The Magic Glove

Andrew Smith
andrewrs@cs.washington.edu

Zachary Brown
zacharyb@cs.washington.edu

Soyoung Shin
soyoung@cs.washington.edu

ABSTRACT

The Magic Glove is a wearable touch sensitive musical instrument similar to a drum machine in use and application. A user controlling the device can generate music from predetermined sound libraries which at time of demonstration included sound sets in the genres of jazz, dubstep and classical. Audial feedback is provided to the user and potentially an audience, and visual and physical feedback are provided primarily to the user. The project was implemented with pressure sensors, an Arduino microcontroller, a standard web camera, software built on ChucK, Java, Openframeworks, and several sound samples from www.freesound.org.

1. INTRODUCTION

We sought to create a device, which allowed for expressive musical improvisation through finger movements, which played sounds depending on the physical position of the hand and the finger that was moved. The device was based conceptually off of drum machines, from which a musician can play sequences of samples (which may or may not be drums) by pressing buttons on the drum machine board. Our glove, however, has a much simpler interface, which allows amateurs as well as professionals to utilize it with ease.

This device is suitable for use by musicians for both live performances, improvisations and studio recording sessions. The glove also doubles as a fashion accessory. White rhinestoned gloves are out, cyber punk is back in.

2. SOLUTION

2.1 Hardware

Mounted on the fingertips of a basic glove are five 1lb Flexiforce Pressure Sensors which measure the pressure applied to each finger, and each sensor signal is amplified by an op-amp. The signals are captured by an Arduino microcontroller that is connected to a computer via USB.

2.2 Software

The software layer consists of four main components: a serial driver that reads the finger-pressure data from the Arduino, the ChucK program that handles all of the sound synthesis and a majority of the program logic, various Java utilities that act as user interfaces for the software, and color tracking software which provides visual feedback to the user. Each of the components communicates to the others using Open Sound Control (OSC,) which allows each of the different components to cooperate seamlessly despite all being implemented in different programming languages.

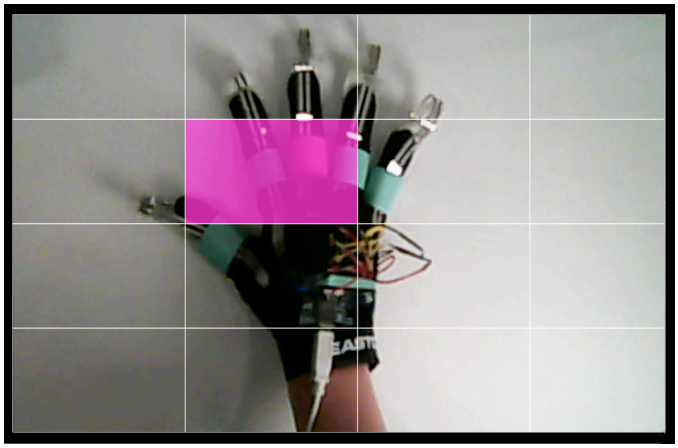

Figure 1. A screenshot of the tracking software.

3. RELATED WORK

3.1 Akai MPC

There are several drum machines which are similar in utilization as the glove. The Akai MPC line offers several devices that are sampling and sequencing capable with pitch and frequency moduation. The MPC is utilized by many artists in live performance and recording including DJ Shadow and Nosaj Thing.

3.2 AIRduino Guitar

Additionally, there are many interactive Arduino based instruments; of particular interest is the AIRduino Guitar which uses finger socks made of conductive fabric to determine the virtual fret, an accelerometer to determine the timing of a guitar strum, and an ultrasonic sensor to measure fret position. [1]

3.3 Reactable

The Reactable synthesizer is a product which is used with frequency in live performances. The Reactable uses a camera underneath a transparent table to track objects and motion. It is built around the TUIO framework for multitouch interfaces using fiduciary markers to differentiate objects from one another and track rotation. The TUIO framework performs computer vision similar to that in the glove software.

4. CONCLUSION

We measured success using two categories: glove usability and software usability.

4.1 Glove Usability

Although our project had a lot of room to become an easily understood, user friendly instrument, we were not able to realize its full potential in the time that we had. The glove was ultimately functional, though it did have a learning curve. Additionally, the glove was fragile making it unusable over a long period of time, though it was functional by the presentation date.

4.2 Software Usability

Ultimately, some of the software including that which would allow looping of sequences was unable to be used during the demo due to inconsistencies in musical timing and computer-to-computer networking issues. However, the software which was integrated for the demo was quite simple to use from the end user perspective, and the setup was minimal because of design choices including using OSC for communication, and because of this, it is agreed that the software was quite successful.

5. REFERENCES

[1] Fournier, David, Jean-Louis Giordano, Monireh Sanaei, Maziar Shelbaf, and Gustav Sohtell. "How to build an Air Guitar with Arduino, aka the AIRduino Guitar." instructables. instructables, 10 Nov 2009. Web. 19 Mar 2011. <http://www.instructables.com/id/How-to-build-an-Air-Guitar-with-Arduino-aka-the-A/>.