FLASHY FLESH

An Open-Source Audiovisual State-Engineering Installation

Harnessing neuroscience, psychedelic research, and open hardware to facilitate non-ordinary states of consciousness at the intersection of art, technology, and community

---

Authors: Dan N. & Claude (Chief Engineer)

February 2026 | Working Draft v0.2 (Updated — Volumetric Edition)

TABLE OF CONTENTS

1. ABSTRACT

Flashy Flesh is an open-source, community-buildable audiovisual installation designed to facilitate non-ordinary states of consciousness through coordinated sensory stimulation. The machine employs three rotating LED disk arrays arranged in a volumetric staggered configuration — each disk occupying a different depth plane and height, with individually controllable extendable arms — coupled with synchronised strobe lighting, directed audio, and real-time WiFi-enabled VJ control via JSON. Its scientific foundation rests on four mechanisms: (1) photic driving via frequency-following responses (FFR) in visual cortex (Zheng et al. 2022); (2) Klüver form constants — universal geometric hallucination patterns endogenous to human visual cortex; (3) Default Mode Network (DMN) suppression and neuroplasticity windows (Carhart-Harris et al. 2017, 2022); and (4) QRI Symmetry Theory of Valence. The machine employs moiré interference between counter-rotating disks and three-disk volumetric RGB colour composition to achieve perceptual complexity without exceeding the photosensitivity safety threshold. Unlike expensive clinical devices (Lucia No.03 €7,200, roXiva RX1 $5,500), Flashy Flesh operates at festival scale as an open-source installation: MIT-licensed firmware, CERN-OHL-P hardware design, buildable by any maker with access to laser cutting and 3D printing. Estimated component cost: €2,400–2,600 for a working prototype including servo extension hardware. Primary deployment target: Modem Festival, Croatia, 2026.

2. VISION & CONTEXT

2.1 The Spiritechnics Tradition

Graham St. John's term 'spiritechnics' describes the assembly of sensory technologies to optimise liminal conditions at tribal gatherings — the intentional engineering of ecstatic experience through coordinated light, sound, and rhythm. This practice is not new. Shamanic drumming circles, Hindu temple mandalas, Islamic geometric tile patterns, and Sufi whirling dervish rituals all represent forms of spiritechnics: sensory environments engineered to shift consciousness. The modern instantiation emerged in the 1990s psytrance movement, where full-spectrum sound systems, moving lights, and elaborate stage designs became integral to the experience of electronic music festivals. The Modem Festival in Croatia exemplifies this ethos: a gathering rooted in psychedelic music, conscious dance, and community exploration. Flashy Flesh emerges from this context: a spiritechnics installation native to the festival environment, open-source and replicable, honest about its mechanisms.

2.2 The Gap in the Market

Clinical devices — Lucia No.03 (€7,200) and roXiva RX1 ($5,500) — are closed-source systems for therapeutic contexts, inaccessible to festival communities. Consumer devices (Kasina, DAVID Delight Pro) are designed for personal solo use. Neither category produces a tool suitable for a 5-minute standing experience at festival scale. The 2022 Dreamachine revival drew 38,000 visitors, proving substantial public appetite for accessible artistic audiovisual altered-state experiences. Flashy Flesh fills this gap: MIT firmware, CERN-OHL-P hardware, community-buildable, aesthetically serious, and grounded in current neuroscience.

2.3 Design Philosophy

Flashy Flesh is built on five core principles: (1) Open Source — all firmware, hardware schematics, and preset libraries under permissive licences; (2) Community-Buildable — any maker with laser cutter, 3D printer, and basic electronics tools; (3) Honest Science — all claims grounded in peer-reviewed literature with explicit caveats; (4) Safety-First — hardware-enforced strobe rate caps (4 Hz absolute maximum), consent protocols, exclusion criteria, and emergency shutdown; (5) Aesthetically Serious — a genuine scientific and artistic instrument designed with care for geometry, colour theory, and experiential beauty.

