Noteworks – Usability Testing Report

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Executive Summary

This report outlines the methods, findings, and recommendations of a usability study produced for the music creation program called Noteworks. Noteworks is a program that uses a network approach to model and create music compositions.

Methods: Our team recruited six users – one for pilot testing and five for data gathering – and gave them a set of tasks to complete using Noteworks. Eight tasks were designed in order to evaluate a variety of functions within the program, and to determine how users actually interact with the system. Each user was required to answer pre and post-test questionnaires; these questionnaires were used to determine the level of computer and musical proficiency, as well as reflections on their experience with the software. Users were asked to think out loud during the tests so that the data logger could document the user's reactions and interactions with the software. After all the tests were completed, we then summarized and categorized the various usability problems. We subsequently developed a set of recommendations and brainstormed what areas of research needed more study.

Findings & Recommendations: Based on the data we collected, we have five key findings.

1) ***Users experienced numerous problems when trying to manipulate nodes and their properties.*** Many users did not understand how the echo and chance nodes interacted with regular MIDI nodes. Also, users were discouraged by the inability to use common copy and paste keyboard shortcuts. The Noteworks team should consider redesigning the chance node icon to better match the metaphor or create comprehensive help and tutorial documentation to support the software. The developers should adhere to common software standards, like copy and paste shortcuts, to facilitate ease of use.
2) ***Users were confused by the arrow tool and how it was supposed to be used.*** Users sometimes placed nodes too closely together, which made it hard to connect them with arrows. Most users also initially assumed that arrow length corresponded to node duration. Accordingly, the Noteworks team should consider preventing users from placing nodes too closely together and they should consider making arrow length related to timing instead of using node properties.
3) ***Users had difficulty learning the uses and limitations of the selection tool.*** Users couldn't change properties of multiple nodes at the same time. Also, the fire a node and grab tools look very similar but have very different functionality, which users found confusing. We suggest that the Noteworks team merge the selection and grab tools to avoid some of the tool confusion, and that the software should allow users to change the properties of multiple nodes simultaneously.

4) ***Creating and saving a recording caused problems for users.*** For example, one of the users had a hard time figuring our how to begin and end recordings. The save interface did not follow common Mac OS X practices and when users pressed cancel while trying to saving, they lost their recording and had to begin again. We therefore suggest that the program should follow common Mac OS X save interfaces and that a warning message should be implemented to warn users about hitting cancel.
5) ***Many functions in Noteworks are not readily apparent to users, preventing them from performing actions as efficiently as possible.*** Users failed to discover the shortcuts used for switching between tools, and there are many hidden functions with zoom which may only be discovered by accident. Consequently, we suggest that the Noteworks team make most tools available in the top navigation and make available shortcuts more noticeable.

Discussion: Limitations of our research include the designed tasks, the sample size, and the failure to detect problems during the previous heuristic evaluation. Areas for further research include conducting usability studies with other user groups, such as music educators, adolescent users, and users with no music background.

Introduction

Noteworks is a Java-based computer application that produces music through the use of temporal networks. The temporal networks are represented by arrows linking MIDI nodes (Musical Instrument Digital Interface) to one another; the arrows denode sequence and relationships between the different nodes. The end result: Noteworks is a music composition program that enables users to craft both visual and auditory works of art, eschewing traditional music notation for a more modern approach to sound.

Noteworks is a system that originated out of a GROCS (Granted Opportunities [Collaborative Spaces]) project proposal submitted in 2008. Since 2008, the brainchild of Rob Alexander, Patrick Turley, and John Umbaugh has developed into a full-fledged computer application that is targeted for an early February 2010 beta-release. The original idea came out of a neuroscience class that one of the creators was taking, and after learning about how different sections of the brain could be connected via pathways to create thoughts, retrieve memories, and produce emotions, the question became, "what else could be modeled after the neuron paradigm?"

During its two years of development, Noteworks has shifted from a word-based poetry visualization program to a music composition application that is attracting considerable interest amongst electronic music enthusiasts and music educators.

