Segmented Generation for Qualitative Data Visualization

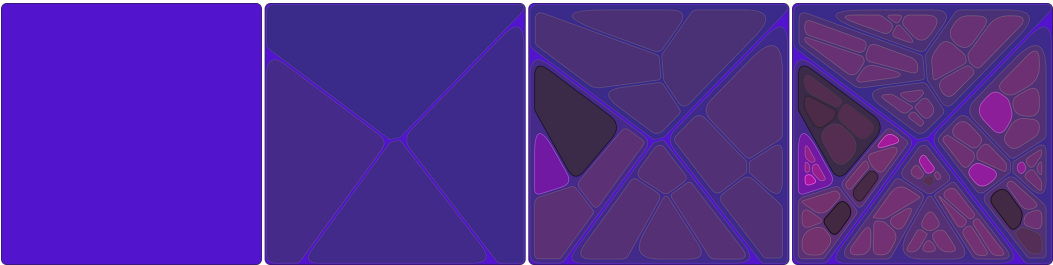MICHAEL NGUYEN, Texas A&M University, USA

Fig. 1. Full output visual of one complete generative portrait progressing from favorite color to deepest sublayer. Assume all generated figures use the following values by default unless otherwise stated. (Values - HSV: 260 90 80 | MBTI: INFP | Alignment: True Neutral | Seed: 0)

This project generates a "personality portrait" by combining nested Voronoi diagrams with a custom cellular-automata overlay. Users specify a base hue (HSV), an MBTI code, and a moral alignment; these inputs drive how cells are seeded, how their colors shift per generation, and how vibrancy and spatial irregularity respond to Good/Evil and Lawful/Chaotic settings. Cells then evolve under a B34/S234 life rule (birth on 3 or 4 neighbors; survival on 2–4), with smooth lerp-based interpolation to ensure "bounce-back" oscillations instead of collapse. The result is a perpetual, trait-reflective animation.

CCS Concepts: • **Computing methodologies → Procedural graphics**; • **Human-centered computing →** *Visualization*.

Additional Key Words and Phrases: generative art, Voronoi, MBTI, cellular automata, data visualization

1 Introduction and Related Works

Generative art that encodes personal data into abstract visuals has grown rapidly, leveraging psychology to inform form. Early work by Holtzman demonstrated how user inputs can map to geometric parameters in interactive pieces [5]. More recent studies in Explainable AI emphasize transparency and user trust in procedural systems, suggesting that visual metaphors for internal logic deepen engagement [4] [1].

Author's Contact Information: Michael Nguyen, manguyen@tamu.edu, Texas A&M University, College Station, Texas, USA.

MBTI-based coloration has been explored for static portraits, but few systems animate personality over time [2]. Conway's Game of Life pioneered emergent cellular animation, yet its classic rules often lead to stasis or extinction [3]. By blending trait inheritance (70% persistence, 20% neutral, 10% flip) with modified B34/S234 rules and smooth interpolation, MBTI Voronoi Life maintains perpetual motion while preserving trait coherence. This fusion of layered Voronoi segmentation and balanced life rules offers a novel avenue for living data portraiture.

2 Methodology

The generator combines p5.js and d3.voronoi to build three nested Voronoi layers from user inputs, and adds a smooth cell-automaton that continuously animates each cell's "alive" state. Users still enter:

