

Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2017-70
Project Title:	Construction waste sorting and recycling robot
Principal Investigator:	Professor Li Heng, Department of Building and Real Estate, The Hong Kong Polytechnic University
Total Approved Grant:	\$1,987,360
Duration:	1/2/2018 to 31/1/2022
Project Status/Remarks:	Completed
Project Scope:	<p>Construction waste management is crucial for the sustainable development of Hong Kong. Currently sorting and recycling of construction waste is done manually, which is costly and inefficient.</p> <p>This project aims to design and develop a robot for automatic construction waste sorting and recycling to improve the efficiency and cut down manpower costs. Akin to a domestic cleaning robot, the construction waste robot would search through a construction site after working hours, to collect, sort out and place recyclable construction wastes into designated bins for further processing. The robot should be able to go back to its original location for recharging battery if needed.</p> <p>This project aims to develop a computer-vision based system that could identify recyclable wastes, in this stage of study, only scrub bricks, waste paper, and residual wood blocks would be collected and sorted. The project adopted the Light Detection and Ranging technology for the robot to move autonomously. A coverage path planning algorithm would be developed for the robot to avoid obstacles and plan its optimal path to maximise its coverage of the construction site. Experiments both in the laboratory and on real construction sites would be conducted to test the feasibility and efficiency of the proposed robot. This project could potentially help improve the efficiency of construction waste management by introducing automatic waste sorting and recycling method and benefit the Hong Kong environment in the long term.</p>
Summary of the Findings/Outcomes:	Construction waste management is crucial for the sustainable development of Hong Kong. One of the strategies initiated by the government to deal with the urging problem is to maximize reusing and recycling of construction wastes. However, currently, sorting and recycling of construction waste is done manually, which is costly and inefficient.

This project enabled the project team to design and develop a robot for automatic construction waste sorting and recycling to improve the efficiency and cut down manpower costs. Akin to a domestic cleaning robot, the construction waste robot searches through a construction site after working hours, to collect, sort out and place recyclable construction wastes onto designated bins for further processing.

Specifically, the project team developed a computer-vision based system that could identify recyclable wastes. Then the team adopted the Light Detection and Ranging (LiDAR) technology for the robot to move autonomously. A coverage path planning algorithm was developed for the robot to avoid obstacles and plan its optimal path to maximize its coverage of the construction site.

This project could potentially help improve the efficiency of construction waste management by introducing automatic waste sorting and recycling method and benefit the Hong Kong environment in the long term.