NSF Hearables Challenge

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MSU hearing aid technology to eliminate background noise

For hearing aid users, a conversation in a busy restaurant often includes a menu of unwelcome sounds. Turn the hearing aid up, and the unfiltered environment becomes a symphony of unwanted voices and annoying disturbances.

Mi Zhang, a Michigan State University assistant professor of electrical and computer engineering, is developing cutting-edge technology to solve this problem.

“Background noises make following a conversation difficult,” Zhang said. “The problem is that existing hearing aids are essentially amplifiers that amplify all the sounds, the ones you want and also the ones you don’t want.”

According to the National Institutes of Health, nearly 30 million adults could benefit from using hearing aids, but research has shown that one in five of those who should wear them do not, with difficulty in noisy situations and background noise cited as a common reasoning.

To attack this problem, Zhang and his team – which includes doctoral student Xiao Zeng, research associate Kai Cao and undergraduate student Haochen Sun – are working on developing a smart hearing aid device that can enhance the clarity of conversation and remove unwanted sounds in the background.

“The biggest challenge is filtering the sound quickly, in real-time,” said Zeng, the lead researcher on the project. “That means processing sound very fast, in about 10 milliseconds. Otherwise, sound and moving lips don’t synch and it tends to cause dizziness or drowsiness of hearing aid users.”

“Human voices are very close, complicating our task,” added Cao. “We are having success with a machine learning-based approach and are hoping to work out the subtle frequency differences. If we can do that, your cell phone should also be able to enhance voices and mitigate the other noises.”

Sun, the undergraduate member of the team, is working on the miniaturization of the hardware of the smart hearing aid device. The researchers hope to work with hearing aid manufacturers to integrate this new technology with existing
products. They plan to deliver the first prototype by the end of May 2018.

The project, “SharpEar: Real-Time Speech Enhancement in Noisy Environments,” won third place in the National Science Foundation Hearables Challenge. It was also presented at the 2017 ACM Ubicomp conference recently in Maui, Hawaii.

Related Website: Story courtesy of MSUToday. Communications contact: Patricia Mroczek

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