At this stage of our evaluation of Noteworks, we conducted a usability study in order to examine the software's major usability problems. Usability testing is an important technique used to evaluate a system through the monitoring of actual user behavior; this helps the developers understand what areas of the software cause the most frustration for a user and how it can be improved. Before testing occurred, we wrote a series of tasks and scenarios we wanted users to complete based on the previous studies we had completed for Noteworks (such as personas and heuristic evaluations). This ensures an overall cohesiveness to our system evaluation of Noteworks, and allowed us to target certain aspects of the software that we speculated would cause new users difficulty.

We intended the usability study to answer the following questions:

- What are the major usability issues in Noteworks?
- What common tasks cause users the greatest amount of frustration or confusion?
- Are the tools and commands in Noteworks intuitive to use and easy to find?
- How can we improve these usability issues?

Addressing these questions will help us finalize our overall evaluation of Noteworks. We will be able to aggregate data from our persona & scenarios, comparative

analysis, survey, heuristic evaluation, and usability testing in order to provide the Noteworks design team a set of comprehensive recommendations on how to improve their system.

Methods

We began the study by reviewing data and findings from our past reports; these reports included data regarding the initial interaction map, potential user interviews, the personas and scenarios, comparative analysis, survey, and heuristic evaluation. From these reports, we generated a list of commands and functions that we thought would challenge users and uncover potential usability issues.

After generating the list of commands and functions we wanted to include in the actual user test, we determined who we wanted to recruit for the tests. We decided to recruit users in their 20s who had considerable computer experience, basic musical knowledge, and at least a base level ability to work within Mac OS X. Users had to know how to function within Mac OS X due to Noteworks' newest iteration having compatibility issues within Windows-based operating systems. We emailed potential users and posted notices on our Facebook accounts; we were eventually able to recruit one pilot tester and five user testers for our study. (See Appendix A for a description of our users and their backgrounds.) We advertised baked goods as our user incentive.

We then drafted a consent form, a script, a scenario, a set of tasks to be completed by the users, and pre and post-test questionnaires. All of the written materials were reviewed by each member of our team to ensure task comprehension and in order to limit the number of hints embedded within the task list. This was difficult due to the nature of the functions we wished to test, and as such, certain tasks were more explicit in their wording than others. (See Appendix B for all written user tester materials.)

We conducted one pilot test prior to our five user tests. The pilot tester fell within our normal recruiting parameters and the data gathered was used to filter out potential problems with the script and tasks. For instance, one of the tasks we had assumed would work was discovered to be impossible during our pilot test, and that was the copying of multiple nodes; this task was subsequently changed to the copying of a single node. We had accidentally deleted task 8 from the task sheet and we put it back in for the actual user tests. We had also originally planned on using Camtasia to record our user tests, however, it was discovered that no trial version of Camtasia exists for Mac OS X and we then tried Jing during our pilot test. We found that Jing's five minute limit was too disruptive for our users so we decided not to record our users' session and subsequently relied on data logging for gathering information.

Each user testing session began with a briefing on the background of our evaluation, what the usability test would entail, and how their data would be used. We then gave them a consent form to sign and asked them to fill out the pre-test questionnaire. After those were completed, the user was given five minutes to acquaint themselves with the system and were previewed the "Noteworks hip hop" video on YouTube as an example of what a possible composition within the program would look like.

Our official user testers were asked to complete the following tasks while talking us through their thought and action processes:

Task No.	Task	Functions being tested
1	**Starting a short composition**	Tool bar at bottom Metaphor of icons Create MIDI nodes Connect nodes with arrow Play/Fire function
2	**Changing time**	Timing tab at left Wording of the timing tab
3	**Creating another line of music**	Selection tool Echo node Transposition and volume properties of echo node
4	**Connecting the two pieces together**	Chance node
5	**Changing instruments**	Selection tool Change instruments function
6	**Zooming in and zooming out**	Top navigation Keyboard shortcut Hidden scrolling function
7	**Copy a node from your composition**	Selection tool Right-click dropdown menu
8	**Making a recording**	Top navigation Saving a file interface

Table 1 *Task list and target test functions*

Users were allowed to give up on tasks or to move on to the next task prior to completion. Users were also timed using http://www.online-stopwatch.com/, so that our team could record the time of event occurrences and task completions.

