Introduction

Sound is all around us, from birds in trees to traffic in our environment; life has a soundtrack of its own. However the spontaneity of the sounds we hear in everyday environments cannot be controlled or sequenced. Many of the auditory effects we hear are the results of natural phenomena, such as wind whistling through trees or past our ears, or of manmade functions such as engines, horns, buzzers and so on, all of which are very specific in the sound that they create. Although some devices we hear in our environment are the result of computer circuitry, they are still considered to be "acousmatic" with regard to recording sound. The idea of recording elements of these natural everyday sounds and composing musical scores from them is known as "Musique Concrete". The Term "Musique concrete" simply means "Concrete Music" or, "Real Music" and is a term that was pioneered by Pierre Schaeffer in the 1940's. "Musique Concrete" is generally considered to be music made using natural or environmental sound, and without the restrictions of conventional music such as melody, harmony and rhythm. Some of Schaeffers most celebrated "Musique Concrete" compositions were collectively known as "Five Studies of Noises" and included "Study in Purple" and "Study of Railroads" illustrating the theory behind "Musique Concrete" perfectly.

Pierre Schaeffer (Source of image http://home.swipnet.se/sonoloco19/grm/schaefferop.jpg)

Tonality

The timbre of a sound describes its characteristics. For instance the timbre of a brass instrument is what allows the ear to distinguish the difference between the tone of saxophone from the tone of a trumpet. Timbre can also describe the “colour” or “quality” of a sound whether musically or naturally generated. Every sound that we hear has timbre and “Musique Concrete” was a perfect platform for young pioneering composers such as Schaeffer to use early recording technology to illustrate this. Using the fundamentals of musical tonality and applying them to everyday environmental sounds, Schaeffer was able to compose pieces with conventional musical narrative but without a musician in sight.

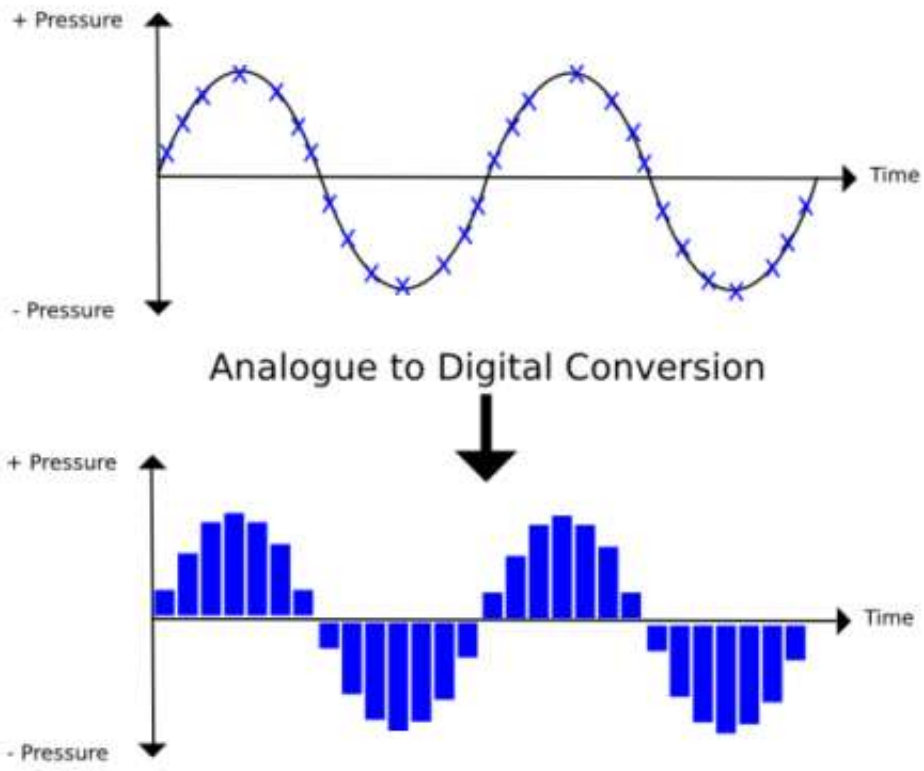
The word “Consonance” is used in music to describe a tone that is harmonious or considered musically “stable”. Its opposite is “dissonance” which refers to a sound that is disharmonious or “unstable”. Simply put, Consonance and dissonance, explain whether a multi tonal sound works well to the ear or not, but is not restricted in use with regard to “musique concrete”. For example short clips of a flock of birds chirping may be considered to have consonance qualities where as the sound of an eighteen wheel truck zooming past might be considered to be dissonant. Both may be captured and edited to give a result that pleases us; however, tonally both are very different.

