

Development of a Smart Waste Management System with Automatic Bin Lid Control for Smart City Environment

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Abstract

As cities worldwide transform into smart interconnected urban environments, the management of municipal waste emerges as a pressing challenge. This paper, offers a sophisticated solution that integrates seamlessly within the concept of smart cities. This system harnesses the power of the Internet of Things (IoT) to optimize waste collection and enhance urban cleanliness. The primary aim of this research is to create a smart waste management system that extends beyond traditional waste bins. It introduces a network of intelligent waste containers equipped with automatic lid control mechanisms that operate based on real-time waste level data. When approaching these bins, the lid control mechanism automatically opens the bin only if the waste level is not full thereby, facilitating convenient waste disposal. In the context of smart cities, this innovative approach presents several advantages. It optimizes waste collection efficiency by prioritizing bins in need of immediate attention and ensures that waste containers are not prematurely emptied, reducing unnecessary waste disposal trips. Moreover, the system enables city authorities to gain insights into waste level trends, fostering data-driven and proactive waste management strategies for a cleaner, more sustainable urban environment.

Keywords: Smart City, Smart bin, Internet of Things, Waste Management System, Machine Learning

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1. Introduction

Smart cities are at the forefront of urban development, harnessing technology to create efficient, sustainable, and connected urban environments [1][2]. One of the key challenges faced by smart cities is the effective management of municipal waste. [3] The conventional waste collection systems are often characterized by inefficiencies, resource wastage, and the lack of real-time data, hindering the transition to truly smart and eco-friendly urban areas.

This research work responds to the challenge by offering a groundbreaking solution that aligns perfectly with the

smart city paradigm. It introduces an advanced waste management system that utilizes the power of the Internet of Things (IoT) to optimize waste collection, promote cleanliness, and contribute to a sustainable urban future. [4]

The core objective of this research is to develop a smart waste management system that extends beyond conventional waste bins. It envisions a network of intelligent waste containers equipped with automatic lid control mechanisms, designed to operate based on real-time waste level data. When individuals approach these bins for waste disposal, the system automatically opens the bin lid only if the waste level is not full, promoting efficient waste disposal practices.

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