Robotics bring the white cane into the 21st century

September 16 2021, by Amy Norton Healthday Reporter

The "white cane" that many blind people rely on for navigating the world

hasn't been upgraded in a century, but researchers are reporting progress on a "robo-cane" they hope will modernize the assistive device.

The prototype cane is equipped with a color 3D camera, sensors and an "on-board" computer designed to guide the user to a desired location—and avoid any obstacles along the way.

There are still issues to hammer out before the robotic cane is ready for the real world, according to lead researcher Cang Ye, a professor at Virginia Commonwealth University's College of Engineering, in Richmond.

The device needs to be made light enough, for example, to be user-friendly. And once the technical details are refined, the cane will face the ultimate test: acceptance among people with visual impairments.

"Is this a device people will really want to use?" Ye said.

The hope is to make it easier for visually impaired people to navigate large, unfamiliar indoor spaces, which can be challenging enough for sighted people, Ye noted.

Right now, people who use white canes can put technology to use in certain ways, according to Ye. There are phone-based apps that help with navigation outdoors, for example.

But big indoor locations are another matter.

In previous versions of the robo-cane, Ye's team tried to address the indoor navigation issue by incorporating building floor plans. Users could tell the cane where they wanted to go, and the cane—via voice cues and a motorized roller tip—could help guide them to their destination.

But, Ye said, it's difficult for a blind person to, for example, make a completely accurate turn. And over a long distance, little inaccuracies could build up and eventually leave the user in the wrong location.

The latest robo-cane—described recently in the journal *IEEE/CAA Journal of Automatica Sinica* — seeks to address some shortcomings. The researchers added a small color-depth camera that not only sees features like doorways, stairs and potentially dangerous obstacles like overhangs, but also determines how far away they are.

Using that information, along with data from a special sensor, the cane's on-board computer can guide the user precisely, and alert him or her to obstacles along the way.

"You can kind of view this as a combination of a robotic guide dog and a cane," Ye said.

Dr. Michael Chiang is director of the U.S. National Eye Institute, the federal agency that helped fund the research.

"We've never had so much technology available, and this research is an example of where we can match a human need with science and technology," he said.

It's important that studies not only aim to treat diseases, but also look at ways to "support the whole person," Chiang added.

"We live in a very visual world," he pointed out. "Driving, reading, navigation—all rely on visual cues. If you can't see well, it's hard to use many of the devices that get us around in this world."

Chiang said research like the robo-cane project is about "expanding opportunities for people with low vision."

There is no way to predict when a robotic cane might be commercially available. "One of the challenges is turning a proof-of-concept into a real-world product," Chiang said.

Ultimately, he noted, any product will have to be approved by the U.S. Food and Drug Administration as a medical device.

According to Ye, the electronic components of the robotic cane should be durable. The roller tip will likely wear, but Ye said it could be replaced without the need for a whole new device.

Some issues now include refining the cane to work well in indoor places with lots of people walking around—like airports and subway stations—since all that movement could interfere with the system.

Once such a next-generation device is available, Ye said, "it will be ready to test for acceptance in the visually impaired community."

More information: The U.S. National Library of Medicine has more on vision impairment.