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Automatic Waste Segregator Machine

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Abstract: ***Considering our rapidly deteriorating ecological conditions due to waste incineration, underground water contamination from garbage landfills and ocean dumping, there is obviously a serious waste management problem. A large portion of our garbage can be reclaimed, recycled and resold. Traditionally waste containers have not been designed to facilitate the source separation required for highly effective recycling programs to be successful. Nor have they incorporated the convenience required to encourage wide spread, willing participation.***

In essence, this type of waste container is unsatisfactory because it makes it necessary to provide separate containers that require additional space for people who separate their recyclable waste. It is easy to understand why only a very small portion of our population takes part in any recycling effort. Waste containers have been suggested in which a plurality of self-supporting sub-containers are held in a large, open-topped box type of container or a frame, but these tend to be expensive and to be difficult to handle. Other containers have been proposed in which single plastic bags are supported, or, in laundry hampers, in which bags made specially to be accommodated by the hampers are arranged to receive different kinds of laundry, or in which partitions are arranged, but not to support plastic bags. All of these have had drawbacks that have evidently militated against their commercial acceptance when it comes to the segregation of recyclable trash.

Therefore, in this present work, an attempt is made to study to separate the biodegradable and non-biodegradable waste. In non-biodegradable waste we will separate the metal and plastic. This machine will be designed as to automatically separate biodegradable waste and non-biodegradable waste in commercial building, where people throw all types of waste together hence require more time for separating waste from dustbin.

Keywords: **inorganic waste, moisture sensor, metal detector, dual shaft motor, jumper wire, volt regulator, automatic waste segregator machine.**

I. INTRODUCTION

From the beginning of the human civilization, people used various methods of waste disposal to get rid of unwanted material. Sometimes it was buried in the land, thrown in the sea, fed to the animal or burnt. Getting rid of unwanted material is always a major concern for the modern society. Trash has played a tremendous role in history. The Bubonic Plague, cholera and typhoid fever, to mention a few, were diseases that altered the populations of Europe and influenced monarchies. They were perpetuated by filth that harboured rats, and contaminated water supply. When wastes are not properly managed then it may cause serious hazard, as seen in 1350. "Black plague" erupted and more than 25 million people from all over Europe fall victim to it in just five [years]. There is an increasing rate of waste generation in India. The Waste Generation Rate (kg/cap/day) is expected to increase to 0.6 in 2025. A significant percentage of the population has zero access to proper waste disposal services, which will in effect lead to the problem of waste mismanagement. The total waste collection rate in major cities of india. When waste is not properly collected, it will be illegally disposed of and this will pose serious environmental and health hazards to the people of India. This is not the only problem of indian city but also for other big cities around the world. With so much concern recently about being greener and economically friendly, waste management has become a very important topic. People and companies are starting to realize that the things they use and the way they dispose of them can make a big impact on our world. Proper management of waste plays a vital role in global environment. That is why a waste sorting system is designed which can be used in houses, offices, industries as a part of smart waste man.

Waste sorting is the process by which waste is separated into different elements. Waste sorting can occur manually at the household and collected through curbside collection schemes, or automatically separated in materials recovery facilities or mechanical biological treatment systems. Hand sorting was the first method used in the history of waste sorting.

Waste can also be sorted in a civic amenity site. "Waste segregation" means dividing waste into dry and wet. Dry waste includes wood and related products, metals and glass. Wet waste typically refers to organic waste usually generated by eating establishments and are heavy in weight due to dampness. Waste can also be segaregeconomic concern.

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II. PROBLEM STATEMENT

A. Soil Contamination

Soil contamination is the No. 1 problem caused by improper waste removal and disposal. Some wastes that end up in landfills excrete hazardous chemicals that leak into the soil. Take the case of plastic bottles. When they eventually break down, they release DEHA, a carcinogen that affects our reproduction systems, causes liver dysfunction, and weight loss. Soil contamination does not only affect plant growth, it is also unhealthy to humans and animals feeding on those plants.

It is therefore important that every household takes recycling to heart. Plastics, metals, paper, and electronic wastes can be recycled at your local recycling centres. If everyone takes time to segregate and sort their recyclable wastes and bring them to recycling centres, the bulk of waste that will be removed from the landfills.

B. Air Contamination

Waste that contains hazardous chemicals, such as bleach and acids, needs to be disposed of properly, and only in approved containers with correct labels.

