# Automatic Trash Segregator Using Raspberry Pi-0

**Akalya K[1], Bavithra Devi M[1], Jeevananth S[1], Karthickumar S[1], Prem Kumar S[2]**

UG Students, Dept. of ECE, Knowledge Institute of Technology, Salem, Tamilnadu, India[1]

Assistant professor, Dept. of ECE, Knowledge Institute of Technology, Salem, Tamilnadu, India[2]

**ABSTRACT**: The main objective of this project is to design an automatic trash segregator using Raspberry Pi. This project segregates trash at source level to wet, dry and metallic waste such that the value of each kind of trash can be understood and converted to a source of energy, in a cost effective way. IR sensor continuously transmits the signal to detect the presence of obstacle. When the waste is dumped into the bin the receiver receives the reflected signal from the waste and starts the entire process using Raspberry pi. The moisture sensor is used to monitor the moisture content present in the trash. Proximity sensor is used to detect the metal waste. The Raspberry Pi in turn activates DC motor by executing program to rotate the motor in the forward direction. Two DC motors are used for the smooth rotation of the conveyor belt. Both DC motors rotate in forward direction allowing the waste to be detected by the sensors connected in series near the conveyor belt. All these sensor status and dustbin status is monitored by IoT based real time technology.

**KEYWORDS:** Wet, Dry and Metallic wastes, Raspberry pi, conveyer belt, IoT, Android application.

## I. INTRODUCTION

As the production and consumption is proliferating due to the increase in population, extensive amount of solid materials are generated and rejected by people on regular basis. Garbage Mountains are commonly seen today. The waste dumped is ubiquity in the form of rotting mound that dot our terrains and make our rivers, wells, lakes abhorrent. 68.8 million tons/year of municipal solid waste is generated in India. After separating the waste materials, inorganic waste (non-degradable) such as paper, plastic, glass, metal can be sold to waste bankers or waste traders who then become suppliers to the manufacturing sectors where products are made from this recycled plastic and metal. And the organic waste (degradable) such as leftover food, vegetable peel is converted into compost which can be used as a substitute of chemical fertilizers and methane gas which can be used as biogas for cooking, etc. For this purpose we are designing an automatic trash segregator which segregates different types of waste with the help of Raspberry pi-0 and sensors. Different wastes are detected and automatically segregated using conveyor belt and DC motors. IoT (Internet of Things) based system or android app are created to monitor the trash segregation process and to check the sensor status and dustbin status.
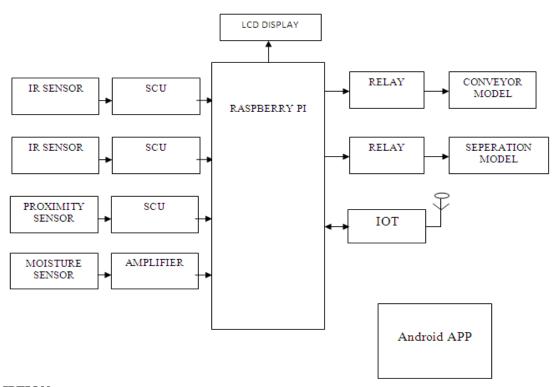
## II. EXISTING SYSTEM

The existing system is focusing on the continuous increase in waste generation due to the increase in population. Waste generated in India is in the range of 200-870 grams per day and its rate is rising by about 1.3% per capita per year in India. In addition to this, portion of waste is burnt openly on dumpsites or streets. Consequently, dioxins and furans are emitted in the lower atmosphere deteriorating the environment. Some of the materials present in wastes have markets, so it's expedient to take them out of waste for reuse and recycling. This is possible only if waste is segregated which leads to exigency of a mechanism that could separate the waste. This is used to detect the trash using IR sensor and moisture level is monitored by moisture sensor.

## III. SYSTEM SPECIFICATION



**DESCRIPTION:**
**1. RASPBERRY PI**

The Raspberry Pi is a credit card-sized computer developed in the UK by the Raspberry Pi Foundation with the intention to promote the teaching of basic computer science in schools. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. It does not include a built-in hard disk or solid-state drive, but it uses an SD card for booting and persistent storage, with the Model B+ using a MicroSD. The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, C, Java and Perl.

