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SoliScratch: A Radar Interface for Scratch DJs

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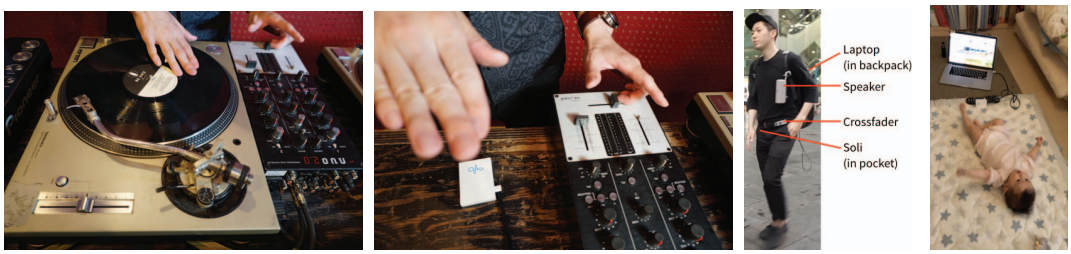

(a) (b) (c) (d)

Figure 1: (a) A typical scratch DJ setup: one hand operates a crossfader, the other hand moves a record. (b) We replace the record with a Soli device. (c) Our mobile prototype gives scratch DJs a unique capability: scratching while walking outside. (d) Our system makes scratching much easier—even infants can use it!

Abstract

Scratching is a DJ (Disk Jockey) technique for producing rhythmic sounds by moving a record back and forth. It requires a high level of manual dexterity and its difficulty has been likened to playing an instrument. Our goals are: first, ease of use, so that novice users can start scratching immediately; second, to enable users to scratch while walking.

We employ millimeter wave radar sensing technology to replace record movements with mid-air gestures that are captured at 1 kHz. We developed our systems in several iterations with professional DJs. The accompanying movie shows that we could achieve our goals.

1 Demo Description

What makes it unique and special? Our demo uses a prototype Soli sensor [4] from Google ATAP, an attractive sensing device with very high sampling rate and low latency. We developed our system in several iterations with a professional DJ (Tomishi) with 16 years of experience and an accumulated practice of over 10,000 hours; in 2014 he qualified for the Japanese championship of DMC, the world's premier scratch DJ organization.

Our software pipeline is based on VDMX5 [6], Mixxx [5], and the Soli SDK [3]. We receive raw displacement data from the Soli SDK and then send it through the OSC protocol to the multimedia environment VDMX5. In VDMX5 we perform filtering and system control through a state machine. We then send control commands through the MIDI protocol to the open source DJ software Mixxx. The most challenging part in our development process was to adjust the filter parameters in order to turn noisy radar signals into a stable control signal suitable for scratching.

Novelty. So far, few interactive systems have been built using milimeter wave radar sensing. Most of them use it to address standard user interface tasks, such as object manipulation [2]. A few music systems have been developed, for example [1], but none of them addresses the needs of DJs, in particularly scratch DJs.

Why will it draw a crowd? Our demo is very enjoyable, as it enables users to immediately scratch on a tabletop setup and while walking. As our accompanying movie shows, even infants can create expressive music with it (see Figure 1(d)). Additionally, we believe that many ISMAR attendants will be interested to see the capabilities of Soli, as it can deliver versatile gesture input that can be used in a lot of mobile augmented reality applications.

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2 Demo Requirements

We will bring all essential equipment for this demo; we will show it in two modes: tabletop and mobile. We would like to ask the organizers for a few additional items:

- A standard table with a nearby power outlet
- A screen (larger is better) for showing details of the realtime radar signal processing. Alternatively, a projector and suitable projection surface would also work.
- As our demo outputs music (higher volume is better): please put us in an area that can accommodate this.

Acknowledgments

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