Exploratory Study Protocol

Code

Interviewer reads this highlighted text as is
Interviewer tells instruction to participant
Interviewer asks question to participant
Instructions for interviewer

Pre-study instructions

- Tell the participant to clone the repository

`git clone` BLINDED FOR REVIEW

- Tell the participant that they can follow the instructions in the README.md file to set up and run the program locally on their machine

Instructions (5 minutes)

Good __. My name is _____. Thank you for coming.

This study involves a task focusing on debugging the performance of a configurable system. The study consists of two parts. In both parts of the study, I want you to work on the task and talk about what goes through your mind and how you approach the task as you work on it. There are no right or wrong, or desirable or undesirable actions, steps, or things to say or do. Also, you do not need to finish the task in the fastest amount of time, and probably will not have time to finish. That is completely fine. Rather, I just want to observe you and listen to you as you work on the task.

In the first part of study, you will work on the performance debugging task in a configurable system. Due to the complexity of performance debugging and debugging in general, I might give you some information if you are working on something for which I have that information. But, throughout this part of the study, I want you to work on the task describing what is that you are doing.

In the second part of the study, I will give you more concrete and targeted information about the performance behavior of the configurable system, so that you can continue working on the performance debugging task. In that part of the study, I will not give you any additional information besides the information that I will give you at the beginning of this part of the study. Similar to the first part, I want you to work on the task describing what is that you are doing.

If it is okay with you, I would now like you to share your screen so that I record video and audio of our conversation. The purpose of the recording is so that I can get all the details of what you are thinking as you solve the task, but at the same time, I can carry on an attentive conversation

with you. I assure you that all your comments will remain confidential. I will be compiling a report without any reference to individuals. (Wait for participant to share screen and start recording). Could you please state on the recording that you consent to participating in this study and that you can stop the study at any time? (Wait for participant's consent).

Let's beginning with the task

Study 1.1: Info Needs and Debugging Process (25 minutes)

Type of study: Wizard of Oz with Thinkaloud
Task: Address the bug report. Specifically, answer the question "why is the system taking so long to execute?"

Check out the "bug-report-1" branch

```
git checkout bug-report-1
```

The scenario for the entire study is that you are a software engineer who has limited experience working with Density Converter, a real open-source configurable system. That is, you have a general idea of what the system does, but do not have extensive knowledge of all components of the system nor how the configuration options affect the functionality and quality attributes of the system, including performance. One week, you are the engineer on-call, who is in charge of answering questions about the system on forums and addressing bug reports. One bug report that you received and need to address is found in the README.md file.

- Read the performance bug report.
- What is the bug report saying?

- Read the task
- What is the task about?

I included the description of all options of the system, as well as assumptions about the scenario.

Work on the task

Data and information that we have available:

1. If the participant would like to know the execution time of the program under any configuration, we will tell them how long the program takes to execute
2. We collected performance profiles of the system under 8 different configurations
3. If the participant would like to know the execution time of a method under any configuration, we will tell them how long the method takes to execute.
4. If the participant would like to know which options influence the execution time of a method, we will tell them which options influence those methods

5. If the participant would like to know which options influence the value of parameters and variables, we will tell them which options influence those components

While the participant is working on the task, ask the following clarifying questions as necessary:

- What kind of information are you trying to get?
- Why are you getting that information?
- How are you getting that information?

After the participant has collected some information or learned something new, tell them to continue working on the task and talking as they work on it.

If the participant is going in to a rabbit hole, or they want to work on a time-consuming task:

- This is one direction that you and can get some useful information if you continue on that path. However, it might take a long time to get that information. Are there any other approaches that you want to try?

If the participant suggests to change the image, configuration, or hardware:

- The user will tell you that they do not want to change the image, they want the functionality that they selected, and they will not buy different hardware/the system runs in fixed hardware

If the participant suggests that they have addressed the bug report without understanding how options and their influence affect the execution time:

- Why is the program taking so long with this option?

After the participant has worked on the task for 25 minutes

- I am going to stop you at this moment with this part of the study. It is fine if you did not complete the task.

Study 1.2: Explore Information Needs (25 minutes)

Type of study: Wizard of Oz with Thinkaloud
Task: Address the bug report. Specifically, answer the question “why is the system taking so long to execute?”

Check out the “bug-report-2” branch

```
git checkout bug-report-2
```

Assume that you have spent some time conducting experiments and you have determined that SCALE is the option of interest. That is, SCALE drastically changes the execution time of the program, which you can see in the table that I have provided. From the experiments you conducted, you also determine that SCALE drastically changes the execution of two methods, which you can see in the table that I have provided. As part of the experiments, you collected

performance profiles for both values of the option, which you can find in the directory “./src/main/resources/profiler”.

Assuming that you have collected this information and you have it available, and you also have access to the source of the program, I want you to, in this setting, to address the bug report. Similarly to the previous part of the study, I will observe the actions that you take and note what you say and think as you figure out why the program is taking so long. But this time, I will not give you additional information besides what I already described

Work on the task

If the participant is going in to a rabbit hole, or they want to work on a time-consuming task:

- This is one direction that you and can get some useful information if you continue on that path. However, it might take a long time to get that information. Are there any other approaches that you want to try?

After the participant has worked on the task for 25 minutes

- I am going to stop you at this moment with this part of the study. It is fine if you did not complete the task.

Debrief (5 minutes)

I want to ask you a couple of questions before we wrap up.

- What was some useful information that helped you during the task?
- What other information would you like to have to help you in this task?

Thank you for participating.