**2. LCD DISPLAY:**

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs doesn't emit light directly. They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube (CRT) displays in most applications. They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they cannot suffer image burn-in. LCDs are more energy efficient and offer safer disposal than CRTs. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically-modulated optical device made up of any number of pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in colour or monochrome. The earliest discovery leading to the development of LCD technology, the discovery of liquid crystals, dates from 1888. By 2008, worldwide sales of televisions with LCD screens had surpassed the sale of CRT units.

**3. IR SENSOR:**

Infra-Red sensor (IR sensor) is an electronic device that measures infrared (IR) light radiating from objects in its field of view. Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall. All objects emit what is known as black body radiation. It is usually infrared radiation that is invisible to the human eye but can be detected by electronic devices designed for such a purpose. "Infra" meaning below our ability to detect it visually, and "Red" because this color represents the lowest energy level that our eyes can sense before it becomes invisible. Thus, infrared means below the

energy level of the color red, and applies to many sources of invisible energy. Infrared transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other. The transmitted signal is given to IR transmitter whenever the signal is high, the IR transmitter LED is conducting it passes the IR rays to the receiver. When receiver receives the signal from the transmitter it resistance value is low. Its resistance value becomes high when the signal was cut. By this sensor sense the value.

## 4. PROXIMITY SENSOR:

Proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive proximity sensor or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target. Proximity sensors can have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between the sensor and the sensed object. Proximity sensors are also used in machine vibration monitoring to measure the variation in distance between a shaft and its support bearing. This is common in large steam turbines, compressors, and motors that use sleeve-type bearings. International (IEC) 60947-5-2 defines the technical details of proximity sensors. A proximity sensor adjusted to a very short range is often used as a touch switch.

## 5. SOIL MOISTURE SENSOR:

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. One common type of soil moisture sensors in commercial use is a frequency domain sensor such as a capacitance sensor. Another sensor, the neutron moisture gauge, utilizes the moderator properties of water for neutrons. Cheaper sensors -often for home use- are based on two electrodes measuring the resistance of the soil. Sometimes this simply consists of two bare (galvanized) wires, but there are also probes with wires embedded in gypsum. Measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. Not only are farmers able to generally use less water to grow a crop, they are able to increase yields and the quality of the crop by better management of soil moisture during critical plant growth stages. Besides agriculture, there are many other disciplines using soil moisture sensors. Golf courses are now using sensors to increase the efficiencies of their irrigation systems to prevent over watering and leaching of fertilizers and other chemicals offsite.

## 6. AMPLIFIER:

An electronic amplifier is a device for increasing the power of a signal. It does this by taking energy from a power supply and controlling the output to match the input signal shape but with high amplitude. In this sense, an amplifier may be considered as modulating the output of the power supply. Here we use inverting amplifier as a gain amplifier. We can change the gain by adjusting the value of feedback resistance value. As the open loop DC gain of an operational amplifier is extremely high we can afford to lose some of this gain by connecting a suitable resistor across the amplifier from the output terminal back to the inverting input terminal to both reduce and control the overall gain of the amplifier. This then produces and effect known commonly as Negative Feedback, and thus produces a very stable Operational Amplifier system. Negative Feedback is the process of "feeding back" some of the output signal back to the input, but to make the feedback negative we must feed it back to the "Negative input" terminal using an external Feedback Resistor called Rf. This feedback connection between the output and the inverting input terminal produces a closed loop circuit to the amplifier resulting in the gain of the amplifier now being called its Closed-loop Gain.

## 7. INTERNET OF THINGS (IoT):

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The definition of the Internet of things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation and others all contribute to enabling the Internet of Things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", covering devices and appliances that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smart phones and smart speakers.

APPLICATIONS:

The extensive set of applications for IoT devices is often divided into consumer, commercial, industrial, and infrastructure spaces.

