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Examining the Wording of Digital Synthesizer Presets to Help Novice Producers

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Abstract

My research looks into the use of ”presets” in digital synthesizers, which alter the timbre (quality) of the synthesizer's sound by loading in pre-selected configurations of settings. My study compares imagery-based and feelings-based preset names – for example, Cloud City Keys and Mellow lead, respectively – in an attempt to see which better predicts the sound it represents. Through my results, I will then explain how the wording of these preset names affected my subjects' perception of certain sounds. The results I found lead me to believe that imagery-based preset names could be representative of their respective presets' sounds.

1 Introduction

Almost all popular music you hear today relies on the use of virtual instruments. Virtual instruments are emulations of real instruments, like analog synthesizers (see Figure 1) or orchestral instruments (such as violin or horns). I will be investigating the use of “presets” in digital synthesizers. Presets allow for quick sound design, and have become quite popular in commercial products over the last few years.

For instance, take a preset for a digital synthesizer named “Bubbly Vast Meadows.” To reflect the “Bubbly” and “Vast” part of the name, the preset might have some echo and reverberations to it. To reflect something bright like “Meadows” I would add more energy in the high frequencies of the synthesizer. A name like this represents the sound of the synthesizer well. Now, take a preset name like “Bad Wedding” or “Sprinkled Mustard.” Names like these are confusing, vague, and the producer can deduce very little from these kinds of ambiguities.

Having a preset name that is representative of its sound is very helpful for music producers. One does not always have the time to click through 1000 presets and test out each sound. With a good preset name, producers can save time with their sound selection and be more efficient.

Presets are named after a feeling, an image, colors, or some other qualities. Producers often associate presets' names with characteristics of those presets' sounds. For example, if we take the preset name “Cold Blizzard” from table 1 below, a producer could expect a metallic, eerie sound from that preset. A producer could expect a preset with a happy name like “Warm Echoing Fields” to sound bright with echoes. Names like these can help producers efficiently select presets.

The goal of my study is as follows: given two well known sets of preset names – presets that evoke a feeling and presets that evoke an image – which set of names will help the novice producer predict presets' sounds better? I chose presets named after feelings and images because they are two of the most popular and recurring in commercial synthesizer products.

Figure 1: An example of an analog synthesizer by company Arturia. [1]

Preset Category	Image	Feeling	Color
Examples	Cold Blizzard Bubbly Fields	Red Love Temper Tantrum	Mango Orange Vanilla

Table 1: Examples of preset names, categorized.

1.1 Background

1.1.1 Digital Audio Workstations

Digital Audio Workstations (DAWs) are software applications used to create and manipulate music. They are used in practically every field of music today – from music composition to recording and mastering vocals to sound recreation in cinema, DAWs are extremely powerful and popular. In this study, I used an industry standard DAW from Ableton, Ableton Live 10. This DAW will run our virtual instrument we create, and allows me to test and create music with it as well.

1.1.2 Virtual Instruments

The virtual instruments of today are used for sound creation, and can be run in a DAW. These are the actual pieces of software which make sound. Great examples of these are synthesizers or imitations of real instruments like strings or trumpets. Imitations of real instruments have pre-recorded sounds of the real instruments which play the corresponding note pressed. Synthetic instruments generate some sound

