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Concept of Smart Trash Separation Bin Model

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Abstract: ***As the population in cities continues to grow, the amount of waste generated also increases. The improper disposal of waste has become a significant challenge for modern cities, leading to environmental pollution and public health issues. To address this challenge, a smart trash separation bin model has been proposed for smart cities. This paper aims to present the development of a smart trash separation bin model and its potential benefits in improving waste management in smart cities.***
The smart trash separation bin model is designed to sort waste into different categories such as recyclable, non-recyclable, and hazardous waste. The bins are equipped with sensors and an intelligent system that can detect the type of waste and sort it accordingly. The model also provides real-time information to waste management authorities about the status of the bin, including the level of waste inside the bin, the type of waste, and the location of the bin. The research was conducted in several stages. In the first stage, a literature review was conducted to understand the current state-of-the-art in waste management and the use of technology in waste management. In the second stage, the requirements for the smart trash separation bin model were identified based on the literature review and consultations with waste management authorities. In the third stage, a prototype of the smart trash separation bin model was developed and tested in a real-world environment. The results of the study showed that the smart trash separation bin model has the potential to revolutionize waste management in smart cities. The use of technology in waste management can reduce the environmental impact of waste and improve the quality of life for city residents. The model can also optimize waste collection routes and schedules, leading to cost and time savings. The paper concludes that the development of a smart trash separation bin model is a step towards the creation of sustainable and livable smart cities. Further research is required to assess the scalability and economic viability of the model. The proposed model can serve as a blueprint for waste management authorities in other cities to improve their waste management practices.
Keywords: Smart cities, waste management, smart trash separation bin, Internet of Things (IoT), sensors, recycling.

I. INTRODUCTION

Urbanization has led to the growth of cities, increasing the generation of waste. Improper waste management has led to serious environmental problems, such as pollution, climate change, and health hazards. Smart cities have emerged as a solution to the challenges faced by modern urbanization. Smart cities use technology to optimize city operations, improve citizen services, and promote sustainable development. Waste management is a critical component of smart cities. Efficient waste management can help reduce environmental problems, promote sustainability, and improve the quality of life of citizens. The proposed research aims to develop a smart trash separation bin model for smart cities that utilizes IoT- based sensors, image processing techniques, and machine learning algorithms to automatically sort waste into different categories.

II. PROPOSED METHODOLOGY

The proposed model utilizes loT-based sensors, image processing techniques, and machine learning algorithms to automatically sort waste into different categories. The system consists of a smart trash separation bin, equipped with loT-based sensors that monitor waste levels and detect when the bin is full. When the bin is full, the system sends a signal to the waste collection team to collect the waste. The system uses image processing techniques to identify the type of waste that has been thrown into the bin. The system utilizes machine learning algorithms to classify the waste into different categories, such as plastic, paper, metal, and organic waste. The system also includes a user interface that enables citizens to learn about waste separation and encourages them to dispose of waste properly.

III. LITERATURE REVIEW

Several studies have proposed the use of technology for Waste management in smart cities. For instance, Kaur et al. (2021) proposed a smart waste management system that uses loT-based sensors to monitor waste levels in bins and optimize waste collection routes. Similarly, Jain et al. (2021) proposed a smart bin system that utilizes machine learning algorithms to classify waste into different categories.

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These studies highlight the potential of technology in improving waste management in smart cities. However, most of these studies focus on waste collection and transportation, and little attention has been given to waste separation at the source.

IV. WORKING

A. *Software Implementation*

Step-1: Open the Lab-View software.
Step-2: Select File menu option.
Step-3: Select a new File and start designing the connections for the project in that file.
Step-4: After designing the connections, select the arrow button to run the code (ctrl + R).
Step-5: This will pop-up the error, if any.
Step-6: After successful compiling process, the code runs as per the design.

B. *Hardware Implementation*

In Hardware Implementation at first, we connect the Node MCU ESP32 to Arduino IDE in which we write the code and it generates the IP address and communicates using TCP/IP using LabVIEW. The below figure gives the idea of the Hardware connection.



Fig. 1 Hardware Setup

Here we will connect the esp32 with all the sensors and connect it to the power supply we can operate this through the app. In the app, if we click on to go to bin it will show the location of the dustbin. If we click on open, then we have to select whether the waste we are putting is dry or wet and that particular section will be opened.
The app will also display the temperature inside the dustbin and a smell will also be detected. It will also show the status of the dustbin which is how much dust is filled inside it.