“Critical bandwidth” plays a big part in how our ears perceive the sound that is all around us. In order to explain the significance of critical bandwidth we must consider how sound is interpreted by our ears. If we listen to a two tone signal with a frequency difference of Zero, only a single note is heard, but as we increase the frequency difference, beats occur but are not perceived as our sonic perception is restricted by the basilar membrane in our ear which fuses the two tones together. As the frequency difference is increased to between 12 to 15 Hz the beats cease and are replaced with dissonance. This dissonance occurs when the basilar membrane is unable to decide which frequency to vibrate at and continues until the frequency difference is increased to a point that the basilar membrane is able to separate the two tones, this is known as the point of “Critical Bandwidth”. This helps us to understand how our ears perceive sounds in our environment and how the frequencies

of our surrounding elements interact to create what we hear. With regard to recording environmental sounds, Microphone selection can affect what results are achieved. A microphone with a wider polarity and a higher frequency response will achieve different results than a microphone with a narrower polarity and a lower frequency response placed in the same environment. Although early pioneers of “Musique Concrete” were restricted by the recording equipment available to them (usually early tape recorders or other analogue devices), today we are able to take our recorded material and convert them into binary data, giving us the freedom to utilize digital manipulators and sequencers to create results that appeal to us. This process is known as sampling.

Sampling

Sound sampling is a process used to convert analogue sounds into digital binary data that can be stored and handled by a computer. Analogue sound waves are continuously changing and the oscillation of the sound wave (its frequency) determines the pitch that we hear. The higher the frequency of the sound, the higher the pitch we hear. However computers do not deal with continuously changing signals and require solid binary information (1’s and 0’s). Therefore we must apply the process of sampling to the analogue sounds we have recorded in order to convert them into binary data. To perform this task we need to implement a device known as an analogue to digital converter (ADC). This device works by sampling the sound wave at regular intervals and giving it a binary value for that sample point. The analogue to digital converter performs this process a certain number of times per second and this is known as the “sampling rate”. For instance a 16 KHz sample will perform this process 16,000 times a second.



