An early prototype of the augmented PsychoPhone

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Abstract

In this poster we present the early prototype of the augmented Psychophone - a saxophone with various applied sensors, allowing the saxophone player to attach effects like pitch shifting, wah-wah and ring modulation to the saxophone, simply by moving the saxophone as one would do when really being enthusiastic and involved in the performance. The possibility of scratching on the previously recorded sound is also possible directly on the saxophone.

Keywords: Augmented saxophone, Physical computing, hyper instruments, mapping.

1. Introduction

In this poster we present the early prototype of an augmented saxophone, aiming to emphasize the effect of the natural gestures of the saxophone player, as well as transform the saxophone into a multi instrument and sequencer.

Other examples of augmented saxophones have been implemented recently. Three different augmented saxophones, the *Gluisop*, *Gluialto* and *Leathersop* are presented in [1]. In [2] Schiesser and Traube suggest several mapping possibilities for various sensors attached to the saxophone, among others things coping with the muscle actions of the saxophone player. The metasaxophone [3] and the use of it [4] [5] is an example of how a saxophone can be transformed into a completely new instrument or controller.

The aim of this project was to create an early prototype of an augmented saxophone with a predefined mapping system. One of the most important motivations behind the design of the mapping system, was to do an attempt to copy the most vivid gestures of an average expressive saxophone player, and attach a relevant effect to the most noticeable expressive movements.

An example of this could be when a saxophonist is tilting the saxophone up in the air in the middle of a solo. This is often done when the player is blowing extraordinary hard, playing a very high pitch, or when expressing himself in a more aggressive manner.

Another important motivation for this project was to implement an interface allowing the saxophone to be the sole instrument on the stage - playing and controlling all the different aspects of a musical performance - instead of being a simple wind instrument.

2. Applied sound effects

Four different effect were applied to the saxophone. These effect were chosen in an attempt to make four very audible different effects.

2.1 A wah-wah bandpass filter effect

The wah-wah effect is very successful for playing rhythmic and almost percussive phrases on the saxophone.

2.2 A ring modulation effect

In order to implement a distorted bold saxophone solo sound, a ring modulation effect has been employed.

2.3 A pitch shifter effect

In order to play bass-like, low-frequency sounds, a pitch shifter was used - only passing the lower octave of the original sound.

2.4 Scratching on the recorded sound

As a last effect, it was decided to implement the possibility to scratch on a recorded sound. This would give the user a very percussive and rhythmic sound to play with.

3. Mapping and implementation

This project was implemented as a combination of Arduino units with sensors, and Max/MSP processing the input sound from a saxophone microphone. As data acquisition

units, Arduino NGs are used, connected via USB cable to a MacBook running Max/MSP 5.
In order to give the user as much physical freedom from the microphone as possible, a wireless Sennheiser EW122P G2 clip-microphone was attached to the saxophone. .

3.1 Mapping of the wahwah effect

An ADXL202 accelerometer placed on the front of the saxophone bell was utilized to measure fairly small, up-and-down movements of the saxophone, and it was decided to map this directly to the central frequency of the wah-wah effect - also slightly changing the amplitude of the q-point in the filter.
In this way, the saxophone player would be able to slightly, but still visually perceivable by the audience, shake the saxophone while playing it - and by this, attach a wah-wah effect to the output sound.

3.2 Mapping of the ring modulation

The action of the saxophone being heavily tilted upside vertically, was mapped to a ring modulation effect. Tilting the saxophone in this manner is fairly demanding when one is still playing on the saxophone. This action seems to fit well to the sound produced, as applying ring modulation to a wind instrument has a very strong effect changing the sound significantly. This action was captured using the attached accelerometer.

3.3 Mapping of the pitch shifter

Applying this effect gave the saxophone a very deep, growling, bass sound. This effect was mapped to the saxophone being tilted heavily to the left side. This action was measured by a Sharp GP1S036HEZ tilt sensor, attached next to the accelerometer, on the front of the saxophone bell.

3.4 Mapping of the scratching part

When scratching on a classical vinyl DJ setup, the DJ is typically 'opening' and 'closing' the sound using a fader in one hand - and moving the vinyl back and fourth with the other hand.

Figure 1: Closeup of the fader and pushbuttons on the psychoPhone

It was decided to copy the way a DJ is scratching very directly. One slider controls the amplitude of the sound, and the other slider can be seen as the actual vinyl surface being moved back and forth. By moving these two sliders attached to the saxophone, the performer would trigger the scratching part.
Furthermore, four buttons were placed on the side of the bell - and by pressing one of these, the player was able to choose between four recorded sounds to scratch on.

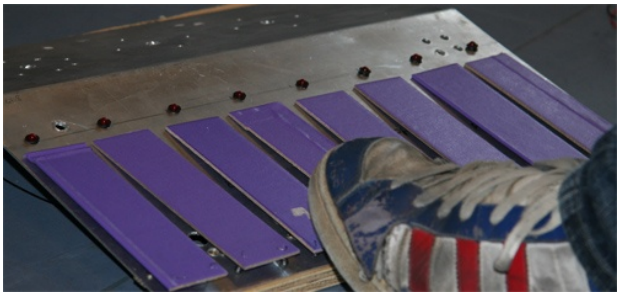

Figure 2: The prototype of the foot-pedal sequencer in action

In order to use the saxophone as the sole instrument on the stage, a small 8-step foot controlled sequencer was implemented. This allows the user to play back the four recorded sounds from the saxophone, in a similar way to a vintage analog step sequencer.

4. Future development

The implementation of the augmented Psychophone is an undergoing process, and improvements of the design, mapping and applied sensors are currently being improved. Demonstration videos of the instrument in use will be uploaded to
http://www.imi.aau.dk/~nib/augmented_psychophone
in the nearest future, along with pictures of the current state of the instrument.

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