AUTOMATED WASTE SEGREGATOR SYSTEM

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Abstract - *In recent times, disposal has become an enormous problem within the world. There are large scale industrial waste segregators present, it's always far better to segregate the waste at the source itself. Presently, there's no automated system for segregation of wastes in household level. This paper shows the event of low-cost recycle bin that automatically separates the wastes consistent with their types in household level.*

Keywords—waste segregator, automated waste segregator

1. INTRODUCTION

Global Waste Management Market reported that the number of waste generated worldwide is 2.02 billion tones. Solid waste management has become one among the most issues in both urban and rural areas everywhere the planet. "Wastes aren't always waste if it's segregated because it was". The value of waste is best comprehended when it's segregated. To properly manage the waste, it's to be handled, segregated, transported and disposed so on reduce the risks to the general public lives and sustainable environmental. Waste management is a crucial requirement for ecologically sustainable development in many countries. There is a rapid increase in capacity and categories of solid waste as a results of urbanization, constant economic process and industrialization.

Currently there is no such system employed of segregation of paper, plastic, wet and metallic wastes at household level. This work presented here gives a novel approach in handling and disposing of the daily solid wastes in an efficient method. In this proposed model we use different sensors for detecting different waste material.

Several advancements in technology has also allowed the refuse to be processed into useful entities like Waste to Energy. When the waste is segregated into basic streams like wet, dry and metallic, the waste features a better potential of recovery, and consequently, recycled and reused. The wet waste fraction is usually converted either into compost or methane-gas or both. Compost can replace demand for chemical fertilizers, and biogas are often used as a source of energy. The metallic waste could be reused or recycled. The purpose of this project is that the belief of a Compact, low cost and user-friendly segregation system for urban households.
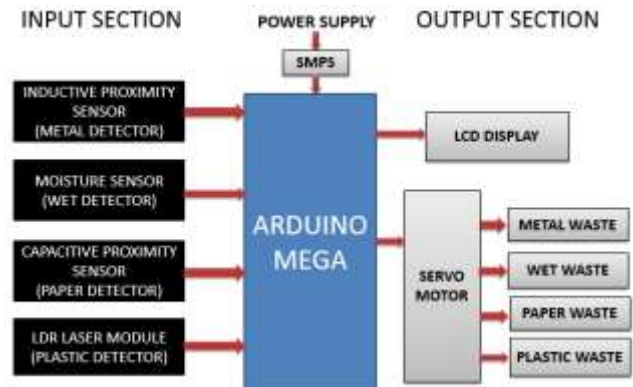
2. BLOCK DIAGRAM

Fig – 1: Block diagram for Automated Waste Segregator System

2.1 Arduino Mega

The main reason behind why we choose Arduino mega is the additional features that are inbuilt with this board. First feature is that the large I/O system design with inbuilt 16 analog transducers and 54 digital transducers that supports with USART and other communication modes. Secondly, its inbuilt RTC and other features like analog comparator, advanced timer, interrupt for controller wakeup mechanism to save lots of more power and fast speed with 16 MHz crystal clock to get 16 MIBS. It has more than 5 pins for VCC (5v) and GND to connect other devices to Arduino Mega. It supports ICSP as well as USB microcontroller programming with PC. This is used to control the hardware process by software (Arduino code).

2.2 Inductive Proximity Sensor

An inductive proximity sensor can detect metal targets approaching the sensor, without physical contact with the target. Inductive Proximity Sensors are roughly classified into the following three types according to the operating principle: the high- frequency oscillation type using electromagnetic induction, the magnetic type using a magnet, and therefore the capacitance type using the change in capacitance. The output of the proximity sensor is given to the relay module and the output of the relay module is connected to Arduino.

2.3 Capacitive Proximity Sensor

Capacitive proximity sensors are almost like inductive proximity sensors. The main difference between the two types is that capacitive proximity sensors produce an electric field rather than an electromagnetic field. Capacitive proximity switches will sense metal also as nonmetallic materials like paper, glass, liquids, and cloth. The Sensing range is 3-5 CMs. Using the data of that sensor we can detect only paper by modifying the Arduino code for capacitive sensor.

2.4 Moisture Sensor

Moisture Sensor is employed to differentiate between the dry waste and wet waste. We are using a raindrop sensor to detect the moisture content level in waste material. And the output of the raindrop sensor is directly given to the Arduino. Using the info of that sensor we will detect wet and dry waste separately by modifying the Arduino code for raindrop sensor.

2.5 Servo Motor

A servomotor may be a positioner or linear actuator that permits for precise control of angular or linear position, velocity and acceleration. It consists of an appropriate motor coupled to a sensor for position feedback. It also requires a comparatively sophisticated controller, often a fanatical module designed specifically to be used with servomotors. We are using one 3KGs servo motor for rotating the sensor board based on type of the waste materials and two 3KGs servo motors rotated 40 degrees simultaneously to drop the waste in the bin. We use a separate 6V power supply for driving the servo motors.

