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AUTOMATIC WASTE SEGREGATOR USING RASPBERRY PI

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ABSTRACT
Rapid increase in volume and types of solid and hazardous waste as a result of continuous economic growth, urbanization and industrialization, is becoming a burgeoning problem for national and local governments to ensure effective and sustainable management of waste. The Economical value of waste is best realized when it is segregated. Segregation of waste at dumping sites consumes more time and manpower. This work proposes an Automatic Waste Segregator (AWS) which is a cheap, easy to use solution for a segregation system at households. The AWS uses an inductance sensing mechanism to identify metallic items and resistive sensors to distinguish between wet and dry waste**.**

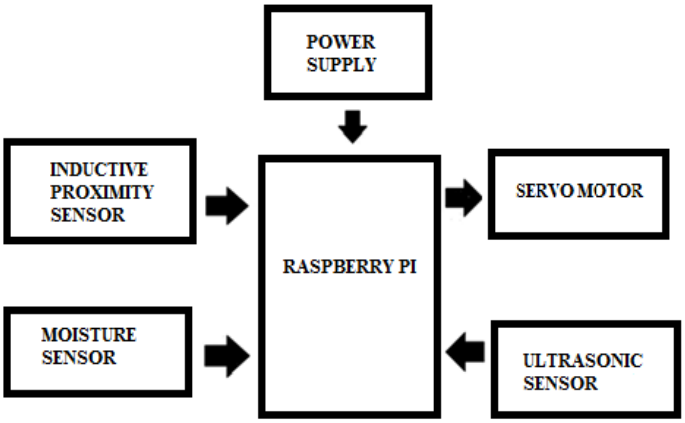
Keywords*: *Raspberry pi 3, Ultrasonic sensor, Inductive Proximity sensor, Servo Motor.

I INTRODUCTION

The economic value of the waste generated is not realized unless it is recycled completely. When the waste is segregated into basic streams such as wet, dry and metallic, the waste has a higher potential of recovery, and consequently, recycled and reused. The wet waste fraction is often converted either into compost or methane-gas or both. Compost can replace demand for chemical fertilizers and biogas can be used as a source of energy. The metallic waste could be reused or recycled. Even though there are large scale industrial waste segregators present, it is always much better to segregate the waste at the source itself. The benefits of doing so are that a higher quality of the material is retained for recycling which means that more value could be recovered from the waste. The occupational hazard for waste workers is reduced. Also, the segregated waste could be directly sent to the recycling and processing plant instead of sending it to the segregation plant then to the recycling plant. The purpose of this project is the realization of a compact, low cost and user friendly segregation system for urban households to streamline the waste management process.

II.SYSTEM REQUIREMENTS

The system in this paper consists of Raspberry pi 3,servo motor, ultrasonic sensor, moisture sensor, inductive proximity sensor. Here moisture sensor is used to identify the waste is dry or wet.



BLOCK DIAGRAM

2.1 RASPBERRY PI3

The Raspberry Pi 3 is the third generation Raspberry Pi. It replaced the Raspberry Pi 2 Model B in February 2016.It has 1.2GHz 64-bit quad-core ARMv8 CPU, 802.11n Wireless LAN, Bluetooth 4.1.As pi 2 raspberry pi3 also has some similar features like 1GB RAM, 4 USB ports, 40 GPIO pins, Full HDMI port, Ethernet port, Combined 3.5mm audio jack and composite video, Camera interface, Display interface Micro SD card slot, Video Core IV 3D graphics core.

The Broadcom BCM2835 SoC used in the first generation Raspberry Pi is somewhat equivalent to the chip used in first generation smartphones (its CPU is an older ARMv6 architecture),[14] which includes a 700 MHz ARM1176JZF-S processor, VideoCore IV graphics processing unit (GPU),[15] and RAM. It has a level 1 (L1) cache of 16 KB and a level 2 (L2) cache of 128 KB. The level 2 cache is used primarily by the GPU. The SoC is stacked underneath the RAM chip, so only its edge is visible. The Raspberry Pi 2 uses a Broadcom BCM2836 SoC with a 900 MHz 32-bit quad-core ARM Cortex-A7 processor (as do many current smartphones), with 256 KB

shared L2 cache. The Raspberry Pi 3 uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache.

2 .2 Servo Motor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors .Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.

2.3 Inductive Proximity Sensor

The inductive sensor is based on Faraday's law of induction. An inductive proximity sensor is a type of non-contact electronic proximity sensor that is used to detect the position of metal objects. The sensing range of an inductive switch is dependent on the type of metal being detected. Ferrous metals, such as iron and steel, allow for a longer sensing range, while nonferrous metals, such as aluminum and copper, can reduce the sensing range by up to 60 percent. Since the output of an inductive sensor has two possible states, an inductive sensor is sometimes referred to as an inductive proximity switch.

