Title of Proposal: Evaluation of a Multi-User Collaborative Sound and Music Interface
Researcher: Tyler Sammann
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Is this proposal related to a sponsored project? No
If yes, please indicate:

All investigators, including faculty supervisors, on this project must complete the self-study course on protection of human research subjects.
Certification: I/We have completed the course:
Tyler Sammann (CS Master's student) 8/22/12
Barbara M Cutler 7/2/08, refresher 11/2/11

Objective: To evaluate and compare the effectiveness of different features of our multi-user collaborative sound and music interface. Each user will be given their own USB mouse, and have their own unique cursor, thereby allowing them to work together on the same interface. We will specifically evaluate how effective certain interface elements are in a multi-mouse multi-user environment. The interface elements in question will allow users to simultaneously modify the parameters of different sound filters and sound effects.

Methods: The participants will be working in groups of 4-6 people. One of the users in each group will be given an electric guitar, and will provide the original sound input. The others users will be working together as editors of the input sounds using the provided interfaces. Two different systems will be tested and compared. My own system and multi-mouse multi-cursor interface will be tested against a well known free and open source Digital Audio Workstation (Audacity). In both test scenarios, users will be given the same set of guidelines and goals. In general, users will be asked to record at least three layered "tracks" of sound, delete sound "tracks", add effects, and make other changes using the two respective systems.

All users will simultaneously be participants in the study. We will use a video camera with audio to record the user sessions with the interface. During the exercise, participants will be asked to speak aloud to each other and to the researcher about their observations of the system and the overall interaction. When the tasks have been completed, or the users decide that they have gotten to a satisfactory stopping point, or time has run out, each participant will be asked to fill out a paper and pencil questionnaire. The questionnaire will be about the system and interface, the usefulness of having multiple mice, the strategies used, the collaboration between users, and the quality of the sound results when using both systems. The system introductions will take approximately 10 minutes, the interaction sessions will last approximately 20 minutes each, and the written questionnaire will take about 20 minutes to complete. The entire study (system introduction, interaction sessions, and questionnaire) will last approximately 1.5 hours. We will ensure each participant is completed with the entire study in a maximum of 2 hours.

Our primary data collection devices will be the post-study paper questionnaire, and a log (recording) of each user's keyboard and mouse actions during the study. These recordings will allow us to do further analysis related the success of the interface, and the strategies of users and groups of users. We will also video tape the session, and separately record the audio from the session. Video and audio from the video camera, and the logged keyboard and mouse actions may be sampled in the thesis document. The data collected from video taping, audio recording, and mouse and keyboard logging, will be fully anonymized before publication. Faces and bodies will not be visible in the imagery. We will not publish the audio files, only possible extracted quotations. We will also release any claim to Copyrights for any of the video and audio recordings. If users wish to claim Copyrights for the works they produce or are involved in as part of the study, we will provide them with the works, given that they acquire permission from all other users involved in the production of the works in question.

The participant will be told that they are under no obligation to participate in the study, and that they may withdraw from the study at any point, without giving a reason.

Participants for this study will not be monetarily compensated for their time. The volunteers may vary in population. Some subjects will be recruited from RPI, but volunteers will not necessarily need to be enrolled students. Student subjects will not be recruited from any of Prof. Cutler's current classes as she may be helping to conduct the experiment. Student's will be recruited from other RPI classes, but the professors will not know which, if any, of their current students participated in the experiment. Some subjects will need to have musical experience, but most will not need to have any musical experience or background.

Effects on Subjects: See benefits and risks.

Benefits to Participants: The participants will gain first-hand experience with a new type of user interface that promotes collaboration and simultaneous multi-user interactions. Participants may also learn about the sound parameters that they modify, and will hopefully create enjoyable and rewarding sounds and musical elements. The result of this study will help us develop and improve our multi-user interface and its features, leading to a better tool for educational, collaborative, artistic, and entertainment purposes.

Documentation of Risks: Most participants will be standing or sitting around a small table, manipulating USB mice on the table and observing imagery projections on a screen in front of them. A standard office projector will be used. Office chairs will be made available for all users. One participant in each group will be standing (or sitting) and will be playing an electric guitar for the sound input to the system. This user will have previous guitar playing and other musical experience. At least two, possibly four speakers will be set up in the space. Two speakers will be placed on either side of the projection screen, facing the users. If four speakers are used, the other two will be place behind the users, facing their backs.

There is a small risk of permanent hearing damage if participants are exposed to loud sounds, especially sustained loud sounds for long periods of time. Users will not be subject to sustained sounds for more than a half hour, and the total time hearing sounds from the system will be less an hour or less. OSHA guidelines dictate that hearing loss can occur if listening to sustained sound or noise levels at or above 85 dB(A) (A-weighted decibel scale) for 8 hours or more, and halve that amount of time for each increase of 3 dB(A). (hence, sound levels at 88 dB(A) can last no longer than 4 hours). The sound levels in the experimentation environment will be tested with a sound level meter, and measures will be taken prevent sound levels from ever exceeding 85 dB(A).

