

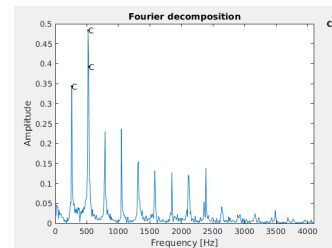


Bachelor thesis project proposal:

Can computers hear? – The mathematics of music

Project description. Have you ever wondered how a computer program can recognize music, voices or sounds in general? As we know sound waves are composed of several frequencies. To study the frequency content of sound waves, the Fourier transform can be used.

In this project you will write a computer program that can recognize individual musical notes generated by an instrument. Once the frequencies are recognized there are various possible applications and extensions.



The project consists of the following tasks:

- Read about the Fourier transform, frequency spectra and the relation between musical notes and frequencies. Read about the discrete Fourier transform and FFT.
- Generate sound waves in Matlab. Take the Fourier transform of the generated sound waves and verify that the frequencies are the same as the generated ones.
- Record sounds to the computer and use the FFT to transform the time signal to the frequency domain. To begin with record single notes. Then record melodies and split them up into smaller chunks with individual notes.
- Identify individual notes or chords. One simple approach is to choose the strongest frequency in the spectrum but then we cannot recognize chords. This approach can be refined in various ways.

References and further reading:

- Review the Fourier transform.
- Matlab documentation about FFT (<https://se.mathworks.com/help/matlab/ref/fft.html>)
- Frequency and harmony (https://en.wikipedia.org/wiki/Music_and_mathematics#Frequency_and_harmony)

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