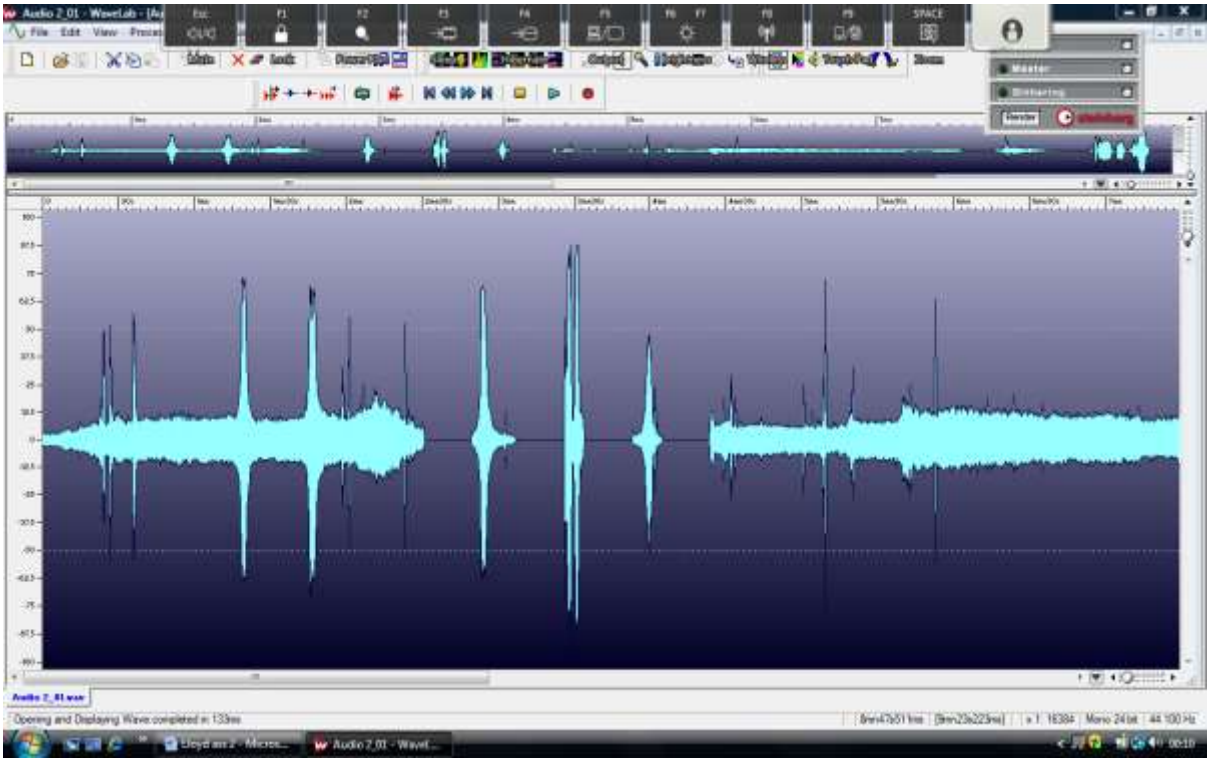
Analogue to Digital Conversion

(Source of Image http://www.jodysalt.com/wp-content/uploads/2009/09/analogue_to_digital.png)

My Recordings

After researching the history of “Musique Concrete” and applying what I had learned to my own recordings, I decided to base my compositions on the sound of trains as homage to the early work of Pierre Schaeffer. Using a portable marantz recorder and dynamic microphone I positioned myself next to a train stopping area near Hendre Lake in the St Mellon’s area of Cardiff. Over the course of around 45 minutes to an hour I was able to collect various sounds of trains zooming past and stopping so that I could record the pistons and vibrations of the engine, and moving slowly, allowing me to record the grinding of the wheels along the tracks. I recorded during the evening as there would be minimal background noise allowing me to concentrate solely on capturing noises of trains. Once I had recorded my sounds I was then ready to transfer them onto my Computer via a USB

cable. At this point my audio was one continuous sound file, so my first task was to open the audio in Steinberg Wave lab where I could select points of interest and cut them from the original sound file. I was then able to clean up each snippet by trimming them at the zero crossing points. This ensured that there were no clicks or pops from clumsy editing when importing them into my sampler later. It was also at this point that I normalised the audio I had recorded, in order to make sure that all my recorded sounds were of the same volume. Each clip was treated in wave lab and saved as a short wave file to the computer's hard drive to be loaded into my sampler.

