HandSonor: A Customizable Vision-based Control Interface for Musical Expression

Srinath Sridhar
MPI Informatik and Universität des Saarlandes

max planck institut informatik

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

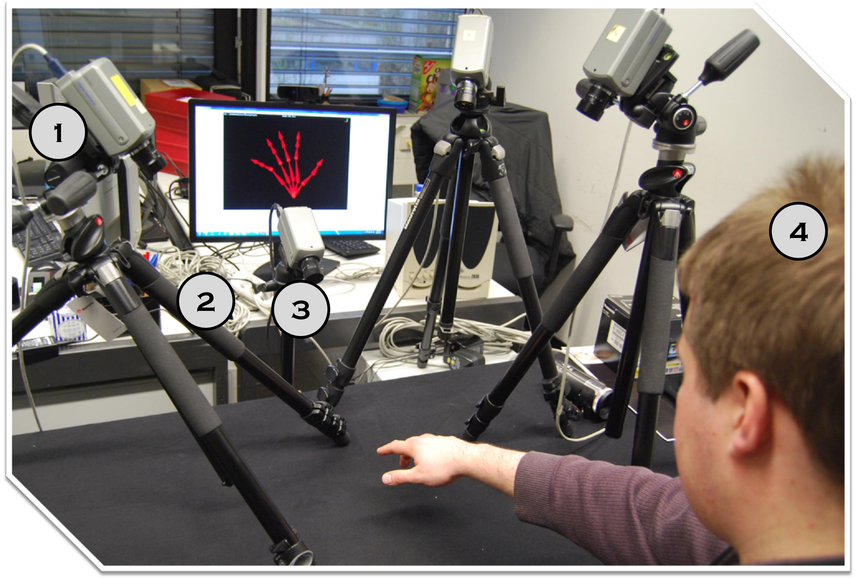
- Develop a method that uses ***computer vision*** to track the user's full hand motion and convert it into music.
- Give users ***complete control*** over the type of musical instrument and how they want to play it.

CONTRIBUTIONS

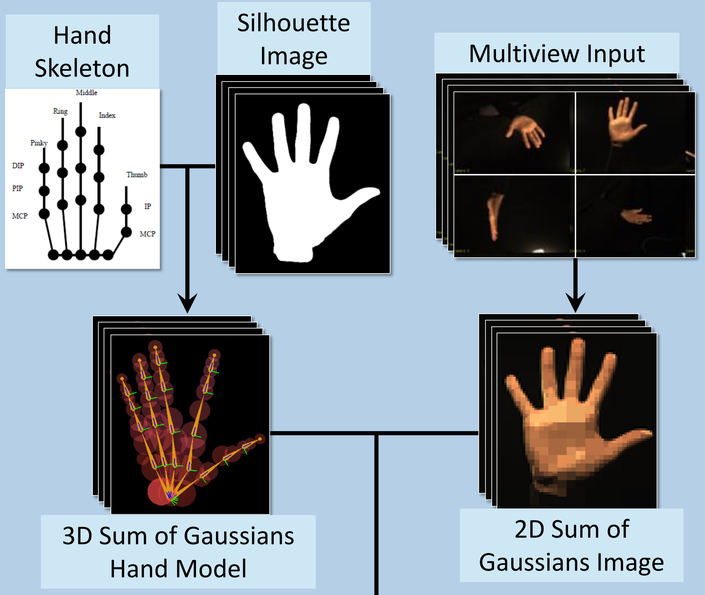
- Computer vision based ***hand motion tracking system***
- Instrument-hand ***parameter mapping system***
- ***Music synthesis system*** to transform hand motions into sounds
- ***Pilot study*** to assess user perception about HandSonor

1 Experimental Setup

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

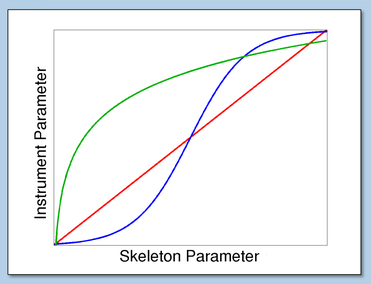


2 Hand Motion Tracking



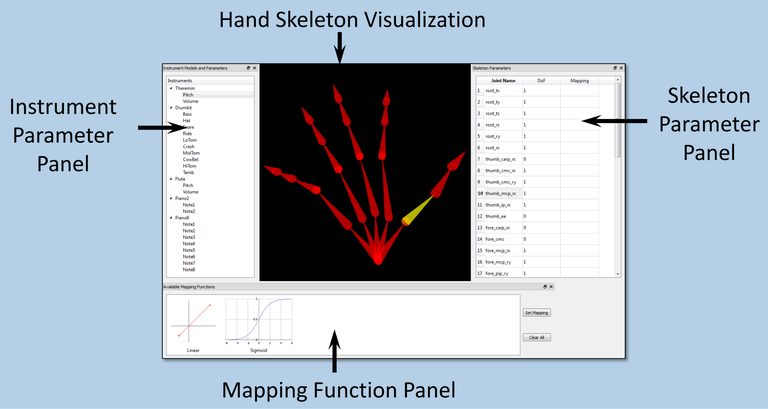
Optimization using a modified gradient ascent algorithm to maximize a similarity measure between 2D sum of Gaussians (SoG) images and 3D SoG hand model [1].

3 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.

4 Technical Performance and Pilot Study

Hand Motion Tracking

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

Supervised by
Prof. Dr. Christian Theobalt Dr. Antti Oulasvirta

I would like to thank Anna Feit and Thomas Helten.

ssridhar@mpi-inf.mpg.de
http://www.mpi-inf.mpg.de/~ssridhar/handsonor

[1] C. Stoll, N. Hasler, J. Gall, H. Seidel, and C. Theobalt, "Fast articulated motion tracking using a sums of Gaussians body model," in 2011 IEEE International Conference on Computer Vision (ICCV), 2011, pp. 951-958.