MERCI HA.2 Report on Embodied Interaction on Creative Instruments

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1. Validation of the hexaphonic HyVibe Guitar prototype

We tested the prototype empirically, using a Roland GR 55 synthesizer pedal. The output of the hexaphonic sensor was sent to the input of the pedal, and the output of the pedal was sent to the input of the HyVibe System (Figure 4).

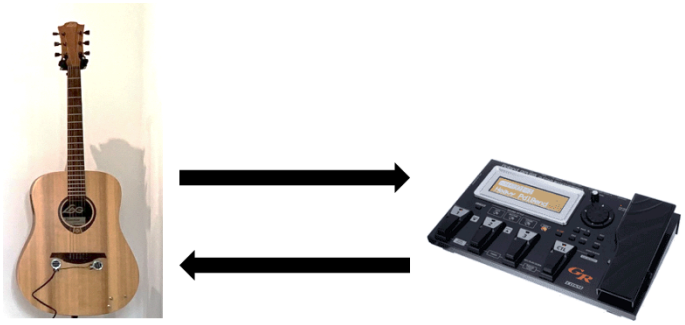

Figure 1: test of the hexaphonic HyVibe Guitar using a Roland GR 55 guitar synthesizer

This test showed excellent results, in terms of polyphonic guitar real time analysis and synthesis. The two main conclusions were 1) the hexaphonic sensor makes it possible to split efficiently the six guitar strings, and 2) the mechanical feedback in the guitar is treated efficiently using the HyVibe processing, whatever synthesized sounds were used (instrumental sounds with effects).

2. First experiment using Somax and the hexaphonic HyVibe Guitar prototype

Once the guitar prototype was validated, first experiments were organized between the ANR MERCI partners. The first setup is presented in Figure 2. In this case, the Roland GR 55 is used to transform the hexaphonic guitar signals into MIDI signals. These signals are processed in Somax and sent to the HyVibe System, and finally to the guitar body. Different music corpuses were tested, from Palestrina to Ligeti and Jazz standards. These works showed promising results. Even if the HyVibe and Somax technologies were developed independently, they interacted very smoothly. However, certain errors in the detection of events appeared (see HA 2 Annex 1 for more details).

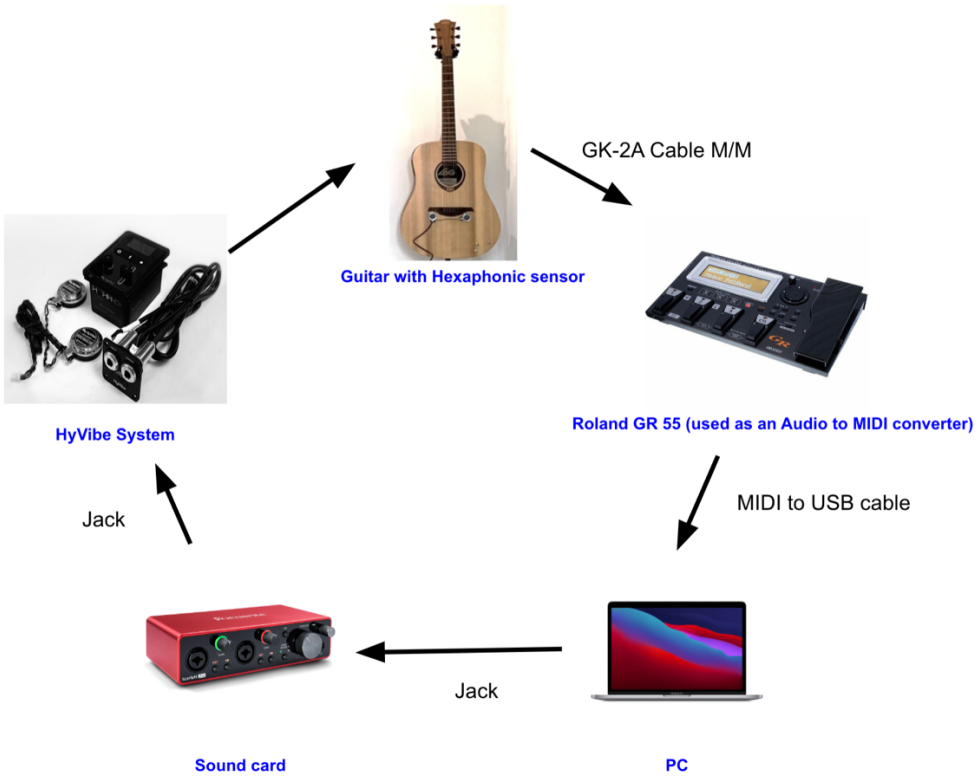

Figure 2: First experiment using Somax and the hexaphonic HyVibe Guitar prototype

