*SymmetryWorks* UX Testing: Software Manual

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1. **Background**

This software provides a way to explore the intricacies of symmetry by creating mathematically-generated wallpaper patterns. Created by mathematics Professor Frank Farris from the University of Santa Clara, the software reflects Farris’ research on the complex mathematics of symmetry, implementing certain function to create images that are symmetrically and (hopefully) aesthetically pleasing. The super-short technical recap: the software uses what is called the “domain-coloring algorithm,” which, for each pixel in the output image, computes its color by converting it to a complex number (of the form a + bi), using it as the input for a wave function with a given set of parameters (selected by the user). It then uses a particular color wheel to take this output value and find its corresponding color.

As an interdisciplinary summer project, we are working with Professors Sean Barker, Mohammad Irfan, and William Barker to adapt this software to be more useful for artists. This involves improving its interface, usability, and performance, making it more intuitive for artists and mathematicians alike. A secondary and future endpoint is guiding the user toward designs that will yield an interesting wallpaper pattern.

We’re hoping to get some feedback today about how the interface as it is might be improved to be more user-friendly. We hope you enjoy playing around with it.

1. **PART 1: Adjusting the function constants**

When you launch the software, you will see a window with a large preview display window in the center. This is what will change when you adjust the function parameters. In the box on the bottom of the window, you will find the Function Constants editor. This essentially controls the coefficients for the function which you will use to create your image. Try changing the value of n1 from 1 to 2. Now change m1. Though you may not understand the exact mathematical underpinnings you can get a sense of what happens as you adjust these variables. Now try using the sliders for the coefficient plane. The r1 slider represents the radius , while the a1 slider represents the angle which are used in the complex valued function. You can even click the “Set on Plane” button to see a visualization of these values on a polar coordinate plane. On the left hand side, you can click the View/Edit All Terms button to see all the terms of the function you are using. Adding a term essentially superposes another wave function on top of the current one. You can add or remove terms from the list and adjust their parameters from this window, too.

1. **PART 2: Changing the function and color wheel**

Now click the “Reset” button below the preview on the right to reset the wallpaper to its default settings. On the left, you’ll see a Pattern Type box. This lets you change the function from its default Hex3. These functions are named mathematically, but play around with them and see if you can find one you like. Beneath, you can change the color wheel. You can think of this like the “original image” before it undergoes any of the wallpaper generation. To see what the initial color wheels look like, select Cx Polyn and then browse through the color wheels. Now try loading an image via the “From Image” option under the Color Wheel menu. Choose Hex3 (or any other function of your choice), and play around with adjusting the function constants and adding more terms.

1. **PART 4: Saving your creations**

Excited about your creation but want to keep exploring? Click “Update Preview” below the preview to add it to a running “history” list. You can view these to restore back to previous settings. When you find a design you really like, select “Export Image…” in the middle below the preview, and pick a name. You can save it to PPM or JPEG format, and you can adjust the size of the exported image in the “Image Properties” box on the top left under “Output Width/Height.”

**QUESTIONS FOR THE USER**

1. How do you feel about the general layout? Is the function constants box distracting since it’s hard to tell what effect changing the values will have on the output pattern?
2. In terms of changing the function, would it be helpful to include an icon of the function with a brief icon to preview an example of that function on an image?
3. Can you see this software being useful for art students? If yes, how might it be used? If no, could it (or a version of it) be adapted to be better suited for artists?
4. Any other comments?

Thank you for participating in this user experience session! We appreciate your feedback.