After the test, users were required to fill out a post-test questionnaire. The post-test questionnaire was used to gather user reflections about the system and we encouraged users to express opinions that may not have been voiced during the actual testing process. Upon completion of the post-test questionnaire, each user received their brownies.

Our test data was logged using the following format:

User No.	Task No.	Task complete?	Elapsed Time From Start to Completion	Other comments
U1	2	Yes	1:15	Trying to play the piece
	3	Yes	1:23	Start task

Table 2 *Logging sheet example*

(See Appendix C for a list of users and task completion.)

Our team discussed the results of our user tests and compiled the major usability problems observed, what recommendations should be considered, as well as the limitations and shortcomings of our tests.

Findings and Recommendations

Summary Results

We observed a number of minor problems during our user testing. In order to keep our findings and recommendations to a manageable number, we have attempted to lump them into five broad groups for the developers to focus on:

- Node manipulation and changing properties
- Problems with the arrow tool
- Problems with node selection and grab tools
- Problems with creating and saving a recording
- Noteworks' hidden functions

Key Findings and Recommendations

Node Manipulation and Changing Properties

Finding:

Users experienced numerous problems when trying to manipulate nodes and their properties.

Evidence:

1. The node names and icons were ambiguous to our users. The chance and echo nodes, especially, were difficult for users to decipher and several of them hesitated before attempting to use them. The chance node was the most puzzling because neither the name nor its icon (it looked like a cube) used traditional music terminology, since chance does not exist in normal instrumentation. For instance, U6 never figured out how to use the chance node in order to complete task 4.

2. Users did not understand how echo and chance nodes interacted with the regular MIDI nodes. Users were unsure how chance nodes were to be connected to MIDI nodes and the purpose of echo was unclear. U4, who had considerable prior experience with other music software, did not understand the echo node's purpose at all since it was not used for reverberation.
3. Every user tried using shortkeys, such as "ctrl c" or "ctrl v," to copy and paste nodes during task 7, but these common software conventions did not work.
4. The terminology of delay and sustain were problematic to our users. In order to change the tempo of a piece, people had to change the length of each delay: no one intuitively understood this use of terminology. Instead, users tried changing sustain first and then changed delay in order to complete task 2.
5. When using the create a node tool, users did not immediately understand that single clicking on the canvas created a new node, and so they had to keep deleting extraneous nodes and found it extremely frustrating. This often occurred when users were trying to deselect nodes because the nodes were flashing and the flashing annoyed them.
6. Finally, when people played compositions using the chance node, a bug occurred. It appeared that when the chance node was selected, the nodes before the echo would play multiple times.

Recommendations:

1. Since chance is not a musical term, it is important to change the chance icon to something that makes more intuitive sense to users.
2. Having tutorials or help files would assist users to understand node functionalities and purposes.
3. We highly recommend enabling shortcuts for copying and pasting nodes, especially if they comply with the "ctrl c" and "ctrl v" software standard.
4. The developers should conduct further research to determine possible alternative terms for the concepts of delay and sustain in order to make these more intuitive for users. We considered suggesting that Noteworks borrow the traditional rhythm notation of Western music; however, we worry that doing so could inhibit Noteworks' goal of being easily usable and understood by users who lack extensive musical training.
5. The developers should change how nodes are created. One way to do this would be to make the user hold down a key and click the mouse to cut down on extra nodes being created.
6. It is not clear what is causing the chance node bug. The developers will probably need to examine the underlying code to figure out what is causing the problem.

Problems with the Arrow Tool

Finding:

Users were confused by the arrow tool and how it was supposed to be used.