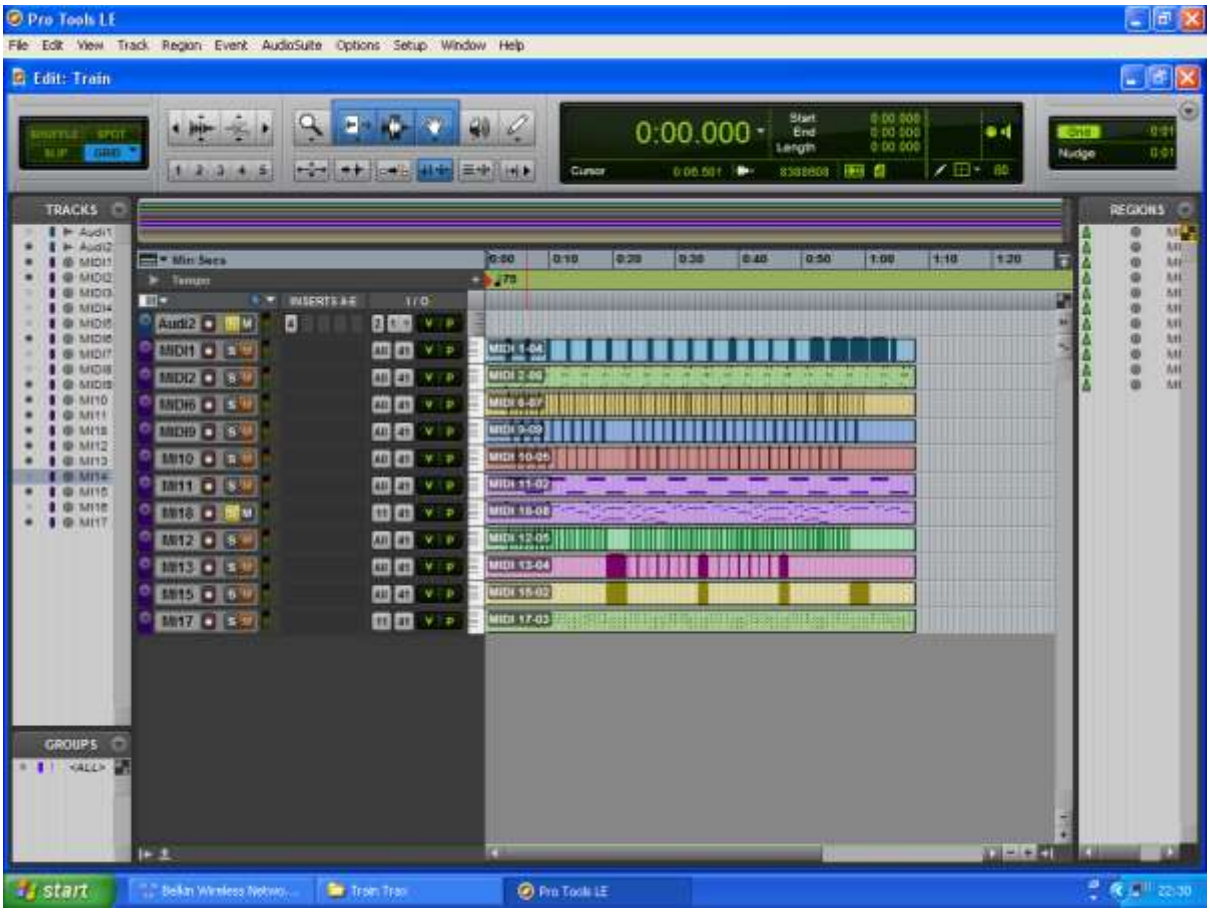


How my sounds looked when imported to Steinberg Wave lab 6

Sequencing samples Using Pro tools and Kontakt

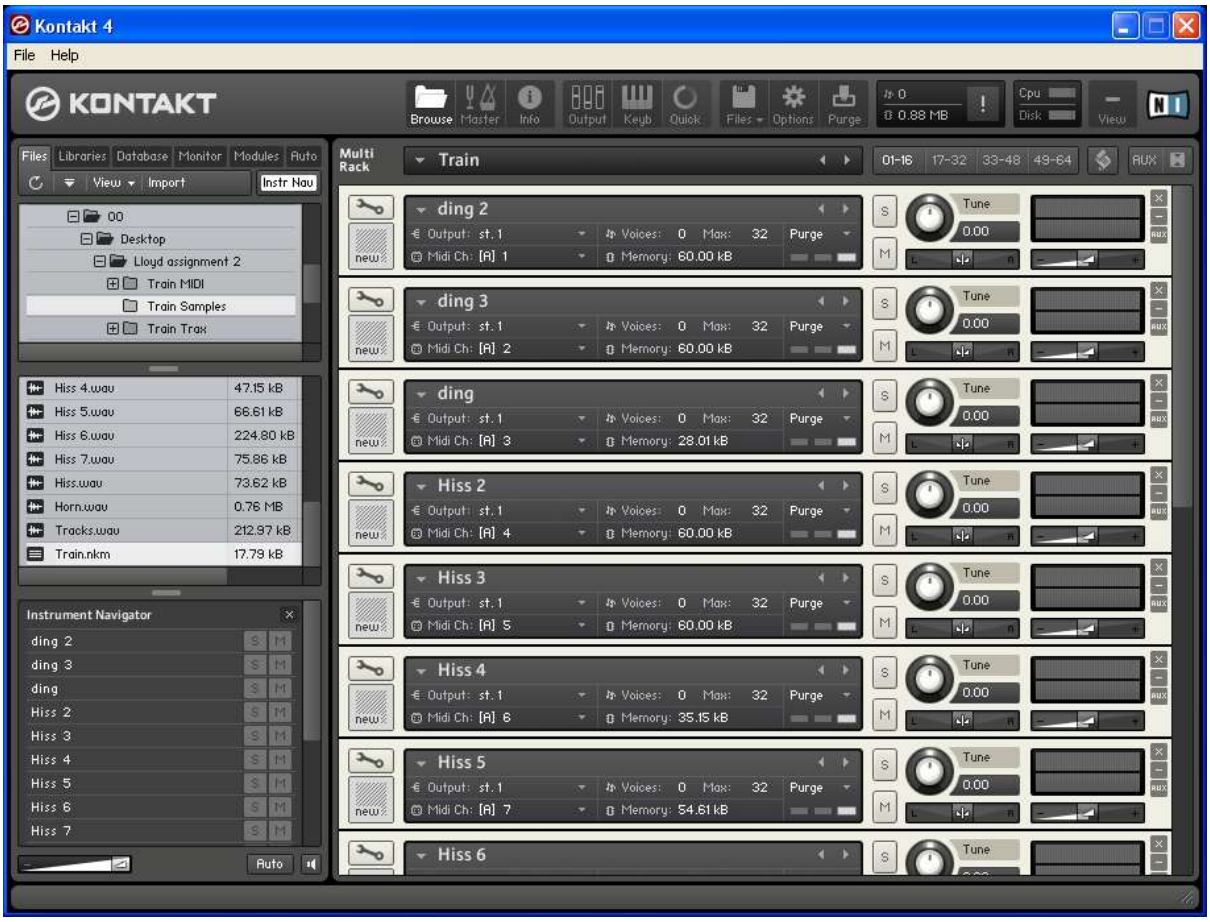
Before I could import each of my sampled sounds into Kontakt I decided the best place to start would be to set the tracks I would need in Pro tools and select my inputs and outputs correctly. I did this by opening a blank project in pro tools, then adding two new audio tracks, one mono and one stereo. On the mono audio track I inserted a click to give me a time reference to play my samples too. I decided at this point that as the piece was made entirely of train sounds, I wanted to keep the

