

MA Commercial Music Production Assignment

X
Tilleyard Education,
University of Wales Trinity Saint David

“Household Space”

DEVELOPMENT
ELEMENT D2b - ESSAY

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Introduction

In a lecture with *Richard Strange* (Strange, 2021) we discussed the performance piece, *I am sitting in a room* by *Alvin Lucier* (Lucier, 1981), I happened upon the idea of this performance's process having a transferrable use. In the performance, speech continually degrades through the resonant frequencies of the room to the point of pure harmonics by recording and then playing back that speech in the through amplification room to be recorded once again. As suggested by *David Byrne* (2012 p.15) states that “..context largely determines what is written,..sung,or performed.” The sound created from the performance entirely depending on the context or space it was in and it seemed plausible that the same could be true for the creation and conceptualisation of an instrument's sound.

In conjunction to this I'd recently been developing a taste for *Hyperpop* (Kornhaber, 2021), specifically listening to releases from the label *PC Music* which is home to artists such as *A.G. Cook* (Cook, 2021) and *SOPHIE* (Xeon, 2021). Not only does this genre include music that is built using techniques such as *musique concrete* and found sound to create it's compositions often manipulating real world noises with synthesisers such as the *Elektron Monomachine* (Nagle, 2004) or *plugins* from *DAWs* such as *Logic* or *Ableton* (What is a DAW?, 2021). I could envisage my instrument being used in the composition of a track such as this. A user could have an initial clean recording of a sound but then have the choice over how warped and peculiar they could make that source; more ethereal and unrepresentative of the original recording through the blending of the pure harmonics gained from the room the sound was recorded within.

The musical possibility of this idea became apparent with knowledge gained about the process of building a sample based instrument from a further lecture with *James Yates* (Yates, 2021). I was looking to do this in as organic and natural a way as possible, most of the sounds I wanted could be achieved through recording samples alone and not through assistance of a digital effect. All effects are essentially based on an acoustic property that is achievable in the real world (Yates, 2021) . Echo and reverb occur across all spaces from churches to mountains. Distortion also occurs in natural environments. How each sampled recording interacted with one another would create the warping of the original and not require an effect plugin or additional hardware. *Yates* had also discussed building his own acoustic version of a singularly electronic instrument of a *Roland TR-808* drum machine provided further influence as I wanted to create a melodic instrument that had acoustic recordings but their interaction would provide the electronic manipulation to the user's ear.

Decisions Made Through Limitation: The Recording Space and Found Objects

Although during the time of making this instrument the restrictions of the recent COVID-19 pandemic were reduced, meaning that access to the professional recording facilities at Tileyard Education was available, a couple bouts of self-isolation and having to work extra shifts to make

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up for the financial shortfall from these periods restricted my recording time to taking place at home.

Not only did this limit my recording equipment options, as I only possess a couple basic options of condenser and dynamic mics as well as only a mono recording audio interface, it also reduced my options of spaces to record within. These inadequacies, specifically with the lack of stereo, would prove problematic later when editing the audio and constructing the overall sound of the instrument.

The performance piece (Lucier, 1981) suggests that any room could provide its own resonant quality but I would have liked to have more options available to me for experimentation and to discover which space provided the most interesting recordings in terms of musicality. Multiple recordings from multiple spaces could have been interesting in terms of crafting and blending a more specific tone and definitely something I would explore in the future were I to construct a future sample based instrument.

It became apparent through some experimentation that glassware seemed like the easiest object in my home that would get a clear specific note. Most other objects directly available to me such as books and furniture tended to have the same basic thud to them. This decision was influenced by seeing many performances online of glasses achieving an almost orchestral level of playability and usability (B, 2010). Although the method in which I would achieve my sound differed from the norm.

I saw my proposed instrument being used with a MIDI keyboard which has keys on it similar to a piano, which is generally considered to have elements that make it a percussive instrument as well as a stringed one (Rogers, n.d.). This drew me to the conclusion of striking my glass as opposed to playing the top of it with my finger and water. Not only did it seem like the more intuitive option, which would become more apparent when creating distinct velocities of recording, but it also removed any impedance of skill level as I wouldn't have to perfect my ability to be able to produce a note from the later method. It also became apparent very quickly that only very specific types of glass were ideal for this method whereas any glass could be struck.

Selecting the glass proved to be another difficult limitation. Most of the glasses in my house seemed to all have the same basic shape and, as I later discovered through recording, tonal quality. Nothing other than a tulip shaped half-pint glass seemed to provide a clean, consistent note. All other glasses I owned either had a rather dull thud to their sound or seemed to produce a noise that had too much fluctuation in their note which wouldn't provide consistent and repeatable recording.

