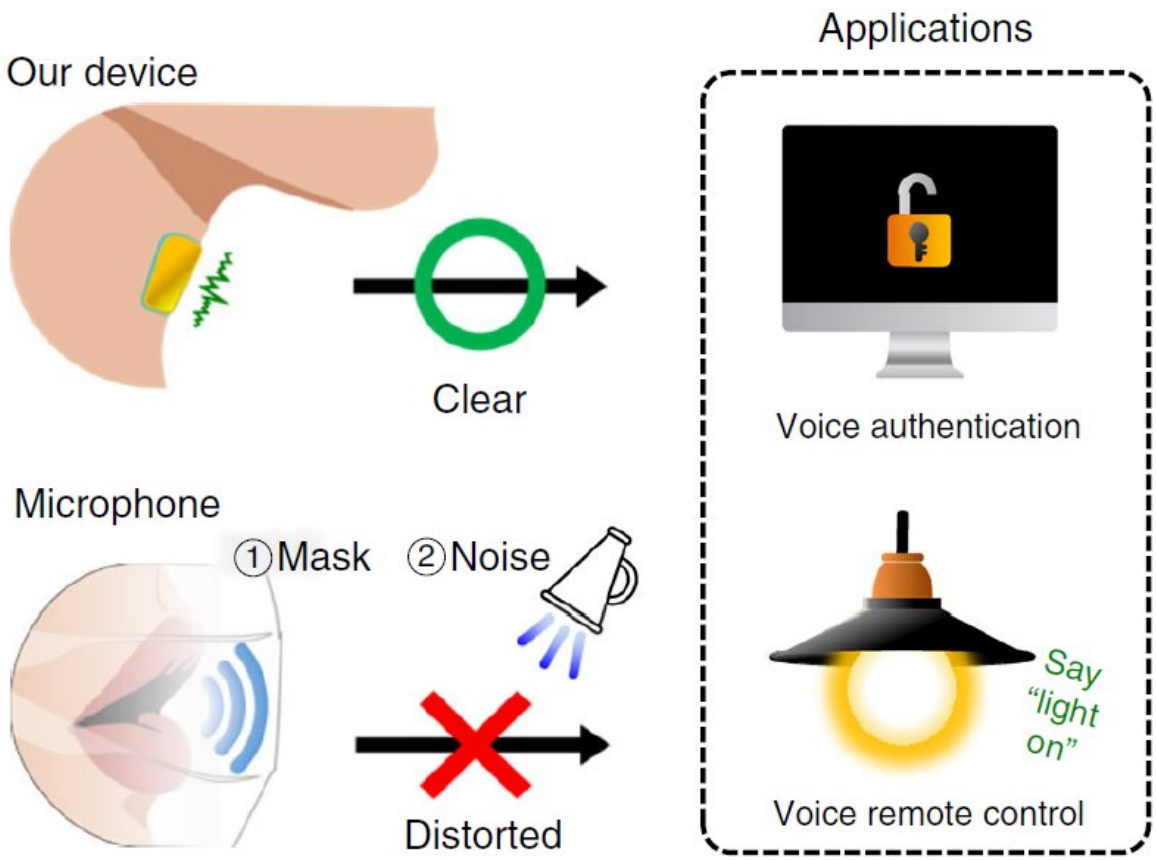
A wearable vibration sensor for accurate voice recognition

June 24 2019



Schematic image of the comparison between our device and a reference microphone (Bruel & Kjaer, microphone type 4192, sensitivity of 1 V Pa?1) for voice authentication and voice-controlled applications. Credit: POSTECH

A voice-recognition feature can be easily found on mobile phones these days. Oftentimes, we experience an incident where a speech recognition application is activated in the middle of a meeting or a conversation in the office. Sometimes, it is not activated at all regardless of numbers of times we call out the application. It is because a mobile phone uses a microphone which detects sound pressure to recognize voice, and it is easily affected by surrounding noise and other obstacles.

Professor Kilwon Cho of Chemical Engineering and Professor Yoonyoung Chung of Electronic and Electric Engineering from POSTECH successfully developed a flexible and wearable vibration responsive sensor. When this sensor is attached to a neck, it can precisely recognize voice through vibration of the neck skin and is not affected by ambient noise or the volume of sound.

Conventional vibration sensors recognize a voice through air vibration and the sensitivity decreases due to mechanical resonance and the damping effect, therefore they are not capable of measuring voices quantitatively. So, ambient sound or obstacles such as a mouth mask can affect its accuracy of voice recognition and it cannot be used for security authentication.

In this study, the research group demonstrated that the voice pressure is proportional to the acceleration of neck skin vibration at various sound pressure levels from 40 to 70 dBSPL, and they developed a vibration sensor utilizing the acceleration of skin vibration. The device, which is consists of an ultrathin polymer film and a diaphragm with tiny holes, can sense voices quantitively by measuring the acceleration of skin vibration.

The researchers also successfully exhibited that the device can accurately recognize a voice without vibrational distortion even in the noisy environment and at a very low voice volume with a mouth mask worn.

This research can be further extended to various voice-recognition applications such as an electronic skin, human-machine interface, or wearable vocal healthcare monitoring device.

Professor Kilwon Cho explained this study in an interview. "This research is very meaningful in a way that it developed a new voice-recognition system which can quantitively sense and analyze voice and is not affected by the surroundings. It took a step forward from the conventional voice-recognition system that could only recognize voice qualitatively."

More information: Siyoung Lee et al, An ultrathin conformable vibration-responsive electronic skin for quantitative vocal recognition, *Nature Communications* (2019). DOI: 10.1038/s41467-019-10465-w

Provided by Pohang University of Science & Technology (POSTECH)