Measures to Minimize Risk: The study will be conducted in a quiet mixed-use lab/office space in the Materials Research Center.

- The participants will be given an overview of the system and all components of the system will be described to them. They will have an opportunity to ask questions about the system before the study begins, and the participants may ask questions during the study as well.
- Measures will be taken in the system (such as compressors/limiters) to ensure that the loudness of the sounds in the environment does not exceed 85 dB(A). The environment will be tested with a sound pressure level meter before, and during the study. The sound level meter will be placed at the same distance from the speakers as the users. Users will be at least 5 ft away from all speakers in the environment. Users will be told about the sound levels, and the potential risks. Participants will also be told that if they are ever uncomfortable with the loudness in the environment, they can request that the master volume of the system be turned down to a more comfortable level, or stopped completely. If any unforeseen problems occur with the sound, the sound can be muted and the experiment can be stopped at any time. Users will also be free to leave the study at any time they wish.

The entire study will last approximately 1.5 hours. The participants will be encouraged to work at their own pace and take breaks as needed to stretch or sit down (chairs will be available in the room) and will be told they may stop the study at any time without giving a reason. The study will consist of 2 sessions. Each session consists of a period of roughly 20 minutes, followed by a break where the user may sit at a desk in the room to answer written or verbal questions and receive instructions for the next exercise. If

a participants have not completed both sessions within 1.5 hours, we will stop the interaction portion of the session and have the users complete the post-study questionnaire. Similarly, we will ensure that the participants complete the entire process within 2 hours.

Likelihood of Harm: Very minimal.

Alternate Method Not Using Human Subjects: None

Qualifications of Researcher: Barbara Cutler has a PhD in Computer Science from Massachusetts Institute of Technology. Tyler Sammann is a 5th year Coterminal Master's student in Computer Science at Rensselaer Polytechnic Institute studying user interface design, sound programming, and graphics programming.

Recruiting of Subjects: We will ask for volunteers, 18 years or older, who have a working knowledge of computer software and interfaces. For each group session, one of the volunteers will need to have some musical background, be able to play the electric guitar, and have some experience with music writing or composition. It may also be necessary for this user to have experience with Audacity or other Digital Audio Workstations. This participant will play the role of the "player", and will provide the input sounds to the system.

The other users will be the "editors". These users will not play any instruments, but will use a mouse to edit the input sounds with the interface of system. These users may have a knowledge of music and music editing software, but it is not a requirement for their participation. Having a general interest in music or musical creation is enough.

Confidentiality: Participants will be identified by a randomly assigned ID number that is used only for this study. All recordings and design files will be labeled with this ID (and not the participant's name). All information and data relating to the user study will be protected to secure confidentiality. All electronic files will be stored on password protected computers in locked offices, which can be accessed only by the investigators of the user study. All paper forms (e.g., the exit questionnaire) will similarly be labeled with the ID and not name. The paper forms will be stored in Barbara Cutler's locked office. The correspondence between ID number and participant name will be recorded by Barbara Cutler and stored on a password protected computer, accessible only by the her. This correspondence will be destroyed once analysis of the data is complete, within 1 year after participation in the study. The video/audio recording will be destroyed within 1 year after participation in the study.

Institutional Review Board
Rensselaer Polytechnic Institute

Informed Consent Form

I understand that Barbara Cutler, who is a professor of Computer Science at Rensselaer Polytechnic Institute, and Tyler Sammann, a Computer Science Master's student at Rensselaer Polytechnic Institute, would like me to use a new sound interface and answer a short questionnaire as part of the research project on a new multi-user collaborative system for sound and music editing for Tyler Sammann's research. I understand that they will be making their best possible effort to guarantee me every possible protection, including the following:

1. I am 18 years or older.
2. I am under no obligation to be participate in the study or to be complete the questionnaire if I do not wish to do so.
3. I am not obligated to perform any of the exercises or answer any of the questions. I may decline to answer any or all of the questions, and I may terminate the study at any point, without giving any reason.
4. There will be no monetary compensation for my participation in this study.
5. I will be identified by a randomly assigned ID number that is used only for this study. All recordings and log files will be labeled with this ID. All information and data relating to the user study will be protected to secure confidentiality. All electronic files will be stored on password protected computers. All paper forms will be stored in a locked office. The correspondence between the ID number and my name will be recorded by Barbara Cutler and be accessible only by her. This correspondence will be destroyed once analysis of the data is complete, within 1 year after participation in the study.
6. The interaction session may be recorded with a simple video camera (positioned behind users, capturing the players backs and not their faces). The players voices will also be recorded. The audio recordings will not be used, but quotations from the recordings may be extracted as samples in the thesis documentation. The video/audio recording will be destroyed within 1 year after participation in the study.
   ____ I agree to be video and audio taped.
   ____ I do not agree to be video and audio taped.
7. System audio produced and created as a result of using the interface will be recorded and saved as digital files for later analysis. Mouse and keyboard motion and interactions will also be logged and saved for later analysis. The logged mouse and keyboard interaction data may be used in the thesis document. The system audio recordings will not be used in the thesis documentation. These data files and recordings will be destroyed within 1 year after participation in the study. Within this time, and with the permission of all users in the study, recorded system audio files will be released to participants upon request.
   ____ I agree for my mouse and keyboard actions to be logged and saved.
   ____ I do not agree for my mouse and keyboard actions to be logged and saved.