2.6 LCD Display

An LCD display is attached to the setup which would display the types of waste that detect in the sensor and display the bins level. We use an I2C LCD module to interface LCD with Arduino.

2.7 IR Sensor

We use four IR sensors to continuously monitor the bin levels and notify the user whether the bin is filled or not. If the bin is filled the IR sensor give signal to the arduino and the arduino switch on the LED.

2.8 LASER AND LDR Module

Laser and Light Dependent Resistor Module is used to differentiate between paper and plastic waste material. Laser and LDR are placed directly opposite to each other and the LDR is connected to Arduino. When the beam is interrupted the LDR is output value is decreased if there's no interrupt the LDR value Remain high. Using this property, we will identify between paper and plastic.

2.9 SMPS

We used switch mode power supply (SMPS) to convert the 230V AC power to 12V DC supply and then the 12V DC supply directly connected to the proximity sensors. And Using Regulated ICs the 12V DC supply is converted into 6V DC supply for servo motors.
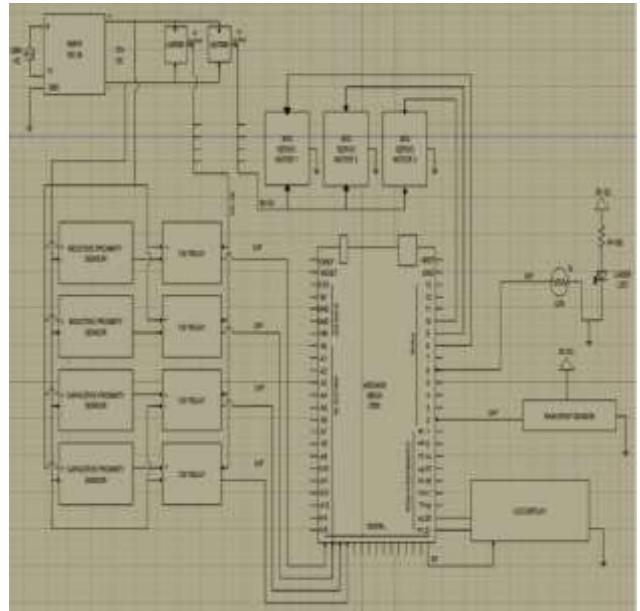
3. CIRCUIT DIAGRAM

Fig – 2: Circuit diagram for Automated Waste Segregator System

4. WORKING

Initially all the servo motors are set to the home position and all the sensor are switched on. When the garbage dropped on the sensing board all the sensors sense the waste and give the sensed output to the Arduino. And the Arduino analysis the outputs to find the appropriate waste material type. Once the waste material is identified then servo motor rotate predefined angle to put the waste in the appropriate bin.

In this proposed model we try to differentiate four waste materials namely wet, metal, plastic and paper. And we use four different sensors to identify the waste material. Raindrop sensor for detecting the wet waste its sense the moisture level of the wastes and determine the waste type. If the waste is wet waste then servo motor rotates the sensing board to 30 degrees and it drops directly into the wet bin.

Inductive proximity sensor for detecting the metal waste it only senses the metal waste. When the metal reaches the sensing are of the sensor then the relay is switched on and the signal is given to the Arduino. If the waste is metal waste (inductive proximity sensor) then servo motor rotates the sensing board to 60 degrees and it drops directly into the metal bin.

Laser and Light Dependent Resistor module is used to differentiate plastic and paper waste. Paper block the Laser beam and the plastic allow the beam to pass through using this property we can easily identify the waste material. If LDR value is high then the sensing board rotated by 90 degrees and directly drop into the plastic bin. If the LDR value is low then the sensing board is rotated by 120 degrees and drop into the paper bin.

After completing each round, the servo motor comes to the home position and LCD display the current waste type. And we have four IR sensor for continuously monitoring the bin level if the bin s filled then the IR sensor give the signal to the Arduino and the Arduino notify the user using LED.

5. RESULT

Fig – 3: Model

Fig – 4: Automated Waste Segregator System

6.CONCLUSIONS

In this paper, the development of automated waste segregator system is presented to effectively sort waste according to its base. During the process of development, the bin prototype and sensing mechanism are integrated with an Arduino Mega microcontroller. It is a low-cost system and it requires less amount of power supply.

Implementation of this system at a local level like societies, educational institutes, etc. can reduce the burden on the local authorities. The automatic waste segregator is one small step towards building an efficient and economic waste collection system with a minimum amount of human intervention and also no hazard to human life.

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