Chapter 20
IoT-Driven Smart Bins: Enhancing Waste Segregation and Its Impact on Public Health

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ABSTRACT

This research paper is organized around automation concerning cleanliness, hygiene, and waste management systems. Trash dumping on the ground and in public areas is a common practice in all developing countries, which harms the environment and causes a number of unhygienic issues. The concept of a "smart netbin" combines hardware and software technologies to address these problems. It involves mounting a Wi-Fi system to a standard garbage can so that users can use the internet for free for a certain period of time. In order to provide efficient trash management in a community, the technology incentivizes users to keep their surroundings clean.

I. INTRODUCTION

Efficient waste management ensures both public health and environmental sustainability. The ineffective collection techniques, exposure to dangerous materials, and incorrect waste segregation are common problems with conventional waste management systems. This situation may increase the danger of infectious disease transmission, contaminate water and soil resources, and increase the population

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of rodents and insects that spread disease. One workable answer to these problems is the integration of Internet of Things (IoT) technologies with waste management systems. Trash segregation efficiency might be greatly increased by IoT-driven smart bins, which can accurately recognize and separate various waste types at the source. Sensors, automated procedures, and data analytics are some of these containers. As a result, there is a lower chance of injury and infection, and there is less interaction between people and hazardous garbage, which lessens the possibility of contaminating recyclable goods. Moreover, overflow and unhygienic conditions are decreased by real-time data collecting and monitoring, making waste pickup schedules more effective. By connecting these smart bins with cloud-based platforms and mobile apps, the waste management authority may get real-time alerts and messages that guarantee prompt collection and lower the possibility of garbage accumulation.

IoT sensor data analytics can also be used to forecast trash generation patterns, optimize collection routes, and manage resources more wisely. Cleaner and healthier urban settings are the outcome of this prediction skill's proactive, as opposed to reactive, approach to waste management problems. IoT-enabled smart bins improve trash management and segregation, lessening the load on healthcare professionals and enhancing community well-being by fostering healthier urban environments. Utilizing the most recent technologies in trash management not only encourages environmentally friendly activities but also improves the quality of life for locals by guaranteeing cleaner streets, lowering pollution levels, and limiting the harmful health effects of improper garbage management. The widespread use of smart bins with Internet of Things (IoT) capabilities holds considerable potential for the long-term achievement of environmental and public health objectives. This emphasizes how significantly technology advancements have affected sustainability and public health.

The amount of trash produced daily by homes and businesses is growing at an alarming rate. The rising use of different commodities such packaged goods, textiles, paper, food, plastics, metals, and glass is the main reason for this increase. As a result, managing this garbage has become essential to daily life. Most developed countries correctly dispose of this waste utilizing a range of effective methods. However, a number of variables, such as a lack of rigorous rules limiting the use of biodegradable materials, poor environmental policies, and a lack of regulations for sustainable development, might be linked to the deadly outcomes of waste management. These elements are especially common in some underdeveloped nations where people don't take proper care of their surroundings. One of the main causes of the increase in various respiratory ailments is trash. In addition to threatening human health, hazardous emissions including CO2, methane, and nitrous oxide can taint water supplies and damage the air. Plastics and other hazardous trash put people and aquatic life in danger when they are dumped in water. Trash that is piled high is another nuisance in the neighbourhood. Everyone enjoys traveling to brand-new, spotless cities. Tourists avoid unpleasant-smelling, litter-filled cities, which leads to missed chances and financial losses. India, home to 377 million urban dwellers who generate 62 million tons of rubbish a day as their affluence rises, ranks third globally in terms of waste generators.

Especially in rural areas, the incorporation of Artificial Intelligence (AI) into Internet of Things (IoT)-based smart waste management systems presents a revolutionary way to manage waste more effectively and sustainably.(Sinthiya et. al.,2022) These systems can solve many of the conventional problems with waste management, like inefficiencies in garbage collection, sorting, and treatment, by fusing AI's predictive and analytical powers with IoT's real-time data collection capabilities. IoT systems benefit from AI because it makes predictive analytics and optimal decision-making possible. AI systems, for instance, can predict when garbage bins will be full by analyzing data from IoT sensors in the bins. This makes waste collection scheduling more effective. By reducing the number of collection visits, this predictive capa-