Sound Analysis and Synthesis of Musical Notes

Final Project Review

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Outline

1. Recap of mid-term Review
   - Sound Analysis
2. Synthesis
   - Inverse Fast Fourier Transform
   - Waveguide Synthesis
   - STFT and Envelop Estimation

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Sound Analysis

- FFT : To extract essential frequency components from sound samples
- STFT : To obtain time variation of the frequencies in sound samples
- Audio compression using STFT.

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IFFT

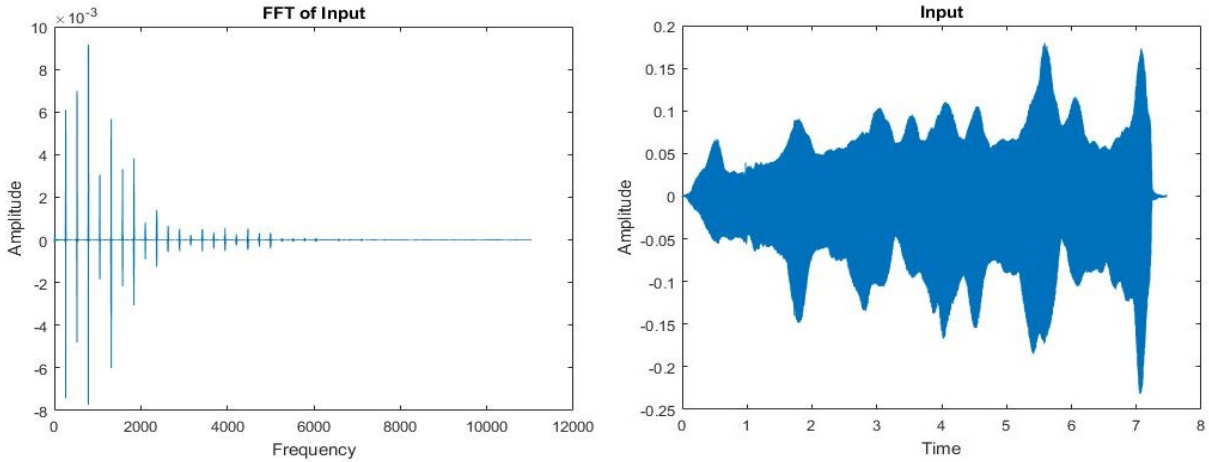

Figure : Original Recorded C4 Note

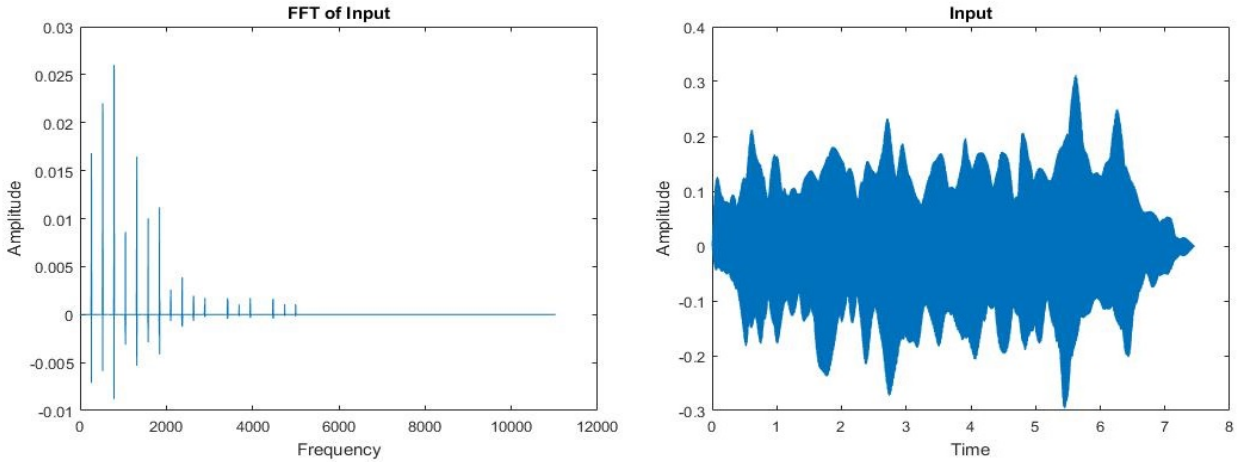

Figure : Synthesis using Inverse Fast Fourier Transform

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Waveguide Synthesis

Waveguide method was successfully applied to synthesis the Acoustic Guitar. However the Harmonium synthesis requires indepth study of physical and mechanical phenomenon behind the note generation in the Harmonium.

