HandSonor: A Customizable Vision-based Control Interface for Musical Expression
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**MOTIVATION**
Interfaces for music synthesis are typically non-customizable and do not make use of all the degrees-of-freedom of the human hand.

**GOALS**
- Develop a method that uses computer vision to track the user’s full hand motion and convert it into music.
- Give users complete control over the type of musical instrument and how they want to play it.

**CONTRIBUTIONS**
- Computer vision based hand motion tracking system
- Instrument-hand parameter mapping system
- Music synthesis system to transform hand motions into sounds
- Pilot study to assess user perception about HandSonor

**Experimental Setup**
Setup with 4 calibrated and synchronized cameras, a display and speakers.

**Hand Motion Tracking**
- Hand Skeleton Image
- Silhouette Image
- Multiview Input
- 3D Sum of Gaussians Hand Model
- 2D Sum of Gaussians Image
- Tracked Hand Motion

**Parameter Mapping**
- Continuous instrument parameters are mapped using mapping functions e.g. theremin, violin.
- Discrete instrument parameters are modeled as boolean parameters and mapped using an indicator function and several activation regions e.g. piano, drumkit.

**GUI** allows users to creating mapping schemes for continuous and discrete instrument parameters.

**Technical Performance and Pilot Study**
- Degrees-of-freedom: 26
- Interactive Framerate: 17 FPS
- Latency: 30-60 ms

**Pilot study** consisted of a playing task to evaluate if users were able to reproduce a musical piece and an exploration task to evaluate if they could create new mapping schemes.

**Users playing music using HandSonor**
- Piano
- Theremin

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