3. SCIENTIFIC FOUNDATIONS

This section reviews the empirical and theoretical basis for audiovisual state engineering. Evidence quality varies across domains, and all claims are made at the appropriate level of certainty.

3.1 Brainwave Entrainment & Photic Driving

The human visual cortex responds to rhythmic photic stimulation with frequency-following responses (FFR): occipital neural oscillations entrain to the driving frequency. For a rotating disk with N spiral arms rotating at R RPM: $f_{eff} = (R / 60) \times N$. Flashy Flesh achieves 40 Hz neural entrainment via a 4-arm disk at 10 RPM, keeping the raw strobe safely below the 4 Hz public-safety threshold. Zheng et al. (2022, PMC9759142): synchronised AV stimulation at 40 Hz entrains gamma oscillations in the amygdala, hippocampus, and insula. Evidence caveat: Höller et al. (2024) found only 5 of 14 entrainment studies showed robust effects; effect sizes modest (Cohen's $d = 0.3$–0.6); ~50% of effects attributable to expectancy. Photic driving is real but not sufficient alone.

3.2 Klüver Form Constants

In 1928, Heinrich Klüver documented four universal geometric forms generated by hyperactivated visual cortex: the tunnel/funnel, the spiral, the lattice/cobweb, and the filigree/radial pattern. These arise from visual cortex architecture — retinotopic organisation of V1, hexagonal lattice of orientation columns, and logarithmic spiral geometry of cortical magnification. Flashy Flesh's disk design explicitly targets all four Klüver constants: Disk 1 (4-arm logarithmic spiral), Disk 2 (3-arm spiral + moiré tunnel effect), Disk 3 (hexagonal lattice with radial spokes).

3.3 Default Mode Network Suppression

The Default Mode Network (mPFC, PCC, hippocampus, inferior parietal lobule) generates the continuous sense of self. Carhart-Harris et al. (2017, 2022) demonstrated psilocybin produces substantial DMN desynchronisation correlating with ego dissolution (Cohen's $d = 2.2$–2.3). The REBUS model (Carhart-Harris & Friston, 2019) proposes that psychedelics reduce high-level priors, making the brain transiently dependent on immediate environmental content. Flashy Flesh operates without psychedelics, so DMN modulation is necessarily modest — but the design principle holds: create conditions of attentional focus and maximum receptivity to the aesthetic environment.

3.4 QRI Symmetry Theory of Valence

Andrés Gómez Emilsson (QRI) proposes that the mathematical symmetry of conscious experience directly determines its hedonic valence. High-symmetry visual patterns should theoretically maximise positive valence during entrainment. The 4-arm spirals, hexagonal lattice, moiré figures, and three-disk Lissajous configurations all exhibit high mathematical symmetry. Important caveat: the Symmetry Theory of Valence is theoretically elegant but remains under experimental validation. It is included as a guiding design principle, not a proven mechanism.

3.5 Neural Annealing & The Set/Setting Window

Michael Johnson (QRI, 2019) describes Neural Annealing: high-energy brain states flatten the energy landscape, creating a metaplasticity window where new patterns crystallise based on available input. This reframes Leary's set/setting thesis mechanistically. The Concord Prison Experiment (Doblin, 1998) demonstrated 34% recidivism reduction versus 60% baseline under structured positive psilocybin environments. Flashy Flesh provides exactly this structured positive environment via geometry, light, and sound — independent of pharmacological assistance.

3.6 Multi-Disk Moiré & Emergent Complexity

Richard Taylor's fractal dimension research: D = 1.4–1.5 is the human visual preference sweet spot. Counter-rotating disks produce moiré interference — emergent complexity (D ≈ 1.6) exceeds either disk alone without exceeding the aversion threshold (D > 1.7). The addition of staggered depth planes creates physical 3D moiré visible from approximately 100 cm: three overlapping disk patterns at different Z positions create volumetric interference that shifts organically as the observer's viewing angle changes slightly.

