

A Solar-powered IoT-based Control and Monitoring System for a Smart Bin

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Extended Abstract

Waste accumulation in large cities is becoming increasingly challenging due to issues related to waste collection, proper management, and disposal. Humans all around the world are impacted because of inefficient waste management and a lack of separation of disposable waste. Furthermore, mixing disposable and non-disposable waste significantly reduces recycling rates. The objective of this paper is to introduce a smart waste management approach that can lead to effectively disposing and recycling waste in an environmentally and ecologically friendly way. This research paper details a smart monitoring and safety system for remotely managing and monitoring waste containers. The system is made up of different sensors, such as an ultrasonic sensor, a temperature and humidity sensor, an air quality sensor, and a flame sensor. All of these are used to collect data and display it on a webpage accessible via a Wi-Fi module. The Blynk IoT platform is utilized to develop the interface of the control station webpage in the suggested project. It is a cloud-based platform that displays all sensor information for concerned parties. The information collected can also be analyzed and used to develop effective strategies for waste management. The system also contains a water pump with a valve. This is to be used as a fire extinguishing system when required. The sensors were tested under different conditions and the values for dangerous levels were recorded. The results were used to specify the range for when a warning message or action needs to be displayed. Based on the information acquired by the sensors, the system is designed to take remote action or assign a worker for human intervention. The use of multiple sensors and the Arduino Mega microcontroller allows for monitoring the fill level and condition of each bin, as well as detecting fire, gas leakage, and any problems related to air pollution. The proposed technology uses solar energy as a power source. This is to align with its sustainability goals. This system provides a complete solution, which can improve sanitation and eliminate hazards. The discussed model can be integrated into a smart bin, which is a system that can autonomously classify and segregate waste using machine learning techniques. This Smart Bin will be beneficial in future smart cities, neighbourhoods, shopping centres, and any public space so people can easily dispose of their waste items and keep these places unpolluted. In fact, according to estimates, Saudi Arabia's market for smart cities would grow at a compound annual growth rate of 19.6% from 2020 to 2027, reaching over \$15 billion [1]. The benefits of waste management can extend to public health, economic welfare, and environmental sustainability, and the Smart Bin can aid in reaching these goals.

References

- [1] Saudi Arabia Smart Cities market size, share and growth: 2027. Allied Market Research. (n.d.). Retrieved September 14, 2022, from <https://www.alliedmarketresearch.com/saudi-arabia-smart-cities-market-A10247>