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PI AND IOT BASED SMART GARBAGE SEGREGATION AND LEVEL INDICATOR SYSTEM

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ABSTRACT

As human technology has advanced, trash generation has also increased significantly. The only way to handle this enormous volume of rubbish is by recycling. However, recycling calls for the separation of waste. rubbish cannot be recycled without division since various types of rubbish need different recycling techniques.

Furthermore Users should be informed and given advice on how to dispose of waste every time they approach the trashcan. To achieve this, we created a voice-activated trash disposal system that talks to the user every time they approach a dustbin. The system employs many dustbins.

The device uses a camera to determine whether or not someone is in front of the trash can. When a person is identified, the system speaks to the user and gives them information on where to dispose of their waste. It tells the user to locate another trash can to dispose of their trash in if the current one is full.

In order to construct this system, a Raspberry Pi controller is used. For detection and communication, the controller is interfaced with a speech speaker and a camera. Ultrasonic level sensors with LED indicators interfaced to each one are used by the controller to collect dustbin level input. Bin levels are continuously sent into the Raspberry Pi by means of the level sensors.

Additionally, a WiFi module is interfaced with the Raspberry Pi in order to send the level data online. It is simple to install the Level sensor panels over any trash can. This makes it possible to quickly install the system by just screwing it over any trashcan.

The information is sent via IOT to the IOT Gecko platform, which uses the internet to show the bin level data. The authorities might be notified by this indicator that the trash cans need to be emptied. Consequently, the system uses IOT to automate waste segregation and level monitoring in an effort to combat the garbage epidemic.

I.INTRODUCTION

1.1 INTRODUCTION

Two cutting-edge technologies that have evolved to solve the rising waste management difficulties encountered by many metropolitan areas are smart trash segregation and dustbin level indicators. The quantity of garbage generated rises along with the population and industrialisation of cities, placing pressure on the current waste management systems. It has been shown that the conventional practice of throwing all waste kinds in one trash can is environmentally damaging and not sustainable.

A system known as "smart garbage segregation" makes it possible to automatically separate waste into several categories, such as dry and moist. This technology reduces the need for human labour and improves process accuracy and efficiency by using sensors and cameras to detect and sort the garbage.

On the other hand, dustbin level indicator technology offers a real-time trash level in a dustbin monitoring system. This lessens the possibility of overflowing trash cans and littering in public areas by assisting waste management authorities in better planning and overseeing the collection process.

These two technologies when combined may greatly enhance waste management systems, lessen pollution to the environment, and encourage sustainable living.

1.2 BLOCK DIAGRAM

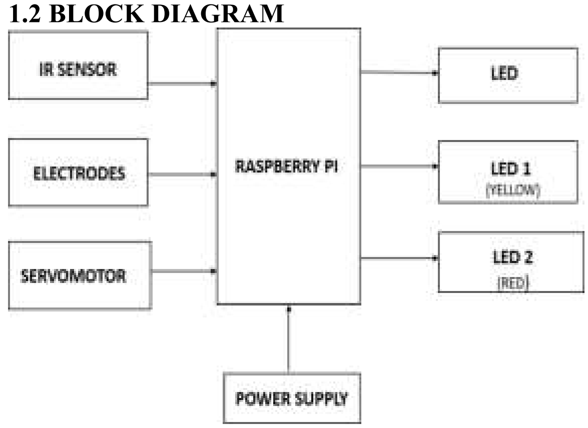

FIG 1.1 BLOCK DIAGRAM

1.3 DETAILS OF BLOCK DIAGRAM

1.3.1 RAPBERRY PI

The Raspberry Pi Foundation is a British company that created the Raspberry Pi line of tiny single-board

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computers. Due to their many uses, portability, and low cost, these little and inexpensive gadgets have become very popular in the computer and technology industries. Because Raspberry Pi boards include CPUs, memory, and other necessary parts, they can run a variety of operating systems and applications.

