

# Prototype device allows users to listen to music through the sense of touch

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A prototype devised at the UMA will allow listening to music through the sense of touch. Credit: University of Malaga

People with hearing loss will be able to listen to music through the sense of touch thanks to a pioneering prototype that has been devised by

researchers of the Department of Electronics of the University of Malaga, members of the R&D group Electronics for Instrumentation and Systems.

It consists of an audio-tactile algorithm that, by using "tactile illusions," renders monophonic [music](#) into tangible stimuli based on vibration. "It's like 'hacking' the nervous system to receive a different response to the real stimulus sent," they say.

"What we want to achieve in the long term is for people who do not hear to be able to 'listen' to music," says the researcher of the Ph.D. Program in Mechatronics Engineering Paul Rémache, main author of this paper, who insists on the power of music to influence mood, as well as its possibilities as a therapy for mental disorders and treatment of pain.

This would result in a portable terminal that could be brought to a concert, since this prototype, according to the researchers, will be easily transferable to technological devices such as cell phones.

## **Mapping music**

The algorithm developed by this young researcher, along with the professors at the UMA Andrés Trujillo and Fernando Vidal, is capable of converting musical features and structures extracted from MIDI files—Musical Instrument Digital Interface—to "vibrotactile stimuli."

"It's something similar to mapping music," explains Rémache, who adds that this is possible because this type of files not only can be played and generate sound, but also provide "symbolic representations."

## **Controlling vibrations**

Current models do not warrant the correspondence between the

emotional response to music and the vibrotactile version of it. In view of this, these engineers of the UMA propose an arrangement of the "tactile illusions" in order to improve and extend the spectrum of musical features, adding dynamics to the vibration in the form of movement, changes of direction and location.

"It is a challenging process since the perceptible frequency range of the skin is lower than that of the auditory system, which may cause the loss of some musical features," they explain.

### **Different emotional response**

First experiments completed, in which over fifty volunteers took part, suggest that the arrangement of "tactile illusions" evokes more positive emotions than negative ones. They are also perceived as more agreeable and stimulating than the audio, provoking a different [emotional response](#) from that of the original music.

### **Smart instrumentation and application in health care**

This first prototype was presented in the 11th International Workshop on *Haptic and Audio Interaction Design* (United Kingdom)—the biggest international event specialized in these areas of study—after being published in the journal by the same name. At present, the researchers of the UMA are working on a second model and continue with the experiments.

The research is the product of Paul Remache's [doctoral thesis](#) and is part of the National Plan project "Smart instrumentations and application in healthcare."

**More information:** Byron Remache-Vinueza et al, Mapping Monophonic MIDI Tracks to Vibrotactile Stimuli Using Tactile

Illusions, *Haptic and Audio Interaction Design* (2022). [DOI: 10.1007/978-3-031-15019-7\\_11](https://doi.org/10.1007/978-3-031-15019-7_11)

Provided by University of Malaga

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