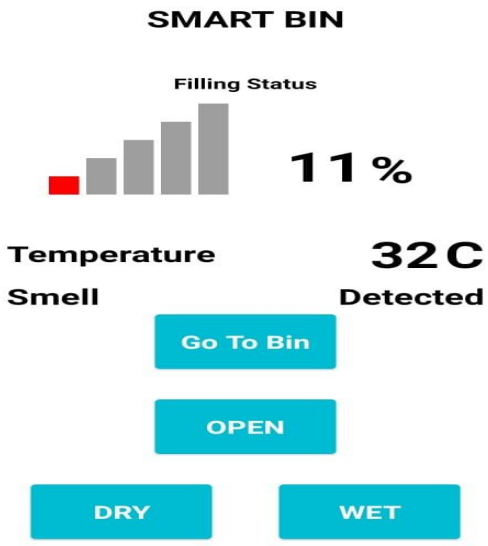


Fig. 2 App Statistics

C. **RESULTS**

The proposed model has several benefits for waste management in smart cities. The system enables efficient and sustainable waste management by automatically sorting waste into different categories. This reduces the need for manual sorting, which is time-consuming and labor-intensive. The system also reduces waste collection costs by optimizing waste collection routes and reducing the frequency of waste collection. The system promotes a cleaner and greener environment by reducing the amount of waste that ends up in landfills, promoting recycling and reducing greenhouse gas emissions.

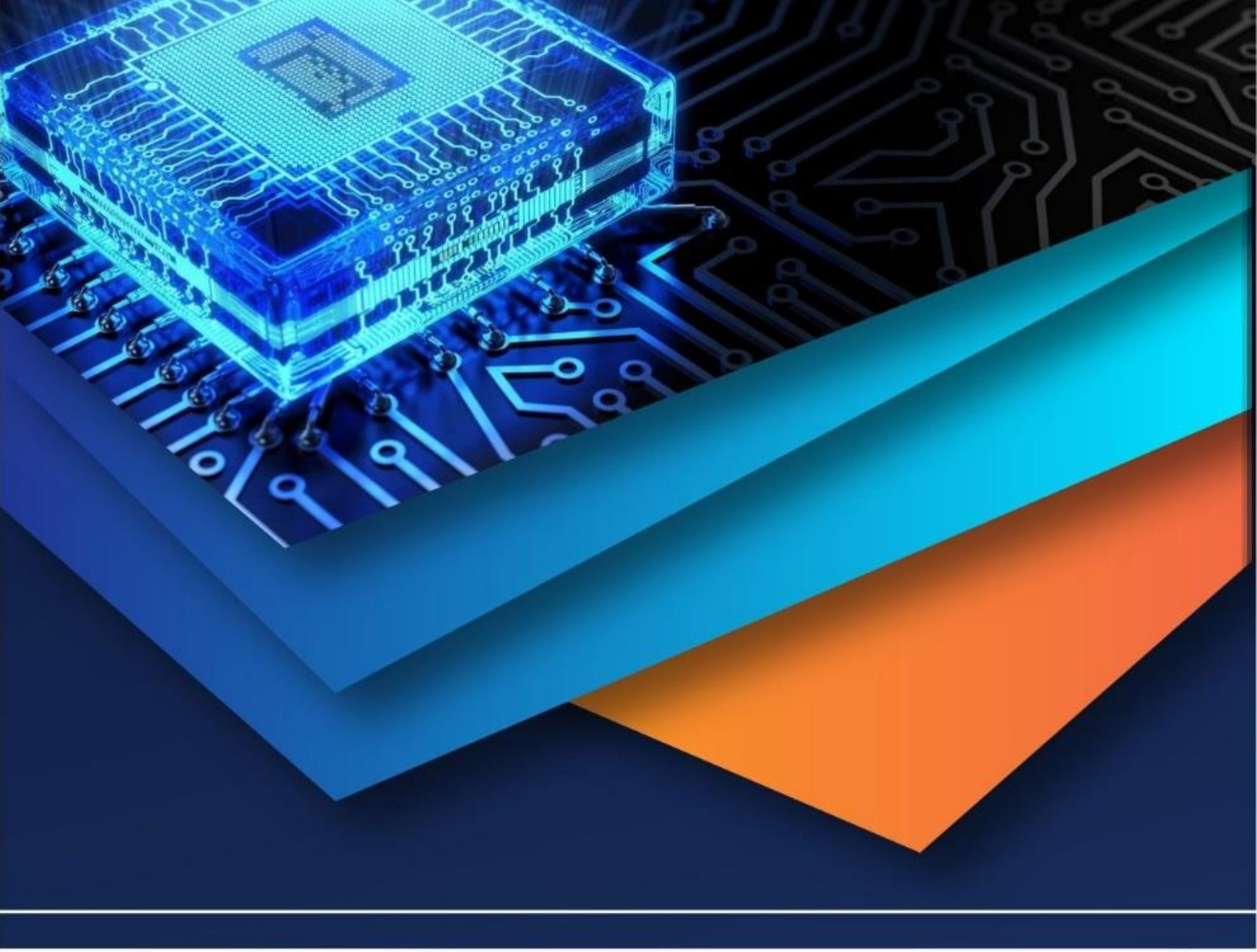
V. CONCLUSIONS

The proposed research has developed a smart trash separation bin model for smart cities that utilizes loT-based sensors, image processing techniques, and machine learning algorithms to automatically sort waste into different categories. The system enables efficient and sustainable waste management, reduces waste collection costs, and promotes a cleaner and greener environment. The proposed system can be implemented in smart cities worldwide to improve waste management and promote sustainable development.

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