



Wendy Ju/Provided

A trash barrel robot, controlled remotely by Cornell researchers, follows a janitor through the streets of Manhattan.

## (Almost) everyone likes a helpful trash robot

By Patricia Waldron,

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How do New Yorkers react to robots that approach them in public looking for trash? Surprisingly well, actually.

Cornell researchers built and remotely controlled two trash barrel robots – one for landfill waste and one for recycling – at a plaza in Manhattan to see how people would respond to the seemingly autonomous robots. Most people welcomed them and happily gave them trash, though a minority found them to be creepy. The researchers now have plans to see how other communities behave. If you're a resident of New York City, these trash barrel robots may be coming soon to a borough near you.

A team led by **Wendy Ju** (<https://tech.cornell.edu/people/wendy-ju/>), associate professor at the Jacobs Technion-Cornell Institute at Cornell Tech and the Technion, and a member of the Department of Information Science in the Cornell Ann S. Bowers College of Computing and Information Science, constructed the robots from a blue or gray barrel mounted on recycled hoverboard parts. They equipped the robots with a 360-degree camera and operated them using a joystick.

“The robots drew significant attention, promoting interactions with the systems and among members of the public,” said co-author Frank Bu, a doctoral student in the field of computer science. “Strangers even instigated conversations about the robots and their implications.”

Bu and Ilan Mandel, a doctoral student in the field of information science, presented the study, “**Trash Barrel Robots in the City** (<https://dl.acm.org/doi/10.1145/3568294.3580206>)” in the video program at the ACM/IEEE International Conference on Human-Robot Interaction last month.

In the video footage and interviews, people expressed appreciation for the service the robots provided and were happy to help move them when they got stuck, or to clear away chairs and other obstacles. Some people summoned the robot when they had trash – waving it like a treat for a dog – and others felt compelled to “feed” the robots waste when they approached.

However, several people voiced concerns about the cameras and public surveillance. Some raised middle fingers to the robots and one person even knocked one over.

People tended to assume that the robots were “buddies” who were working together, and some expected them to race each other for the trash. As a result, some people threw their trash into the wrong barrel.

Researchers call this type of research, in which a robot appears autonomous but people are controlling it from behind the scenes, a Wizard of Oz experiment. It’s helpful during prototype development because it can flag potential problems robots are likely to encounter when interacting with humans in the wild.

Ju had previously deployed a trash barrel robot on the Stanford University campus, where people had similarly positive interactions. In New York City, initially she had envisioned new types of mobile furniture, such as chairs and coffee tables.

“When we shared with them the trash barrel videos that we had done at Stanford, all discussions of the chairs and tables were suddenly off the table,” Ju said. “It’s New York! Trash is a huge problem!”

Now, Ju and her team are expanding their study to encompass other parts of the city. “Everyone is sure that their neighborhood behaves very differently,” Ju said. “So, the next thing that we’re hoping to do is a five boroughs trash barrel robot study.” Michael Samuelian, director of the Urban Tech hub at Cornell Tech, has helped the team to make contact with key partners throughout the city for the next phase of the project.

Doctoral student Wen-Ying “Rei” Lee also contributed to the study.

*Patricia Waldron is a writer for the Cornell Ann S. Bowers College of Computing and Information Science.*

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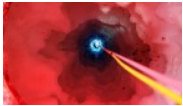
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