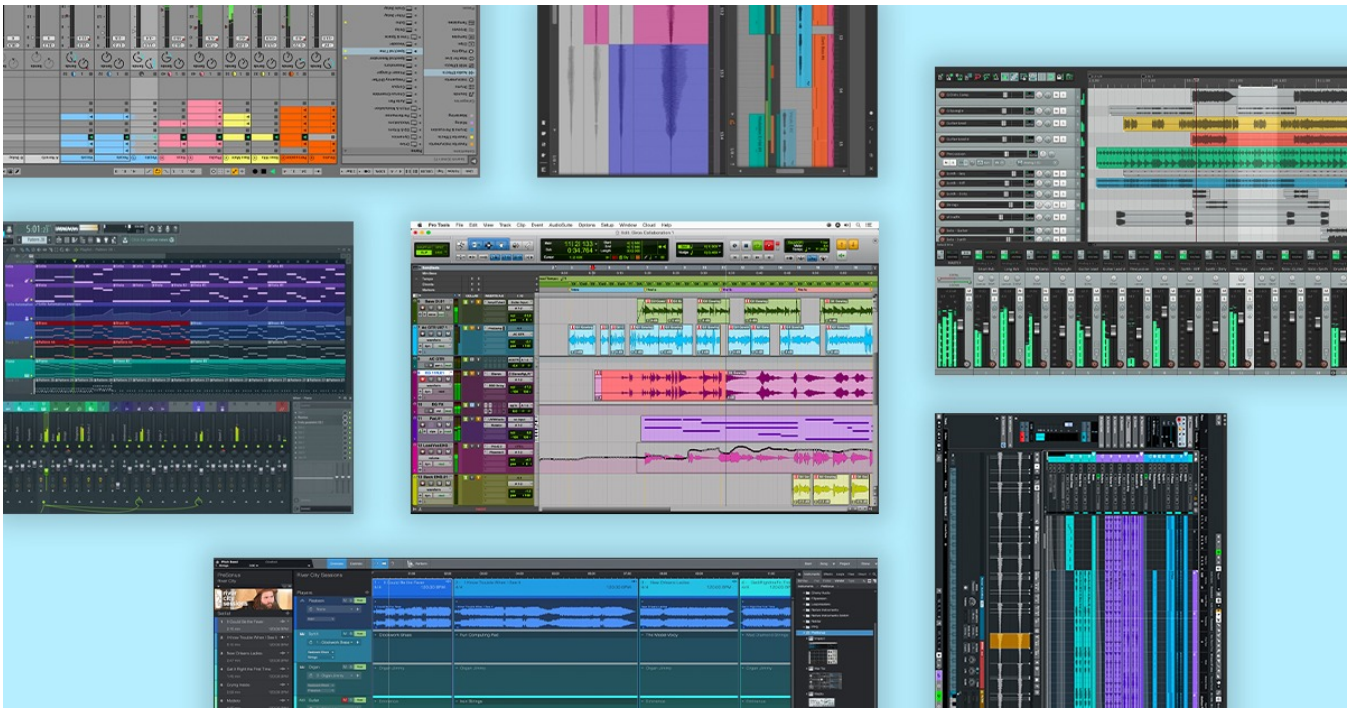

Figure 2: Music producers use many different Digital Audio Workstations, provided here by Landr. [9]

Figure 3: A collection of virtual instruments by renowned company Native Instruments. [5]

Figure 4: An example of a digital synthesizer interface with its presets. [7]

wave created by the computer – the sound generated depends on the parameters set on the instrument via adjustment tools.

1.1.3 Presets

As discussed before, presets alter the timbre (quality) of the sound by loading in a pre-selected array of settings. The use of presets allow for quick and easy sound design of synthesizer instruments, which in turn allow for producers to compose music faster and more efficiently. Many commercial, digital synthesizers have a library of ”stock” presets that the respective companies create, and also allow for custom presets to be made by producers and third parties.

1.2 Related Work

Although it is not a very popular area of study, there have been a few studies done on how to make the user interface of virtual instruments optimized for the consumer.

1.2.1 Higher Level Knobs

My initial research was focused on developing a way to make virtual instruments more user friendly for the beginner music producer. Digital synthesizers can seem very daunting to a novice, with the many different

Figure 5: The Diablo audio plugin by Cymatics, which uses high level knobs in its design. High level knobs such as ”HEAT”, ”PUNCH”, and ”BOOST” can be seen on the plugin’s interface. [2]

preferences and adjustment tools they provide. I hypothesized that this would attract many more people with no producing experience to the world of music production, where they could then feel confident to experiment in DAWs with these kinds of virtual instruments. I originally wanted to prove that synthesizers with high level adjustment tools were more beneficial to beginner producers than synthesizers with standard tools. More specifically, how could I make virtual instruments more user friendly for the novice producer without sacrificing functionality? The more I developed my research project, however, the more my focus shifted away from high level adjustment tools to preset names. This was because I had to limit the amount of changes I was making to the synthesizers for the user study.

There has been some already research done in high level knobs and adjustment tools [4]. In some work done on high level knobs, researchers used computer-assisted sound design to make high level knobs mapped to low level controls nonlinearly. [4]. There has also been a good deal of research in the mapping of a high level quality and a low level control linearly [6]. An example of this is a high level knob which makes a sound more ”sluggish.” To make it sound slower, we would directly increase the attack and delay in the low level controls (which would create a slower effect on the instrument) as the high level ”sluggish” knob is turned up more.

1.2.2 Making Virtual Instruments More Interactive

Making virtual instruments more interactive and user-friendly for producers is a topic that has been researched very regularly, such as creating virtual instruments which can be accessed on equipment other than computers like mobile devices [8]. Making instruments more interactable and appealing to users helps keep them engaged and develop a good workflow.

2 Design Requirements

2.1 Materials

2.1.1 Personal Computer

I used my local computer to create the forms that subjects fill out during the user study and used my computer to pick which preset names/sounds I'll use. To create the forms, I used Visual Studio Code as my editor. Its interface makes version control easy and running Django (discussed in the design section) fairly straightforward. I used Ableton as my DAW to use the digital synthesizers, but there are many other DAW options listed in the "Budget" section. The digital synthesizers I use are listed in detail below.

2.1.2 Testing Computer(s)

I initially thought that I needed computers which can run my Django project. I throught downloading the code and running a local server on a computer in one of the computer science labs such as the CROCHET or PASTA labs was the best route. However, because of the COVID rules with social distancing, I decided to virtually test subjects. Because of this, I only needed to have the code for the Django project on my computer.

2.1.3 Digital Synthesizers

Access to commercial digital synthesizers with presets is crucial to this project. Selecting preset names from commercial products helped eliminate bias compared to if I were to come up with preset names on my own. There are many digital synthesizers on the market, but I examined preset names and sounds from Kontakt Hybrid Keys, Kontakt Vinage Machines, Podolski, and Tyrell N6. There are a bountiful amount of commercial synthesizers online, so there are many alternates to using these few. The requirements when picking a synthesizer were that it must have preset selection and a library of presets included, like in Figure 4.

2.2 Safety

This project is objectively safe, as my study was exempt from the Human Subjects Review Program (HSRC) at Union. There was no actual physical testing on subjects – they were simply required to fill out a survey.

2.3 Cost

Refer to Budget section for monetary costs (125 USD). In terms of time, a half hour (sometimes less time) was required from each subject tested in the user study.

3 Design

In this section, I will discuss the methods and design of the user study, and how in the future a virtual instrument could be coded and used in the study.

3.1 Survey

I developed a survey which has been sent out to community forums such as Reddit and the music community here at Union College. This will help me gain insight on what should be changed in the user interface of synthesizers. From my own experience working with music industry producers and artists, I believe that an optimized user interface (in this case, making preset names better) would help the beginner – however, gaining insight from others will help confirm my research.