Evidence:

1. Some users had difficulty understanding the purpose of the arrow tool; it took them a while to realize that arrows were needed in order to make the nodes play. U2 did not think the arrow was intuitive for connecting nodes, and thought it should look something more like a drawing tool.
2. The lack of arrow error correction caused considerable frustration on the part of our users. For example, U4 kept repeating actions over and over again when trying to rationalize the function of the chance node; U4 had understood the purpose of the chance node but, due to the lack of arrow error correction, he assumed he was misunderstanding something within the program when it was actually a limitation of the software.
3. Users would place nodes too close together, which made it hard to connect the nodes using the arrow tool. They had to switch tools and individually move the nodes before attempting to connect them again.
4. Multiple people thought the length of an arrow correlated with a node's duration.

Recommendations:

1. We recommend that the Noteworks team create tutorials, definition files, and help files in order to explain the arrow tool and its associated purpose and uses. Another possible solution for addressing metaphor problems is to research alternative symbols to see if a more intuitive icon can be created.
2. Noteworks should incorporate a greater degree of error correction into its program to help users and avoid forcing them to attempt tasks over and over again.
3. Noteworks should prevent users from placing nodes too closely together in order to avoid the connection difficulty our users experienced.
4. The Noteworks team should investigate the possibility of using arrow length to indicate node duration.

Problems with Node Selection and Grab Tools

Finding:

Users had difficulty learning the uses and limitations of the selection tool.

Evidence:

1. Users initially assumed that the fire a node tool and the grab tool had similar functions due to the fact that both tools used hand metaphors for their icon images.
2. Users found the selection tool to be very limited; for example, users couldn't change the properties of multiple nodes at the same time.
3. Users had difficulty discovering the selection-click ability; some users thought they had to draw a rectangle in order to select a node instead of the simple single click option. This confusion was due to the rectangle graphic used in the selection icon.
4. Users lacked a simple method for deselecting nodes, meaning they had to switch tools and click off-node in order to deselect items; our users were

annoyed by the flashing of selected objects and kept trying to deselect objects in order to make the flashing stop.

Recommendations:

1. We recommend that the fire a node tool be changed to a play icon or a similarly recognizable symbol. We further recommend merging the selection and grab tools into a single tool to avoid confusing the user.
2. Noteworks should allow the properties of multiple nodes to be changed simultaneously.
3. The single click confusion could be helped through the addition of tutorials and help files. As another option, the icon could be changed to a combination of arrow and rectangle graphic.
4. Users should be able to deselect a node or multiple nodes by clicking anywhere else on screen and while using any tool. Also, to avoid annoying users with the flashing nodes, we suggest that nodes only flash twice but remain highlighted while selected.

Problems with Creating and Saving a Recording

Finding:

Creating and saving a recording caused problems for users.

Evidence:

1. U2 had a hard time figuring out how to begin and end a recording. During task 1, when they were trying to play their composition, U2 clicked on "Begin a recording" with the expectation that the piece would play on its own and never successfully finished task 8 because of this misunderstanding.
2. The "Save" window does not follow Mac OS X conventions and, although this was not a major barrier for users, did cause some minor frustration and surprise to our users.
3. Saving a recording lacks an error recovery feature; U4 hit cancel the first time they attempted to save a recording and was irritated when they had to record the piece again. Although the compositions our users created were short and the recordings they were asked to create would be simple, users who are creating longer compositions would be considerably more frustrated at the lack of warning.
4. Recordings made within Noteworks cannot be played internally but have to be played by an external audio player. U4 commented that this was a silly limitation that added a layer of non-functionality to the system.

Recommendations:

1. As stated under previous recommendations, creating a help file or tutorial would help alleviate some of the misunderstandings caused by unclear language and lack of prior musical software experience.
2. The save window should be redesigned to meet common Mac OS X standards. The lack of consistency is a clear sign to users that the program is still in a beta-testing phase and has yet to be completed.

3. Noteworks should have a warning message for signaling to users that if they press cancel, the recording will be lost.
4. Noteworks recordings should be playable within Noteworks.

