

## STSM Report

**Applicant:** Marcos Alonso Ruiz

**Host Institution:** KTH, Department of Speech Music and Hearing

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### Purpose of the mission

The main goal of the mission was to add the **DJ scratch model developed at the KTH** (Royal Institute of Technology) by Kjetil Hansen and Roberto Bresin to the **reactable** developed at the Music Technology Group of the Universitat Pompeu Fabra and where I am currently working. We wanted to focus the work on finding the best way to control the DJ scratch model using the reactable tangible interface and how to incorporate it to the current reactable modular synthesis paradigm.

In order to develop and test the system I prepared a small and portable version of the reactable that I brought to the KTH. The system was a small table with a transparent surface and internal illumination, a webcam at the bottom facing up and a reduced set of tangibles marked with fiducial markers. I also installed the reactable software and all the development tools necessary for the development in my own laptop.

### Working Diary

*Monday, October 2:* I arrived at 16:00 to the department of Speech Music and Hearing and I met Kjetil and Robert. I filled my guest profile, got the lab key and I was introduced to the people at the lab. Once in my office I mounted the table.

*Tuesday, October 3:* On Tuesday morning I got the *portable* reactable running for the first time. I adjusted the software to the dimensions of the table and created a small set of tangible objects. Then I had a meeting with Kjetil and Roberto. We discussed how to port their DJ scratch model to the reactable tangible paradigm. We decided to reimplement their model using the reactable audio engine instead of adapting their own implementation. I spent the rest of the afternoon studying the reactable audio synthesizer and how to add new components to it.

*Wednesday, October 4:* After a meeting with Kjetil we decided to start with the implementation of the speed controller. This object simulates the way a scratch DJ moves the record on the turntable forward and backward. I had to add a very simple inertia function to the reactable loop player to simulate the way a record spins on a turntable.



*The portable reactable during the STSM*

*Thursday, October 5:* On Thursday morning I added different envelopes to the speed controller but instead of using prerecorded gestures like they did in their implementation I made an algorithmic model that generates them, this way the player can create smooth transitions between the different gestures. After that I started working on the amplitude controller.

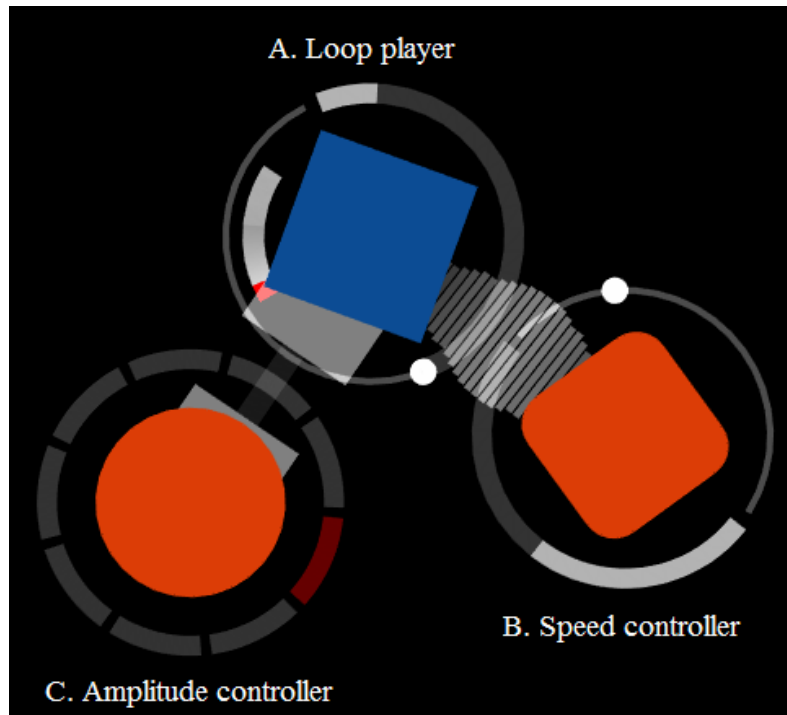
*Friday, October 6:* For the amplitude controller we decided to use a set of predefined patterns. Based on their research we created a list of common patterns scratch DJs use while performing. During the afternoon I rewrote the sample playback algorithm to improve the sound quality.

*Monday, October 9:* I finished the amplitude controller object and added some random variations to the movement amplitude to make it sound more natural. During the afternoon we organized a demo for the lab members, I introduced the reactable project and the work I was doing there, and let them try the system. People's reaction was very positive and we could gather some feedback about what we were doing.

*Tuesday, October 10:* On my last day at the KTH I worked on the amplitude tables. I also worked on the synchronization between the speed and the amplitude controllers.

## Results

The resulting system is divided into three main components; each one of those is controlled with a tangible object on the table. The system mimics a real scratching DJ scenario where one object represents the record on the turntable (loop player), another one represents the hand the DJ uses to move the record (speed controller) and the last one represents the hand the DJ uses to control the amplitude (amplitude controller).



*Graphical feedback of the objects in action*

*A. Loop player.* It is based on the reactable loop players but has some modifications to simulate the inertia of a record on a turntable. Its rotation controls the position in the sample where the scratch movement is applied. The slider on its side lets the player control the overall sound amplitude with his/her finger.

*B. Speed controller.* The rotation of this object changes the speed of the scratch gesture. The slider on its side transitions between three different gesture envelopes. And its distance to the loop player is mapped to the amplitude of the movement and thus the pitch of the sound. This amplitude control is divided into steps to avoid unintentional changes while rotating the object.

*C. Amplitude controller.* With the rotation of this object the user can choose between nine different amplitude patterns. This object is synchronized internally with the speed controller to match the different patterns with the forward and backward movement of the record.

## **Further work**

Even though the system is fully functional it should be tested by actual scratch DJs to verify the decisions we made during the development and to adjust the control mappings. Once the system is finished we will have to decide the way to incorporate it into the current reactable modular synthesizer paradigm.

A joint paper about the developed system and the results of the test with professional DJs has also been planned.