Applications for the Raspberry Pi are many and include digital signs, media centres, robotics, and home automation. It is the perfect platform for embedded systems and Internet of Things (IoT) applications because to its small size and low power consumption. Moreover, the open-source community around Raspberry Pi offers an abundance of materials, projects, and lessons for users of all experience levels, making it an excellent tool for learning and experimenting. There are many opportunities for creativity and invention with Raspberry Pi, whether you're a professional, student, or enthusiast.

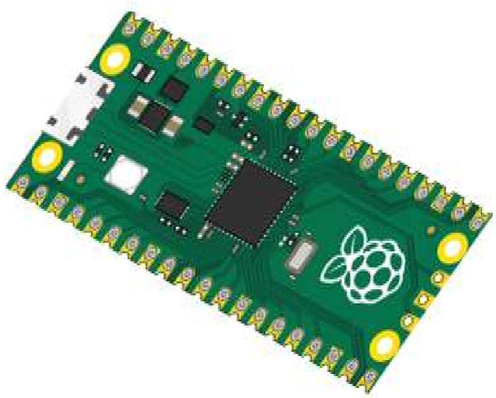


Fig 1.2 RASPBERRY PI

1.3.2 IR SENSOR

An IR sensor is a type of electronic sensor that identifies and quantifies infrared radiation. A kind of electromagnetic radiation known as infrared radiation has a wavelength that is longer than visible light but shorter than radio waves. Temperature sensing, security systems, and remote control systems are just a few of the many uses for infrared sensors. They function by seeing infrared light and translating it into an electrical signal that a microcontroller or other control system can read and understand. Photodiodes, thermopiles, and piezoelectric sensors are a few popular kinds of infrared sensors.

Fig 1.3 IR SENSOR

1.3.3 ELECTRODES

Wet sensing electrodes are made to recognise changes in a liquid or solution's electrical characteristics. Applications including conductivity sensing, dissolved oxygen detection, and pH sensing often employ these electrodes. The materials used to make the electrodes are usually glass, ceramic, or polymers covered in a conductive layer, such carbon or metal.

An electrical signal proportional to the ion concentration or characteristics is produced when the electrode is submerged in a liquid or solution due to interactions between the conductive layer and the ions in the liquid. For instance, the conductive layer of a pH detecting electrode interacts with the hydrogen ions in the solution to produce an electrical signal that is proportionate to the solution's acidity. Wet sensing electrodes are extensively used to measure and monitor the characteristics of liquids and solutions in a variety of sectors, including healthcare, environmental monitoring, and the manufacturing of food and beverages.

Fig 1.4 ELECTRODES

1.3.4 SERVOMOTOR

One kind of rotary actuator that is utilised for accurate control of acceleration, velocity, and angular position is a servomotor. It is made up of a control circuit, a position detecting device, and a motor. The control circuit moves the motor in the proper direction to move the shaft to the target position after comparing the shaft's actual position with the goal position. Servomotors find widespread use in several fields such as precise instrumentation, robotics, and aerospace. They are very dependable and effective, and they're simple to program to do a variety of motion control jobs.

Fig 1.5 SERVOMOTOR

1.3.5 LED

When an electric current flows through a tiny, solid-state LED (Light Emitting Diode), the LED produces light. LEDs are extensively employed in many fields, such as lighting, electronics, and display technologies. They come in a variety of colours and sizes and are very effective, resilient, and long-lasting.

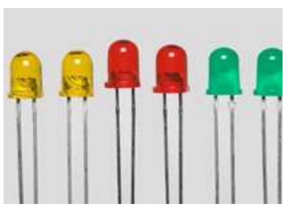
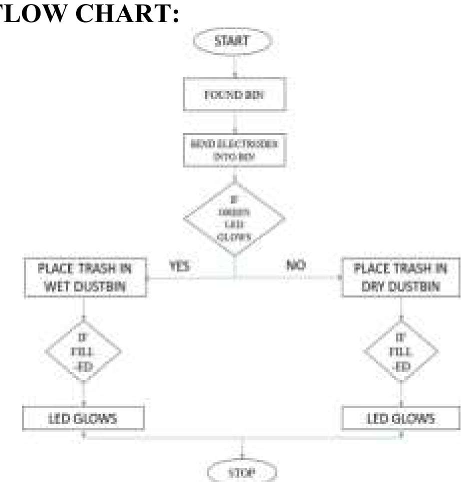