Appendix A shows the survey I had 14 amateur music producers fill out. I included questions asking what features they did or did not want when they were or still are a beginning music producer. The results showed: 9/13 people thought preset selection was an important control to have in a synthesizer, and 8/14 preferred a limited amount of adjusting tools on a digital synthesizer's interface. This survey helped me gain insight on what I wanted to simplify in the synthesizer – out of the many options that could be chosen as "important controls," presets tied for the highest choice. From there, I decided to examine preset selection in synthesizers, and then narrowed the study down to examining the different categories of preset names.

3.2 Approach

In this section, I explain the methods for the user study and how it helped attempt to answer the research question. I explain the process of mimicking the prediction of sound, using SQLite to store the subjects' answers in the database, and how the Kontakt Script Processor can be used to efficiently design synthesizers.

3.2.1 Mimicking the Visualization of Sound

Many novice producers have a sound in mind when they compose, and they want to find the best preset to match that sound. I will play a preset sound for a subject and have them pick the name that closest represents the given sound. This will mimic the real world process of finding a preset from the sound from a producer's head.

3.2.2 Storing Subjects' Data Using Django

An efficient way to store subjects answers is crucial to the user study. To carry out these specifications, I created a web interface with forms. I used Django, a python-based framework used for creating web applications. It follows a model-template-view design, which is closely related to the model-view-controller design (mentioned in the CS class Large Scale Software Design). I chose Django instead of using traditional HTML/CSS and JavaScript to make my web application for a few reasons. The first is the built-in database using SQLite, a querying language similar to SQL. Data is sent from the forms which subjects fills out directly to the database. The Django Admin interface in Figure 6 also makes it possible to manipulate attributes and values in its built-in database. This was very helpful when testing questions. The admin page reflects the SQLite database, so when you make a change to a value in the admin interface, it makes that change directly to the database. I also chose to use Django because I am much more proficient in Python (compared to JavaScript), and the structure of Django is beneficial to the user study. This is because every question I asked the subject had to be on a different page to avoid biases – if a user saw different preset choices from a different question, it could have influenced their answer. Django makes it very easy to link webpages to one another using the model template view.

3.2.3 Kontakt Script Processor

The Kontakt Script Processor (KSP) is a powerful feature built into the industry-standard virtual instrument sampler Kontakt. The KSP allows developers to build custom instruments through a scripting language. The Kontakt Script language is similar to any scripting language such as JavaScript, except it is solely built for utilizing the internal system of Kontakt. Because there is already a very extensive built-in library for making virtual instruments, the KSP is an excellent platform for building a synthesizer. I did not have enough time to build a synthesizer and create preset names and sounds, but it is definitely something to look into for future work. Figure 7 shows a virtual instrument I made with the Kontakt Script Processor with a cutoff knob, which can adjust the frequency cutoff of the instrument. The instrument plays a synthetic noise that I imported which is mapped from keys C-1 to C-4.

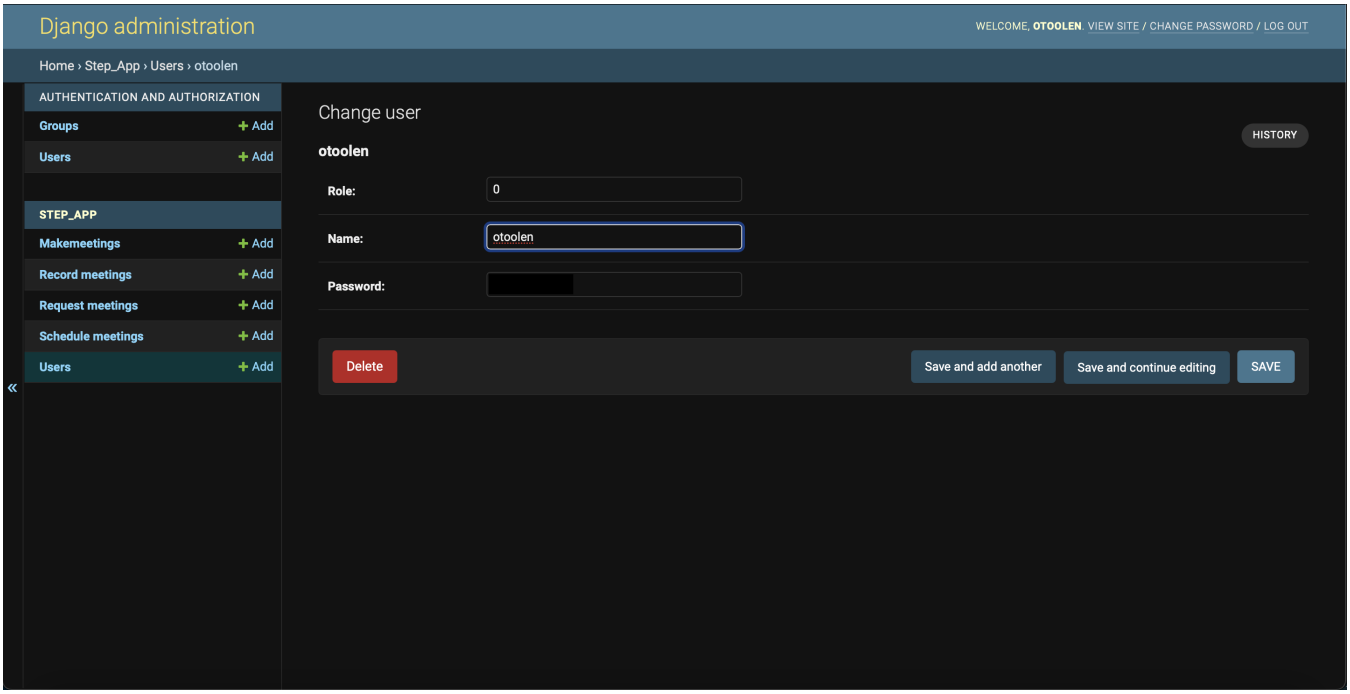

Figure 6: The Django Admin Interface.