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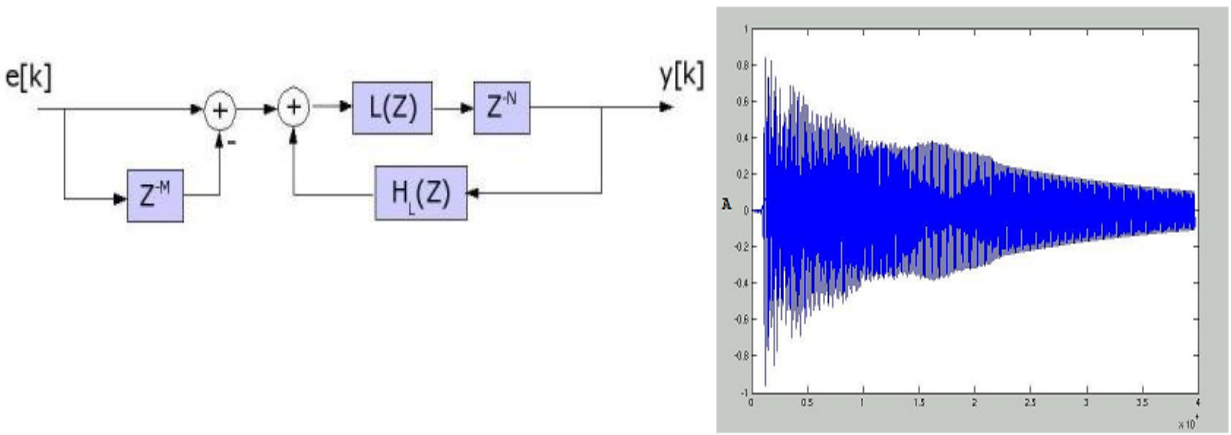

Figure : Waveguide Synthesis

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Short Time Fourier Transform