Fig 1.6 LED

II. FLOW CHART:



III.RESULT

3.1 CIRCUIT DIAGRAM OF PROJECT:

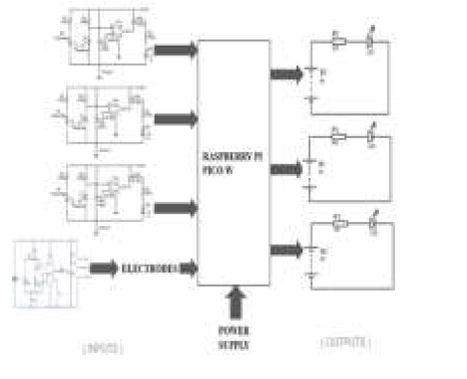


Fig: 3.1 CIRCUIT DIAGRAM

3.2 RESULT:

Fig 3.2: WITHOUT POWER SUPPLY

Fig 3.3: WITH POWER SUPPLY

Fig 3.4 OUTPUT WHEN TWO BINS ARE EMPTY

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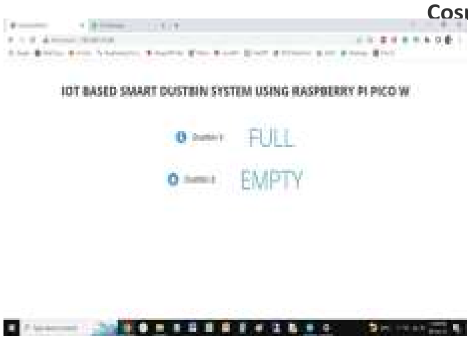

Fig 3.5 OUTPUT WHEN DUSTBIN 1 IS FULL

Fig 3.6 OUTPUT WHEN DUSTBIN 2 IS FULL

3.3 ADVANTAGES

Effective Waste Management: The initiative gives waste management staff the ability to plan their routes more efficiently by using real-time information on the amount of rubbish in each container. This guarantees that garbage is collected only when needed and does away with the need for regular, set-time collection programs. Because of the decrease in labour hours, fuel consumption, and vehicle wear and tear, this results in considerable cost savings.

Better Distribution of Resources: Through precise monitoring of trash bin fill levels, the technology enables waste management agencies to more efficiently use their resources. They are able to determine which locations generate more garbage and adjust the priority of collecting activities appropriately. This improves operational efficiency by making the best use of personnel, vehicles, and other resources.

Preventing Overflow and Environmental Hazards: By giving real-time information on the fill levels of trash cans, the level indicator system makes it possible to take swift action to stop overflow problems. This lessens environmental risks, stops disease transmission, and reduces trash. The initiative helps to preserve cleaner, healthier environments by making sure that dumpsters are removed on schedule.

Recycling and Smart Segregation: Recycling and smart segregation systems work together to automatically separate trash into several categories, such as recyclables and non-recyclables. This makes the process of sorting garbage into different categories easier and guarantees that recyclables are correctly recognised and sent to the right recycling facilities. It encourages recycling, reduces garbage going to landfills, and supports environmentally friendly waste management techniques.

Real-time Monitoring and Alerts: When a bin fills up to capacity, the project may notify trash collection staff and give real-time garbage level monitoring. By being proactive, you may reduce the likelihood of unpleasant odours and environmental damage by making sure that dumpsters are emptied before they overflow. Additionally, it saves time and money by lowering the need for manual inspections.

Data-driven Decision Making: The initiative produces useful data on fill levels, trash production trends, and other factors. Waste management authorities may optimise their operations by making well-informed choices based on the analysis of this data. They may boost productivity and save costs by seeing patterns, modifying collection plans, and allocating resources in accordance with real demands.

