Informing and Evaluating Computer Aided Design Tools for Beginning Lighting Design Students

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Abstract

Two custom plug-in tools were created to assist beginning lighting design students in learning Computer Aided Design. The tools were evaluated in a pilot study with two participants involving interviews and direct observation. The study suggested that the tools created a more positive experience and students are eager to utilize them. New directions for further development and evaluation were suggested.

1 Introduction

This quarter, I took a class called Advanced Lighting Design, taught by UCSB Professor Vickie Scott. One thing in this class that differs from its prerequisite classes, Stage Lighting Design or Dance Lighting Design, is that for the first time, students use Computer Aided Design (CAD) instead of hand drafting for their projects. The specific program used is Vectorworks, a CAD software for architecture, engineering, and entertainment.

As someone with a good amount of experience with Vectorworks and a background in technology, I was designated as the person to go to with any questions about using Vectorworks. Through the course of the quarter, I worked with students to help troubleshoot their problems and guide them through some of the more complicated processes involved in drafting a light plot, the most common task lighting designers turn to CAD to do. At the same time, I was the Associate Lighting Designer on a show at UCSB designed by Michael Klaers, a lighting designer and architectural drafter who has created and published a number of custom Vectorworks plug-ins. He pointed me towards Vectorscript, the program's built-in scripting language based on Pascal, and encouraged me to start making my own tools.

Having both seen and experienced first-hand the steep learning curve of Vectorworks, I decided to try and make tools to improve this experience. Early on, the software has high difficulty of use compared to relatively little progress in the sophistication of what can be created. I set out to lower the difficulty that corresponds to the sophistication of tasks for a beginning lighting design student. This paper details a pilot-study based on evaluating two new tools and guiding their future development.

2 Methodology

Two students from the Advanced Lighting Design class were asked to be a part of the study. Each subject's participation lasted under an hour. It consisted of a pre-interview, a presentation of the tools, observation of working on a task with the tools, and a post-survey. The study took place during the last week of the quarter, after the Advanced Lighting Design class had finished. The participants gave consent for video and audio recording, as well as for their names to be included in this paper.

2.1 Participants

The participants were Laila, a fourth year undergraduate majoring in Music Studies, and Kaitlyn, a second year undergraduate majoring in Theater. Both had taken THTR 23: Stage Lighting Design the quarter prior and had their first introduction to Vectorworks at the start of this quarter in Advanced Lighting Design.

2.2 Early Tools

One new tools was called "Select By Something" (Figure 1). Users could double click the tool's icon to input the name of a field. Then, when they clicked a lighting device, all other lights with the same value in that field as the one clicked would become selected. Users could also double click and input a specific value, which, after clicking to use the tool, would select all lighting fixtures with the input value in that field. Lastly, users could use the

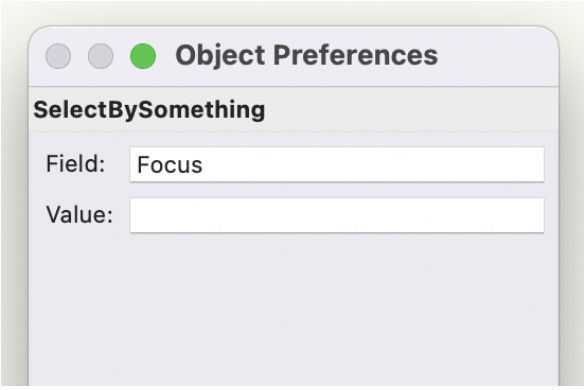

Figure 1: Providing information for the Select By Something tool.

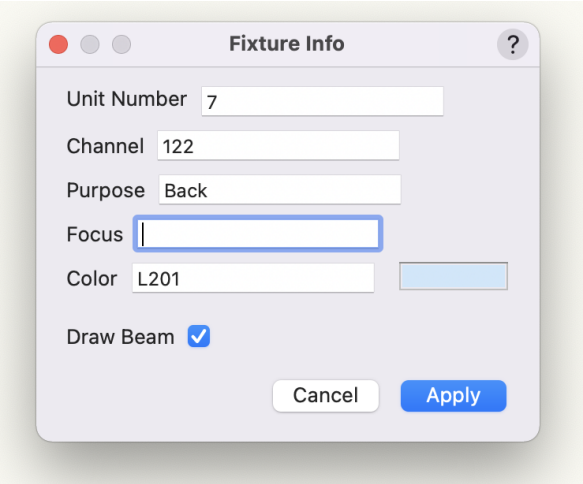

Figure 2: Modifying fixture values through the Direct Info tool.

tool to click a focus area and highlight all fixtures with that area as their focus. This tool was based off of my own frustration with wanting to easily see where all of my lights of a certain quality are. The best way of doing this currently is the built-in custom selection tool, which takes a minimum of ten clicks to set and execute and is annoying to use repeatedly.

The other new tool was called "Direct Info" (Figure 2). With this tool selected, users could click on a light to see a small menu which contained five relevant fields they could view and change the values of, as well as a check box to toggle the "Draw Beam" feature and a gel color preview. This tool was based on a conversation I had with Professor Scott where she mentioned that the Object Info Palette, the current way to access the field values of a Vectorworks object, has so many parameters listed for lighting devices and makes the user search for the relevant fields, confusing beginners.

Neither of these tools provided the ability to do something that was previously impossible to do in Vectorworks. However, they did simplify and streamline their relevant processes.

