

WasteXpert Auto: A Review of Robotic and IoT Technologies for Automated Waste Handling

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Abstract: According to the abstract, urbanization and population growth have made waste management more challenging in urban areas (parks, streets/public transport). The traditional method of waste collection requires significant manual labor and is inefficient, expensive, and poses numerous health hazards to sanitation workers. Recently, robots, artificial intelligence (AI), and the Internet of Things (IoT) have developed autonomous, human-activated, intelligent waste management systems that can detect, collect, and separate waste. This paper reviews the intelligent robotic solutions to automated waste collection and separation. Several subsystems of intelligent robots will be discussed: perception, navigation, manipulation, sorting, and IoT, the last of which is also known to produce waste management data. Other sensors technologies will be described including ultrasonic sensor, inductive sensor, and moisture sensor in addition to machine vision and deep learning algorithms for waste proper classification. The use of communication architectures will also describe how robots use gsm, gps, or a mobile app while talking to a user in real-time to track and operate the robot. There will also be a discussion, using examples, detailing the automated systems to date, and while many advances have been made towards automation in waste collection there are still many long-term challenges, particularly around energy, outdoor usage, or the implementation of systems to work on a wide scale.

Keywords: Autonomous Waste Management, Intelligent Robots, WasteXpert Auto, Smart City, Internet of Things (IoT), Artificial Intelligence (AI), Waste Segregation, Robotic Waste Collection, Environmental Sustainability, Machine Vision