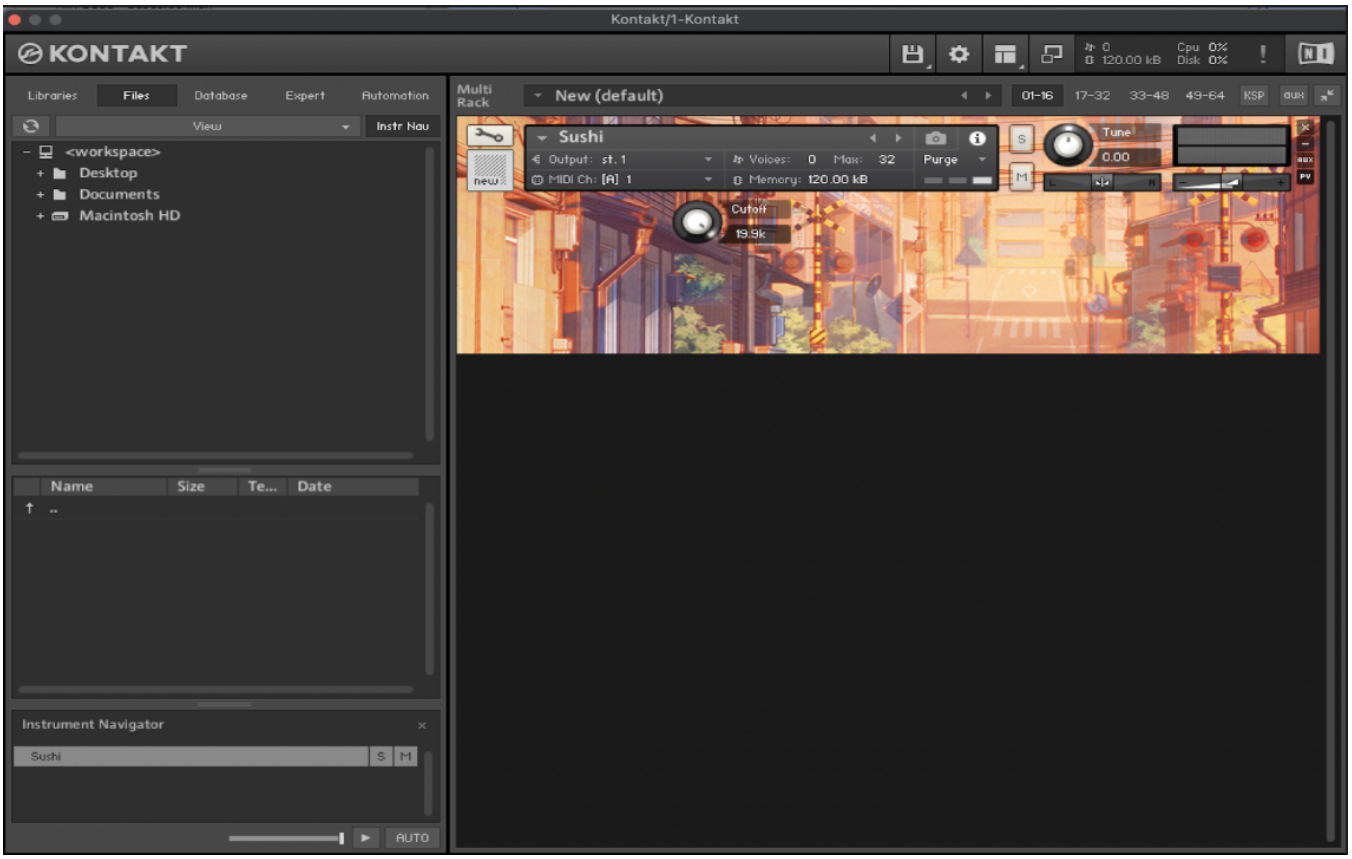

Figure 7: A simple virtual instrument I designed using the KSP.

3.3 User Study Design

3.3.1 Description of Sample Population

Around 20 subjects would have been ideal for my user study, so I was satisfied with the 15 that I got. I initially wanted to test users with at least some music technology experience, whose ages ranged from about 18-22. My subjects were within the age range I wanted, but a small portion of users in my study had never used DAWs before. I expected the population to be mostly male (as there is an astounding amount more of male producers than female [3]), but I ended up getting about an even split of male and female participants.

3.3.2 Overview

I first had subjects listen to a melody through their computers. I then had two choices of preset names, one from the imagery preset category and one from the feelings category. I then have the subjects choose which one is more representative of the sound. This will be done ten times with ten different sounds, with five sounds from imagery-based presets, and five sounds from feelings-based presets. We then compare which preset category the test subjects named more accurately. My goal was to prove that one preset category is picked correctly more than another, as I can then hopefully conclude that one preset category is a better representation of the presets' sound.