Some papers and plastics are burned in landfills, emitting gas and chemicals that hurt the ozone layer. Waste that releases dioxins are also dangerous and pose a health risk when they diffuse into the air that we breathe. Add to that the methane gases that decomposing wastes release.

Finally, landfill gas produced by the decomposing wastes, can be explosive and can harm nearby communities

C. Water Contamination

Hazardous wastes in the environment leech into the ground, and ultimately, into ground water. This water is used for many things, from watering the local fields to drinking. Toxic liquid chemicals from waste can also seep into water streams and bodies of water.

Untreated sewage can threaten marine life that comes into contact with the contaminated water. It can destroy and suffocate marine habitats, such as corals. Contaminated water is also dangerous and harmful to humans who consume fish and other marine life.

D. Bad Impact On Human Health

Improper disposal of waste can greatly affect the health of the population living nearby the polluted area or landfills. Waste disposal workers and other employees in these landfill facilities are at a greater risk. Exposure to improperly handled wastes can cause skin irritations, blood infections, respiratory problems, growth problems, and even reproductive issues.

E. Impact On Animals And Marine Lifeit Cannot Be Stressed Enough

Our carelessness with our waste and garbage does not just affect us. Animals likewise suffer the effects of pollution caused by improperly disposed wastes and rubbish. Styrofoam and cigarette butts have been known to cause deaths in marine animals who consume them. Animals who consume grasses near contaminated areas or landfills are also at risk of poisoning due to the toxins that seep into the soil.

F. Disease-Carrying Pests

Mosquitoes and rats are known to live and breed in sewage areas, and both are known to carry life-threatening diseases. Mosquitoes breed in cans and tires that collect water, and can carry diseases such as malaria and dengue. Rats find food and shelter in landfills and sewage, and they can carry diseases such as leptospirosis and salmonellosis. Moreover, moisture production from waste is a breeding ground for mould. It's bacteria that has the ability to spread and grow given the appropriate conditions, such as moisture production from appliances and food scraps.

G. Adversely Affect The Local Economy

Everyone wants to stay and live in a healthy, clean, fresh, and sanitary place. A city with poor waste management will certainly not attract tourists or investors. Landfill facilities that are mismanaged can cause the local economy to sink, which can then affect the livelihood of the locals.

H. Missed Recycling Opportunities

There is revenue in recycling. Cities that do not implement proper removal and recycling of wastes miss on this. They also miss out on the resources that can be reused and on the employment opportunities that a recycling centre brings.

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I. Causes Extreme Climate Changes

Decomposing waste emits gases that rise to the atmosphere and trap heat. Greenhouse gases are one of the major culprits behind the extreme weather changes that the world is experiencing. From extremely strong storms and typhoons to smouldering heat, people are experiencing and suffering the negative effects of greenhouse gases.

J. It Is Slowly Killing The Planet

We only have one planet, and our careless handling of waste is harming it. Taking care of the environment is everyone's responsibility, for ourselves, for our planet, and for our children.

III.REVIEW OF LITERATURE

A. Design and Development of Waste Sorting Machine 1 S.J. Ojolo, 2 J.I. Orisaleye, 1Adelaja, A.O., 3Kilanko, O.

A waste sorting machine has been developed which have been able to sort wastes from the University of Lagos into light weight and heavy materials. It was

observed that wastes consist of approximately 32% of light materials which were separated by the means of a fan blowing through a channel. The machine needs modifications of the magnetic end to efficiently separate ferrous metals from other metals. The machine can be manufactured at a well equipped mechanical workshop, using locally sourced materials and at a good price.

B. Design of Garbage Sorting Machine Stephen Kwasi Adzimah and Simons Anthony.

This study considered the design of an efficient and cost-effective machine, which is capable of sorting out garbage into the various components which can be recycled or used in generating energy.

C. Automatic Waste Segregator and Monitoring System Aleena V.J., Kavya Balakrishnan, Rosmi T.B., Swathy Krishna K.J., Sreejith S, T.D. Subha*

The waste segregator as the name suggests, segregates the waste into three major classes: plastic, organic, metallic.The proposed system would be able to monitor the solid waste collection process and management of the overall collection process.The inlet section is provided with open and close mechanism to regulate the flow of waste on to the conveyor.Inductive proximity sensor is used to detect the metallic waste.A blower mechanism is used to segregate dry and wet waste.The timing and movement of the conveyor belt is controlled by Arduino Uno. Continuous and unnecessary operation of any particular section is thus avoided.

