

Automatic Waste Separator and Management System

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Abstract - In this paper, the amount of waste has been increasing due to the increase in human population and urbanization. In the cities, the overflowed bin creates an unsanitary environment. Hence it degrades the environment. To avoid this situation “Automatic waste Separator” is developed to reduce the work for ragpickers the wastes are separated by human beings which leads to the health problem to the workers. The proposed system separates the waste into three types i.e. wet, dry and metallic waste. Each of the wastes are detected by the respective sensors and gets separated inside the bins which is assigned to them.

Index Terms - IR Sensor, Metal Detector, Arduino Uno, Raindrop Sensor, LCD Display, Servo Motor, Motor Driver, Sub Bins.

1.INTRODUCTION

Now a day everyone is looking towards smarter and automated technologies. Arduino is used to control and automate processes. Now a days the population is increases rapidly. This population led to the improper waste disposal. Managing the waste requires a lot of manpower. It also takes more time. In recent years the waste disposal is becoming a huge cause. Common method of waste disposal is mostly the unplanned. And it is dumped at the landfill sites. This method of waste management affects on all living beings. This method can generate liquid leachate and other fungus which pollute the surface and underground water also accelerates harmful diseases which leads to the degradation of an aesthetic value of environment. In our country recycling of solid waste is done by the ragpickers. This ragpickers play an important role in this process. At that time the ragpickers get affected with many health problems likes skin infections, respiratory problems the dependent of ragpickers can be reduced if the automatic waste separation takes place in the dustbin. These wastes are into three types wet, Dry and metallic these wastes have a large potential of recycled and reused. Even through there

are multiple industrial waste separator present, it is always better to separate the waste at source itself. The benefit of doing this type of separation is, there is no need of ragpickers to segregate the waste. And, the separated waste can be directly sent to the recycling plant, instead of sending the waste to separation plant and then to recycling plant. Now a days there is no such system for the automatic separation of waste into dry, wet and metallic waste. The main moto of this project is compact, low cost and user-friendly waste separation system for urban cities to streamline the waste management process.

2.LITERATURE REVIEW

In that paper, it gives a solution to achieve automatic segregation of waste at the primary levels i.e. where the wastes are produced. If the waste items are segregated properly at their primary level, a major portion of the waste management cycle is covered. The usage of automation in segregation of waste items can greatly improve its efficiency and at the same time reduce the health hazards associated with manual segregation. [1]. This paper presents a smart and cost-effective solution for waste segregation. The foremost goal of this project is to automatically segregate the wastes and to perceive the level of the dustbins [2]. This paper gives, a prototype is presented for smart waste management. It is also capable of waste segregation at the ground level and providing real-time data to the administrator. [3]. In this paper, the objective of the project is to enhance practicality of IoT based solid waste collection and management system for smart city. In this paper they have proposed system which can be deployed in general purpose dust bins placed at public places and which allows us to monitor its status remotely over web browser for efficient waste management. [4]. It concentrates on Industrial waste whose value is unrecognized since people don't spend time on segregating waste into

their basic streams. The metallic and non-metallic waste is sorted. [5].

3. METHODOLOGY

In this paper we are designing an Automatic waste separator and management system. In that the waste is separated into three main categories namely dry, wet and metal. Here we used IR sensor to detect waste. To sense the metal waste, we are using Inductive Proximity sensor. To detect wet waste, we are using Raindrop Sensor. In that we are using three motor driving M1, M2 and M3 on that the three sub bins are mounted i.e. for dry waste, for meatal waste and for wet waste. M1 is motor driving the conveyer belt, M2 is motor driving the separator to put metal waste into the bin, M3 is motor driving the separator to put the wet waste into the bin. Once the input waste is entering the conveyer belt motor turns on and the conveyer belt starts moving. The Arduino all the motors and sensors are turned on. The waste is sensed by metal detector here we used inductive proximity sensor as a metal detector to detect whether it is a metal or not. If metal, then M1 turned off and M2 turned on waste is falls into metal waste bin. If not metal waste, then M1 kept on and waste comes in contact with Raindrop sensor if waste has some humidity it is detected as a wet M1 turned off and M2 turned on and the waste falls into wet waste bin. If not wet waste, then M1 kept on and waste dropped into dry waste bin. Finally, the wastes are dropped into the respective bins and the separation process completed.

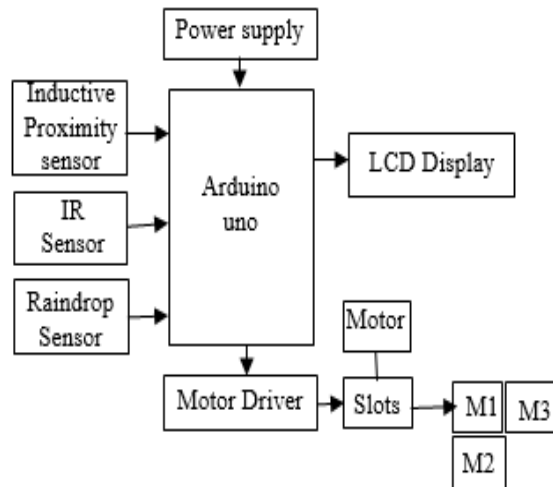


Figure 1: Block Diagram of Project

3.1 Arduino Uno:

An Arduino is an open source computer hardware and software, project and user community that designs and manufactures Microcontroller based tools for building digital devices and interactive objects that can sense and control real world. We tend to be victimization Arduino Uno as a controller that controls all the operations. The Arduino Uno that could be a microcontroller board supported the AT mega 328 as we all know “Uno” suggest that one in Italian thus named to mark the coming unleash of Arduino one. 0 it’s in tern fourteen digital input or output pins, Six analog inputs, A16 Mc ceramic resonator, A USB affiliation, an influence jack, associate degree ICSP header and a push button.



