Using Datasets to Generate Embroidery Patterns

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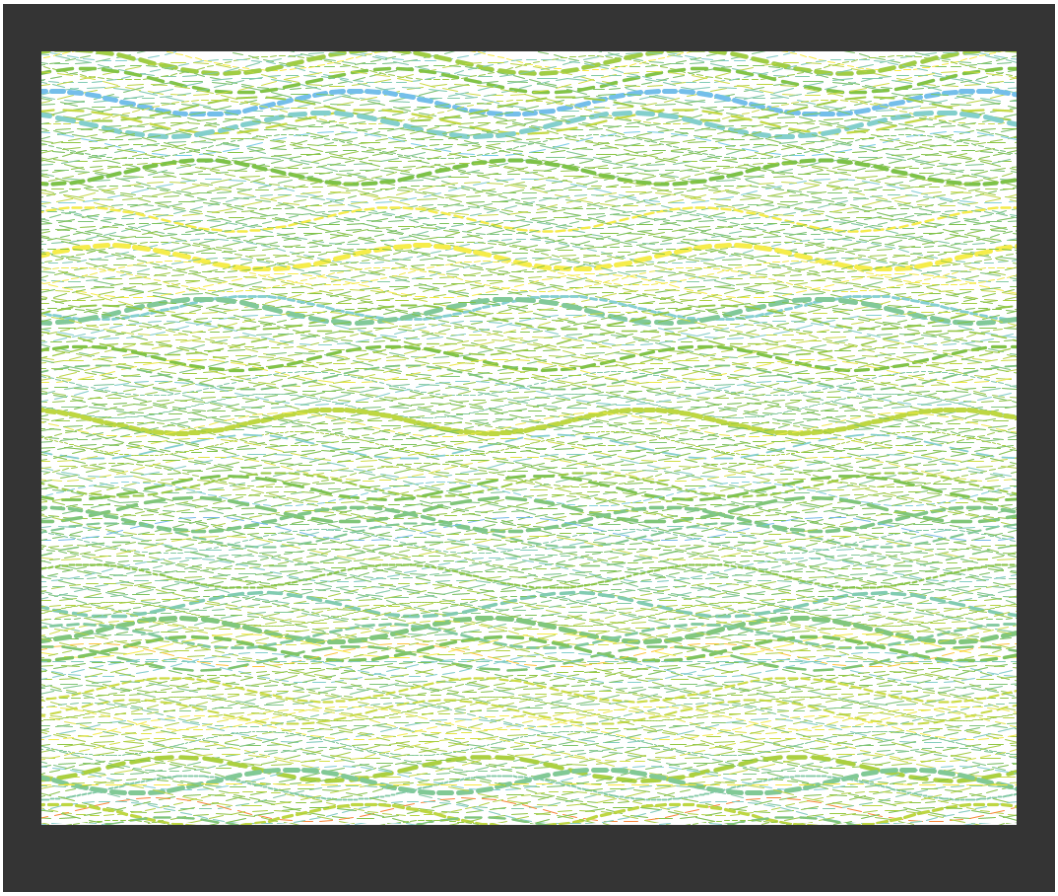

Fig. 1. The final pattern designed from the dataset. It uses the first quarter of the data, spacing them out to fill the canvas evenly. The width of the lines is the movement recorded in sleep-thicker lines for stiller sleep, the length of each stroke is the heart rate recorded-shorter strokes for rapid heartbeats and longer for calm hearts, The amplitude of the waves reflects the stress levels-high stress, high waves, and the color is mapped to the duration of sleep in hours-cooler colors to longer and warmer for shorter.

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This project explores the visualization of biometric data through generative embroidery, translating sleep and stress metrics into a textile pattern that can be created physically in the future. My goal was to make intangible bodily states visible and tactile, using heart rate variability, sleep duration, movement, and stress levels to generate line-based patterns. The stitch length, color, thickness, and vertical positioning represent each variable, respectively. The final output is both an artwork and a record of physiological rhythms. This work highlights the emotional weight of data and emphasizes the embodiment in computational art. The results demonstrate a compelling merger of embroidery with scientific self-tracking.

