

Live Demonstration: FPGA-based Real-Time Acoustic Camera Prototype

B. Zimmermann and C. Studer*

Integrated Systems Laboratory
ETH Zurich, 8092 Zurich, Switzerland
e-mail: studer@iis.ee.ethz.ch

I. ISCAS TRACK SELECTION

- Track 14: VLSI Systems, Architectures, and Applications
- Track 5: Digital Signal Processing

II. DEMONSTRATION SETUP

Fig. 1 shows the real-time acoustic camera prototype. The system consists of a field-programmable gate array (FPGA) base-board and an A/D-conversion board with 32 attached microphone modules arranged in a rectangular array. The FPGA base-board is connected to an external TFT display. Two loudspeakers will be connected to a laptop and play audio test-signals. The external display visualizes the location and intensity of the generated sound sources in *real-time*. The following list summarizes the components required by this demonstration setup:

- 1× FPGA base-board
- 1× A/D-conversion board with microphone array
- 1× external power supply
- 1× external TFT display
- 2× small loudspeakers
- 1× laptop (to generate the test-sounds)

III. DEMONSTRATION EXPERIENCE

The goal of this live demonstration is to show the audience how an acoustic camera works. In particular, we want to demonstrate the advantages of *real-time* visualization. The visitors will be able to move the speakers or the microphone array and see the immediate change in the generated video signal, i.e., the intensities and locations of the sound sources are visible on the display as one would look through the microphone array. Fig. 2 shows a typical image of the real-time acoustic camera. In addition, the test-signals can be changed (e.g., noise, sine-waves at different frequencies, or other audio signals can be generated), which enables to show the impact of the signal itself to the generated images. For example, unwanted artifacts such as spatial aliasing or reflections on walls can be visualized with the prototype system. In summary, our live demonstration includes

- Demonstration of the real-time acoustic camera prototype
- Visualization of the impact on the generated images by different test-signals

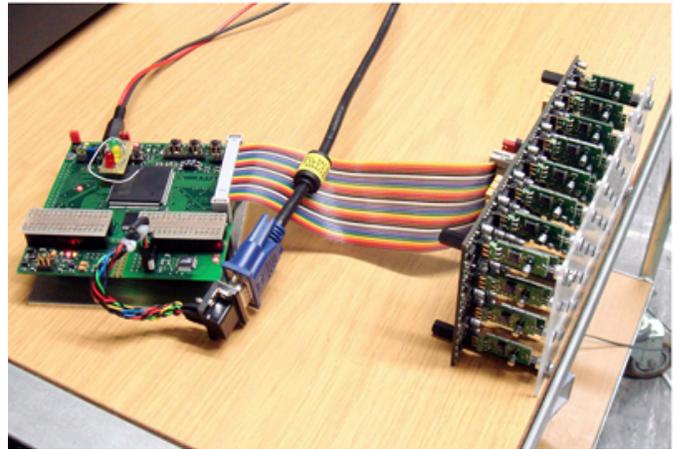


Fig. 1. Photo of the real-time acoustic camera prototype. Left: FPGA base-board, right: microphone array (32 microphones are plugged directly into the A/D-conversion board).

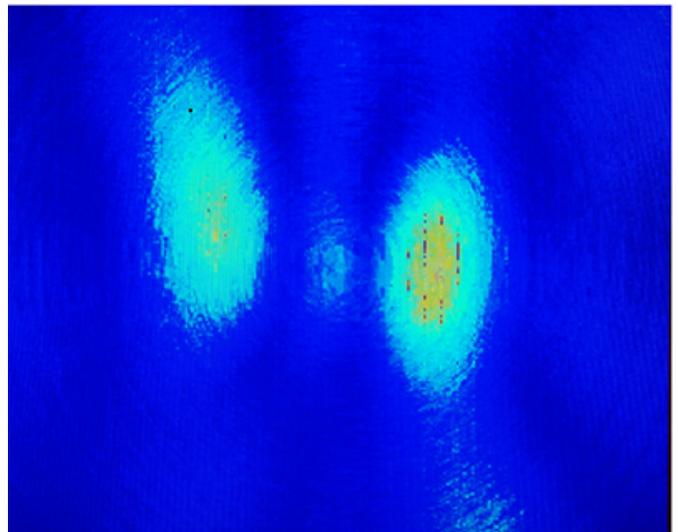


Fig. 2. Typical output on a display generated by the real-time acoustic camera. The picture shows two separated sound sources, each generating a 10 kHz sine-wave in two meters distance of the microphone array.