Noteworks' Hidden Functions

Finding:

Many functions in Noteworks are not readily apparent to users, preventing them from performing actions as efficiently as possible.

Evidence:

1. Users failed to figure out the short keys to switch between tools. It was very laborious for users to switch from tool to tool.
2. Users would often try searching in the top navigation for tools or functions but could not find what they were looking for. For example, U4 was the only person who was able to change the instrumentation for multiple nodes simultaneously using Edit > Change instruments. Every other user changed instruments individually.
3. There are three different methods for zooming in and out: using keyboard shortcuts, using top navigation, or by scrolling. Some users used shortcuts, some tried the shortcuts but did not see a perceptible change and wound up using the top navigation, while other users strictly used the top navigation, but no one discovered the scrolling. Users who zoomed-out using the top navigation found it inefficient and annoying.
4. Users mentioned that they thought there would be better ways to accomplish tasks but could not figure out how to do so. The way many tools and actions in Noteworks are designed to work often seemed wrong to users, like inconvenient workarounds to compensate for their inability to figure out how to perform the action more efficiently.
5. Our pilot user created an endless loop while trying to accomplish task 4 and after they began to play the composition, was unable to stop it and the data logger had to intervene to make Noteworks stop.

Recommendations:

1. Make the tools available through the top navigation and have the keyboard shortcuts visible to the user that way.
2. Make most, if not all, tools and commands available through the top navigation.
3. Make available shortcuts more noticeable, both in the top navigation and in the help and tutorial documentation. Also, increase the change in zoom for each mouse-click or button press, so as to make the change less incremental and more noticeable for the user.
4. Again, help menus, tutorials, and more visible shortcuts would help users find more efficient ways to complete tasks.
5. Turn "fire a node" into a play/pause button to supplement the "stop" option available in the top menu.

Discussion

The chief shortcoming of our study lay in the assigned tasks: our tasks involved composing extremely brief, simple pieces. Additional problems could emerge or the severity of some problems could increase when users attempt longer and more complex compositions. Likewise, we would be able to see how long it takes to develop user proficiency if longer tasks were assigned.

Another potential shortcoming of our study lay in the limitations of our sample. A slightly larger sample size – seven test subjects rather than five – could have detected additional problems or lent greater reinforcement to problems we observed less frequently with only five users. On the other hand, we feel our sample accurately reflects the target potential user – young adults who are experienced with computers and generally college educated.

A final limitation is that we had failed to notice some problems with the software in our heuristic evaluation, such as the lack of error recovery in the "Save a recording" window. Had we noticed these earlier, we could have incorporated them into our test and thereby been able to more clearly assess the degree to which they distressed the user.

It may be desirable to conduct separate, additional rounds of testing, with revised tasks, with music educators and younger learners (children and adolescents). A fourth round of testing could also be attempted with users who have no experience with music theory at all and consequently no understanding of Western pitch, which we speculate could prove extremely difficult for such users of Noteworks. On the other hand, we have no data to draw from to conclude whether such users would even be interested in, or likely to use, the program.

One significant question that remains unaddressed is one that we have posed in previous evaluation reports: how can Noteworks be incorporated into music education? This question lies beyond the scope of our user testing but it is one that still needs to be addressed. We did not incorporate it into our study due to a lack of time and recruitment resources, so we felt it best to start with general users in order to extrapolate the main usability problems first.

Conclusion

The key findings of our user testing are that the arrow tool is confusing and not an intuitive symbol for all users. We also found that the selection tool is problematic and users encounter unexpected barriers when attempting to manipulate multiple nodes at one time. Additionally, many functions are not readily apparent to users and the save interface should follow the conventions of Mac OS X.

Based on our aggregated findings, we recommend that Noteworks should conduct further research on alternative symbols for the arrow tool and chance icon. We also

heavily endorse the creation of tutorials and help documents to guide users when problems occur. We suggest that the software should enable users to select and edit multiple nodes simultaneously. Moreover, all the tools and functions should be available through the top navigation and the save interface should follow operation systems' conventions.

