STEREO SPREADER

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ABSTRACT

The spreader_mod function spreads a mono audio signal though the stereo image summing the dry original signal with a combination of delay and pitch shift which are independently applied to the left and right channels.

1. INTRODUCTION

This report analyses the main function by breaking down its main parameters. It will also analyse four different audio signals; a 1kHz tone, acoustic guitar, vocal track, and a vocal track recorded through a telephone. Each of these files where used to expose the different effects of this function.
The spreader function aim is to be used as an effect during music mixing situations. A hypothetical scenario would be; having a piece performed by different instruments where some of them clash with each other, since they share the same space in the stereo image, this processing effect would let the instruments be perceived as being spread through the horizontal plane of the mix, therefore letting other lead instruments take the centre.

2. SYNTAX

```
spread_out = spreader_mod( signal , delayL , delayR , pitchL , pitchR , mixer , fs )
```

3. DESCRIPTION

The main parameters of this function are:

signal: this would be the mono signal to be processed.
delayL: this is the amount of delay in milliseconds for the signal in the left source.
delayR: amount of delay in milliseconds for the signal in the right source.
pitchL: amount of pitch shift for the left source in cents.
pitchR: amount of pitch shift for the right source in cents.
mixer: amount of dry signal in the output
fs: sample rate in Hz

Is important to take into consideration that only a mono input can be used for this function. The output signal will be a double column matrix (stereo file). This function calls to the pitch shift function which was adapted by Adam Nunces from DAFX by Udo Zoelzer.

4. SIGNAL ANALYSIS

As mentioned before, their are five signals that were analysed; 1kHz tone, an acoustic guitar, a saxophone, a vocal track and a vocal track recorded through a telephone. The reason of choosing this five signals is to show the results given in different instruments with different qualities.

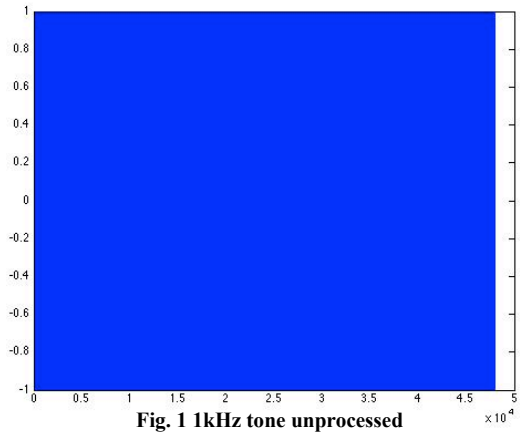

Fig. 1 1kHz tone unprocessed

Fig. 1 shows how the 1kHz tone looks unprocessed. But now processing the signal with slight parameters (Fig. 2) we can see how it affects the left and right signal differently.

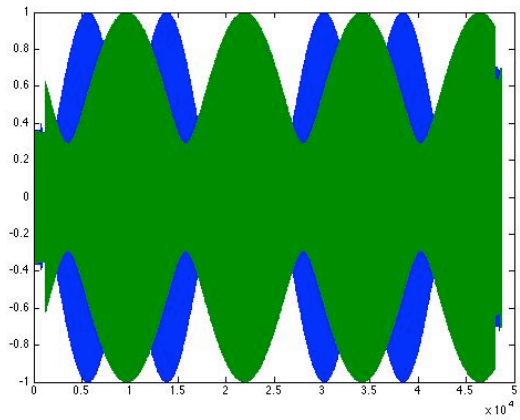

Fig. 2 1kHz tone slightly processed

In fig. 3 we can see how dramatically changing the delay time to 112 ms and the signal's pitch in the left source to -45 cents changes the relationship of left and right signals significantly.