D. Development of Automatic Smart Waste Sorter Machine Mahmudul Hasan Russel1, Mehdi Hasan Chowdhury1, Md. Shekh Naim Uddin1 ,Ashif Newaz1 ,Md. Mehdi Masud Talukder2*

In communities where appropriate sites are available, sanitary landfills usually provide the most economical option for disposal of solid waste. However, it is becoming increasingly difficult to find sites that offer adequate capacity, accessibility and environmental conditions. The amount of waste, which is been recycled or reused, stands for the reduction of waste to be managed by the authority. Proper management of waste plays a vital role to control global warming [1]. Automatic Sorter Machine for Smart Waste Management System is an excellent example of proper waste management. It will also ensure effective recycling system. Hence, the improvement of waste sorter will ensure economic and ecological development.

E. Fabrication & Testing Of Dry Waste Sorting Machine

Pradip Baishya1, Shanjenbam Brojendro Singh 2, D.K. Mahanta3

Studies revealed that there are many shortcomings in the existing practices followed for the management of municipal solid waste. There is inadequate segregation system and awareness among the people as well. To overcome the deficiencies in the existing systems, stress on segregation using machinery and design of such segregation devices is required. The waste sorting machine is able to sort wastes into light weight and heavy materials with an average overall efficiency of 55.60%. This would increase the recycling rate and also decrease the amount of waste disposed into the landfills. Such type of waste sorting machine which are simple in design could be an answer to the struggling municipalities all over the country.

F. Automated Waste Segregator

Amrutha Chandramohan, Joyal Mendonca, Nikhil Ravi Shankar, Nikhil U Baheti, Nitin Kumar Krishnan* Suma M S

Automated Waste Segregator has been successfully implemented for the segregation of waste into metallic, dry and wet waste at a domestic level. However, it cannot segregate ceramic into dry waste because of its higher relative dielectric constant when

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compared to other dry wastes. Noise can be eliminated in the sensing module to increase accuracy and overall efficiency. The system can segregate only one type of waste at a time with an assigned priority for metal, wet and dry waste. Thus, improvements can be made to segregate mixed type of waste by the use of buffer spaces. Since, the time for sensing metal objects is low the entire sensing module can be placed along a single platform where the object is stable to ensure better result.

G. Arduino Based Automated Waste Segregator by Arunkumar Balakrishnan Iyer

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. Using a conveyor belt makes the system far more accurate, cost-effective and also easier to install and use at a domestic level. Segregating all these wastes at a domestic level will also be time-saving. While implementing our system we came across many problems like the sensing range of inductive proximity sensor, the accuracy of the moisture sensor, adjusting the range of IR sensors and some more, but using some modifications we tried the make the system as reliable as possible but not completely perfect.

H. Smart Dustbin for Economic Growth by u. Nagaraju, ritu Mishra, Chaitanya Kumar, Rajkumar

This project work is the implementation of Automatic Garbage Fill Alerting system using Ultrasonic sensor, Arduino Uno, Buzzer and Wi-Fi module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. It will take power supply with the help of Piezoelectric Device .If the dustbin is not cleaned in specific time,then the record is sent to the Sweeper or higher authority who can take appropriate action against the concerned contractor. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimately helps to keep cleanliness in the society. Therefore, the Automatic Garbage Fill Alerting system makes the garbage collection more efficient.

I. An Application of Image Processing for Automated Mixed Household Waste Sorting System Zol Bahri Razali

It was hoped to gain an excellent understanding of neural networks. Developing a neural network framework from scratch turned out to be an interesting experience that helped in acquiring the understanding of neural networks that was paramount for this project. With the help of the gained knowledge, it was possible to find appropriate network configurations and training data to conduct the various experiments. Bigger networks, especially networks with two hidden layers, might have produced a different behavior, because of the added complexity. However, bigger networks were not used in the experiments because of the heavily increased runtime of the training process due to their complexity. The work done in this project has shown that neural networks are very well capable of acting as a visual system. The model was very simple. The input images were reduced to black and white. The set aims were all reached, although more work is still to be done. A great understanding in neural networks was achieved, not least because of the strategies that neural networks employ was also gained. In this project the authors only managed to sort out paper and plastic because if time constraint.