tempo quite slow to give the listener the sensation of the piece “chugging along”. The tempo I settled on was 75bpm as this gave me the result I wanted. On the second stereo audio track, I inserted Native instruments Kontakt as an Real Time Audio Suite (RTAS) insert. I now needed to insert the MIDI tracks that I would actually use to play each part of my composition. I knew that there are 16 MIDI channels available simultaneously, so I inserted 16 MIDI track in my pro tools project.



Next I needed to create 16 instruments in Kontakt that would have each of my recorded samples loaded into them. Switching to Kontakt, whilst using it as an RTAS instrument, I used the navigator to find the folder I had stored all of my samples in, then by double clicking each sample in the navigator, they opened in the workspace window loaded into an instrument. Each instrument was numbered 1 to 16 corresponding to the 16 MIDI channels I had created in Pro tools. Now I routed the output of each MIDI track to corresponding Kontakt channels. For instance MIDI track 1’s output was set to Kontakt channel 1, then MIDI channel 2’s output was routed to Kontakt channel 2. This

was done 16 times until all 16 MIDI channels had been routed to its corresponding Kontakt channel. I felt that completing this process in advance would save me any trouble when it came to actually composing my piece. To summarise, Each MIDI channel would have my MIDI port selected as its input and its corresponding Kontakt channel as its output, with the overall sound of Kontakt going through a stereo audio track as an RTAS instrument.



Now my project was set up and I was able to start composing. I knew that a lot of the sounds I had recorded of trains would be great for creating rhythm for my piece. The sound of pistons and steam and the chugging of the engine have a naturally percussive timbre, however, I needed to manipulate some of my samples to give them more cosanance, making them more pleasing to the ear and allowing me to create melody and harmonic progression. I had captured the sound of a train horn and when this was loaded into its Kontakt instrument I was able to open the manipulation tools for that instrument by clicking the wrench icon to the left. This dropped down a tool bar that would allow me to add multiple filters and effects to the sound as well as fine tune the pitch of the sound I

had created. After playing around with various combinations of filters and effects and tuning the sound of the horn up two semi tones I was able to get a sound that became almost musical and gave me an instrument with which I could create melody and harmony.

Another interesting sound I created was by running a stick along the fence near the area that I was recording the train sounds at. The sound of the wood against the metal gave a nice resonant timbre that once manipulated sounded almost like a steel drum. With this sound I was able to play chord stabs on the keyboard, giving the piece harmonic progression and an almost reggae like feel. Whilst composing my piece I paid careful attention to quantization so that all the parts were tightly in time and also used occasional subtle panning techniques for certain elements to add a sensation of motion to tie in with the train theme.

Conclusion

Overall I was very happy with the recordings I produced. When I began the assignment I was a bit daunted by the idea of making something musical out of sounds that had dissonance and were not naturally musical. However I enjoyed the process of selecting certain regions of those sounds and editing and manipulating the sounds to create musical results. I learned a lot about the sampling process and the theory behind it, and was introduced to how powerful a production tool Kontakt can be when used in conjunction with a sequencer such as pro tools and feel that I will take what I have learned into future studio work.