(1) **Color (HSV):** Base hue, saturation, brightness
(2) **MBTI Code:** Four letters that seed cell positions and hue shifts
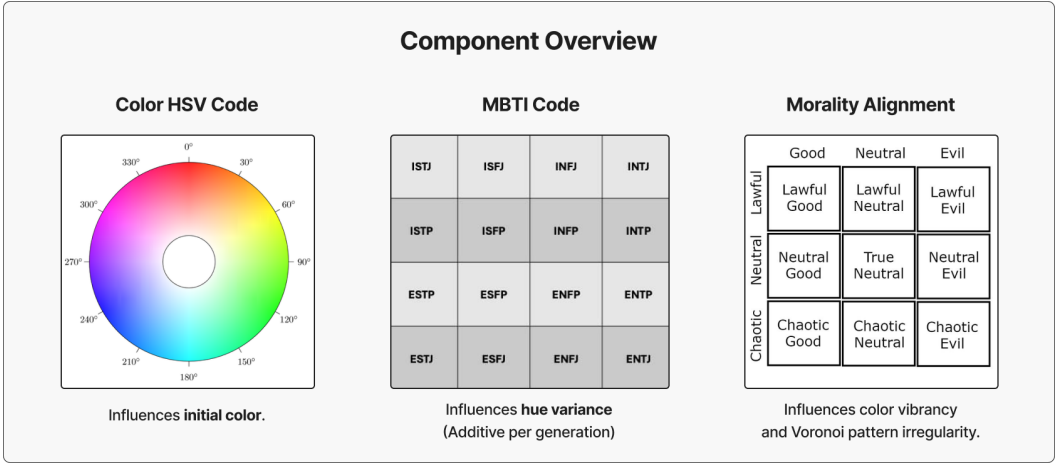(3) **Moral Alignment:** Good/Neutral/Evil (vertical bias) and Lawful/Neutral/Chaotic (positional noise)

Fig. 2. How HSV, MBTI, and alignment feed into cell color, position, and behavior.

2.1 Layer Structure & Pipeline

- **Base Layer:** Four large cells arranged on a circle—one per MBTI letter. Each letter shifts hue by ±5−20°.
- **Sublayer 2:** Each base cell spawns 3 smaller cells inside it. Moral traits (Good = +1, Neutral = 0, Evil = −1) are assigned with a 1:2:1, 2:1:1, or 1:1:2 bias depending on vertical alignment.
- **Sublayer 3:** Each sub-cell generates 2 further cells. Traits inherit from parent with 70% chance, neutralize 20%, or flip 10%.

2.2 Color Logic

- **Hue:** Starts from the user's chosen hue, then shifts by MBTI and layer depth (clamped to [0,360]).
- **Saturation/Brightness:** Modified by moral alignment (Good brightens +15%, Evil darkens −15%) and further modulated by each cell's current alive value (±20%).
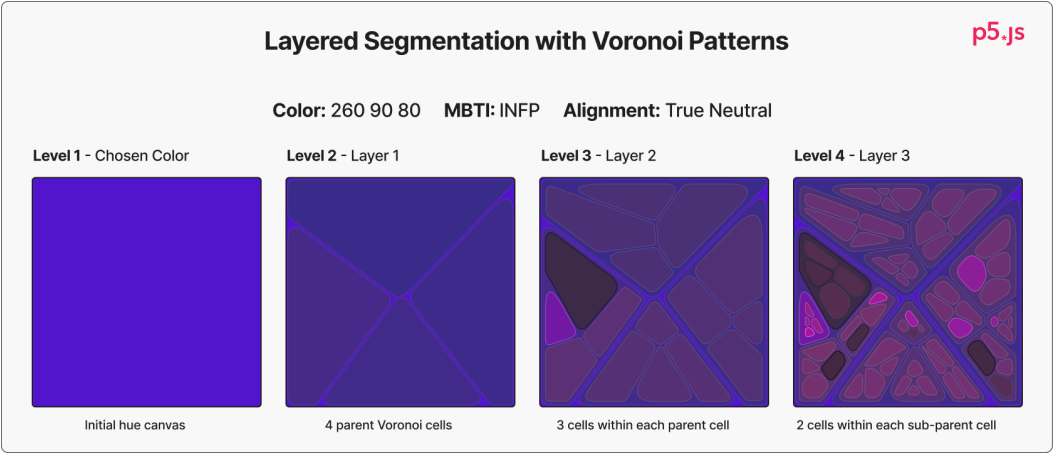
Fig. 3. Pipeline from raw inputs through three nested Voronoi layers.