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1 Introduction and Related Works

My interest in embroidery and human anatomy sparked a desire to translate biometric signals into textile forms. As a college student who navigates stress and sleep challenges, the idea of visualizing this experience intrigued me. Embroidery is a craft I personally use to manage stress, and it's long been associated with comfort, care, and domestic rituals like the making of blankets—symbols of warmth and rest. This connection inspired me to express physiological data in a way that feels both artistic and emotionally resonant. The increasing accessibility of open source datasets from Kaggle has made it possible to collect and use biometric data for multiple projects. This project builds on recent research that explores the relationship between stress, sleep, and heart activity. Hall et al. (2004) [3] examined how acute stress affects heart rate variability during sleep, providing a key link between emotional state and autonomic function. Amaral et al. (2018) [1] explored the role of affect and cognitive processes in sleep difficulties among college students, highlighting the psychological complexity of rest. Fernandes and Lavado (2022) [2] examined how creativity and emotion can be embedded in textile design processes, supporting the artistic framework of this work. These sources grounded the visual metaphors used in my design.

2 Methodology

To create the generative embroidery pattern, I developed a custom Processing sketch that visualizes biometric data as stitched linework across a horizontal canvas, evoking the imagery of a woven blanket. The data set includes four key variables: heart rate variability (HRV), movement during sleep, duration of sleep, and stress level, and each of these contributes a different visual component to the overall composition. The early stages of development began with the testing of a radial spiral-shaped design. This hypnotic pattern was meant to represent cycles of sleep,, but proved difficult to manage visually when more variables were added. The first tests used only heart rate variability to experiment with how stitch length could communicate biometric rhythm. However, as I layered movement, stress, and sleep duration, the radial layout became cluttered and unreadable. I experimented with changing the parameters that each variable controlled, changing color, weight, and angles, trying to get a more appealing look. Eventually, I moved to a horizontal format inspired by the structure of a blanket. This format allowed the data to breathe and visually reinforced the theme of rest and routine. To refine the pattern, I tested how much of the data set to display and how far apart the lines should be spaced. Showing too many entries made the pattern overwhelming, so I limited the output to a representative subset. The final configuration includes: sleep duration assigned to color; HRV that determines stitch length; movement that controls line thickness; and stress that influences wave amplitude. Processing was chosen for its intuitive rendering and visual flexibility. After refining the logic, the final code generates a unique line for each entry, layering

data into a textile-like structure. The code is modular, readable, and reproducible, making it a functional tool for translating intimate bodily experiences into computational craft.

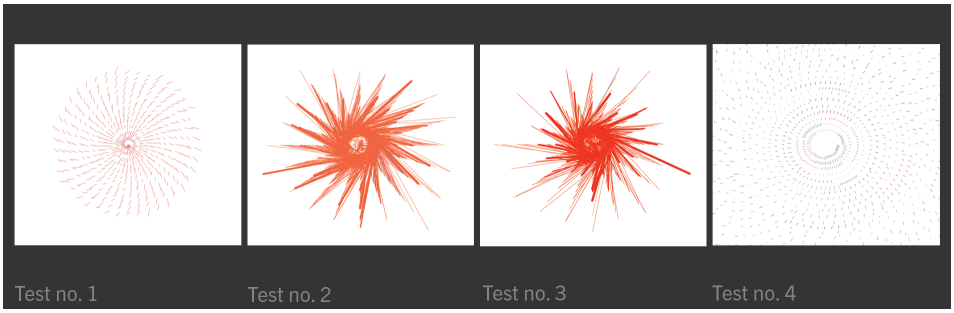

Fig. 2. The first four tests of the code with the dataset. These tests were for spiral patterns before that was scrapped. The first test was more a test of the code, only using heartbeats to get variation of lengths of each stroke. Adding the other variables into the next test, heart rate-length, duration-angle from radius, stress-color, and movement-distance from center. The third test altered the variables' correlations in attempts to fix the look; Heart rate-angle from radius, duration-length, stress-color (shifted hues), and movement-stroke length. Test four, the code was rewritten to better capture the look of test one, with heart rate going back to being length, duration is each stroke's angle, stress was color and movement was to stroke but I struggled to make it work properly.