Sustainability and Environmental Impact: By encouraging effective waste management techniques, the initiative supports sustainability objectives. It helps to minimise environmental effect by minimising needless garbage collection trips, allocating resources optimally, and promoting recycling. By lowering trash production, preserving resources, and encouraging appropriate waste disposal practices, it contributes to a greener future.

3.4 DISADVANTAGES

Initial Setup and equipment Costs: A significant upfront investment in IoT sensors, networking equipment, and software development is necessary for the project's implementation. Installing and keeping up a large-scale sensor network may be expensive, particularly for organisations or municipalities with tight resources.

Connectivity and Network Reliability: Stable and dependable network connectivity is critical to the project's success. On the other hand, problems like signal interference, network failures, or spotty coverage may impede data transfer and reduce the efficacy of the system. For the project to run well, a strong and dependable network infrastructure must be provided.

Data security and privacy issues: The project entails gathering and storing data on fill levels, trash production trends, and maybe other sensitive data. Ensuring user privacy and safeguarding this data from unwanted access are essential factors to take into account. To reduce possible dangers, it is essential to implement strong security measures and adhere to data protection laws.

Updating the system and doing routine maintenance are necessary for the project to run at its best. This include keeping an eye on malfunctioning sensors, swapping them out, updating software, and quickly resolving technical problems. The time and expertise required for maintenance procedures may raise the total cost of operations.

Adoption and User acceptability: It might be difficult to promote community involvement and system acceptability. Some people may not completely comprehend the advantages of the Internet of Things-based waste management system, or they could be averse to change. To educate and engage the community and promote collaboration and active participation, effective communication and education programs are essential.

IoT Devices' Effect on the Environment: IoT devices have an environmental impact due to their manufacturing, energy use, and ultimate disposal. This includes sensors and communication infrastructure. These devices' effects on the environment should be carefully considered, and efforts should be taken to reduce their ecological imprint throughout the course of their lifetime.

Technical Restrictions and Interoperability: The interoperability and compatibility of various IoT devices, software platforms, and waste management systems are critical to the project's success. To guarantee a smooth integration of different components, it could be necessary to overcome technological obstacles, standardise protocols, and resolve compatibility problems.

3.5 APPLICATIONS

There are several uses for the Internet of Things-based smart trash segregation and level indication system project that have the potential to greatly enhance waste management procedures. Among the important applications are:

1. Effective Waste Collection: The initiative gives waste collection workers the ability to plan their routes more efficiently by using real-time information about the amount of rubbish in each bin. By doing this, garbage is only collected when it is absolutely essential, cutting down on pointless trips and increasing collection efficiency.

2. Preventing Overflow and Environmental Hazards: Real-time information on trash bin fill levels is provided via the level indicator system. This aids in preventing overflow scenarios, which may result in disease transmission, trash, and degradation of the environment. Through quick resolution of these problems, the initiative helps to preserve environments that are healthier and cleaner.

3. Smart Segregation and Recycling: By combining smart segregation methods, trash may be automatically divided into categories like recyclables and non-recyclables. By guaranteeing that recyclable garbage is correctly recognised and routed to the right recycling facilities, this promotes effective recycling operations.

4. Resource Optimisation: trash management authorities may examine patterns and trends in trash creation by using data gathered from the level indicator system. By using this data, waste management methods may be improved, resources can be distributed more wisely, and focused waste reduction activities can be put into action.

5. Smart City Integration: By incorporating the project into larger smart city programs, waste management systems and other urban infrastructure may work together seamlessly. For instance, to optimise routes and lessen traffic congestion, garbage pickup schedules might be synchronised with smart transportation systems.

6. Environmental Monitoring: Vital information on environmental parameters, such temperature and air quality, may be obtained via the Internet of Things sensors included into the project. This information may be used to track and evaluate how trash affects the environment, pinpoint possible improvement areas, and put into practice environmentally friendly waste management techniques.

7. Community Awareness and Engagement: Using online portals or mobile apps, the project may communicate with communities by offering resources and ways for them to provide input. In addition to encouraging public engagement and raising

knowledge of proper trash disposal techniques, this also cultivates a feeling of environmental responsibility.