J. Smart Garbage Monitoring System Using Sensors With RFID Over Internet Of Things

Somu Dhana Satyamanikanta1 , M.Narayanan2

This paper concludes that by using this smart garbage monitoring system using RFID over IOT's we can easily dispose the waste present in the garbage bins as early as possible when compared to the previous methods without it affecting to the people and keep the surroundings clean.

IV. MATERIAL

A. Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil.[1] Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

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Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.
But in this case the moister is used to dictate moisture in the waste and separate the waste as biodegradable And Non-biodegradable Waste.

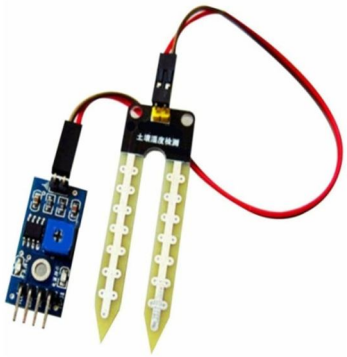

Fig:4.1moisture sensor

B. Metal Detector

A metal detector is an electronic instrument which detects the presence of metal nearby. Metal detectors are useful for finding metal inclusions hidden within objects, or metal objects buried underground. They often consist of a handheld unit with a sensor probe which can be swept over the ground or other objects. If the sensor comes near a piece of metal this is indicated by a changing tone in earphones, or a needle moving on an indicator. Usually the device gives some indication of distance; the closer the metal is, the higher the tone in the earphone or the higher the needle goes. Another common type are stationary "walk through" metal detectors used for security screening at access points in prisons, courthouses, and airports to detect concealed metal weapons on a person's body.
The simplest form of a metal detector consists of an oscillator producing an alternating current that passes through a coil producing an alternating magnetic field. If a piece of electrically conductive metal is close to the coil, eddy currents will be induced in the metal, and this produces a magnetic field of its own. If another coil is used to measure the magnetic field (acting as a magnetometer), the change in the magnetic field due to the metallic object can be detected.
The first industrial metal detectors were developed in the 1960s and were used extensively for mineral prospecting and other industrial applications. Uses include detecting land mines, the detection of weapons such as knives and guns (especially in airport security), geophysical prospecting, archaeology and treasure hunting. Metal detectors are also used to detect foreign bodies in food, and in the construction industry to detect steel reinforcing bars in concrete and pipes and wires buried in walls and floors.
Here the metal detector Dictate metal and separate it from Biodegradable and Non-biodegradable Waste.

Fig:4.2 metal detector

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C. Dual Shaft Motor

Dual shaft motor is the small 9 volt motor with the small mechanism Where when the current flow to the motor start Rotating and both the shaft of the mechanism Start Rotating with the Motor. The Dual shaft Motor is used to make a obstacle to the waste which is dictated By the sensors and make them to fall down from the belt to the dustbin of the Biodegradable Or Non-biodegradable Or Metal.

Fig:4.3 dual shaft motor

D. Jumper Wire

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires.

Though jumper wires come in a variety of colors, the colors don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colors can be used to your advantage in order to differentiate between types of connections, such as ground or power. Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need.

Fig:4.4 Jumper wire

E. Volt Regulator

A voltage regulator is a system designed to automatically maintain a constant voltage level. A voltage regulator may use a simple feed-forward design or may include negative feedback. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.

Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

Fig:4.5 volt regulators

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F. Conveyor Belt

A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys (sometimes referred to as drums), with an endless loop of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. There are two main industrial classes of belt conveyors; Those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport large volumes of resources and agricultural materials, such as grain, salt, coal, ore, sand, overburden and more.

Today there are different types of conveyor belts that have been created for conveying different kinds of material available in PVC and rubber materials. Material flowing over the belt may be weighed in transit using a beltweigher. Belts with regularly spaced partitions, known as elevator belts, are used for transporting loose materials up steep inclines. Belt Conveyors are used in self-unloading bulk freighters and in live bottom trucks. Belt conveyor technology is also used in conveyor transport such as moving sidewalks or escalators, as well as on many manufacturing assembly lines. Stores often have conveyor belts at the check-out counter to move shopping items. Ski areas also use conveyor belts to transport skiers up the hill. Industrial and manufacturing applications for belt conveyors include package handling, trough belt conveyors, trash handling, bag handling, coding conveyors, and more.[12]

