ABSTRACT

The rapid growth of population and urbanization has increased the complexity of waste management in urban areas, including Bandung City. The low waste sorting rate is one of the main challenges in establishing an efficient waste management system. Consequently, the burden on final disposal sites continues to grow, while recycling efficiency remains low. This condition highlights the urgent need for innovative solutions to address waste management issues effectively.

This study designed an Internet of Things (IoT)-based system for real-time monitoring and management of waste. The system utilizes capacitance sensors to detect waste capacity and image recognition technology to automatically classify waste types. The collected data is integrated into a user-friendly interface, enabling more efficient waste monitoring and management. This system is designed to support environmental sustainability programs by improving the efficiency and effectiveness of waste management.

The test results show that the developed system is capable of classifying waste with an accuracy of 93.97% and an average processing time of 18.8s. In addition, the system can optimally distribute waste into the appropriate partitions. The integrated mobile application can also monitor the capacity of each type of waste in real-time and provide notifications when the capacity reaches a certain limit. However, in testing the system towards Firebase, it was found that the system had a delay of 1302,598 ms and a jitter of 18,24923 ms, which was also recorded and stored in Firebase for further performance analysis in the IoT system.

Keywords: IoT, Waste management, Waste classification, Real-time monitoring, Firebase.