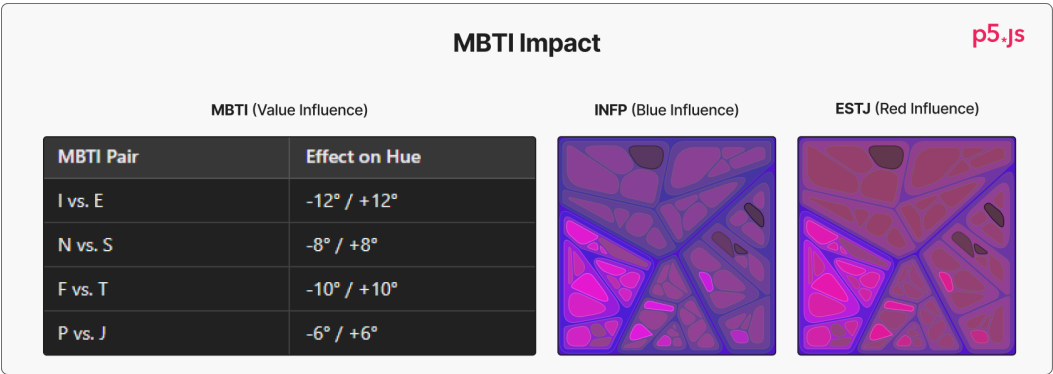- **Determinism:** A user-defined random seed ensures identical results on reload.

Fig. 4. Left: Table of MBTI dichotomies with their hue shifts (I / E ±12°, N / S ±8°, F / T ±10°, P / J ±6°). Right: Two portraits showing how an INFP leans toward cooler blue-purples and an ESTJ toward warmer magenta-reds.

2.3 Life Simulation & Inheritance

- Each cell maintains a continuous alive value in $[-1, 1]$.
- Birth: A dead cell (alive ≤ 0) becomes alive if it has 3 or 4 alive neighbors.
- Survival: A live cell (alive > 0) remains alive if it has 2, 3, or 4 alive neighbors.
- On every frame (60 fps), alive values interpolate toward ±1 using a regen factor (e.g. 0.02) for smooth pulsing.

2.4 Technical Highlights

- Deterministic Generation: Fixed seed → reproducible portraits.
- Trait Inheritance: Probabilistic moral trait passing (70/20/10).
- Smooth Animation: Life states ease via linear interpolation, preventing abrupt flicker.
- Interactive UI: Play/pause, layer opacity sliders, and trait-overlay toggles work continuously.

Life Traits & Inheritance   p5.js

+1 = Good │ 0 = Neutral │ -1 = Evil
+1 = Alive (bright) │ -1 = Dead (dark)

Custom Conway Rules
(Rule notation: B0,3,4 / S2,3)