My isolation also meant that I was unable to borrow any other beaters or other percussive implements beyond my own drumsticks or cutlery. The process of then deciding what to use proved more complicated than I initially thought as I did believe, at first, that the sound I was trying to produce would only be reliant on the glass. This proved to be incorrect as each different

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material that the beater was made from changed the tonal property of the recording. Anything wooden or plastic would flatten the sound out and I found that metal complimented the tone generated by the glass. I later learnt that the material is not the only factor in an instrument's acoustic resonance, many factors from density to shape also play a significant role (Wren, 2007). The most likely reason for the metal teaspoon that I consistently used as my beater for the recording sounded most pleasing was probably due to the glass having similar properties to it and therefore generating complimentary harmonics. Here a limitation actually proved to be useful as once I learnt the basic science behind this a world of infinite experimentation and possibility opened up but instead of endlessly seeking out a perfect combination I was forced to make an informed decision from my rudimentary options.

This understanding is similar to me realising that the perfect recording conditions for this task do not necessarily exist and that the environment can even play a role in aesthetic choices made. I would therefore try to view my limitations as opportunities for creativity. However the potential inconsistencies of the recording and lack of "lab conditions" would mean that some audio manipulation would be required in order to provide a consistency across samples so they would sound like they were of the same instrument. A natural difference for each individual recording of each strike could be detected by the ear and audio manipulation of levels and frequency would assist in counteracting this effect (Yates, 2021) especially when all the sounds would be placed in context, otherwise the final instrument could just sound like a collection of incongruous noises. Although somewhat against my initial aims I felt that this would prove an interesting challenge for my skills as a producer and engineer.

Tracking and Editing

For the initial recordings I chose the least sound reflective room of my house. This would provide a simple sound that would act as control from which future decisions on how I was to approach my other recordings could be made. I also wanted to mitigate the effect of the room on my recording as that was the key factor that was going to shape the tone of the future recordings. This also meant a closer mic placement so that the focus of the recording was on the glass and not where it is the audio space.

Here I applied some slight deadening to the sound with cloth around the top of the mic that wasn't blocking my sound source as well as providing some baffling in a half ring around the glass in the form of cushions but didn't cover the entire area as the recorded sound benefited from at least some echo from the room (Acoustic Geometry, 2013). Another step was to have the glass on a raised soft platform. I relied on my ironing board, thinking that it would be best to remove any potentially sound resonance from the ground itself.

Once my positioning and baffling were decided upon I began the painstaking process of recording the initial 65 individual recordings. This would consist of one whole octave of C to C and five separate strengths of hit or *velocities* (Jones, 2017), from quiet to loud, for each note.

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In theory I could have only recorded one pure note of C and then used a *sampler* within *Logic* to create the entire range of notes across both higher and lower pitched octaves. However, the way in which a *DAW* does this is to change the speed of an audio sample, faster for higher pitches and slower for lower (MusicTechHelpGuy, 2019). If you only have one note a *sampler* only has one audio file on which to perform this process. This can have an interesting aesthetic but at a certain point, I found beyond an octave, you begin to notice the degradation of the tone of the original sound. Having a whole range of tones and semitones would provide more information and context for pitch shifting in the *DAW's* programme and reduce the warping of the original sound while creating a different pitch of each original audio file.

I could have provided myself more options across a wider range of octaves than the three I ended up with by recording at up and down by minor thirds across more pitches (Howell, 2005) but once again the limitation of options for glass prevented this from being possible.

Having different strengths of hit would also mean that on a *MIDI keyboard* a user would have the option of playing soft to loud, five degrees of attack, that would sound more natural to the ear than simply adjusting the gain of recording of each note. You would have something that had the volume shift you would expect but it would sound unnatural as it would be the exact same recording heard five different times just at different amplitudes (Yates, 2021), although technically correct it has an effect similar to the *uncanny valley* as softer and louder hits actually have differing tones (Howell, 2005).

This is why it is useful to employ the concept of *Multisampling* by recording multiple takes of the same hit as each recording has a slightly different tonal quality. These are known as *round robins* (Yates, 2021) and similarly add organicness to the instrument as it limits the number of times a listener hears the same recording. Although I chose to forego this part of the process here as at this point believed the number of resonant recordings I was going to produce would so vast, once I had pitch shifted and edited them, would be so vast that the likelihood of a user combining the same exact settings with regularity to notice that it was the always the same audio file was unlikely. I regret this now as it ignored my initial aim of the user being able to have an organic sounding instrument even at the point of no audio manipulation.

Although this didn't worry me too much at the time as simply maintaining a consistent tone as each recording proved difficult. Not only did I have to be incredibly precise with the velocity of my strike, I was using an incredibly imprecise method of tuning the glass filling or emptying it with water. In the case of a single glass the tuning also seemed to work counterintuitively as the more water I added the lower the note would become. Traditionally I would feel that the higher I up an instrument the higher the pitch but this wasn't the case. Subsequently I realised that why this worked was because I was changing the density of the object through the addition of the water (Wren, 2007). Once this was understood and by using *Logic's* tuner I would find the correct level of water in regards to each note, mark the glass with a pen and repeat the process to find the next note.