3. Second experiment using Somax and the hexaphonic HyVibe Guitar prototype

Following the promising results of the first experiment, we decided to study the performance of Somax when running on a Raspberry Pi (a small single-board computer), which is a first step before embedding Somax in a HyVibe System. The sensor analysis is still done by a laptop computer.

Overall, This experiment was successful. The code transfer (into the Raspberry PI) did not show any major difficulty. The co-improvisation worked well. However, an audible latency occurred, due to the Raspberry PI processing.

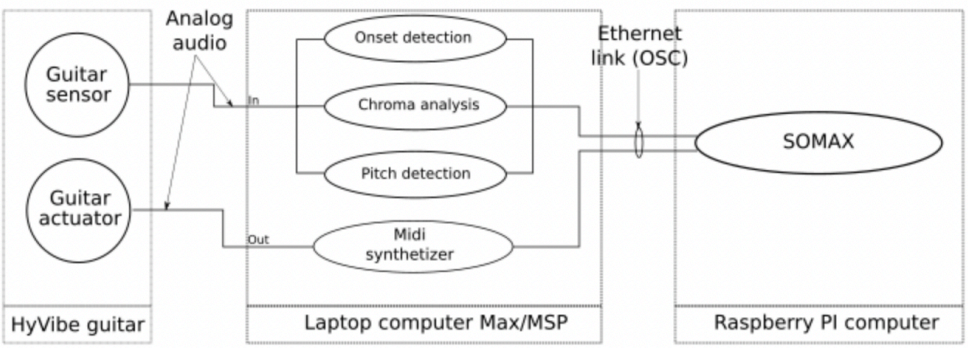

Figure 3: Experiment using a Raspberry PI computer, a laptop, and a HyVibe guitar

4. Conclusion

This report presented successful first experiments using the prototype HyVibe hexaphonic guitar, especially when running the Somax code into a Raspberry PI computer. Several challenges still need to be addressed, like:

- Optimizing the Somax code for the HyVibe guitar case, in order to reduce the latency
- Developing new signal analysis algorithms in the HyVibe System to remove the laptop computer in the prototype.

The future platform is presented in Figure 4. The HyVibe System is used to process the audio signals coming from the guitar sensor(s) with onset and pitch detections, and chroma analysis for instance. Following this analysis, the information is sent to a Raspberry PI using a serial link. The Somax output is then sent back to the HyVibe System, where it is processed before being sent to the guitar actuators.

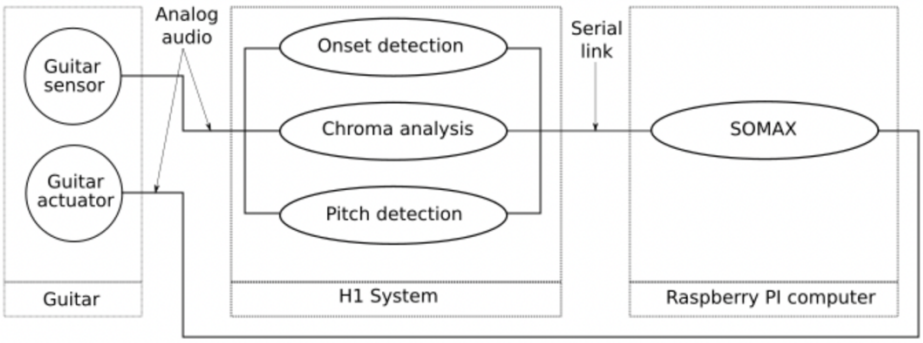

Figure 4: Future platform using a HyVibe System and a Raspberry PI