Amazing grace: How sweet the sound of synthesised bagpipes

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Abstract

A bagpipe is a type of wind instrument that contains a melody pipe, which has an enclosed reed called the chanter and other drone pipes. The chanter is the part of the bagpipe that supplies the note, and the air that the pipes are fed is provided by the bag, which is inflated by a blowpipe and driven by the player's arm. The goal of this project was to create a bagpipe using a program called Supercollider. Supercollider is used for audio synthesis. While creating this artificial bagpipe (here on referred to as a 'synth'), it was broken down into four components: the chanter, the base drone, the first tenor drone and the second tenor drone. The chanter has the frequency of the note, the base drone's frequency will be half that of the chanter and the frequency of the tenor drone will be half that of the base drone. This is because of the length of the pipes in relation to each other. In order to create the synth, a sine oscillator was used, and then put through a resonance filter, and then a reverb filter. This was done in order to mimic the echo that sound has when it is forced through a tube, or enclosed space. All four pipes were added together to create the synth. In order to play a song, the synth was put into a pattern so Supercollider could receive an array of notes, which serve as the frequency of the chanter, and then play the song automatically. The notes for Amazing Grace were transcribed into midi-notes and beat durations and these arrays were fed into the pattern to create the song. The synthetic version of Amazing Grace, in terms of frequency and loudness, was then graphed and compared to the graph of a recording of Amazing Grace played on a real bagpipe. There are differences between the two sound files, the most significant being that the real bagpipe has much more variation in terms of loudness. The synthesized bagpipe had a more gradual and subdued noise level, where the natural bagpipe was much more randomized. Taking the comparisons into consideration, Supercollider can be used to create an approximation of a bagpipe, but under scrutiny, the artificial version currently falls short.

Key words:
bagpipes, sound, synthesized, synthesised, supercollider, composed, synthesised bagpipes

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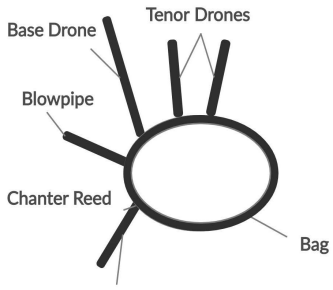
Introduction

- A bagpipe is made of an enclosed reed, a reed pipe, the chanter, drone pipes
- The chanter supplies the note, and the reed is fed from the bag that the operator drives with their arm

Figure 1: Diagram of a Bagpipe



Purpose

To synthesize a bagpipe using Supercollider

Methods

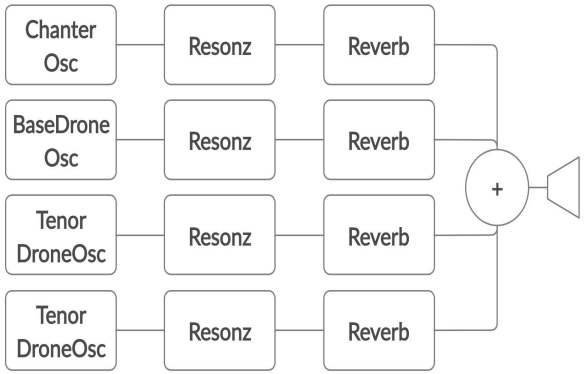


Figure 2: Flowchart of the Synth to an audio output, where Resonz represents a resonator

Methods

- Sheet music to *Amazing Grace* was transposed into midinote values
- Values and Synth were put into a pattern

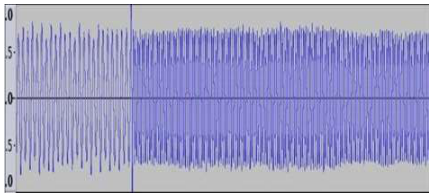


Figure 3: Sound wave of Amazing Grace synthezied

Results

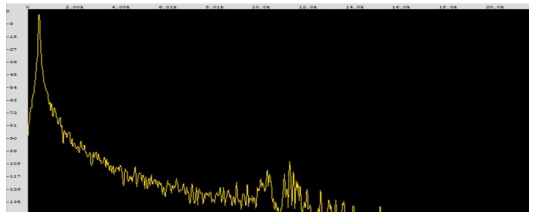


Figure 4: Frequency vs Loudness graph for synthesised version

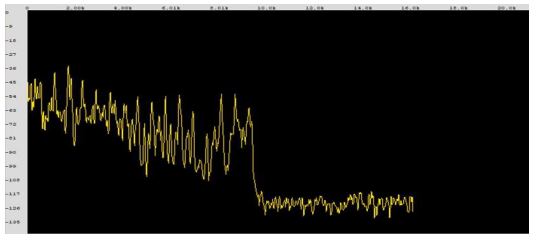


Figure 5 Frequency vs Loudness graph for natural version

Conclusions

- The natural graph has a varied loudness
- The loudness of the synthesied bagpipe drops off in a gardual fashion
- Shows supercollider can produce an approximation of a bagged reed
- Can eventually be used in proformances, and choirs where there are limited memebrs
- Can be used in audio software and audio post production

Literature Cited

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Breizh Partitions. Amazing Grace. N.d, Celtic Scores, N.d. Digital

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