

Report on my Short-time scientific mission at McGill University, Montreal, Canada.

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## **1. Purpose of the visit**

The purpose of my STSM visit was

- a) to come up with a plan for a suitable gestural control for the virtual slide air guitar, especially for recognizing the state (open/closed) of the user's left hand
- b) to discuss how to make the slide guitar synthesizer sound more realistic; especially focusing on the friction and handling sounds
- c) to gather more information about gestural-control systems for future research

## **2. Description of the work carried out during the visit**

We discussed the virtual slide air guitar control issues with Prof. Marcelo Wanderley, and the slide guitar synthesizer issues with Prof. Gary Scavone. I also gave a 45 min presentation about my research, which led to interesting discussions with the researchers at McGill. We also planned future collaboration with Bertrand Scherrer on the research and modeling of guitar plucks.

## **3. Description of the main results obtained**

- a) After the discussion with Prof. Wanderley, we agreed that the gestural control for the virtual slide air guitar should be implemented in the following way:

The infra-red (IR) – camera based user interface will primarily be used. Instead of detecting the user's left hand by using an IR-reflective glove, a real slide tube will be used instead. This has a few advantages; firstly, recognizing the state (open / closed fist) of the user's left hand is much easier when the user wears a slide tube in his finger. When the hand is closed (corresponds to fretted notes), the camera system sees the slide tube as a fairly long rectangular object. When the hand is open (corresponds to unfretted notes), the camera system sees only the top view of the slide tube, illustrating a smaller, elliptical object. If we would use an IR-reflecting glove for this task, the hand state recognition would be a lot more difficult, due to the fact that the user's hand has a more complicated form and is deformable, rather than a rigid object.

Secondly, using a real slide tube instead of a glove is more intuitive for the user. The slide tube immediately reveals that the virtual instrument is different than the earlier virtual air guitar. Also, if a polished metal slide is used, there is no need to cover the slide tube with a IR-reflecting fabric. In the worst-case scenario, if using the slide tube does not produce sufficient accuracy in detecting the state of the left hand, a reflecting glove with a radio-frequency (RF) transmitter will be used. We will embed a simple RF remote control device (from a garage door remote, for example) into the IR-reflecting glove, so that when the user closes his hand, a RF signal is launched. The signal is sensed by the RF-receiver, after which it will be converted into an open sound control (OSC) – message and transmitted to the synthesis engine (running on the PureData software). In this case, the

position of the fretting hand will still be recognized using the IR-camera system.

For the user's right (plucking) hand, either an IR-reflecting plectrum, or a glove will be used. For immersion, it would be better to use a plectrum, but we are afraid that there might be detection problems due to occlusion and the small size of the object, so we will most likely end using a glove after testing both cases.

b) The slide friction model was refined after the discussion. Especially the high-frequency behavior of the model was improved. We will also record the impulse response of a real slide tube for better tuning of the contact sound generator, as suggested by Prof. Scavone.

c) I had a thorough tutorial on the gestural-control equipment at Music Technology Area by Carmine Casciato. I found out that they are primarily using two systems for motion capture; an IR-based Vicon system, and a Polhemus system, based on magnetic tracking. Also other gesture-based control devices were displayed.

#### **4. Future collaboration with host institution**

We planned future collaboration with Bertrand Scherrer concerning the analysis and synthesis of realistic guitar pluck tones. This issue has also been discussed with Dr. Henri Penttinen in TKK - Helsinki University of Technology.

#### **5. Projected publications/articles resulting or to result from the STSM**

A manuscript of a virtual slide air guitar article will be submitted to Computer Music Journal at the end of 2006.

#### **6. Confirmation by the host institute of the successful execution of the mission**

See attachment.