Fig:4.6 Conveyor Belt

G. DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

Fig:4.7 DC motors

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V. METHODOLOGY

VI. DESIGN OF PROJECT SET UP

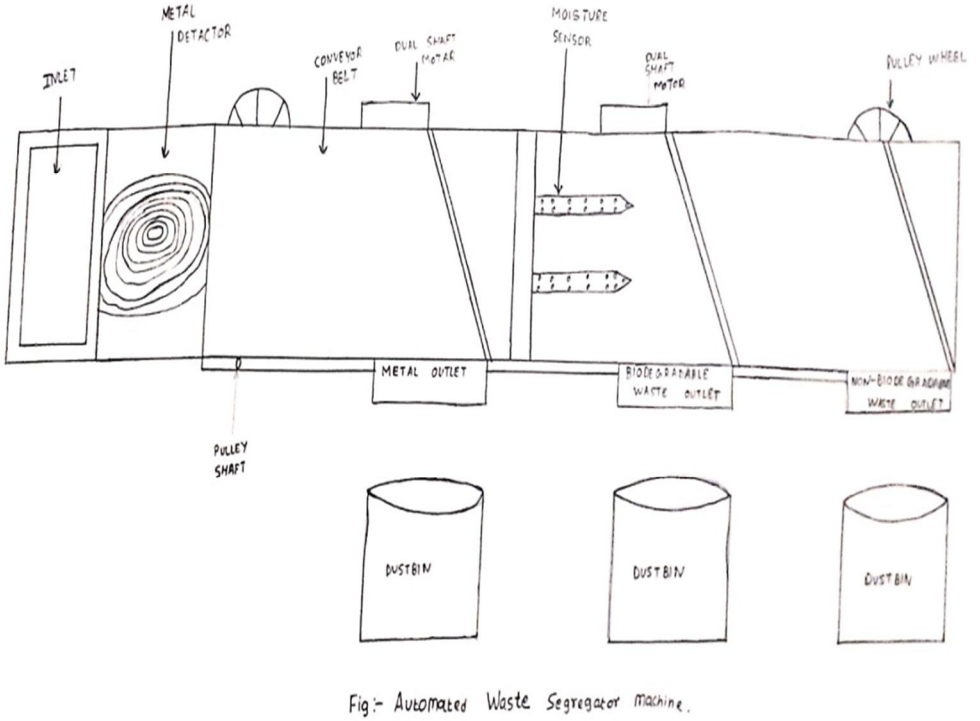

Fig. 6.1 Automatic Waste Segregator Machine

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VII. RESULT

A. Outcomes From the Model

The model or project machine (automatic waste segregator machine) can detect and automatically separate the bio degradable waste (wet waste) , non bio-degradable waste (dry waste) and metal waste.

1) We used or machine in the general store to separate the waste. We used our machine instead of keeping the single dustbin. It was very effective and help full for them to separate the waste as per the waste norms. Mainly their waste contended plastic waste, paper, a little metallic waste was produced. It helped them to recycle and reuse the that metallic waste separated.

2) We also experimented our machine at the commercial building (mall) we suggested them to use our machine instead of keeping a dustbin. The building produced around 10 kg of waste per daily. It included around 60% of dry waste, 25% of metallic waste and 15% wet waste. All this waste is collected in the single dustbin. Our machine would separate all the waste. And the segregated waste can be easily deposed on site. This thing will reduce the production of the waste from the commercial buildings. The wet waste can be used for making the fertilizer and use it for the garden in the commercial building. The metallic waste and paper can be reused or recycled.

3) We also suggested our municipal corporation for the installment of our automatic waste segregator machine in every mall so that the waste production through the commercial buildings will get reduced. As our municipal corporation ask us to collect the dry waste and wet waste separately. But our citizens don't do it. So from this machine it can be done easily.

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VIII. CONCLUSION

A. The automatic waste segregator machine can separate the metallic waste, wet waste, and dry waste.
For example: Metallic waste: batteries, pins, metal sheet waste etc.

1) *Wet Waste:* eaten apple, banana peel etc.

2) *Dry Waste:* paper, rubber, cardboard etc.

B. The machine can be installed in the commercial building instead of dustbin and it would separate the waste properly. And that can be deposed easily.

C. This machine can further also be used in the residential buildings to separate the waste as per the conditions of the municipal corporation.

