Algorithmic Patterns through Glitch Weaving

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Glitch Weaving is a Processing tool designed for weave drafting with intentional errors, termed as "glitches." Though the outcomes may seem random, these glitches are deterministic and consistent. Using Glitch Weaving, users can explore various ways to modify a draft and select their preferred design for weaving. By creating and weaving with this tool, I delved into algorithmic patterning, working alongside errors and choosing glitched drafts based on aesthetics.

CCS Concepts: • **Human-centered computing → Interactive systems and tools**.

Additional Key Words and Phrases: Computational Fabrication, Computer Aided Design

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1 INTRODUCTION

In the Fall of 2022, I developed Glitch Weaving [2], a tool that introduces deterministic algorithmic glitches into woven textiles. This allows designers to decide the extent of intentional error in their creations. Despite the seemingly random outcomes, they are predictable and controlled. While creating glitched samples, I experienced the melding of code and textile patterning. The results can be viewed in Figure 1, where a pristine draft (left) serves as the foundation for a glitched weave (right). These glitched textiles spurred explorations into visual representations and repair methodologies utilizing glitches, paving the way for diverse channels of algorithmic patterning.

2 MOTIVATION

I am pursuing a PhD in Creative Technology and Design at the University of Colorado Boulder. I also serve as a graduate student researcher in the Unstable Design Lab, mentored by Laura Devendorf. My research orbits around computational fabrication, craft-inspired technology, and Human-Computer Interaction (HCI). Before embarking on my doctoral journey, I studied physics and computer science at the University of California Berkeley and contributed as an R&D specialist at a San Francisco-based science museum. The Algorithmic Pattern Salon fascinates me as a nexus of craft and computation, offering avenues to connect with ingenious minds bridging technology and creativity.

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Fig. 1. A pair of woven textiles, one that is unaltered (left) and one that has been glitched (right).

3 GLITCHING TEXTILES

In the early seventeenth century, loom punch cards emerged as precursors to modern computers. Joseph Marie Jacquard introduced a loom that utilized hole-punched cards to dictate thread manipulation with each weaving iteration [4]. Today, computer-controlled Jacquard looms are the preferred tools for making woven textiles at scale.

I was initially inspired to explore glitch and textiles from existing projects like *Glitching the Fabric* [3] and Glitch Textiles [5]. The first is a commercial product for purchasing glitched household textiles like blankets and pillows, and the latter is a dissertation exploring glitch across textiles including weaving and knitting. For this project, I set a constraint to use a table loom instead of a Jacquard loom, limiting the number of possible glitches in a beautiful way.

To make glitched weaves, I designed a tool to alter weave drafts and control how much glitch is introduced into the design. This glitching is deterministic and consistently replicable. Users modified their glitched drafts based on two parameters: one that impacted the frequency of glitching, and the other generated alternative glitches at the same frequency. All glitches would start from a known woven structure, like a twill, basket weave, or a user-input design, and glitches would be subsequently introduced. In Figure 4, the original Monk's Belt pattern is foundational pattern (top left), accompanied by three levels of glitch intensity and position [1].

4 VISUALIZING AND MENDING ERROR

The selected glitched drafts were then woven on a table loom. Early prototypes explored different techniques to visualize the error in the cloth. In Figure 3, I replicated the same draft three different ways: the first with no intervention in highlighting glitch (top), the second with glitched rows highlighted in teal (middle), and the third with glitched rows with snags and loops of increasing size

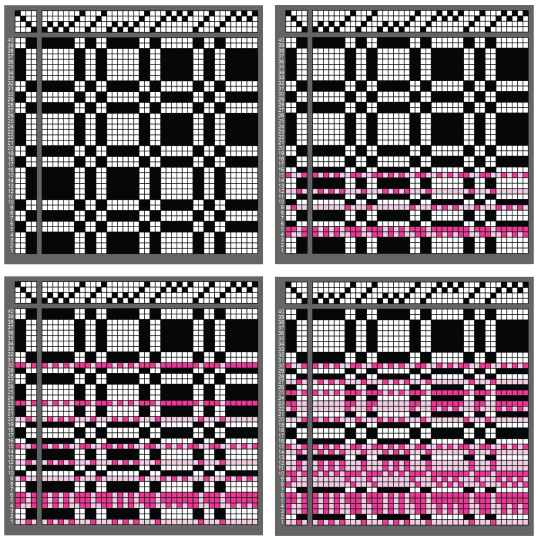

Fig. 2. A Monk's Belt weave structure is glitched three different ways, varying the two parameters of intensity and glitch location.

corresponding to glitch frequency (bottom). These tests informed subsequent weaves with color demarcating error-filled rows.

Fig. 3. Three versions of the same glitched draft exploring different ways to visualize error.

After producing these samples, I integrated them into mending and upcycling garments, embodying the concept of rectifying *error with error*.

Fig. 4. A glitched weaving sample is used to upcycle a denim jacket.

5 DISCUSSION

Glitch Weaving offers insights both algorithmically and through patterning. Algorithms underpin the glitching process, preserving the draft's integrity and ensuring reproducibility. Using a Perlin noise field, I introduced pseudorandom yet deterministic modifications, determining the rows and glitch types. This results in predictable yet flaw-ridden patterns.

The project also explores traditional patterning. Glitch Weaving starts with an established weaving pattern and introduces mistakes in its recreation. It's possible to consider if error-filled patterns could become the next woven designs, reproduced like today's patterns. Perhaps glitch weaving could be the genesis of novel weaving patterns.

6 CONCLUSION

Glitch Weaving navigates the innately algorithmic nature of weaving, intertwining purposeful, reproducible errors into patterns. As an open-source Processing tool, it empowers users to decide the glitched draft they wish to manifest, suggesting novel pattern creation guided by glitches.

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