2.3 Interviews

Participants were interviewed twice, once before completing the task and once after. The pre-interview focused on their prior experience with Vectorworks and lighting design. This information was to contextualize a potential shift in attitude that could be caused by access to better tools. The post-interview focused on how they felt using the new tools during the observation period and if they would continue to use them. This was to reveal the effectiveness of the tools on an emotion level-regardless of their technical success, if they do not support the process on a human level, they have not met the goals set here. The audio of the surveys was recorded and later transcribed for analysis.

2.4 Observation

Participants were given an example Vectorworks file consisting of a simple stage set-up in ground plan and section view. They were tasked with placing front, side, back, and top light as well as giving unit and channel numbers to each of their fixtures. This task was deemed appropriate for their experience level by Professor Scott. The allotted time for the task was 30 minutes. They were not expected to finish the task in 30 minutes; the task was purposefully something that would take longer than that to ensure they had work to fill the whole time. Participants were encouraged to verbalize their thought process while completing their task. I did not step in when they expressed confusion and only answered questions when directly asked. The screen of the computer as well as audio during the task were also recorded.

2.5 Limitations

Because of the length of the observation period, I was only able to observe the usage of the tools through one specific part of the process. Because this study was conducted at the end of the quarter, participants had a base level of familiarity with Vectorworks and were, in this case, learning to integrate the tools into their current workflow, as opposed to learning Vectorworks with them access to them from to start. Additionally, though I

tried to create a casual and relaxed environment, the fact that they were being watched still potentially had some effect on the behavior of the participants.

3 Results

Studies with the two participants took place on March 15th, 2024. The two new tools held up well to early user testing and received mostly positive feedback from the subjects.

3.1 User Experience

In the pre-interviews, both participants mentioned negative emotions surrounding their time starting to learn Vectorworks. Laila described falling behind while trying to absorb large amounts of information about how the program works, though she felt comforted that her peers seemed to be in a similar situation. Kaitlyn mentioned that other theater students had warned her that Vectorworks was "terrible" and difficult to learn, causing her to go into the experience with apprehension. Both mentioned that even introductory tasks seemed to have many steps to them.

Both participants had a positive response to the tools, and the "Direct Info" tool was highlighted as the greater success. Interestingly, while this tool was inspired by the additional time it takes to find the fields in the built in Object Info Palette, both participants specifically mentioned that accessing the key information so quickly made it easier to have an understanding of what they were building.

Laila said that it took her a while to gain an understanding of the tool because she needed to see it in action first. This suggests a need for supplemental documentation of these new tools to contain information in multiple forms (i.e. both written descriptions and visual examples).

Both participants at one or more points forgot about the tools then remembered they were there. This is likely based on the limitation of them having previous Vectorworks experience and therefore not providing a completely accurate idea of how much someone who was learning from scratch would use them.

3.2 Tool Performance

There were no errors or crashes caused by the tools. There was one instance of an unexpected behavior, which involved the "Select By Something" not activating when a focus area when clicked. Upon closer inspection of the testing file, it was noted that this was because the focus area was inside a group. Grouping a focus area with a semi-transparent circle for visual reasons is a common practice, so being able to select a focus area through a group is a likely future improvement.

The "Direct Info" tool caused a few instances of confusion with both participants. A combination of a design choices caused a problem: (1) the tool will effect any highlighted fixtures as well as the one clicked, (2) the tool will keep fixtures highlighted after the menu is closed to make it clear what was just changed, and (3) when multiple fixtures are selected and a field has multiple different values between the different fixtures, that field shows as blank. This caused the tool to lead users to think they were modifying certain fixtures while they actually had even more selected out of sight. It was actually an intentional design choice to have fields appear as empty when there are mixed values selected. However, participants would be confused because they thought they put a value in which was now appearing blank, even though it was blank due to mixed values and not a lack of value. One fix to improve this is to show a "[mixed values]" message in fields with mixed values as opposed to a blank entry, though it could cause confusion when users come to expect a "[mixed values]" message which they won't receive using the normal Object Info Palette. The issue of keeping fixtures selected or not is more complicated. If fixtures stay selected after the tool is used then it makes it easy to accidentally include them in the next usage of the tool. However, deselected fixtures after the tool is used removes the ability to see what was just modified as well as being able to further change values of those same fixtures in the object info palette. More work will need to be done to improve this design before it is ready for further testing.

3.3 Future Work

In order to properly evaluate the success of these tools in assisting beginning lighting designers in learning Vectorworks, these tools need to be available from the moment students first interact with the program. These tools should be tested over longer periods of time with more complicated projects to discover edge cases and confirm their usefulness. Lastly, a larger pool of participants is

necessary to give a more generalized idea of how the tools are received. A more robust study would follow the students of the Advanced Lighting Design class over the course of a quarter as they gain familiarity with the software and complete their assignments. This would involve surveys/interviews at the start, end, and mid-way points of the quarter, as well as more direct observation and, perhaps most importantly, solicitation of honest feedback.

In this situation, students should have access to a more complete suite of tools to help them. Some ideas for tools inspired by this study include a tool to make every layer with a lighting device visible and a tool to automatically draw the plan-view angle guides of where front, side, and back fixtures should land. These tools would need to come with full documentation as there would be no online/outside resources to help, as well as they shouldn't take up instructional time with lengthy explanations. The help that the tools provide must outweigh the extra work to setup and incorporate them.

This pilot study strengthens my belief that with a set of well-developed tools and accompanying resources, the process of learning Computer Aided Design as a lighting design student can become a vastly less stressful experience.

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