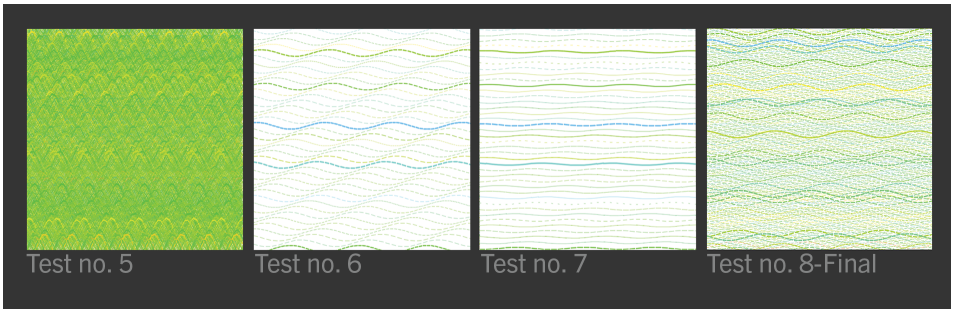

Fig. 3. These three tests were done after I moved to a horizontal layout, adjusting the effects to be heart rate-length, duration-color, stress-wave height, movement-stroke width. Test Five shows the full dataset on the canvas becoming too crowded and noisy. Test Six reduced the number of entries used by .75 and added gaps within the lines to mimic stitching. Test Seven was a sight adjustment in the max wave heights but I finally decided that I like the height of Six but needed more entries on the canvas, as seen in fig1.

3 Result and Future Work

The outcome successfully visualized sleep and stress data as a meditative embroidery pattern. The horizontal form evokes the shape and comfort of a blanket, grounding the visual metaphor in themes of rest and vulnerability. Color and linework reveal emotional and physical rhythms over time. Looking ahead, the next phase of this project is to bring the digital design into the physical world by creating a real embroidered blanket. The goal is for the object to not only represent stress and sleep data visually, but to also provide literal comfort—turning personal biometric experiences into something tangible and soothing for rest. To support this, I want to generate and use my own

dataset, giving me full control over the data collection and allowing for more intentional mapping of variables. Collecting my own data will ensure that the visuals are deeply personal and accurately reflect the rhythms of my body and lifestyle. The Processing sketch is pretty modular and adaptable, so it can easily accommodate new or extended datasets. The focus moving forward is on refining this generative system into a workflow for producing meaningful, data-driven textiles that offer both aesthetic expression and emotional utility—art as a tool for care and self-awareness.

4 Conclusion

This project has deepened my appreciation for the intersection of code, craft, and the human body. Generative embroidery allowed me to reframe data not as numbers, but as a tactile, emotional narrative of stress and sleep. The most memorable moment was seeing how small sleep changes resulted in vastly different stitched impressions—proof that even subtle bodily shifts can be deeply expressive.

Acknowledgments

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References

[1] Ana Paula Amaral, Maria João Soares, Ana Margarida Pinto, Ana Telma Pereira, Nuno Madeira, Sandra Carvalho Bos, Mariana Marques, Carolina Roque, and António Macedo. 2018. Sleep difficulties in college students: The role of stress, affect and cognitive processes. *Psychiatry research* 260 (2018), 331–337.

[2] Ana Margarida Fernandes and Isabele Lavado. 2022. Design Applying Creativity and Its Process, with Different Types of Embroidery. *Perspectives on Design II: Research, Education and Practice* (2022), 315–326.

[3] Martica Hall, Raymond Vasko, Daniel Buysse, Hernando Ombao, Qingxia Chen, J David Cashmere, David Kupfer, and Julian F Thayer. 2004. Acute stress affects heart rate variability during sleep. *Biopsychosocial Science and Medicine* 66, 1 (2004), 56–62.