3.3.3 Minimizing Potential Biases with HTML Functionality

To avoid potential inconsistencies across subjects, I had users read my script from their computers, during the experiment. This will make it so that I can make sure the instructions are the same for every subject to avoid biases. I had the submit button disabled on the web form, which would've allowed for users to continue to the next question until the current one has been answered (if the submit button had not been disabled). Figure 8 shows that the subject is prompted to choose an answer before pressing submit again. To minimize users not picking the question they intended to and need to go back, I added a confirmation box which appears after clicking submit, as seen in Figure 9.

4 Project Schedule

Starting winter term, weeks 1-3 were to be reserved for finishing up any implementation. These weeks of work include finishing up the web interface for subjects to record data, finding preset sounds and names, and writing the script for the user study. Also included was a pilot study, where I ran the fully finished

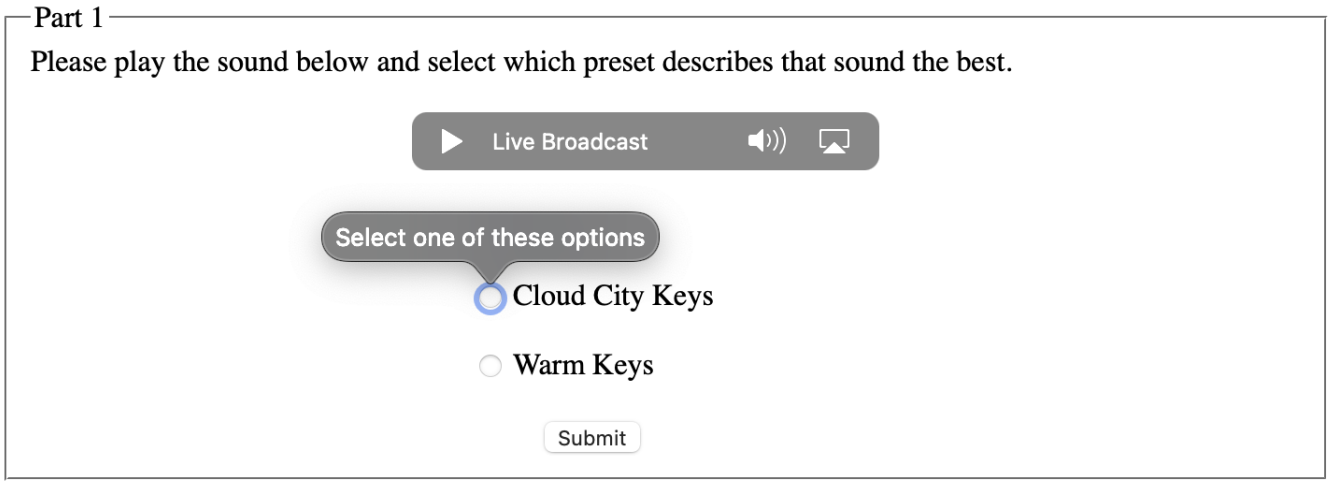

Figure 8: If the user clicks submit before choosing an option as shown here, the user is also instructed to make a choice before submitting.

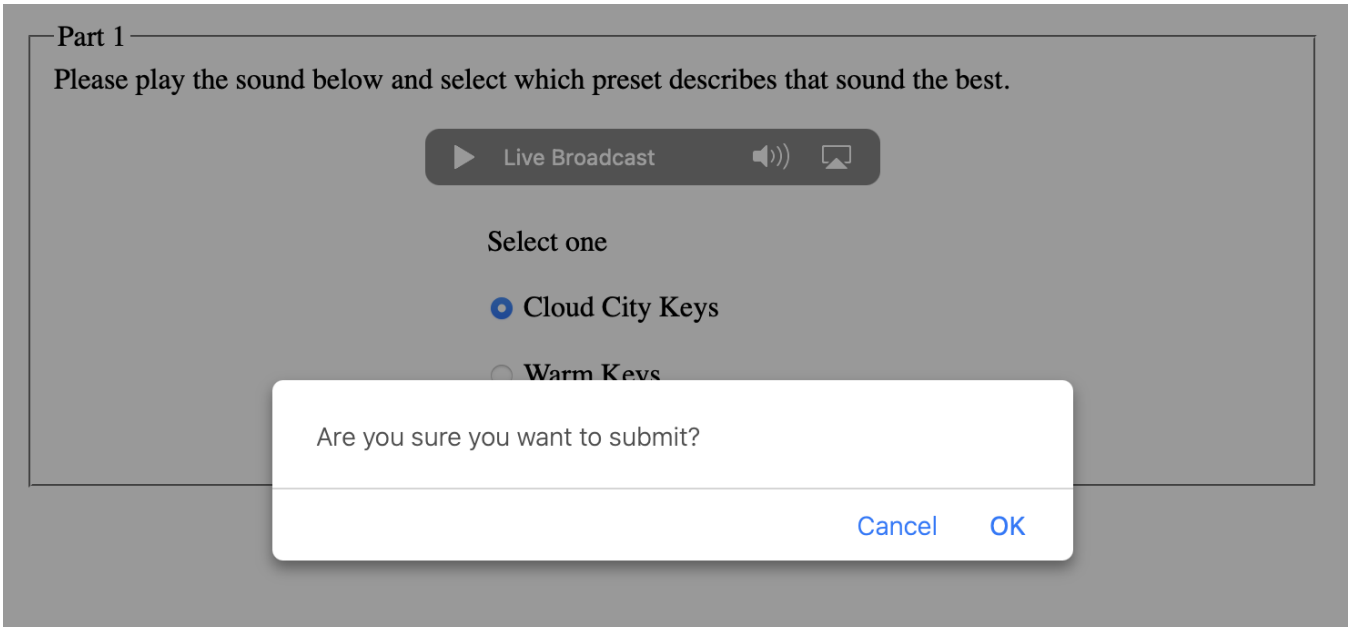

Figure 9: Users are shown a confirmation box after clicking the submit button. ”OK” will send the form’s data to the Django SQLite3 Database, while ”Cancel” will make the confirmation box disappear and allows for users to reconsider their answer.