Figure 2: Arduino Uno

3.2IR Sensor:

An Infrared Sensor is a one type of electronic sensor. An infrared sensor is an electronic device. It emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object. And it detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called as a passive IR sensor. In the infrared spectrum, all the objects radiate some form of thermal radiations. That types of radiations are invisible to our eyes, that can be detected by an infrared sensor. In it the emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode .IR photodiode is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.



Figure 3: IR Sensor

3.3 Metal sensor:

An inductive proximity sensor is a non-contact electronic proximity sensor. An inductive proximity sensor is used for positioning and detection of metal objects. The sensing range of an inductive switch is dependent on the type of metal being detected. It consists of an induction loop or detector. It uses the principle of electromagnetic induction to detect or measure objects. An inductor develops a magnetic field when a current flow through it; alternatively, a current will flow through a circuit containing an inductor when the magnetic field through it changes. This effect can be used to detect metallic objects that interact with a magnetic field. Non-metallic substances such as liquids or some kinds of dirt do not interact with the magnetic field, so an inductive sensor can operate in wet or dirty conditions. It detects magnetic loss due to eddy currents that are generated on a conductive surface by an external magnetic field. An AC magnetic field is generated on the detection coil, and changes in the impedance due to eddy currents generated on a metallic object are detected.



Figure 4: Inductive Proximity sensor.

3.4 Raindrop Sensor:

Raindrop sensor is an electronic sensor. It is a basically a board on which nickel is coated in the form of lines. Raindrop sensor works on the principal of resistance. Rain Sensor module allows to measure moisture via analog output pins, and it provides a digital output when a threshold of moisture exceeds. It detects water that completes the circuits on its sensor boards' printed leads. The sensor board acts as a variable resistor that will change from 100k ohms when wet to 2M ohms

when dry. In short, the wetter the board the more current that will be conducted.

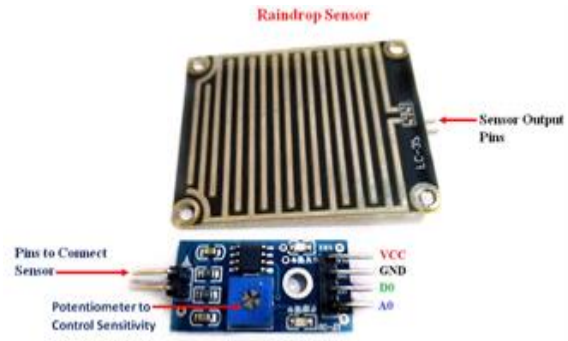


Figure 5: Raindrop sensor

Raindrop Sensor Features:

- Working voltage 5V.
- Output format: Digital switching output (0 and 1), and analog voltage output AO.
- Uses a wide voltage LM393 comparator.
- Comparator output signal clean waveform is good, driving ability, over 15mA.

3.5 Servo Motor:

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. Servo motor consists of a suitable motor coupled to a sensor for position feedback. It is used in applications such as robotics, CNC machinery or automated manufacturing. It works on the PWM (Pulse Width Modulation) principle, which means its angle of rotation is controlled by the duration of pulse applied to its control PIN. It is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears.

It is able to operate at a wide range of speeds—both high and low—without overheating, and to maintain sufficient torque at zero speed to hold a load in place. It can also maintain a constant velocity, despite changes in the amount of torque acting on the system.



Figure 6: Servo Motor.

3.6 LCD display:

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. It does not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are accessible to display subjective images (as in a universally useful PC 24 display) or settled images with low information content, which can be displayed or covered up, for example, present words, digits, and 7-segment displays, as in an advanced clock.

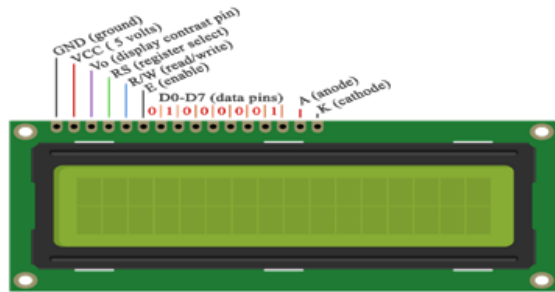


Figure 7: LCD Display

3.7 Motor Drivers:

A motor driver is used to drive the motor. In the stepper motor it is used to rotate continuously by controlling the exact position without using a feedback system. The drivers of this motor mainly provide variable current control as well as several step resolutions. It is the driver circuit that controls how the stepper motor operates. It works by sending current through various phases in pulses to the stepper motor. Engineers rarely use wave driving it is inefficient and provides little torque, because only one phase of the motor engages at a time



Figure 8: Motor Driver

4. RESULTS



Figure 9: Metal dust throwing to the main waste tray



Figure 10: Metal waste detected and falls into respective dust bin i.e. Metal waste bin

5. CONCLUSION

In this Project Automatic waste separator is designed to sort the waste into three types I.e. wet, dry and metallic, thereby making the waste management more effective. To identify waste is wet or dry or metal we have used three type of sensors IR sensor, Moisture sensor and Metal detector. This developed system is not only cost efficient also makes the waste management productive one

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