Warm Chorus - Demo

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Abstract

The Abstract

Keywords — Keyword 1, keyword 2

1 Introduction

Chorus is an effect which purpose is make sound bigger. It simulates that instead of one player or singer there are multple ones.

Dudas was assigned to create chorus effect for New Asia String Quartet to get more ensemble-like sound for Haydn's Seven Last Words, Op.51, performance. Using digital effect was appropriate as they were using amplification and artificial reverb as well. As current chorus effects sound unnatural and they have detectable modulation and beating effects Dudas decided to design new chorus algorithm, Warm Chorus. This algorithm is more based on physical phenomena than just simple mathematical consepts. [1]

In this report we discuss about implementing Warm Chorus algorithm and how it is better than current chorus algorithms. As well we describe in detail how we have implemented the algorithm.

2 Theory

2.1 Generic Chorus

Generic chorus algorithm is based on simple idea that copies the original sound and then delay different copies with different delays and then slightly detune them. The very basic chorus is just parallel delay lines wich are modulated with low-frequency oscillator (LFO) to get some detuning.

Industry standard chorus is is slighly different and even more simple but better sounding. It consist of one feedback delay line and one feedforward delay line whose are modulated with LFO as in the case of basic chorus. Block diagram of the industry standard chorus is shwn in the figure 1

Usually in chorus applications the parameters that can be adusted are not real life related. Usual parameters are for example modulation depth, modulation speed and feedback gain.

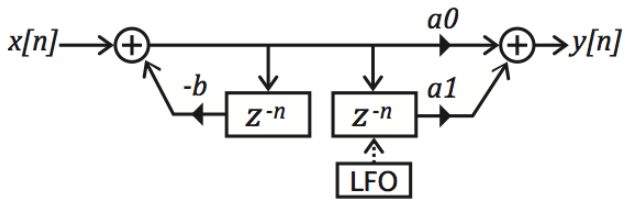

Figure 1: Block diagram of industry standard chorus. [1]

2.2 Orchestral Section Model

Orchestral section model is based on real orchestra section and it takes account placement and playing skills of players. Meaning that the different players play different amount out of tune and usually the worst players are placed in the back of the section. [1]

This is completely new way of thinking about chorus as its interest are based on physical modeling rather than computational tricks. As the current chorus has parameters as modulation depth and modulation speed orchestral section model has more real life parameters. Dudas' warm chorus algorithm is mainly based on such a model [1].

3 Implementation

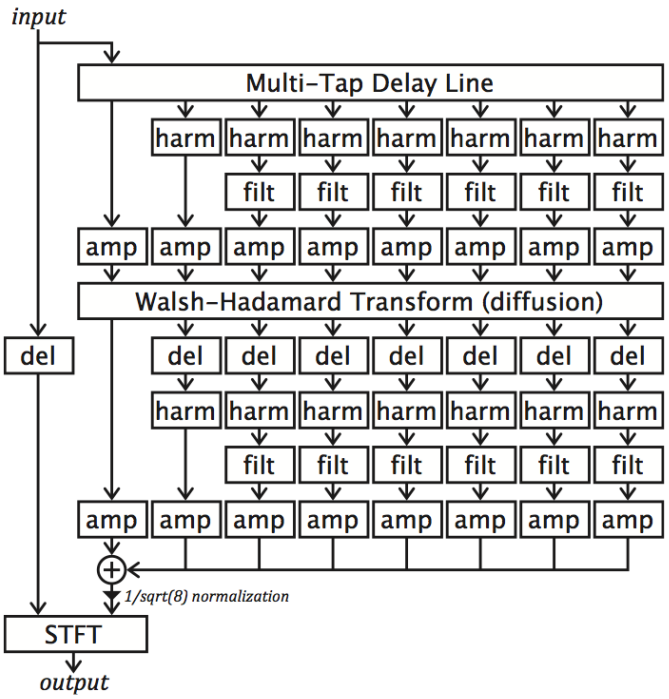

Figure 2: Block diagram of the warm chorus algorithm. [1]

3.1 Harmonizer

Harmonizer is structure which detunes input signal slightly to get different "players" play slightly out of tune as in the real orchestra section. Transpose of the harmonizer is always sharp because Dudas [1] claimed that sharp notes are percieved less out of tune than flat ones. The block diagram of the harmonizer is shown in figure 3

In harmonizer structure there are four channels which are windowed with four sinusoidal windows that are 90 degrees more out of phase than previous. To decrease the beating effect that is present in the current chorus there is added some random variance to the detuning of the sound. That means that each window is slightly differently out of tune. That is as well related to the real world as the players usually do not play whole music piece in same detuning. [1]

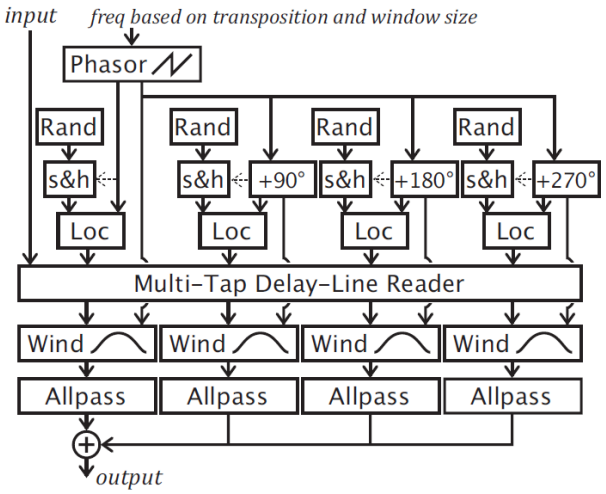

Figure 3: Chorus Harmonizer Block Diagram. [1]

The detuning is made with multi-tap delay-line which is modulated with phasor signal which is basic sawtooth wave form. After that each channel is windowed by using Hanning window and after that it is allpass filtered. The windows are triggered with phasor signal and it as well triggers the randomization for each window. After allpass fitering all the channels are summed together. [1]

3.2 Temporal processing

In addition to the harmoniser stages, the temporal processing includes a multi-tap delay, low-pass filters, random amplitude ramping and a diffusion stage.