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I unfortunately hindered myself again at this point as the tuner I was using would only work in playback. I hadn't realised there was an option to not do it this way until later which may have been a more sensible option. Despite this there was some merit in my method as it forced me to listen to each recording to check for mistakes and to notice the relationship each note and velocity had to each other. It would provide a reason to make continual recording adjustments such as input gain and greater mic positioning where I would notice that there was similarity to positioning a mic on a snare drum. The closer to the source of the strike the harsher the sound. I would also notice the background noises that were still present such as distant rain, which was surprising considering the baffling and use of a condenser mic, and my own movements which I reduced through lowering the input gain. Yet again a limitation became an advantage but it soon became a source of annoyance when I had to change glasses to get a full octave range.

My original glass only reproduced a distinct range of B to G. I discerned the shape of the glass would limit its note range as at certain points the change in its shape would become more uniform and therefore limit the change in tone. I would have to find other glasses to achieve the additional notes required. Consequently 5 glasses were used to create the recordings required for the instrument. I was surprised at how this swap still managed to achieve some consistency in pitch and tone but through the repeated listening process I was employing I realised that the recordings were now slightly out of order or just outside of a uniformity in pitch that I would have to fine tune them later.

Generally the original samples fell around the middle C or C3 octave. After some re-organising and preliminary editing of the original recordings, a process I copied from a further lecture from James Yates (2021) which involved some gain and some EQ adjustments to once again maintain a consistency of tone I began to pitch shift the samples guided by the knowledge gained from an online tutorial (MusicTechHelpGuy, 2019). Finally I had three distinct octaves, all with a range of velocities. I could then begin to create the resonant recordings.

Aiming to repeat the same process just used but with different mic positioning and a larger room to increase the echo and reverberation I fed my original samples out of my computer through a passive re-amplifier then out of a guitar amp. My decision to do this was based upon viewing a video of Lucier's performance (Arts at MIT, 2014) where I could discern the equipment necessary as well as the procedure of the performance. Mine would be more rudimentary but similar, I also noticed that my choice of guitar amp would prove useful as in the video there appears to be an engineer controlling level and eq as the performance takes place and the controls of the amp would in theory allow me to do the same.

Initial waves of recording proved to be successful. The desired effect and aim was being met and I was able to have control over the increasing volume of each round of recording. This changed after about the fourth level of copied recording where the distortion and pitch change would begin to become painful and I would lose the ability to have effect upon that pain. Although the distortion that was occurring with these recordings would add harmonics (Koulakos, n.d.) that after audio editing might have provided a purpose for the sampler

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instrument, the lack of control and doubt in my ability to edit the audio meant that I had to abandon this method of achieving my original conceit.

Upon reflection, resonant recordings I was creating didn't really lend themselves to a practical musical purpose. *Lucier's* original recording in the performance is that of speech which is infinitely more tonally complex and interesting than that of a single strike of a glass. There is a chance for the length of the recording to have more reflections and echoes whereas my single strike is being instantly reflected which is then being amplified with each subsequent recording and thus causing the pain. Even with experiments of turning the volume incredibly low and using a guitar pedal to adjust the reverb the constant layering of noise by playing a recording of a recording just became difficult to control. Hopefully in the future I could discover this process's actual musical use but I decided to move on to mapping the samples into *sampler* so that I could at least have an initial playable instrument to then be able to make further decisions about how to craft its sound.

Mapping and Tuning Adjustments

Having aborted attempts at recording room resonance I returned to *Logic* to *bounce* all my audio files out of the programme as *.wav* files the most accurate version of storing digital audio (Dempsey, 2020). I simply chose this as it would provide more sonic information and would allow more options to be made in terms of how they would be manipulated later with editing and effects.

I took the now 185 files and put them into the *sampler* in *Ableton*. An option influenced once again by Yates' (2021) lecture where he suggested that *Ableton's* sampler allowed more options for control as well as a more intuitive user interface.

Once the files were in and ordered correctly I understood that some further manual manipulation of the samples were required. The first of which was adjusting each sample to be the same length. Although the pitch shifting I had done hadn't changed the length, the actual length of each recording was slightly different, a slight mistake from the tracking phase, to one another and was noticeable to the ear. Another issue was the regularity across velocities, each note had a clean increase in volume across their own velocities but the strongest hit of one note might sound more quiet than another. Once these issues had been corrected then came the fine tuning of each sample.