Despite our best efforts, limitations of our study did occur. We only had five test users and one pilot test user. The result of the test may not be able to present the general demography. Also, during the process of designing the test, subjective opinions may involve and influence the fact that which functions need to be evaluated in the user testing.

This user testing is the last stage of our evaluation. In the next few weeks, we will aggregate all the data we have collected from our different studies and determine our main findings and recommendations. We will then present these findings and recommendations to the Noteworks team and receive feedback on our work.

Appendix A: User Profiles (from Pre-Test Questions)

	U1 - pilot	U2	U3	U4	U5	U6
Prior experience with music composition programs	None	None	Garage Band - beginner	Finale – beginner, Garage Band – expert, Sibelius – expert	None	Garage Band – very beginner
How many hours per week do you use computers for personal use?	20+	20+	20+	20+	20+	20+
How familiar are you with Mac OS X?	Somewhat	Very	Very	Very	Somewhat	Not at all
Describe your musical background	Piano - expert, flute - novice, violin, etc	Saxophone – novice, trombone – novice, piano - beginner	Piano – beginner, violin – novice	Emphonium – expert, piano – novice	Flute – novice, guitar – beginner, piano – beginner	Singer/ choir in junior high
How often do you compose music?	Seldom	Never	Never	Seldom	Never	Never
Age	25	29	27	22	24	27
Have you ever taught music?	Yes	Yes	No	Yes	No	No
If yes, when, how long, and at what level?	Past, 2 years, beginner	Past, 2 weeks, beginner		Past, 3 years, novice		

Appendix B: User Testing Materials

Script

Introduction

Hi, thank you very much for participating in our test. We're School of Information students doing project for a class called Evaluation of Systems & Services. We're testing a music composition tool. Your feedback is really valuable to us in our evaluation. We're interested in how people use the tool and we are not evaluating your performance with this tool. There is no "right" or "wrong" during the evaluation.

This test contains four parts: First, you will answer some background information and general questions. Second, you will perform some tasks using the tool. Third, you will fill out a questionnaire regarding the tasks you just performed and will answer a few questions about your feeling of using the tool.

During the process, we would like you to think aloud. Feel free to speak out whatever you are thinking while performing those tasks. For example, if I wanted to use Firefox to search for information about puppies, I would open Firefox, go to the search box, type in "puppies" and click enter. I am looking through the results, and I will click on this one, because I think it fits my needs the best. We have no personal stake in the system being evaluated, so don't be afraid to give negative feedback; you can speak freely. Your honesty and frankness in feedback is highly appreciated. We will do our best to answer questions for clarification that not related to using the tool during the test. We cannot answer questions about how the tasks should be performed.

We will use a software called Camtasia to record what you do during the evaluation. The data collected from you will only be used academically and your privacy is highly protected. Again, we are testing this system; we are not testing you. You can quit any time if you do not wish to continue. Your feedback will be very valuable in suggesting improvements to the system and we really appreciate your participation.
Please take a moment to review this consent form. If you agree to its terms, please sign it.

[Moderator hands out the informed consent form]
[Moderator takes back the informed consent form.
Thank you.

Informed Consent Form

University of Michigan
Master of Science in Information Studies
Winter 2010: Evaluation of Systems & Services

Dear Participant,

First of all, thanks for participating in this test. Through your kindly cooperation, we hope to learn the current state of the meeting tool and also discover potential problems. Our main purpose is to investigate into how users use this software tool and their expectations towards possible improvements.

During the process, we will use a software called Camtasia to record what you do during the evaluation. It will be destroyed at the end of our project. We will use code names and black out any sensitive information to protect your privacy. In addition, all the data collected from the test will only be used for research and will be disclosed only with your permission. Even if you decide to participate, you are free at any time to discontinue participation.

Thank you very much for your cooperation and participation. If you have any additional questions, please send us e-mail. We are more than happy to answer your questions.

PARTICIPANT AUTHORIZATION

☐ I have read the above statement and have decided to participate.
☐ I decline to accept this interview.