The multi-tap delay line simulates the delays between the players.

4 Results

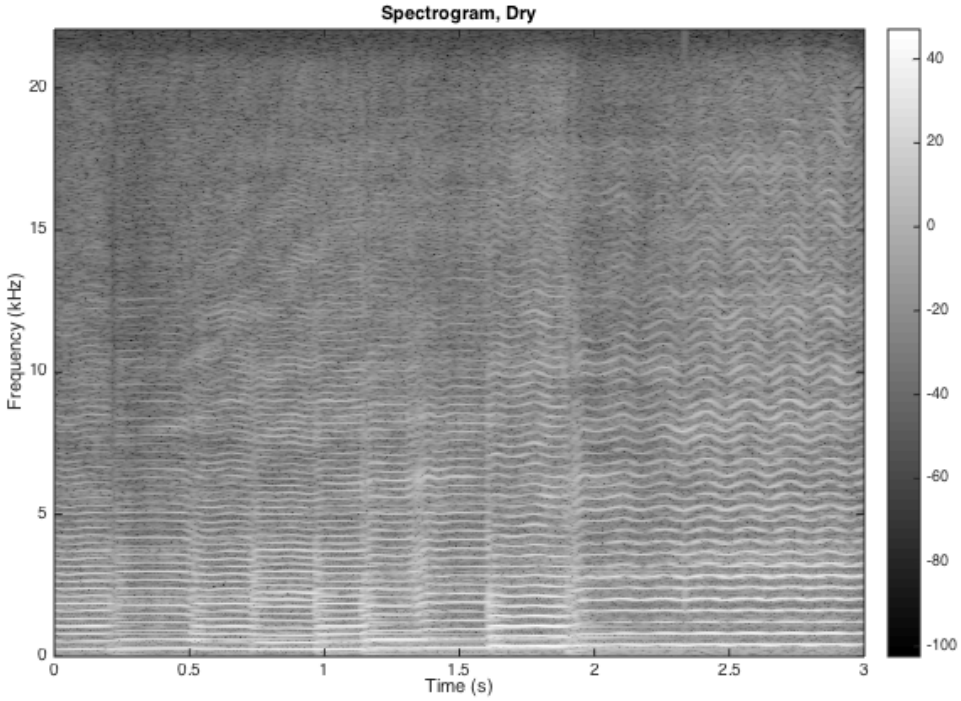

Figure 4: Spectrogram of dry signal.

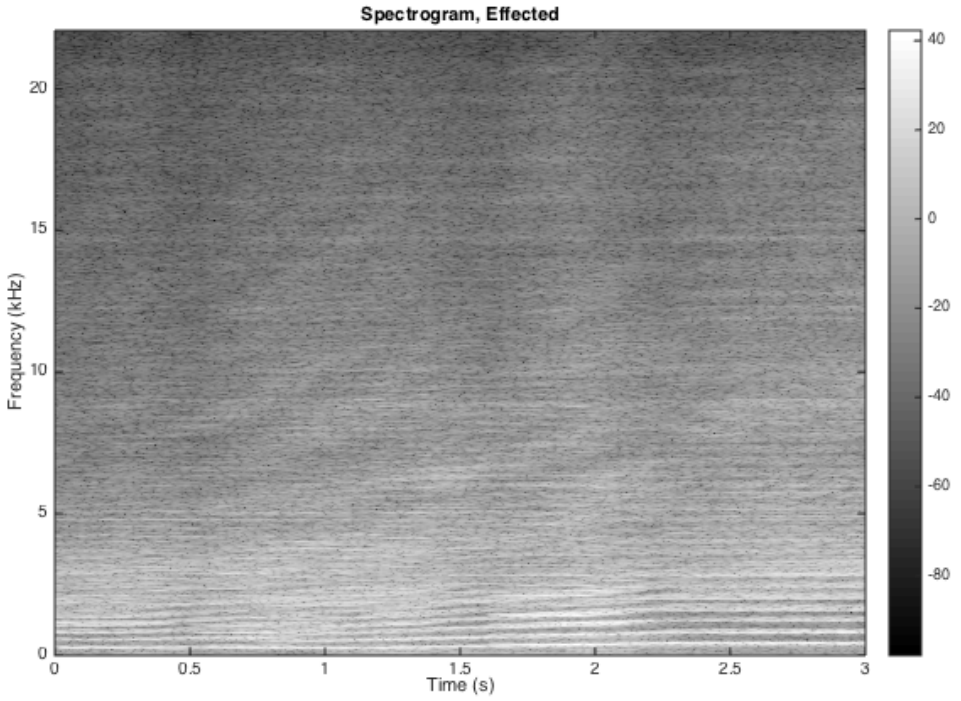

Figure 5: Spectrogram of effected signal.

5 Conclusions

Conclusions text.

References

[1] Warm Chorus...