   ____ I agree for system audio to be recorded and saved.
   ____ I do not agree for system audio to be recorded and saved.

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9. Sounds in the study environment will be limited in the system to a loudness of 85 dB(A), and loudness will be monitored with a sound level meter during the study. Permanent hearing damage can occur if listening to prolonged sound or noise at 85 dB(A) for 8 hours or more. If at any time I become uncomfortable with the loudness, or any other part of the study, I may request for the master volume to be lowered. I may also request for the sound to be muted and/or the experiment stopped at any time. I am also free to leave the study at any time.

10. If there is anything that I do not wish to have quoted, or any interface state files that I do not want made public, I may say at any point during or after the study what I wish to have kept off the record and it will not be quoted or used in a publication or thesis document.

11. I understand that if Barbara Cutler or Tyler Sammann decides to use any portions of my answers to the questionnaire or any examples of my system interaction documentation or verbal comments during system use in subsequent publications, that they will send me a copy of the portions of the questionnaire and any interaction documentation, including any quotations and paraphrases that she decides to use, for my editing and written approval. I will have the right to edit the material and I will have access to the final publication. They will only use the material that I have approved and the use of all material will be anonymous. I may also change my mind at any point up to and including the review of any quotations and paraphrases and interaction documentation that might be used.

Name of Participant	Signature	Date

For further information contact:
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Sample Multi-User Collaborative Sound Interface Instructions

After receiving the system introduction and safety safety instructions, the basic guidelines and instructions for the study are provided to the participants:

1. The user with the guitar will provide the input sounds to the current system. They will not have a mouse. They will not be able to make edits or modifications in the system.
2. Every other user will have a USB mouse. These users will not play any instruments, or provide input sound, but will be able to use their mouse to make modifications and edit the sounds with the interface.
3. There will be two different sessions, and in each session the participants will use a different interface. One of the interfaces will be the well established digital audio workstation, Audacity. The other will be our new multi-user collaborative user interface.
4. Goals for the session are guidelines, and exploring the possibilities of each interface is encouraged.
5. As much as possible, collaborate with your other group members. The "editor" users should be talking amongst themselves to make changes. Even more important is the communication and collaboration between the "editors" and the "player." The player will likely have ideas about how to edit their recordings, and the "editors" will need to communicate with the "player" in order to achieve the kinds of input recordings they'd like to hear.

The goals for each of the sessions will be the same, in an effort to compare and contrast the different interfaces. For example:

1. Record and playback at least 3 layered tracks as a group.
2. Delete at least one track as a group.
3. Every "editor" user should add at least one effect to a track.
4. At least one effect should be removed by the group.
5. Decide on a final musical piece as a group (at least one) and play it back for its full duration.

Sample Post-Design Questionnaire

1. Were the instructions given clear? Did you have any confusion or misunderstanding of your instructions or objectives?
2. What is your level of experience with music and sound? Do you play any instruments or perform in any other musical way? Have you written or recorded music before? Can you read sheet music?
3. Do you have any experience with Digital Audio Workstations (i.e. Pro Tools, Reason, Logic, Audacity, Ableton Live, etc.) or other sound editing or filtering software? If so, please elaborate on which applications you have used, and your comfort level with them. Had you ever used Audacity before this study?
4. What were the positive and negative aspects of using the Audacity Interface?
5. How did multiple users collaborate creatively with the Audacity interface? What was the work flow like?
6. What were the positive and negative aspects of using the Multi-Mouse interface?
7. How did multiple users collaborate creatively with the Multi-Mouse interface? What was the work flow like?
8. Was it better or worse for each editor user to have a mouse, and for users to make different changes simultaneously?
9. Which interface (Audacity or Multi-Mouse) did you prefer? Please explain.
10. Do you understand more about audio editing than you did before the study? Please explain.
11. Are there any features you would like to see added to, or removed from, the Multi-Mouse interface?
12. Did you like your final musical product? With which interface did the group produce a better final musical product in your opinion? Why?