***Introduction***

The purpose of this experiment is to collect data on how users draw circuits when using our program, LogiSketch. This data will be useful for our research group by helping us improve our program to better recognize and model users’ circuit drawings. The system will eventually be used in CS5 and other classrooms by replacing LogiSim, a program to simulate circuit schematics.

During this experiment, we will ask you to perform several drawing tasks on a Tablet PC that I will give you. Before we begin, we will show you a short tutorial about LogiSketch. Also, you will have time to review digital logic circuits and see some demonstrations so you can become more comfortable with the system.

While you complete the tasks we give you, the monitor on the other side of the table will be displaying what you’re doing and we will be recording this screen. Also, we will be taking notes and the system will be recording your sketches for future analysis, but the sketches and recordings will not be linked to you personally, nor will we record your name or any identifiable traits in our notes.

Please think out loud or make any comments about what you are thinking during the tasks. After you are done, I am going to interview you briefly about your experience.

We remind you that the purpose of the study is to collect data, not to test you. If you have any issues with the system, it is the systems fault, not your own. We do not anticipate that the experiment will make you feel uncomfortable in any way, but you may leave the experiment at any time for any reason and still receive your promised compensation. Your participation in the study should take approximately one hour.

Do you have any questions at this time?

Please read and sign this Informed Consent Document now.  Take as much time as you need.

I will now show you a short tutorial in order to instruct you on how to use LogiSketch, and then I will show you how to use some tools in the program.

*Play tutorial video.*

*\*CONDITION 3.5\**

The dashed gate outlines that appear behind gates are exactly the gates that the system is looking for. All of these gates have constant width/height ratios. You should draw your gates to more closely match these gates. If you do this, the system will have an easier time recognizing your sketches and you will need to do less correction work. Any questions?

*\*CONDITION 3\**

The outlines that appear behind the gate shapes are essentially “perfectly drawn” gates that the system is expecting and will be able to recognize. Theoretically, if gates are drawn similar to how the gates are shown, then the system should recognize sketches better. This matters even in how the gate outlines are scaled; for example, if an AND gate is drawn, and it looks like the outline is much shorter than the AND sketch, but it’s the same width, then sketched AND gates must actually be wider to be longer (to fit an AND outline). Any questions?

**Practice Time**

I will now show you how to use some of the tools (some of which were mentioned in the video) and then you can practice using them.

* Demonstrate all methods of selection (using selection button with drag, selection button with tap, and stylus button)
* Demonstrate grouping?

Do you have any questions at this time?

**Review**

Here are pictures of what each logic gate looks like and two pictures of circuit layout examples (one with canes and one without). Note, you will be able to cross wires in your circuit. Please take some time to review this information if needed. We will take this away when you are done, but you may ask for the logic gate pictures at any time during the experiment if you need to see this material.

Any more questions?

**Warm Up Task**

This task will let you practice drawing all of the gates. Please draw the gate that pops up. You should draw the gate once and then click next. You will be asked to draw each gate two times. Also, please only draw the gate, not any wires or inputs.

**Task**

Please draw the circuit corresponding to the equation that comes up on the screen. After you have completed drawing, press recognize. You will then receive feedback from the system that will give you information about any recognition errors and how your drawing was recognized. You should try to correct these errors until all components of the circuit are recognized correctly or until you want to stop. When you are done correcting or ready to move on, you can either let us know you think the entire circuit is correct and we can assure you that it is, or you can just click next to go on to the next circuit. There are seven different sets of equations and you will sketch each set two times, making 14 sketches in total.

**Interview**

I will now ask you some questions about your demographic and your experience with LogiSketch. Please express anything you have to say (including criticisms) without reservations. You may pass on questions if you do not want to answer them.

*Perform interview.*

**Conclusion**

Thank you for participating in our study. We ask you to please not discuss your experience in detail with other people because many of your peers will be participants in the study as well. *Explain how the raffle will work.*

*Tutorial Audio:*

LogiSketch consists of a panel where you can sketch the circuit that you want to be recognized. To sketch, simply draw with the stylus. To erase, invert the stylus and use it like an eraser. If you hover the stylus, two or three buttons will pop up, depending on the situation. The tools button will always show up when you hover. It allows you to delete, undo, redo, and paste. Next, the select button will also always show when you hover. Pressing this button puts you into selection mode so you can select parts of your drawing. You select parts of your drawing by boxing strokes or by tapping the strokes. Alternatively, you can press and hold the gray button on the side of the stylus to box parts of your drawing as well. When you select parts of your drawing, you will be able to perform tasks like cutting, labeling, grouping, moving, resizing, and more on the selected stroke or strokes. After you recognize, you will have other options like labeling and grouping. Finally, the label tool, which we will see later, only appears if you are hovering near strokes and have already recognized.

After you draw your circuit, you will click recognize. After you recognize, your drawing will change colors. The colors of the strokes correspond with what the system thinks the components of circuit are. For instance, wires are colored blue, text is colored salmon, and gates have their own colors. Hovering near a circuit component now brings up all three buttons. The label button shows what the component of your circuit that you are hovering near is labeled as. Tapping this button allows you to re-label parts of your sketch that may be recognized incorrectly. As a side note, you can erase and re-draw then re-recognize to fix recognition errors as well.

*Ghost Gate Tutorial Only:*

After you recognize, dotted outlines of what the system thinks the components of your circuit are will appear on your sketch. If you tap down your stylus, the outlines will go away. Also, after you re-label, a dotted outline of the shape of the new label will be displayed behind your relabeled strokes. Again, if you tap down your stylus, the outline will go away.