

To sing like Shakira, press '1' now

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Vibrato -- the pulsating change of pitch in a singer's voice -- is an important aspect of a singer's expression, used extensively by both classical opera singers and pop stars like Shakira. Usually, the quality of a vibrato can only be judged subjectively by voice experts.

Until now, that is. A research group from Tel Aviv University has successfully managed to train a computer to rate vibrato quality, and has created an application based on biofeedback to help singers improve their technique. Your computer can now be a singing coach.

The invention was recently showcased at an international competition in Istanbul, where it won first prize at the International Cultural and Academic Meeting of Engineering Students. Researcher Noam Amir, a senior lecturer from the Department of Communication Disorders at the Sackler Faculty of Medicine, Tel Aviv University, says the tool might not help record producers find the next great pop music sensation. But it could teach singers how to mimic Shakira's signature vibrato.

Vibrato is a musical effect that can be used when a musician sings or plays an instrument. It adds expression to a song and is created by a steady pulsating change of pitch, characterized by the amount of variation and the speed at which the pitch is varied. TAU's application can teach singers how to mimic the vibrato qualities most attractive to the human ear.

But mastering vibrato is no guarantee for an American Idol appearance. "Vibrato is just one aspect of a singer's impact," says Amir, an expert in the ways that emotions impact speech. "Singers need to arouse an emotional response, and that is a complicated task."

Three years ago, Amir and his colleagues decided that they would look for an objective, numerical assessment of vibrato quality. New vocal students usually don't have good control of their vibrato,

explains Amir. "Their vibrato is erratic and hard to judge subjectively, and it's hard to find to a precise measure for this. We wanted to find a way to emulate a human expert in a computer program."

Amir's team input into their computer many recordings by students singing vibrato and had their vibrato judged by human teachers. Using hundreds of vocal students and expert judges, the team was able to use mathematical measurements to correlate vibrato styles to their quality as judged by the teachers.

The computer was then able to rate the vibrato quality of new voices on its own, producing ratings similar to those given by the expert vocal teachers. In effect, a machine had "learned" how to judge the quality of an individual singer's vibrato. The researchers then added a biofeedback loop and a monitor so that singers could see and augment their vibrato in real time.

Other applications for this type of research, Amir says, could be in automated call centers, where callers communicate with computers. He hopes to be able to teach computers how to recognize a range of different emotions, such as anger and nervousness, so that a live receptionist can jump in when a caller becomes upset with the machine.

Amir's research focuses on how emotions are expressed in speech. He collaborates regularly with speech pathologists and in this particular study worked with Dr. Ofer Amir and Orit Michaely, also from the Sackler Faculty of Medicine.

The original research was published in the journal *Biomedical Signal Processing and Control*.

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