Signature : _____ ___ __
Date : _____ __

Thank you very much for your cooperation and participation.

Team Noteworks
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Pre-Test Questions

1. **Have you used any of the following programs, and if so, what is your skill level (beginner, novice, or expert)?**
   - Ableton Live _____
   - ChordGeometries _____
   - Finale _____
   - Garage Band _____
   - MAX MSP _____
   - Nodal _____
   - Propellorhead Reason_____
   - Sibelius _____
   - None of the above _____

2. **How often do you use a computers (hours per week) for personal use?**

   0-10 11-20 20+

3. **How familiar are you with using Mac OSX?**

   Not at all Somewhat Very

4. **Describe your musical background? (skill level – beginner, novice, or expert)**

   Instrument: _____ Skill level: _____

   Instrument: _____ Skill level: _____

   Instrument: _____ Skill level: _____

5. **How often do you compose music?**

   Never Seldom Frequently

6. **What is your age? _____**

7. **Have you ever taught music?**

   Yes No

8. **If yes, when, how long, and at what level?**

   When: Present Past

   How long: _____ years

   Skill level: Beginner Novice Expert

Usability Testing Tasks

Before we start the test, please feel free to play with this software for 5 minutes.

Watch the composition at the following URL:

http://www.youtube.com/watch?v=vzBgCXPJx4Y&feature=PlayList&p=4953C1E7C4812638&playnext_from=PL&index=7&playnext=3

or google "Rob's hip-hop Noteworks demonstration"

Scenario: Imagine you are a music major at UM, and your professor asks you to complete the following tasks with Noteworks for your final exam. Failing the exam will adversely affect your grade.

Task: Starting a short composition
please start a composition of 7 connecting notes. Please change the pitches and put them into the following sequence: C C G G A A G. Now play your composition.

Task: Changing time
Now try to speed up the tempo of the music. After changing it, please play the piece again and see if it works.

Task: Creating another line
Add 6 new notes but place them in another line: 5 notes and 1 echoing note. After you've made the notes, change the pitches to this order: C C D C F echo. Change the way your echo sounds.

Task: Connect the two pieces together
Now we want to combine the two pieces into one such that one piece will play or the other piece will play, but not both. (Hint: Delete one of the beginning C notes and create two branches.)

Task: Changing instruments
Change the instrumentation for one of the lines so that the notes are played using an xylophone. Now play it to see if it works.

Task: Zoom in and zoom out
Now we have a lot going on on the canvas, try to use the zoom out function to get a bigger view of the canvas.

Task: Copy a note from your composition
Now that you have more space, please copy a note from your composition and attach it to the end of one branch of notes.

Task: Make a recording
Make a recording of the composition and then play it.

Post-Test Questions

1. **What was your overall impression of Noteworks?**

2. **What did you think of Noteworks visual layout?**

	Like				*Dislike*
Icons	1	2	3	4	5
Menus	1	2	3	4	5
Toolbar	1	2	3	4	5
Aesthetics	1	2	3	4	5

3. **How easy or hard was it to find the various commands and tools?**

	Easy				*Hard*
Commands	1	2	3	4	5
Tools	1	2	3	4	5

4. **Was it easy to understand what all the commands meant?**

Easy				*Hard*
1	2	3	4	5

5. **What command(s) or tool(s) did you find most confusing and why?**

6. **Which task was most difficult to perform and why?**
   - Starting a short composition
   - Changing time
   - Creating another line
   - Connect the two pieces together
   - Changing instruments
   - Zoom in and zoom out
   - Copy a portion of your composition
   - Make a recording

7. **If you had any recommendations for the software developers, what would they be?**

8. **Is there anything else you wanted to share with us?**

Wrap-up

Thank you very much for your cooperation and participation. If you have any additional questions, please send us e-mail. We are more than happy to answer your questions.