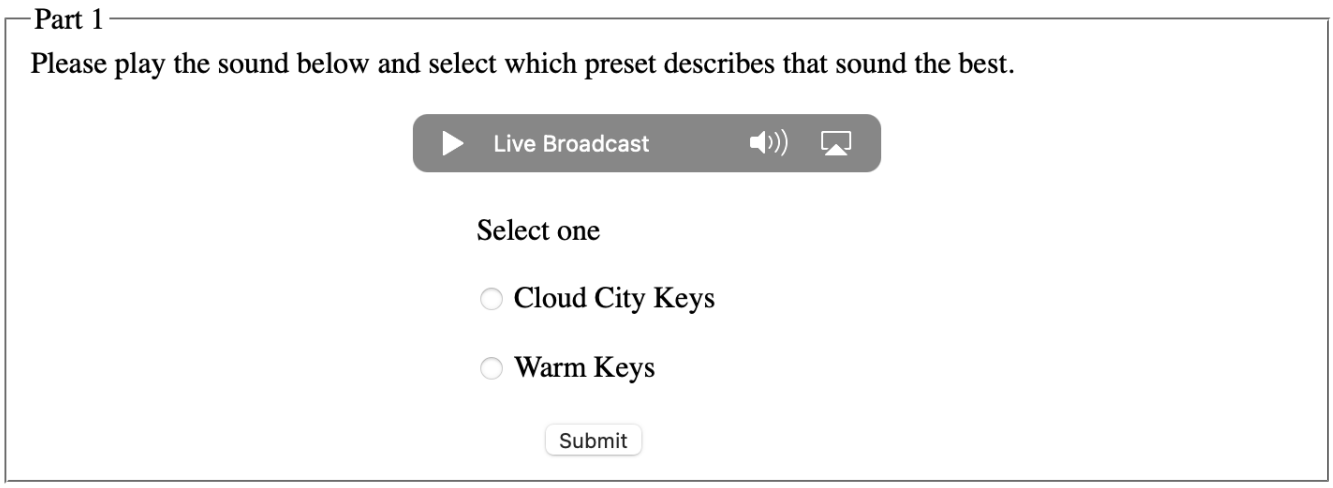

Figure 10: The Form used for Part 1 of the User Study.

test on some friends to identify any problems I find. Weeks 1-3 required lots of intensive, efficient work, as there is a lot to finish up before testing begins. Because of the large amount of work I had to do, this ended up taking me an extra week. Weeks 4-5 were to be reserved for testing, but this ran on from weeks 5-7. Weeks 8-10 was initially for writing the final report, but I also had to use portions of this time to prepare for my Q&A Session (moved from week 8 to week 9) and edit my poster (for the week 10 poster session).

5 User Study

I conducted a user study for my experiment in an attempt to see if imagery or feelings-based preset names allow subjects to better predict the sound those preset names represent.

5.1 Part 1

Subjects were tested over Zoom. I have a local server on my computer hosting the web forms which users complete using Zoom's remote control access feature. Subjects take control of my computer using this feature, and are thus able to fill out the form. In Part 1, I have users play a melody using one of the preset synthesizers. I then recorded how accurately subjects can match the sound played from two lists of presets. I have one set of 5 preset names which are associated with feeling, and another set of 5 preset names associated with imagery. I then compare the test subjects' accuracy of identifying a certain preset between the two different categories of preset names. Accuracy was measured by how many questions the user picks the correct preset name. A sample question from part 1 is shown in Figure 10.

Figure 11: The Form used for Part 2 of the User Study.

5.2 Part 2

In part 2, I present another set of imagery and feelings preset names, 5 for each set. I then have users play a melody with the preset synthesizers and type in a noun-adjective pair to describe the preset that they hear. We then see if a user favored writing feelings or imagery presets more. The first question from part 2 is shown in Figure 11.

6 Discussion

6.1 Feelings-Based Category to Emotions/Sensory Feelings-Based Categories

I introduce a renaming of the feelings-based preset category here, before I delve more into the results. Upon analyzing the preset names I chose for the feelings category, I realized that some names in the study such as ”Warm Keys” were closely related to physical feelings, while some names in the study such as ”Angry Wavetables” were closer to emotions. These are two different enough categories to rename Feelings to Emotions/Sensory Feelings. This helps describe the category more, and does not broaden the scope of it very much.

6.2 Results

6.2.1 Part 1

15 users were tested over the course of three weeks. I found that imagery presets were named with an average accuracy of 74.67 percent, or 3.733/5 questions. Emotions/sensory feelings presets were named with an average of 48 percent, or 2.4/5 questions. From 12 and 13, we can visually see that users tended to

answer more of the imagery preset questions correctly than emotions/sensory feelings preset questions.