Live Neighbors	Dead Cell → Alive?	Live Cell → Survive?
0	Yes	No
1	No	No
2	No	Yes
3	Yes	Yes
4	Yes	No
5 or more	No	No
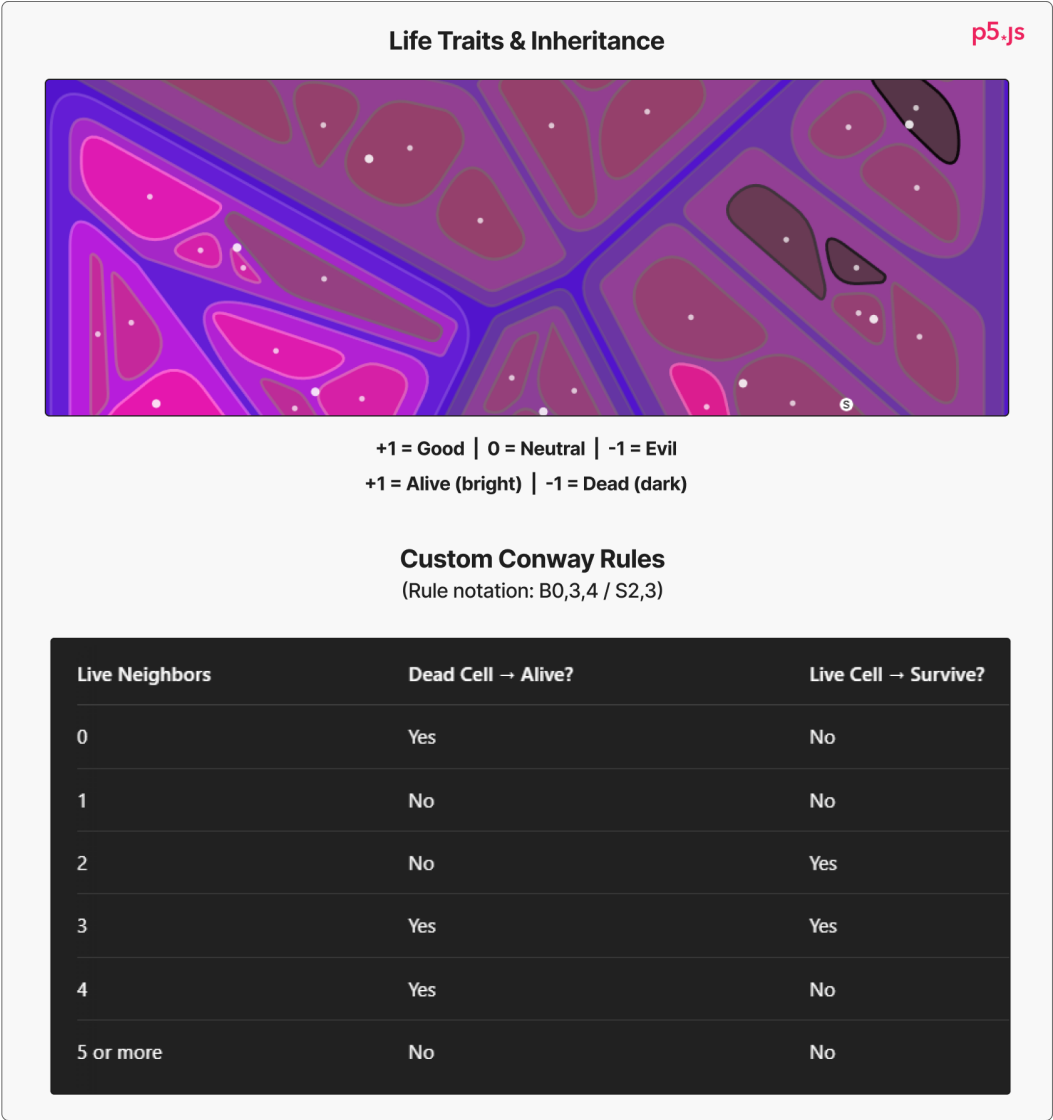
Fig. 5. A 3×3 grid (Base, Sublayer 2, Sublayer 3) illustrating how horizontal alignment governs spatial order: Lawful yields regular, evenly spaced cells; Neutral mixes order and jitter; Chaotic produces highly irregular layouts.

Fig. 6. A 3×3 grid (Base, Sublayer 2, Sublayer 3) showing how vertical alignment affects color vibrancy: Good brightens and saturates cells, Neutral balances them, and Evil darkens and mutes them.

Fig. 7. Cell "alive" value pulses over time under the birth/survival rules.

Fig. 8. Randomized exploration examples.

