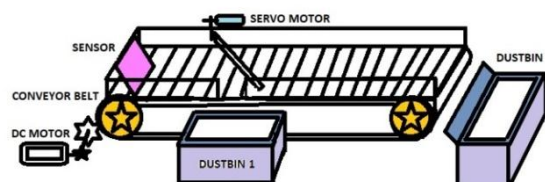
3. METHODOLOGY

3.2 For garbage segregating:

Figure 1: circuit for segregation

Here, as shown in the figure 1, the waste is getting sorted as dry and wet waste. When the waste is placed on the conveyor belt, the moisture sensor attached at the start senses the moisture in the waste. If the moisture is above asset value, then such signals are sent to the arduino. The servo motor which is also programmed through the same arduino, starts rotating. A

wooden block attached to the servo motor blocks the wet waste traffic and puts it in the dustbin of wet garbage which is dustbin1.

If the moisture is not above the set value, the servo motor doesn't rotate and the garbage goes ahead on the conveyor belt and falls in dry garbage dustbin i.e dustbin 2.Here the conveyor belt is rotated using dc motor.
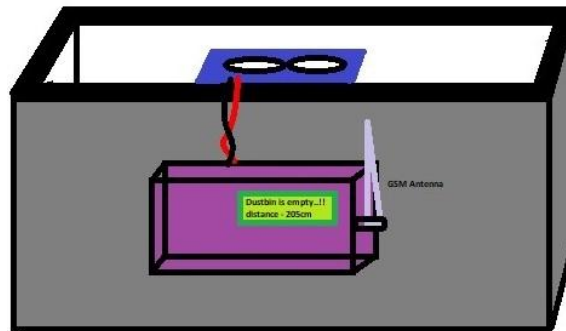
3.2 Monitoring the garbage level:

Figure 2: circuit for monitoring

As shown in the figure 2, 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 Arduino. If the bin is full, the message is sent to the municipal waste department with the location of dustbins using gsm module. The location is programmed in the Arduino code.
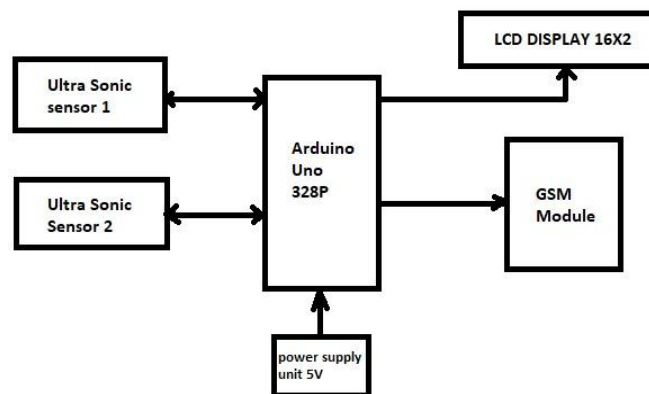
4. BLOCK DIAGRAM

Figure 3: Block diagram for monitoring

Figure above shows the overall block diagram for the garbage monitoring. The main blocks are ultrasonic sensor, arduino 328p, power supply, gsm and LCD display. This display is used to show the dustbin status. The other blocks are explained in the equipment session
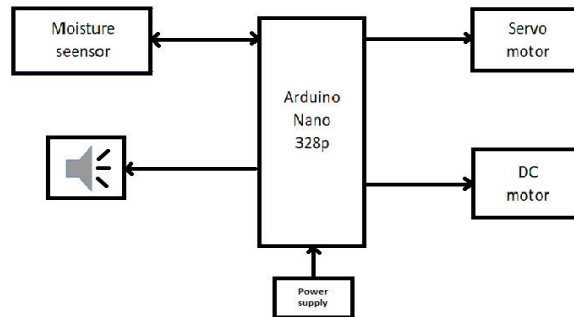
Figure 4: block diagram for segregation

The figure above shows the block diagram for segregation of waste. The main blocks are moisture sensor, servo motor, dc motor and buzzer. The buzzer is used to indicate the sensing completion. The other blocks are explained in equipment session.

5. EQUIPMENTS

5.1 Arduino UNO

Figure 5: Arduino UNO

Arduino uno is a microcontroller ic. It's a atmega series microcontroller no 328. It has 14 input/output pins and it can be programmed in c and cpp. It has analog as well as digital inputs.
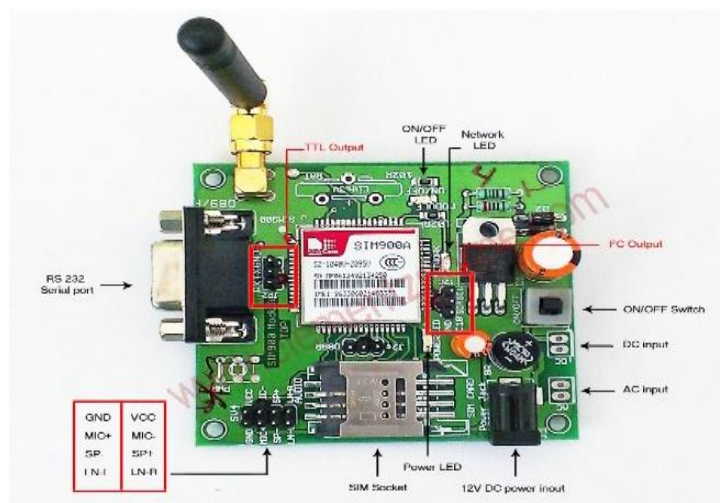
5.2 GSM Module

Figure 6: GSM module

A gsm is a global system for mobile communications. It has a sim slot for simcard. It is used to send the messages from the simcard. It also has an transmitting antenna.

5.3 Ultrasonic Sensor

Figure 7: ultrasonic sensor

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

5.4 Moisture Sensor

Figure 8: moisture sensor

The moisture sensor is used to measure the volumetric water contents in the object. It is also called as a soil moisture sensor. The measured property may vary based on soil type and temperature.

5.5 Conveyor Belt

Figure 9: 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.

5.6 DC Motor

Figure 10: 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.

5.7 Servo Motor

Figure 11: servo motor

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

6. BUILT-UP SYSTEM

Figure 12: built system

7. CONCLUSION

Using this system we can sort the garbage properly on the basic level only. As well as the dustbins won't overflow as the garbage department gets the notification whenever it is about to get full. Using this system we can make the garbage distribution easier for higher levels. This project is useful for basic level as well as it can be increased to further levels with more suitable sensors.

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