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Appendix C: Compiled User Test Data

Task Completion Table

Task No.	U1 – pilot	U2	U3	U4	U5	U6
1	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	YES	YES	YES
3	YES	YES	YES	YES	YES	***NO >> YES***
4	YES	YES	YES	YES	***NO***	***NO***
5	YES	YES	YES	YES	YES	YES
6	YES	YES	YES	YES	YES	YES
7	NA (impossible)	YES	YES	YES	***PARTIAL***	YES
8	NA (not included)	***NO***	YES	YES	YES	YES

Yes = task completed
No = task not completed
Partial = user completes part of task and moves on
No >> Yes = task completed out of order

Task Time Completion Table

Task No.	U1 – pilot	U2	U3	U4	U5	U6
1	1:29	12:19	8:02	4:17	6:20	11:15
2	12:16	15:47	10:53	5:15	9:48	14:19
3	17:00	19:03	18:54	9:57	14:25	***23:02 >> 27:37***
4	26:15	23:25	22:50	18:42	***25:02***	***36:51 >> 48:15***
5	28:06	25:32	26:10	20:10	29:14	38:05
6	29:18	26:15	26:55	20:35	29:37	39:55
7	45:10 (determined impossible)	28:03	29:20	21:45	***32:00***	43:44
8	NA (not included)	***35:43***	30:58	24:29	34:18	44:58

XX:XX = minutes : seconds

XX:XX >> YY:YY = end of first attempt >> end of second attempt

Post-Test Questions

	U1	U2	U3	U4	U5	U6
Overall impression of Noteworks	Probably easier for a non-musician. No scale, no tempo makes it hard to compose. Help menu would help.	Frustrating	Visually interesting. Not very much guidance on how notes work/ connected.	Interesting, there is potential, but needs ___ user interface. I'd like to play with it more in a less structured environment.	It seems pretty cool, but a little hard to figure out. Connecting notes was a part I didn't get.	I like the usage of symbols. The act of putting notes on the screen is easy but I'm not sure I understood how it chooses to play the lines.
Visual layout: Icons	Somewhat like	Neutral	Neutral	Neutral	Somewhat like	Somewhat like
Visual layout: Menus	Somewhat like	Neutral	Somewhat dislike	Neutral	Neutral	Somewhat like
Visual layout: Toolbar	Somewhat dislike	Neutral	Somewhat dislike	Somewhat like	Somewhat dislike	Somewhat dislike
Visual layout: Aesthetics	Somewhat like	Neutral	Somewhat like	Like	Somewhat like	Somewhat like
Findability: Commands	Somewhat easy	Somewhat hard	Somewhat easy	Neutral	Somewhat easy	Somewhat hard
Findability: Tools	Somewhat easy	Somewhat easy	Somewhat easy	Neutral	Neutral	Somewhat easy
Understanding commands	Neutral	Somewhat hard	Neutral	Somewhat hard	Somewhat hard	Neutral
Most confusing commands and tools	Clicking on the choose node was difficult. The arrows were annoying and hard to place.	Selection tool – box vs. click; not being able to select multiple notes and perform actions on them.	Determining that delays were rests	The first icon should be altered, perhaps all function names at the bottom of icons for instant clarity.	Arrow. I couldn't get it to work.	It was hard to remember to switch between them.. The rest, chance nodes tools are hard to use.
Most difficult task	Copy your composition (impossible)	Make a recording	Starting a short composition – because I didn't know how the program worked	Connect the two compositions together – the choice function was strange to work with but that may be me.	Connect the two compositions together	Connect the two compositions together – didn't figure it out. Zoom in and zoom out – didn't figure out an easy/fast way to use the function
General recommendations for Noteworks	Create a staff. Create a tempo. Change more than 1 note at a time.	Make selecting multiples and performing actions easier. Make	More instructions or a tutorial video or something that pops up to guide a user	Better GUI, adding words to the icons, please implement a better way to navigate	Tell me how to use arrows.	The left toolbar should stay up in a general function mode

		the recording function more transparent.		(select all, OSX hot keys).		instead of going blank! Be able to use the lines instead to move.

Visual layout, findability, and understanding commands used Likert scales (1 to 5).