3 Result and Future Work

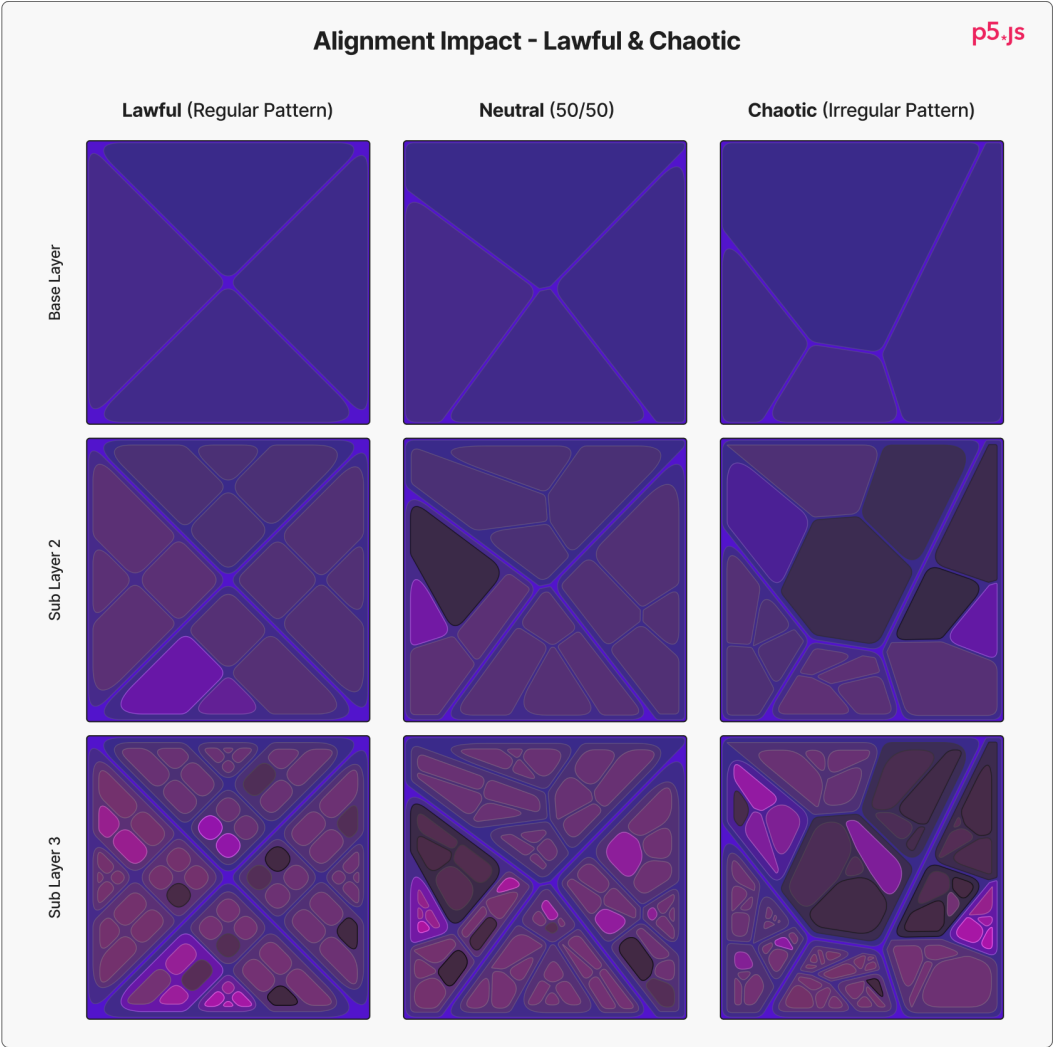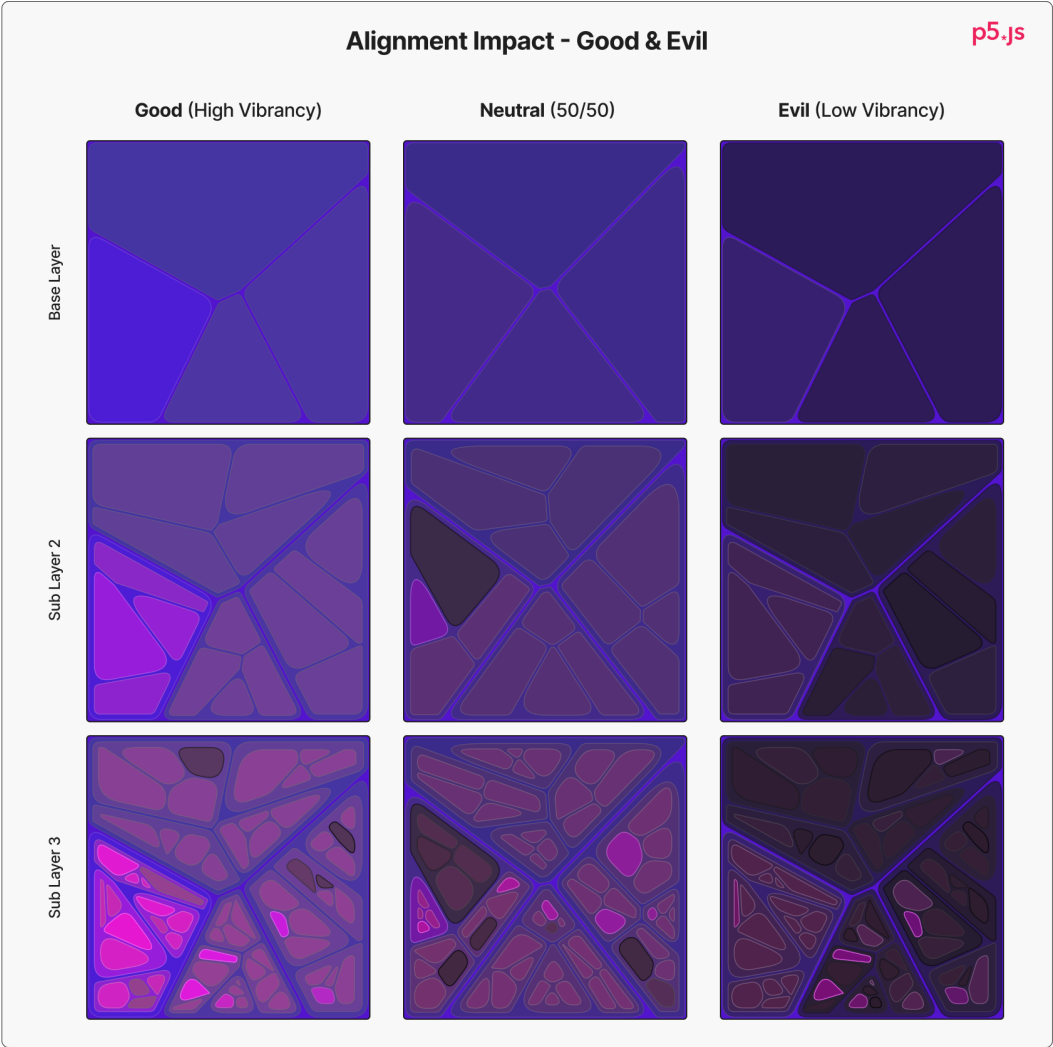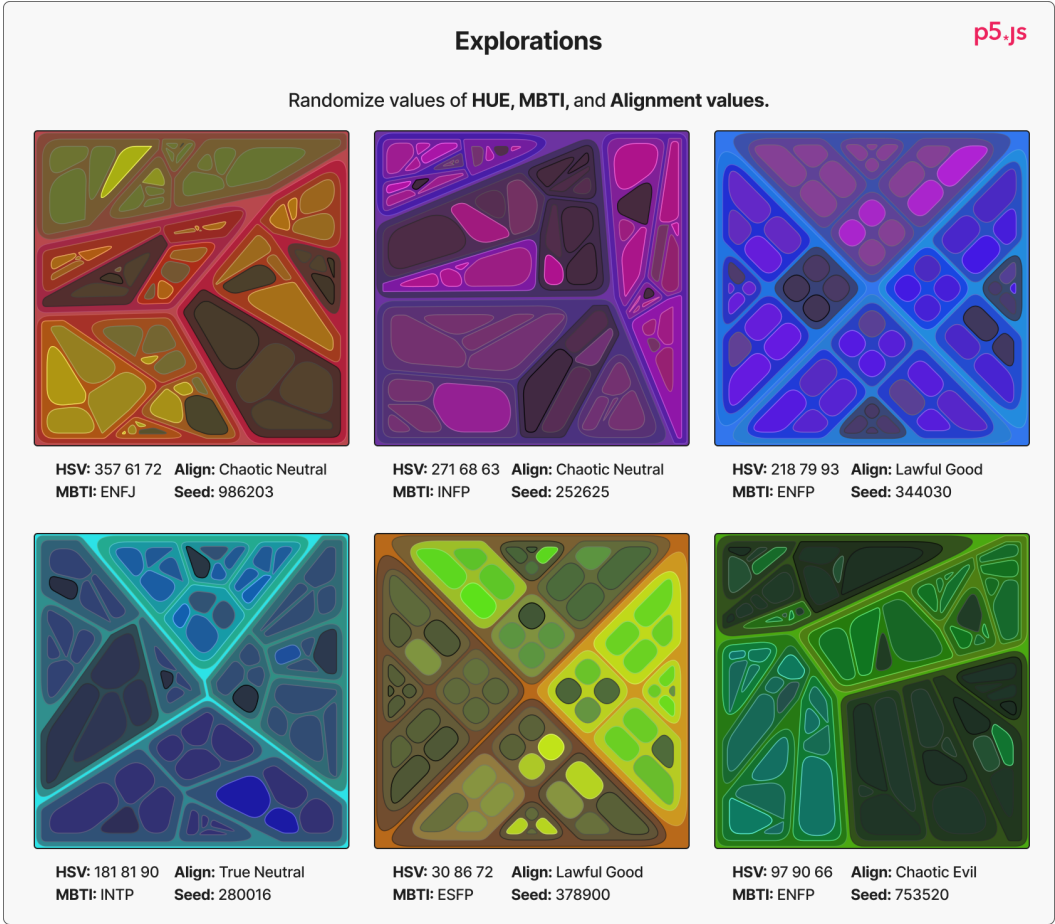The enhanced system now produces living, breathing portraits that continuously evolve rather than remaining static images. As the cellular automaton pulses each cell's "alive" value between −1 and +1, you see smooth color and shape transitions driven by MBTI-informed hue shifts and moral-alignment brightness changes. Lawful alignments yield rhythmic, symmetric pulses; chaotic alignments introduce irregular flicker and clustering. Users can adjust layer opacity and visibility at any time—even when the animation is paused—allowing on-the-fly exploration of structural depth and trait interplay. The result is a layered, interactive portrait that not only encodes identity into form and color but also into time-based behavior, inviting deeper engagement and interpretation.

3.1 Future Work

- Expose life-rule parameters (birth/survival counts, regen rate) in the UI for user-defined animations.
- Add export functionality to record animated sequences as GIFs or videos.
- Experiment with alternative automata (e.g., Brian's Brain, Lenia) for richer cell behaviors.

- Incorporate additional personality models (Big Five, Enneagram) to diversify trait mappings.
- Optimize rendering performance for higher resolutions and mobile devices.

4 Conclusion

By combining trait-driven Voronoi subdivision with a smooth, continuous life simulation, this project transforms static personality portraits into dynamic, interactive narratives. It demonstrates how psychological inputs—MBTI letters, moral alignment, favorite color—can shape not only form and hue but also temporal behavior. The result is a compelling framework for personal data portraiture, where generative art becomes a living reflection of user identity.

Acknowledgments

References

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