IX. ACKNOWLEDGEMENT

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[7] Arduino Based Automated Waste Segregator by Arunkumar Balakrishnan Iyer
[8] Smart dustbin for economic growth By u. Nagaraju, ritu mishra, chaitanya kumar, rajkumar
[9] An Application of Image Processing for Automated Mixed Household Waste Sorting System Zol Bahri Razali *Gunasegaran s/o Madasamy
[10] Smart garbage monitoring system using sensors with rfid Over internet of things Somu Dhana Satyamanikanta1 , M.Narayanan2

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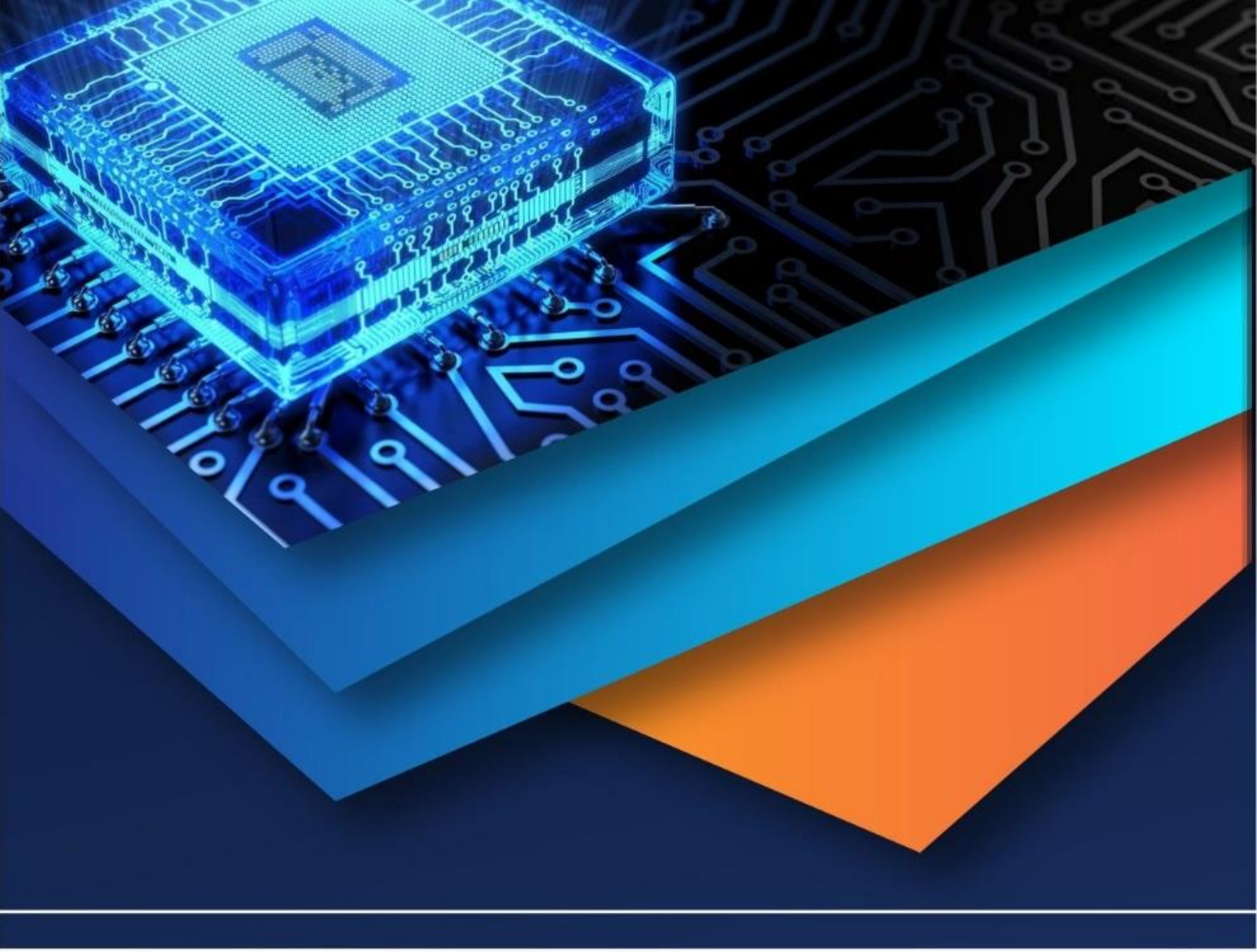

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