Lecture 5 – Short Time Fourier Transform

For audio analysis, the time and frequency domain representations offer little in terms of useful information; the temporal representation does not offer information about the frequency domain and the spectral domain does not provide information about the time domain. For a more useful representation, the time-frequency domain representation is presented. It essentially encompasses the temporal and spectral information in one.

To transform a signal to the time-frequency domain, the Short Time Fourier Transform (STFT) can be applied. STFT is an algorithm that essentially applies the Discrete Fourier Transform (DFT) in small consecutive frames of a waveform. This means that inside the frames, temporal information is lost. However, when the frame is small enough, the signal inside a frame is constant enough that sufficient temporal information is retained.

Lecture 8 – Sound Synthesis

The aim of sound synthesis is to create sounds that are musically, or otherwise, interesting. They can represent real-life sounds, such as instruments or speech, or be creative and artistic. Its applications are mainly artistic, but it is also used in communications. Some important qualities of sound synthesis are that it is real-time and intuitively controllable.

Lecture 8 –Sampling Synthesis

The idea of sampling synthesis is storing recording natural sounds, called samples, then manipulating and playing them back on a system called a sampler. This method of sound synthesis is widely used in artistic applications. A key problem of sampling synthesis is balancing the memory usage and sample quality.

Wavetable synthesis is a method of sampling synthesis that uses single periods of complex waveforms as seeds for the sampler. The seeds are looped, which reduces the memory usage. The looping is possible, because the sustain part of many instruments are roughly periodic. Also, less processing power is needed as the complexity of the waveform is only played back and not somehow computed.

Overall, the lectures were a good package. I especially liked the in-depth explanations of time-frequency representations and their uses. Lecture 7 (Audio coding) was the least interesting out of all, because the topic was not very interesting and very complicated.