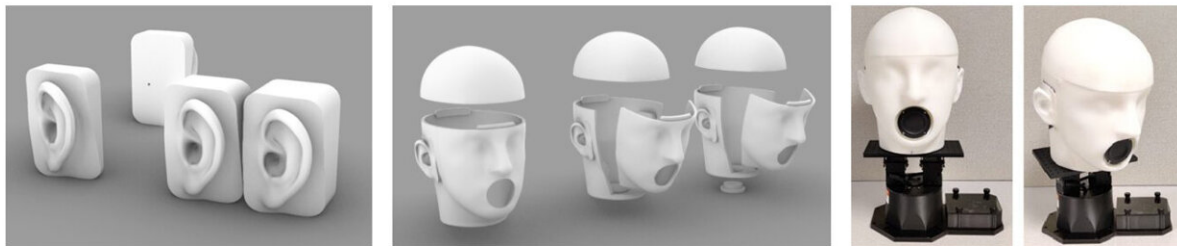


Augmented listening: A cocktail party of 3D-printed robot heads

May 8 2023



The head simulators are 3D-printed into components and assembled, enabling customization at low cost. Credit: Augmented Listening Laboratory at the University of Illinois Urbana-Champaign

Imagine a cocktail party full of 3D-printed, humanoid robots listening and talking to each other. That seemingly sci-fi scene is the goal of the Augmented Listening Laboratory at the University of Illinois Urbana-Champaign. Realistic talking (and listening) heads are crucial for investigating how humans receive sound and developing audio technology.

The team will describe the talking human head simulators in their presentation, "3D-printed acoustic head simulators that talk and move," on Monday, May 8, at 12:15 p.m. Eastern U.S. in the Northwestern/Ohio State room of the Chicago Marriott Downtown Magnificent Mile Hotel. The talk comes as part of the 184th Meeting of the Acoustical Society of

America running May 8-12.

Algorithms used to improve human hearing must consider the acoustic properties of the human head. For example, hearing aids adjust the sound received at each ear to create a more realistic listening experience. For the adjustment to succeed, an algorithm must realistically assess the difference between the arrival time at each ear and amplitude of the sound.

It is important to study human listening in [natural environments](#), like cocktail parties, where many conversations occur at once.

"Simulating realistic scenarios for conversation enhancement often requires hours of recording with [human subjects](#). The entire process can be exhausting for the subjects, and it is extremely hard for a subject to remain perfectly still in between and during recordings, which affects the measured acoustic pressures," said Austin Lu, a student member of the team. "Acoustic head simulators can overcome both drawbacks. They can be used to create large data sets with continuous recording and are guaranteed to remain still."

Since researchers have [precise control](#) over the simulated subject, they can adjust the parameters of the experiment and even set the machines in motion to simulate neck movements.

In a feat of design and engineering, the heads are 3D-printed into components and assembled, enabling customization at low cost. The highly detailed ears are fitted with microphones along different parts to simulate both human hearing and Bluetooth earpieces. The "talkbox," or mouthlike loudspeaker, closely mimics human vocals.

To facilitate motion, the researchers paid special attention to the neck. Because the 3D model of the head design is open source, other teams

can download and modify it as needed. The diminishing cost of 3D printing means there is a relatively low barrier for fabricating these heads.

"Our acoustic head project is the culmination of the work done by many students with highly varied technical backgrounds," said Manan Mittal, a graduate researcher with the team. "Projects like this are due to interdisciplinary research that requires engineers to work with designers."

The Augmented Listening Laboratory has also created wheeled and pulley-driven systems to simulate walking and more complex motion, which they describe on their [website](#).

More information: Conference: acousticalsociety.org/asa-meetings/

Provided by Acoustical Society of America

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