User	Emotions/Sensory Feelings Qs % Correct	Imagery Qs % Correct
1	40%	40%
2	80%	40%
3	100%	40%
4	60%	40%
5	80%	40%
6	80%	80%
7	80%	40%
8	60%	40%
9	40%	60%
10	80%	40%
11	60%	40%
12	100%	40%
13	100%	60%
14	100%	60%
15	60%	60%

Table 2: The percentage of questions correctly answered (out of 5) for questions with Imagery presets and Emotions/Sensory Feelings presets, for each user.

6.2.2 Part 2

In Part 2, users wrote preset names associated with feelings on average 44.47 percent of the time, and names associated with imagery 55.33 percent of the time. The method which I used to decide a preset name's category is as follows: If the name has a sensory feeling or emotion in it, then it will be an emotions/sensory feelings preset. If the name does not meet this criteria, then it will be labeled as an imagery preset. In Table 3 we can also see there is a pretty even split between the two categories. Because these two were very close in percentages, I did not see any significant ways to test the data collected in part 2 any further.

6.3 Statistical Significance in the Study

Based on the Part I results, imagery was chosen more than making a random choice at the preset name. This result was statistically significant, and leads me to believe that imagery preset names could be representative of their respective presets sounds. I conducted a t test on the imagery results. Compared to the control (users answering 50 percent of the questions right), the t value was 4.625, and the p value was .000077. We can say that this was significant at $p <$ than .05.

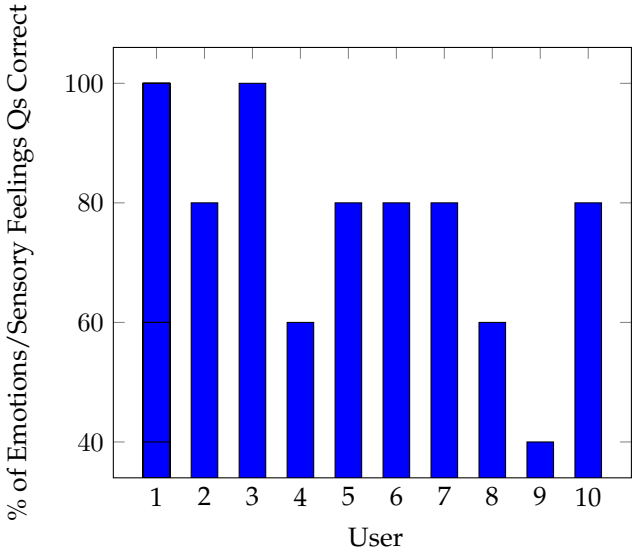

Figure 12: Users graphed against the % emotions/sensory feelings preset questions correct from Table 2.

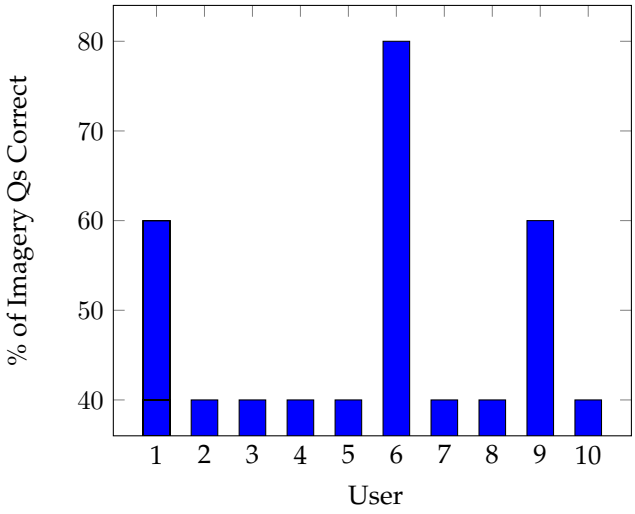

Figure 13: Users graphed against the % imagery preset questions correct from Table 2.

User	Emotions/Sensory Feelings %	Imagery %
1	40%	60%
2	20%	80%
3	60%	40%
4	70%	30%
5	50%	50%
6	40%	60%
7	30%	70%
8	60%	40%
9	60%	40%
10	60%	40%
11	30%	70%
12	10%	90%
13	30%	70%
14	50%	50%
15	60%	40%

Table 3: The percentage of preset names (that users submitted) that were either emotions/sensory feelings names or imagery names, across all users in part 2.

6.4 Validity Threats: The Counterpart Issue

After compiling and analyzing all of the users' accuracy per question, shown in Table 4, I discovered some slightly abnormal patterns in the data from Part 1. Per each question, almost all users were getting each question either completely right or wrong. For example, in question 8, 14 users picked the true preset name of the sound, while just 1 user picked the false counterpart preset name. I came to the conclusion that this may be from how I selected the counterpart. This is best explained through an example. First I select the "Cloud City Keys" preset for my study. This is one of the imagery presets, so I need an emotions/sensory feelings preset name as the counterpart. I then go through my list of presets and find an emotions/feelings preset name which I deem to have a similar wording as "Cloud City Keys." I come across the name "Warm Keys," and choose that to be the counterpart. The problem here comes from how I choose if the preset name is similar. I explain further how I plan to fix this in the Future Work section below – I believe that finding a quantitative way to measure how related two preset names are is the key to fixing the possible biases that come from this counterpart issue.

Question	Users Correct	Users Incorrect
1	13	2
2	11	4
3	8	7
4	11	4
5	13	2
6	12	3
7	1	14
8	14	1
9	0	15
10	10	5

Table 4: A breakdown of the 15 users' correctness in Part 1, per question.

