Robotic Theremin Player

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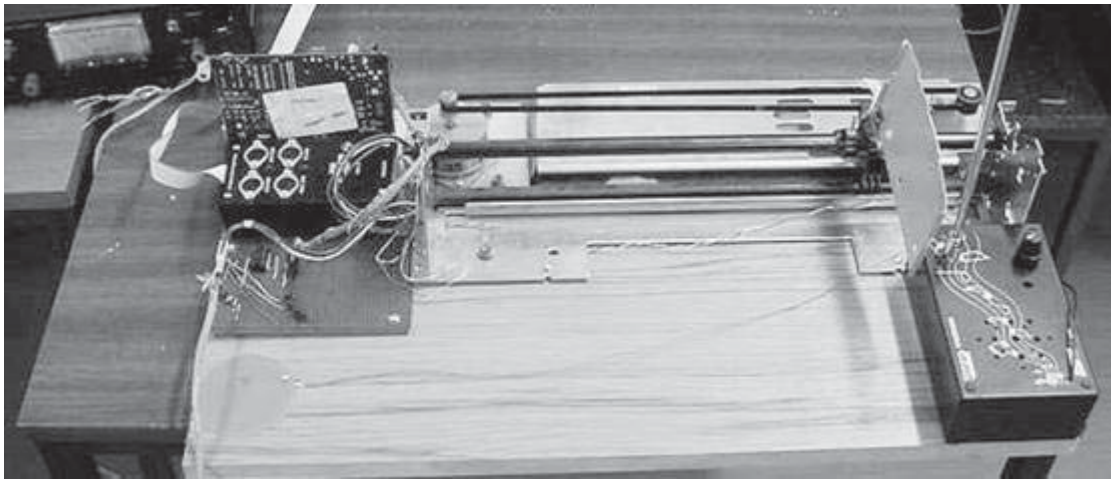

This poster describes a project whose objective is to offer an audience an experience comparable to a performance given by a human musician. A robotic musician, controlled by standard MIDI messages, plays a musical instrument. Real instrument performance, such as the physical vibration of a violin string, is much more expressive musically than can be accomplished with electronic music synthesizers. This area of research links music, robotics, information theory, and computer science.

A robot player responds to MIDI commands by using electric motors to move mechanical 'hands' to play a musical instrument. This particular robot plays a Theremin, a simple electronic musical instrument. A Theremin is played by proximity, not touch, so there is no exact "finger position" to give the desired note. Like a trombone, violin, or human singer, the player must listen to the sound produced to ensure correct pitch and volume. In addition, the response of the Theremin varies with temperature and humidity, and other factors. Therefore, a feedback system is needed to listen to the sound, derive frequency and volume information, and issue appropriate motor control commands.

A powerful microcontroller performs the analysis and control functions in real time, with simple electronic circuits to amplify sound signals and to provide sufficient power to drive the motors.

This system can be the basis for a series of music-playing robots of increasing complexity, eventually playing a range of musical instruments designed for humans (e.g. trumpet, trombone, and guitar), and then entirely new instruments that a human could not play (e.g. a drum kit for a multi-armed drummer, a guitar with 24 or more strings).

The mechanism demonstrated is very much a work-in-progress, so presently the sounds produced can barely be described as music.

References

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