University of Victoria

CENG/ELEC/SENG 399 Fall 2014

**Final Report**

SEES PROJECT

**Spatial Echolocation Enhancement System**

Design Team 14

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Software vs hardware convolution - [pasted from another document … not sure which one!]

One of the most suitable effects in the ‘toolbelt’ of a recording or mixing engineer is Reverberation. Reverb can be created and added to signal in different ways. Reverb could also be .reverb could also be created through computer using Digital Audio Workstation through software.

Software reverbs are divided into two parts convolution and algorithmic. Convolution reverb uses an Impulse Response (IR) to create reverb. The advantage of convolution reverb is that it can accurately simulate reverb and can sound very natural. The disadvantage of convolution reverb is that is it computationally complex which can take up a lot of a computer’s processing.

Software reverb that does not use convolution creates echoes using mathematical algorithms to simulate the delays that occur in reverb. The synthesis of echoes can be performed much for efficiently on a computer using less processing. The algorithm reverb doesn’t sound as natural as convolution reverb. The problem with convolution reverb in real time is you have to convolve your incoming signal with the reverse of the impulse, so you have a minimum latency equal to at least the length of your impulse sample. That's even before you consider any computer or sound card latency. So you could imagine that a really long impulse sample, like a cathedral, could make the effect unplayable in real time [D]

**Glossary**

**Binaural audio -** Type of audio that allows the listener to perceivedistinct and genuine 360° sound.

**CMOS -** Complementary-symmetry metal–oxide–semiconductor**,** a technology for constructing integrated circuits

**Fast Fourier Transform (FFT) –** It is an algorithm to compute the discrete Fourier transform (DFT) and its inverse.

**Fastest Fourier Transform in the West** (**FFTW**) – It is a software library for computing discrete Fourier transforms (DFTs) developed by Matteo Frigo and Steven G. Johnson at the Massachusetts Institute of Technology.

**Head Related Transfer Function (HRTF) -** It is a response that characterizes how an ear receives a sound from a point in space

**Kinect -** It is a line of motion sensing input devices by Microsoft for Xbox 360 and Xbox One video game consoles and Windows PCs.

**SEES** - Spatial Echolocation Enhancement System.

**Time of Flight (ToF) -** Describes a variety of methods that measure the time that it takes for an object, particle or acoustic, electromagnetic or other wave to travel a distance through a medium.