IV.CONCULSION AND FUTURE SCOPE

4.1 CONCLUSION

In conclusion, there is a great deal of potential for the IoT-based smart trash segregation and level indication system project to completely transform waste management procedures. This project intends to overcome the difficulties of effective waste segregation, monitoring, and collection by using the potential of IoT technology.

The project ensures timely trash collection and prevents overflow problems by using smart bins that are fitted with sensors and linked to a central network. This allows for real-time monitoring of garbage levels. By automating the categorisation process, the use of smart segregation strategies further improves waste management efficiency.

The concept has a wide range of potential applications in the future, including sophisticated segregation methods, smart city infrastructure integration, and data analytics for waste management optimisation. Proactive garbage collection is made possible by the possibility of real-time monitoring and notifications, which lowers environmental risks and enhances general cleanliness.

Furthermore, encouraging sustainable practices and appropriate trash disposal among locals may help cultivate a feeling of accountability and sustainability among the populace. The system's capacity to integrate with broader waste management ecosystems is ensured by its scalability and interoperability, which promotes stakeholder engagement and data interchange.

4.2 FUTURE SCOPE

1. Advanced Segregation Techniques: The project may investigate and put into practice more sophisticated methods of sorting trash into separate categories, such as using computer vision or machine learning algorithms to automatically recognise and classify waste. This might improve the process of segregation's accuracy and efficiency even further.

2. Integration with Smart City Infrastructure: As smart city projects gain traction, combining the smart trash segregation system with other municipal infrastructure may provide all-encompassing waste management solutions. In order to optimise trash disposal and recycling procedures, this may include connecting the system with smart grids, transportation networks, or garbage collection services.

3. Data Analytics and Optimisation: Data analytics and optimisation may be carried out using the level indicator system's acquired data. Authorities may optimise garbage collection routes, schedule collections based on real requirements, and save operating expenses by analysing trends and patterns in waste creation and disposal.

4. Real-time Monitoring and notifications: Proactive waste management may be made possible by improving the system to provide real-time monitoring and notifications. For instance, the system may notify garbage collection workers automatically when a bin fills to capacity, increasing collection effectiveness and minimising overflow scenarios.

5. Community Engagement and Education: Adding community engagement and education activities to the project may increase public knowledge of trash management and motivate locals to become involved. To encourage safe garbage disposal practices, this may include including teaching modules, gamification components, or community feedback methods.

6. Scalability and Interoperability: Facilitating the project's integration into bigger waste management ecosystems may be achieved by ensuring its scalability and compatibility with other IoT systems and platforms. This will facilitate smooth data sharing and cooperation amongst various waste management players, such as trash management firms, recycling centres, and municipalities.

4.3 REFERENCES AND TEXTBOOKS

1. "Introduction to Microcontrollers: Architecture, Programming, and Interfacing for the Freescale 68HC12" by G. Jack Lipovski.

2. "Sensors and Actuators: Engineering System Instrumentation" by Clarence W. de Silva.

3. "Waste Management Practices: Municipal, Hazardous, and Industrial" by John Pichtel.

4. J. Saini, N. S. Verma, and A. Jain, "Design and Implementation of IoT Based Smart Garbage Monitoring System," 2018 3rd International Conference on Internet of Things: Smart Innovation and Usages (IoT-SIU), Bhimtal, India, 2018, pp. 1-4.

5. M. Arumugam, R. Ramya, S. Sasikumar, and R. M. Arumuganathan, "Smart Waste Management System using IoT," 2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT), Coimbatore, India, 2018, pp. 775-779.

6. S. S. Ghuge, P. P. Mallikarjun, and P. M. Jagadeesh, "Smart Garbage Monitoring System using IoT," 2018 International Conference on Inventive Research in Computing Applications (ICIRCA), Coimbatore, India, 2018, pp. 1179-1183.

7. N. H. Batu, A. R. Sucharita, and A. Prasetyo, "Smart Garbage Monitoring System using IoT Technology Based on Android Application," 2019 International Conference on Electrical Engineering and Computer Science (ICECOS), Malang, Indonesia, 2019, pp. 1-4.