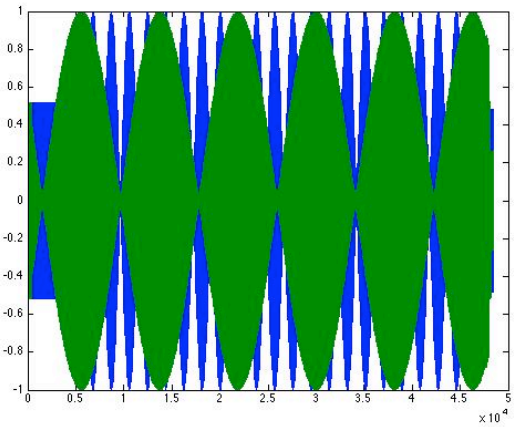

Fig. 3 1kHz tone extremely processed

The values used for fig.2 and fig.3 were the following:

```
proc_tone = spreader_mod( tone , 15 , 25 , -10 , +7 ,
0.5 , fs );
proc_tone_ext = spreader_mod( tone , 112 , 10 , -45 ,
+10 , 1 , fs );
```

The parameters chosen for the guitar, were:

```
proc_ac_gtr = spreader_mod( ac_gtr , 8 , 6 , -2 , +2 ,
0.1 , fs );
proc_gtr_un_thresh = spreader_mod( ac_gtr ,40 , 50 ,
-20 , +20 , 0.5 , fs );
```

The sound for the first set of parameters was appealing to the performance of the guitar, the second set of parameters are drawing the line between how far you should go with them on this specific audio file, the phase relationship between the effected and dry sound makes the guitar sound as if it was jumping from left to right and the change in the pitch parameters made it sound extremely dissonant. When the parameters are too high, the processing does not work in a musical scenario.

The parameters for the sax were:

```
proc_sax = spreader_mod( sax , 15 , 10 , +5 , -3 ,
0.1 , fs );
proc_sax_un_thresh = spreader_mod( sax , 45 , 60 , 45 ,
-60 , 0.9 , fs );
```

The first set of parameters worked fine towards the aim of this effect, the second parameters draw the line of where the processing stops to act as a spatial effect and works more like a harmoniser. The second set does not give a bad result to the output signal, just a different effect.

On the vocal track the parameters used were:

```
proc_vox = spreader_mod( vox , 15 , 17 , -3 , +3 ,
0.1 , fs );
proc_vox_un_thresh = spreader_mod( vox , 30 , 45 ,
-61 , +53 , 0.1 , fs );
```

Same results as the saxophone, this effect starts loosing its aim during the first set of parameters, but brings a harmonising effect. This harmonising effect could be used in cases where there is only one take of the vocals and the mixer decides to create backing tracks for it.

The last track to be analysed is the vocals recorded through a telephone. The reason for this track to be used is to show how the effect works on already effect tracks. The results were similar to the dry vocal track.

Here are the parameters:

```
proc_tel_vox = spreader_mod( tel_vox , 17 , 20 , -5 ,
+5 , 0.3 , fs );
proc_tel_vox_un_thresh = spreader_mod( tel_vox , 60 ,
43 , +109 , -133 , 0.8 , fs );
```

5. DIAGNOSTIC

The aims of this effect are definitively achieved, although they will vary from signal to signal. By listening to the five different processed signals, I can conclude that in the case of harmonically played instruments such as a strumming guitar, the parameters in the effect need to be really low, if they are driven really hard, the effect will cause severe phase incoherence and the sound will not only sound out of tune, but will also give the impression that is jumping from left to right. With an instrument that is performed in a more melodic way, the effect works perfectly fulfilling its aim and when the parameters are driven at high values it acquires harmonising qualities and can be used to create pitch shifted copies of the same file but spread left and right.

6. REFERENCES AND BIBLIOGRAPHY

Stuart Smith . 2013. Stuart Smith . [ONLINE] Available at:http://www.cs.uml.edu/~stu/. [Accessed 27 May 2013].

Zölzer, U, 2011. DAFX: Digital Audio Effects. 2nd ed. West Sussex, United Kingdom: Wiley & Sons.