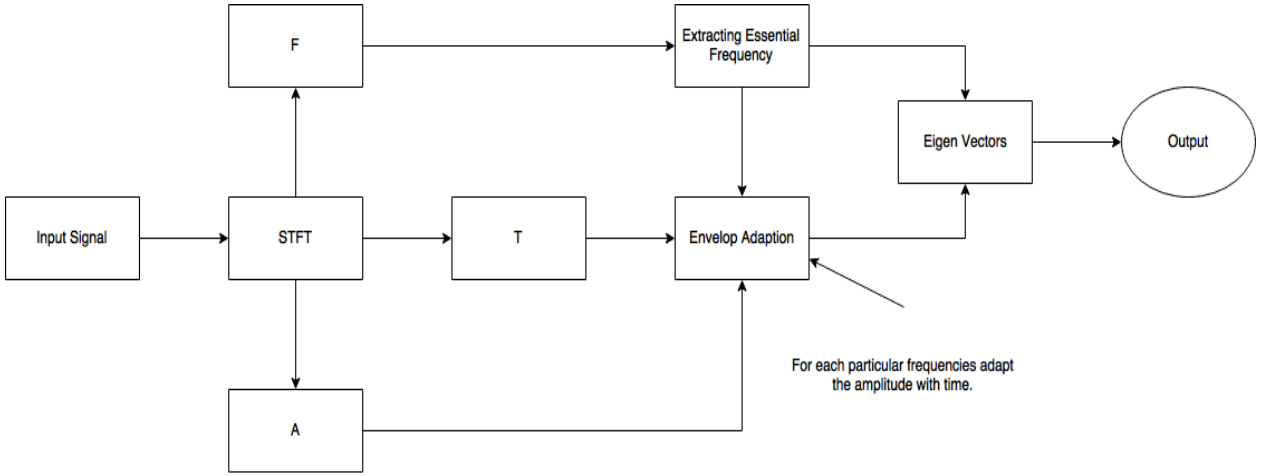


Figure : Synthesis Process

Short Time Fourier Transform

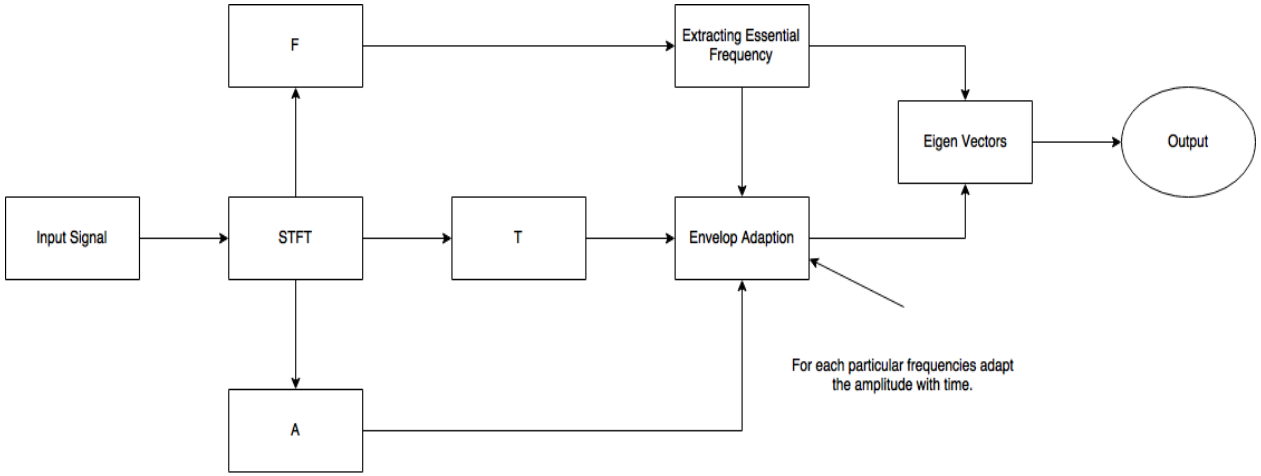


Figure : Synthesis Process

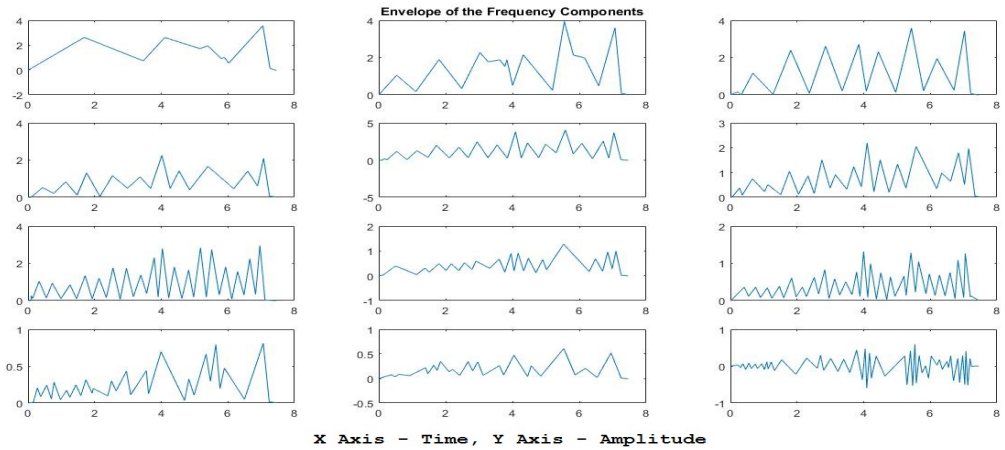
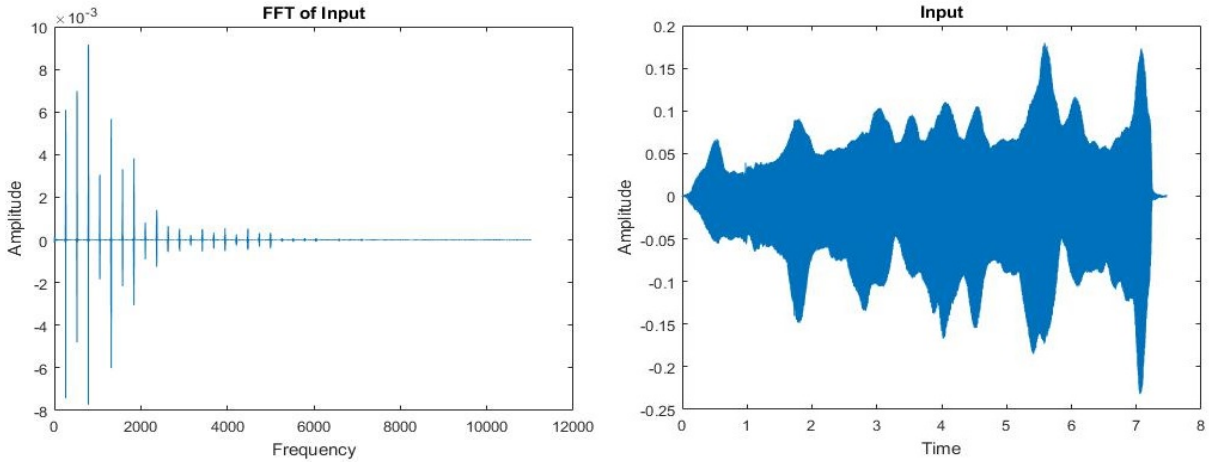


Figure : Envelope Synthesis

FFT



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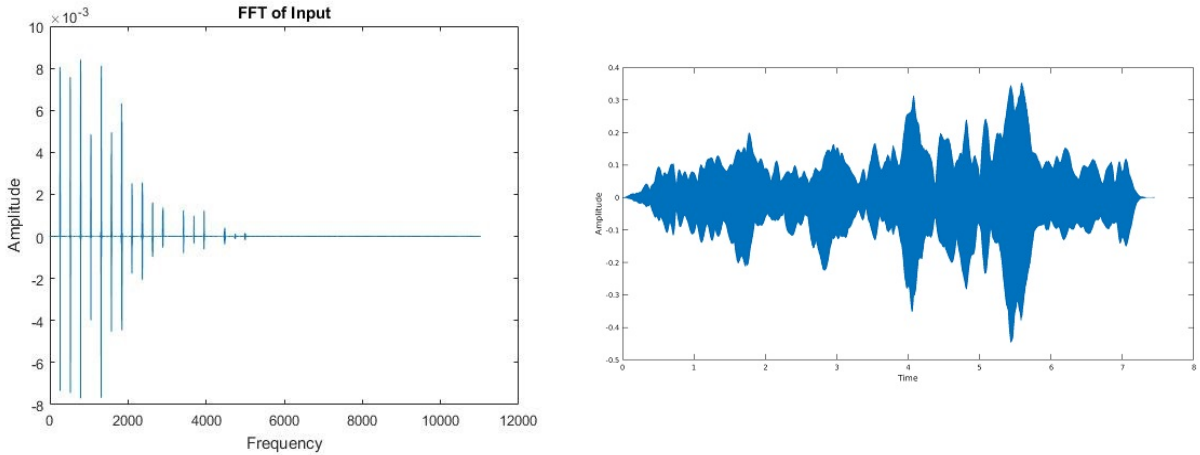

Figure : Synthesis Using STFT and Envelope Estimation

References I

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- Towards High-Quality Sound Synthesis of the Guitar and String Instruments, by Matti Karjalainen , Vesa Vslimski , and Zoltan Janosy. International Computer Music Conference, September 10-15, 1993, Tokyo, Japan
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References II

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