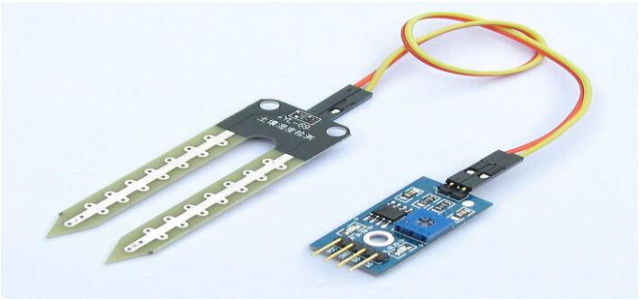
2.4 Ultrasonic Sensor

Ultrasonic sensors are based on measuring the properties of sound waves with frequency above the human audible range. They are based on three physical principles: time of flight, the Doppler effect , and the attenuation of sound waves.

Ultrasonic sensors are non-intrusive in that they do not require physical contact with their target, and can detect certain clear or shiny targets otherwise obscured to some vision-based sensors. On the other hand, their measurements are very sensitive to temperature and to the angle of the target. Ultrasonic sensors "are based on the measurement of the properties of acoustic waves with frequencies above the human audible range," often at roughly 40 kHz. They typically operate by generating a high-frequency pulse of sound, and then receiving and evaluating the properties of the echo pulse

2.5 Moisture Sensor

Moisture sensors measure the volumetric water content in object by using some properties, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content .This makes it ideal for performing experiments in courses such as soil science, agricultural science, environmental science, horticulture, botany, and biology. Use the Soil Moisture Sensor to: • Measure the loss of moisture over time due to evaporation and plant uptake.



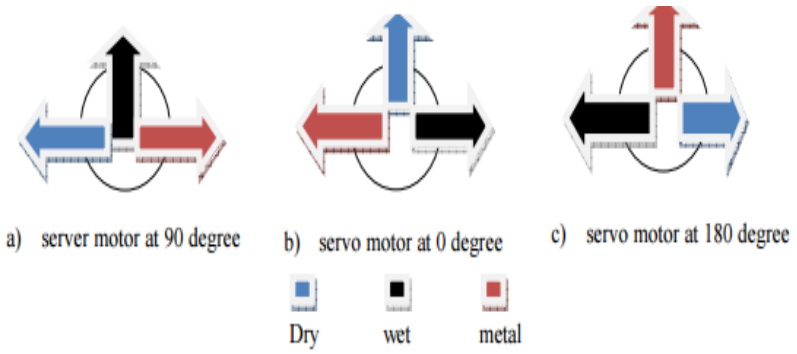
III METHODOLOGY

The main goal of the project is to design and develop a sorting system that sorts the waste automatically into three categories namely metal waste, wet waste, and dry waste. The system mainly consists of Raspberry Pi 3, inductive proximity sensor, ultrasonic sensor, moisture sensor and servo motors.

The waste is dumped into the Automatic Waste Segregator which marks the entry of the waste and starts up the system. It then initializes the sensor modules. The initialization of all modules ensures that any dynamic changes in

the environment do not affect the sensing .As soon as the waste is dumped in to the system the ultrasonic sensor gets activated and recognizes that the waste is dumped. The object then moves over the incline and falls on the inductive proximity sensor which contain an inductive coil. If the metal waste is dumped the inductive proximity sensor detects the metal and the waste is dumped into metal bin. The waste continues down the incline towards the moisture sensing module. Moisture sensor identifies whether the object is dry or wet. If the moisture level of the object is high then the object is identified as wet waste or else dry waste.

To achieve the segregation, a servo motor is used. The containers are placed on a circular base which is mounted on the axle of a servo motor. The circular base rotates as the axle of the servo motor rotates.. The servo motor is given three different positions or angles for the three types of wastes detected. The motor thus always comes to the required position according to the signal obtained. The default bin at the circular base is the dry bin. To avoid overshooting of the container due to the momentum of the base, the servo motor is rotated at lower speeds by using pulse width modulation (PWM) which is generated from the Raspberry pi. Thus the segregation is completed.



IV RESULTS

The project has been tested for different categories of waste namely wet, dry and metal. Wet waste means organic wastes such as vegetable peel, garden wastes etc,. dry waste include paper wastes, plastic bottles etc, and metallic waste include safety pins, foil paper etc,.

: DUMPING

SEGREGATION

V.CONCLUSION

Automatic Waste Segregator has been successfully implemented for the segregation of waste into metallic, dry and wet waste at a domestic level. The system can segregate only one type of waste at a time with an assigned priority for metal, wet and dry waste. The experiment has been conducted for wet, dry and metallic wastes. It is found that the change of moisture value is greater for wet waste and very less for dry waste. Other objects like glass and wood have intermediate relative dielectric constant and thus are detected as dry waste. Experimental result shows that the waste has been successfully segregated into metallic, wet and dry using the Automatic Waste segregator.

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REFERENCES

1] M.K.Pushpa, Aayushi Gupta, Shariq Mohammed Shaikh, Stuti Jha, Suchitra V, "Microcontroller based Automatic Waste Segregator", IJIREEICE, Volume 3, Issue 5, May 2015.

[2]http://www.ijrat.org/downloads/Vol-4/july-2016/paper%20ID-47201638.pdf

[3] http://www.ijireeice.com/upload/2015/may-15/IJIREEICE%2029.pdf

[4] Ruveena Singh, Dr. Balwinder Singh, "Design and Development of Smart Waste Sorting System", IJRECE, Volume 3, Issue 4, OctoberDecember 2015.