

# Technological View on Smart Waste Management

Dr. K. Karunambiga  
Department of CSE  
Karpagam Institute of Technology  
Coimbatore, India

Dr. M. Sathiya  
Department of IT  
Karpagam Institute of Technology  
Coimbatore, India

**Abstract:** The sustainable development goal of society, need of healthy environment and due to growing population quantity of solid waste increases rapidly drives the smart waste management. Since it is unhealthy for humans who involve in manual waste management those field works need automation. The Artificial Intelligence provides the way to achieve the automation to collect and process the solid waste with the help of Internet of Things, Cloud Computing and Intelligent Transport System. We explored the technological development towards the implementation of smart waste management to support further development in this domain.

**Keywords:** Artificial Intelligence, IoT, Cloud Computing, Smart Bin, Waste Management

## 1. INTRODUCTION

The solid waste management is an unhealthy task, the involvement of human in that domain directly affects their physical condition. Apart for that, the expansion of human strength plays a vital role in generation of solid waste in the environment. To deal with this problem, the research towards the Smart Waste Management(SWM) attracts more concern. In waste management, the technological support involved are Internet of Things [5,9], Artificial Intelligence [1,4,10], Intelligent Transport System [11] and Cloud Computing as depicted in the figure 1.

## 2. INTERNET OF THINGS AND CLOUD COMPUTING FOR SWM

The smart bin design using the Internet of Things to sense the condition of dustbins using sensors such as ultrasonic, load and so on [9]. In [11] the framework for smart waste management in Indonesia is depicted using IoT and ICT with the policy designed to face the challenges in the implementing waste management. The technology, economy, social, governance, and environmental are the five dimensions followed for the framework to achieve the sustainable development goals of smart waste management.

The information gathered from the different smart bin were transferred to cloud to store and process. IoT transmits the smart bin data using the internet to the cloud computing device. The LoRa was frequently used protocol in IoT to transfer the data for long range in SWM [8].

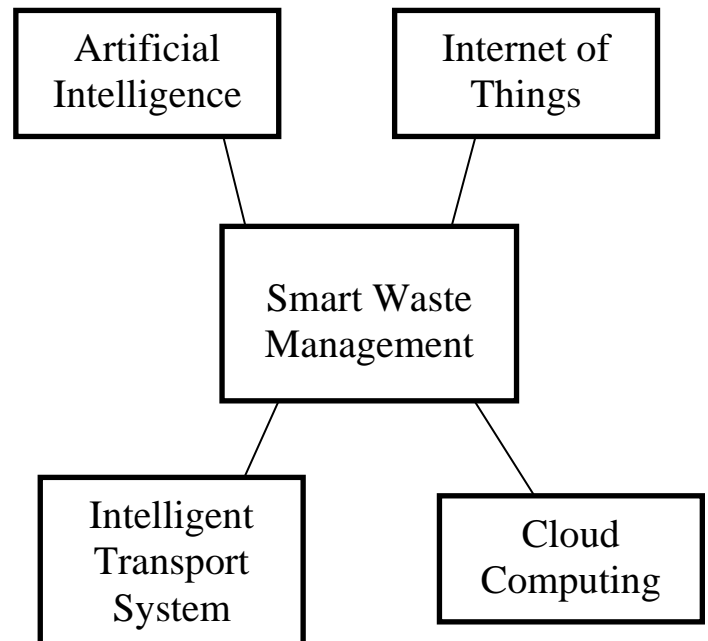


Figure 1: Components of Smart Waste Management

### 3. ARTIFICIAL INTELLIGENCE IN SWM AND INTELLIGENT TRANSPORT SYSTEM

The CNN based predictive models was proposed in [2] for smart waste management. The CNN was used to categorized the waste to take decision of disposal or recycling, which was stored in the cloud. Optimized route selection for the transport system helps to collect the solid waste in order to minimise the transport cost and maximise garbage collection [6]. Generally, the waste were collected periodically or when the bin was full [10]. Those decisions were taken based on the intelligent system implemented for SWM. The controller with GSM convey the information through SMS to the central system to enable intelligent transport system[3].

### 4. DISCUSSION

Internet of Things combined with smart bin helps in collecting the bin status. It also transfers the data using low energy conversing data transfer protocol to the cloud for further process. The machine learning and deep learning algorithms applied on the cloud data helps to design the prediction model. The prediction using artificial intelligence forecasts the garbage which give better performance.

### 5. REFERENCES

- [1] Khan, Feroz, and Yousaf Ali. "A facilitating framework for a developing country to adopt smart waste management in the context of circular economy." *Environmental Science and Pollution Research* 29.18 (2022): 26336-26351.
- [2] Jude, A. Belin, et al. "RETRACTED ARTICLE: An Artificial Intelligence Based Predictive Approach for Smart Waste Management." *Wireless Personal Communications* 127.Suppl 1 (2022): 15-16.
- [3] Yadav, Honey, Umang Soni, and Girish Kumar. "Analysing challenges to smart waste management for a sustainable circular economy in developing countries: a fuzzy DEMATEL study." *Smart and Sustainable Built Environment* 12.2 (2023): 361-384.
- [4] Reddy, Anuradha, et al. "Smart Waste Management Systems by Using Automated Machine Learning Techniques." *Journal of Artificial Intelligence, Machine Learning and Neural Network (JAIMLNN)* ISSN: 2799-1172 2.04 (2022): 16-25.
- [5] Anjum, Mohd, Sana Shahab, and Mohammad Sarosh Umar. "Smart waste management paradigm in perspective of IoT and forecasting models." *International Journal of Environment and Waste Management* 29.1 (2022): 34-79.
- [6] Zhang, Abraham, et al. "Barriers to smart waste management for a circular economy in China." *Journal of Cleaner Production* 240 (2019): 118198.
- [7] Pardini, Kellow, et al. "A smart waste management solution geared towards citizens." *Sensors* 20.8 (2020): 2380.
- [8] Sheng, Teoh Ji, et al. "An internet of things based smart waste management system using LoRa and tensorflow deep learning model." *IEEE Access* 8 (2020): 148793-148811.
- [9] Ali, Tariq, et al. "IoT-based smart waste bin monitoring and municipal solid waste management system for smart cities." *Arabian Journal for Science and Engineering* 45 (2020): 10185-10198.
- [10] Sallang, Nicholas Chieng Anak, et al. "A CNN-based smart waste management system using tensorFlow lite and LoRa-GPS shield in Internet of things environment." *IEEE Access* 9 (2021): 153560-153574.
- [11] Fatimah, Yun Arifatul, et al. "Industry 4.0 based sustainable circular economy approach for smart waste management system to achieve sustainable development goals: A case study of Indonesia." *Journal of Cleaner Production* 269 (2020): 122263.