Firstly, it became more apparent that certain notes sounded off in relation to the others, specifically all the samples of F# and the fourth velocity of E. F# was too resonant and required some filtering whereas E had almost the opposite issue. Some adjusting through use of a high and low pass corrected this somewhat but I wasn't able to entirely fix the issue. Not having time to record again I decided that it added a natural characteristic to the instrument and that would have an aesthetic quality to this part when further manipulated samples were to be blended against this tone.

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A few tuning issues were still apparent and I would have to fine tune each sample in a similar process to that of a piano tuner. Moving the *root* key of each sample brought everything into a similar tonal range successfully. The *root* key is the tone that a *DAW* to then move the sample accordingly, if the tuning is correct then simply moving it to the same note keeps the sample in tune (Casper, 2017), with my samples I would have to place it a few tones away to make all the notes congruous. Ideally I wouldn't have to do this but not having a chromatic tuner available this was the best option.

Development of Initial Instrument

At this point I had a clean range of three octaves. It felt organic but there was a clunkiness to some of what was produced. Additionally I was disappointed that I hadn't achieved my original aim.

Having realised earlier that my experiments with resonance hadn't worked I had to re-evaluate how I was going to at least achieve a semblance of my original aim. I questioned what it was that I was now trying to add to the instrument from the influence of *Lucier's* performance piece. *Lucier* was looking to degrade speech to the point of tone and rhythm only. How could I do this in a musical way with my glass strikes?

I still wanted to be able to produce the effect of having the instrument sound as if the space it was being played in played a role in the sound it would produce and that the user could have some control over that effect. Here I supposed that it would be interesting for the instrument to be able to range between a fairly clunky, more organic and hap-hazard sound, where there are mistakes, to a cleaner or more digital one. Playing with the *uncanny valley* idea I was trying to avoid.

Some of this could have been done easily with plugins but require no real effort on my part. It would also leave the control of sound sonically to be characterised by each plugin. I decided on creating a full *instrument rack* in *Ableton*. Through this I could have multiple sampled instruments, which were all differently edited versions of my first recordings, that could interact with one another through mapped *macro controls* (Søren, 2020). Each sample instrument could be blended with the other through volume control and create an entirely new sound. Synthetically this could reproduce the sound I was aiming for as each sampled instrument could recreate an element of the effect of *Lucier's* performance.

Fortunately, already having 185 individual samples as template of audio to use to then manipulate proved to be beneficial as I could simply tailor these recordings through audio editing to create each desired effect.

The first effect that came to mind was reversing all my samples. When played against the original recording it acted as a primitive reverb effect as it sounded like a sonic reflection (Acoustic Geometry, 2013). This was only for the middle velocities though as I thought a volume control would act as a more intuitive command for this function. Strictly speaking this isn't the

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exact science of how sound reflection works but the effect was aesthetically pleasing enough to prove usable.

I then retracted on not using a *quick sampler* to aid in pitching my samples. I found that by introducing this as a blend it made the instrument more musical and allowed the user the choice between whether they wanted a rougher, more organic sound or more manipulated digital or clean sound or a “truer” tone. Ideally, in the future I would have achieved this through different ways of recording the initial sample, perhaps through a damping of the environment that the glass was recorded in and using a softer beater, but due to time constraints I was unable to add this process. I also believe that through having the sample digitally manipulated it provides a different tonal quality which in turn gives the instrument a wider range of options for the user.

Additionally I then used these manipulated samples to create a second lower octave for each sample. As a result more polyphonic sounds and chords would be available to the user I would argue make the instrument have even closer properties to that of a piano.

Ableton's sampler already allowed the instrument to act as a *polyphonically* instead of merely *monophonic* but this further addition would allow the user even more options sonically.

Regrettably, I had to accept that in order to get closer to the sound of resonance I would have to include some effects in the *instrument rack*. Through listening closely to *Lucier's* performance the distinct changes in the subsequent recordings were mainly affected by echo, reverb and distortion. By *macro mapping* these effects I could also control their properties to tailor them to a specific sound rather than having an infinite possibility. Ideally this would have been achieved through creating my own effects plugins but once time contains made this impossible.

Finally, once these effects were in place I added a glue compressor which would act as a way of leveling out the combined sound of all the effects and samples as well as some additional options for filtering and panning of each individual sampler.

Conclusion

Ultimately I did not achieve my original aim and that was probably due to it being too esoteric or indefinable as an aim. The instrument that I did create was a fairly usable and musical “glass piano” or something like a digital metallophone which can at least go from an original found sound to something completely warped and digital. I did find that it is still easily accessible to use but perhaps it isn't that adaptable. I am not sure of the entire range of uses beyond the context I envisaged.

The knowledge I gained from this exercise has made the possibility of creating sampled instruments for my own compositions something I would explore further as I enjoyed the process and I genuinely believe that this is the most distinct way in creating your own unique sound as an artist. It has also motivated me to do further research in the fundamental science of how sound works in order to create more precise recordings for these instruments.

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