## 8. WIFI

A Wi-Fi-enabled device, such as a personal computer, video game console, smart phone or digital audio player, can connect to the Internet when within range of a wireless network connected to the Internet. The coverage of one or more (interconnected) access points called hotspots comprises an area as small as a few rooms or as large as many square miles. Coverage in the larger area may depend on a group of access points with overlapping coverage. Wi-Fi technology has been used successfully in wireless mesh networks in London, UK, for Wi-Fi provides service in private homes and offices as well as in public spaces at Wi-Fi hotspots set up either free-of-charge or commercially. Organizations and businesses, such as airports, hotels, and restaurants, often provide free-use hotspots to attract or assist clients. Enthusiasts or authorities who wish to provide services or even to promote business in selected areas sometimes provide free Wi-Fi access. As of 2008 more than 300 city-wide Wi-Fi (Muni-Fi) projects had been created. As of 2010 the Czech Republic had 1150 Wi-Fi based wireless Internet service providers. Routers that incorporate a digital subscriber line modem or a cable modem and a Wi-Fi access point, often set up in homes and other buildings, provide Internet access and internetworking to all devices tuned into them, wirelessly or via cable. With the emergence of MiFi and WiBro (a portable Wi-Fi router) people can easily create their own Wi-Fi hotspots that connect to Internet via cellular networks. Now iPhone, Android, Bada and Symbian phones can create wireless connections.

## IV. RESULT

As a result of the process, the trash driven by the conveyor belt is segregated into dry, wet and metal waste. The segregated waste are collected in different trash bins. Once the dustbin is full, we will receive a message saying dustbin is full. This is achieved using IoT.

## V. CONCLUSION

Our system mainly concentrates on separating trash at a low cost. In order to differentiate between wet and dry waste, a moisture sensor is used instead of a capacitive sensor which increases the complexity by making it difficult to differentiate between dry and wet waste by making use of dielectric values of waste substances. In the former system to separate metallic waste, inductive sensors were used which again requires the controller to be pre-programmed with the threshold values, this necessity is removed in our system by making use of a proximity sensor which directly detects metals. At industrial level, methods that are used for segregation of waste are hazardous to human health. The process involves a lot of manual efforts and also complete segregation is not obtained. By segregating waste at root source, not only waste can be recycled but also the beauty of the surroundings can be maintained. The main feature of this project is used to segregate a waste by using separate containers for individual waste (dry, wet, metal wastes). IOT based Real time monitoring system is used in our project to monitor the waste segregator.

## REFERENCES

[1]. Shuchi Gupta, Krishna Mohan, Raj Kumar Prasad, Sujata Gupta, and Arun Kansal, " Solid Waste Management in India: Options and Opportunities in Resource, Conservation and Opportunities. Volume 24, Issue 2, November 1996.

[2].J.S. Bajaj, "Urban Solid Waste management in India", Planning Commission Government of India, New Delhi 1995.

[3].Claudine Capel, "Innovations in waste", Waste- management-world, Volume 11, Issue 2, Mar2010.

[4] D. Eason, B. Noble, and I.N. Sneddon, "On certain integrals of Daniel Hoornweg et al., "What a waste- Global Review of Solid Waste Management", Urban Development & Local Government Unit World Bank, Washington, DC., No.15, Mar. 2012.

[5] Nishigandha Kothari, "Waste to Wealth", NSWAI, New Delhi, Jul. 2013

[6] Claudine Capel, "Innovations in Waste", Waste management-world, Volume 11, Issue 2, Mar 2010.

[7] J.S. Bajaj, "Urban Solid Waste management in India", Planning Commission, Government of India, New Delhi, 1995.

[8] Claudine Carpel, "Waste Sorting - A Look at the Separation and Sorting Techniques in Today's European Market", Waste-management world, Volume 9, Issue 4, Jul 2008.

[9] LDC1000 Inductance to Digital Converter, Texas instruments, Dallas, TX, Sept 2013.

[10] Enders Hauser, Weilam Rhein, Baden-Württemberg "Relative Dielectric constant (dk value) of liquids and solid materials", 200