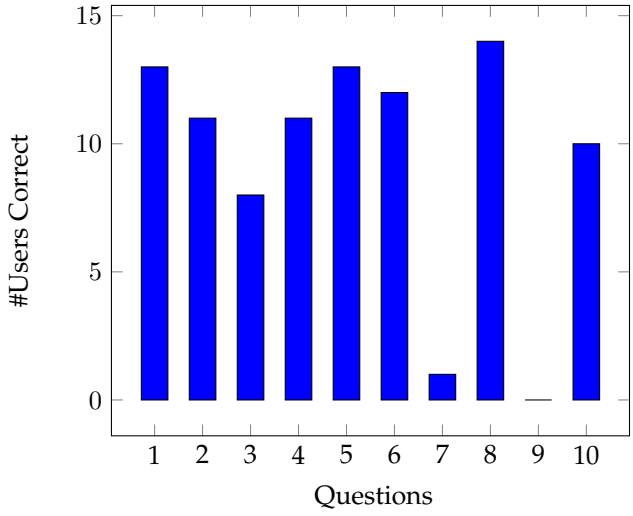

Figure 14: Data from Table 4 graphed.

7 Future Work

7.1 Larger Population in the User Study

My future work focuses on the improvement of the user study. I found 15 users to be sufficient for this first user study. I had less time to test – and had to cancel a few experiments – because of sickness that hit me in week 8, which was less than ideal. I do believe if I were to do a second round in this study, a larger population could help solidify the statistical significance I found. This could also help bring out some significant data in Part 2, as I did not find anything worth analyzing in great detail from Part 2 of this User Study.

7.2 Finding Quantitative way to measure the similarity of Preset Names

As discussed in the Validity Threats section, my counterpart names I chose in Part 1 could have unintentionally biased subjects. Finding some way to quantitatively measure the ”relatedness” between the true preset name and its counterpart could help eliminate a great deal of this bias. This would mean many of the questions would have to have their counterpart rewritten, and many different counterpart examples would have to be tested for each of the 10 questions. However, the biases that this process could potentially eliminate may give very different results in another round of this study.

8 Conclusion

Music production is the catalyst for any songs you hear today – whether it's a global artist or an aspiring musician in a basement, chances are the songs that they record will be using DAWs and virtual instruments. The power of virtual instruments, generating industry quality sounds from the screens of our laptops, is indisputable. Identifying which set of preset names help the novice user predict presets' sound better would further the knowledge in music production. And hopefully it will change the way preset names are chosen for commercial synthesizers in the future.

My data from Part 1 of my user study leads me to believe that preset names with imagery could very well be representative of its sound it is named after, but I also believe that running the experiment again with the modifications to the user study (as described in the Future Work section) would really solidify these findings (or, perhaps show some drastic new results). My counterpart names could have put some biases on subjects, so coming up with a better way to measure similarity between two presets could bring out different results. Adding a larger population could also help generate some significant results in part 2 that I can further analyze.

The use of presets are currently changing the music industry. Presets allow for extremely quick sound design, and the best preset names help users predict the sound of synthesizers. Through my research into the world of presets, I conducted a detailed user study in hopes of finding which category of preset names are better for the beginning producer.

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Appendices

A Raw Survey

Below is the survey which I discussed in the ”Survey” section of the report.

Music Production Survey

This survey was designed by me, Nicholas O'Toole, a student of Union College, in order to gain more background before conducting my thesis. I am planning on creating a virtual synthesizer which is more use friendly for the beginner music producer. Your information will be kept anonymous and will be used for research purposes only.

* Required

1. First, how would you rate your experience in music production? *

Mark only one oval.

- ◯ Expert, have been producing for multiple years and have been trained to produce music
- ◯ Intermediate, not an Expert but are experienced in the field
- ◯ Beginner, still learning how DAWs (Digital Audio Workstations) work
- ◯ No experience

2. Next, what genres do you produce music for? Check all that apply. *

Check all that apply.

- ☐ Hip-hop/Rap
- ☐ Pop
- ☐ R&B
- ☐ Classical
- ☐ Country
- ☐ Rock
- ☐ Jazz

Other: ☐ _____

3. What features, as a beginner (either presently or in the past) do you think you do or did need a synthesizer? Check all that apply.

Check all that apply.

- [ ] ADSR Envelope (Attack, Decay, Sustain, Release control, etc)
- [ ] Arpeggiator Controls (Rate, Octaves, Order, Gate, etc)
- [ ] Filter (Cutoff, Resonance, Low/Hi Cut, etc)
- [ ] Oscillator (Waveform Selection)
- [ ] Preset Selection
- [ ] Misc (Chorus/Flanger, Delay, etc)
- [ ] Other: _____

4. What features, as a beginner (either presently or in the past) do you think you don't or didn't need on a synthesizer? Check all that apply.

Check all that apply.

- [ ] ADSR Envelope (Attack, Decay, Sustain, Release control, etc)
- [ ] Arpeggiator Controls (Rate, Octaves, Order, Gate, etc)
- [ ] Filter (Cutoff, Resonance, Low/Hi Cut, etc)
- [ ] Oscillator (Waveform Selection)
- [ ] Preset Selection
- [ ] Misc (Chorus/Flanger, Delay, etc)
- [ ] Other: _____

5. Next, as a beginner (either now or previously), what kind of synthesizer interface would you prefer? *

Mark only one oval.

- ◯ One that provides a large amount of knobs and adjustment tools, but allows for you to make sounds very precise
- ◯ One that provides a limited amount of adjustment tools and knobs, but allows for a quick design of a sound, however not as precise fine tuning.

6. Finally, what other features should a synthesizer have that don't already exist (that would help beginner)? *