3.7 Audiovisual Coupling

Zheng et al. (2022) found that 40 Hz synchronised audio-visual stimulation requires actual light-sound onset synchronisation for deep-brain gamma coupling. Flashy Flesh achieves this via real-time BPM detection on the ESP32's I2S interface, cross-triggering disk timing and strobe/spot lighting to phase-lock to audio BPM. The 'invisible spectral flicker' approach (Herrmann 2001) allows 40 Hz neural entrainment via alternating RGBW LED colour pairs — achieving gamma coupling without visible strobing.

4. THE MACHINE

4.1 Overview

Flashy Flesh is a standing audiovisual installation comprising three rotating LED disk arrays arranged vertically (face-on to the observer) at staggered depth positions, each independently driven and colour-assigned (D1=RED, D2=GREEN, D3=BLUE). Disks spin in the vertical plane — like clock faces — so the observer looks directly into the rotating geometry. Each disk sits on its own horizontal axle driven by a motor mounted behind it, with a 6-wire gold-contact slip ring delivering continuous LED power and data. The three disks occupy different Z depths and Y heights, creating a physical 3D volume of overlapping patterns visible to the standing observer. Estimated service capacity: 3–5 simultaneous user[illegible]rs per hour.

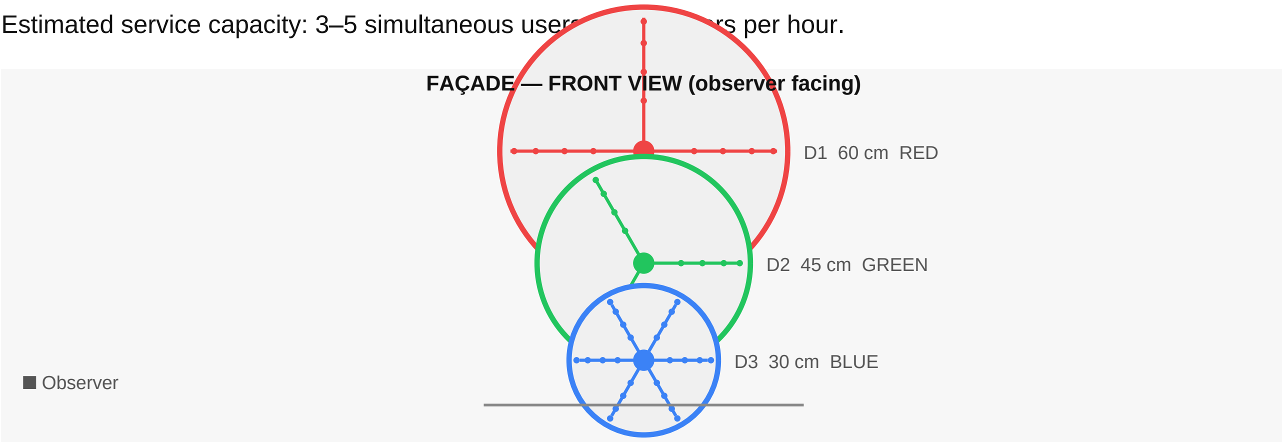

Figure A: Front view — three vertical disk faces facing the observer. D1 (RED, 60 cm) · D2 (GREEN, 45 cm) · D3 (BLUE, 30 cm). Each disk mounts on its own horizontal axle; motor is behind.

4.2 System Architecture

The ESP32 microcontroller coordinates five primary subsystems: (1) Disk Drive — PWM motor speed control via L298N modules; (2) Arm Extension — PCA9685 I²C servo driver per disk (addresses 0x40/0x41/0x42), controlling SG90 micro-servos via the existing I²C channels of the 6-wire slip ring; (3) Lighting — SK6812 addressable LEDs on disks + independent DMX-controlled spot fixtures; (4) Audio — I2S BPM analysis + speaker sync; (5) VJ Interface — WiFi AP (192.168.4.1) accepting JSON parameter uploads. All safety limits are enforced at the hardware timer interrupt level.

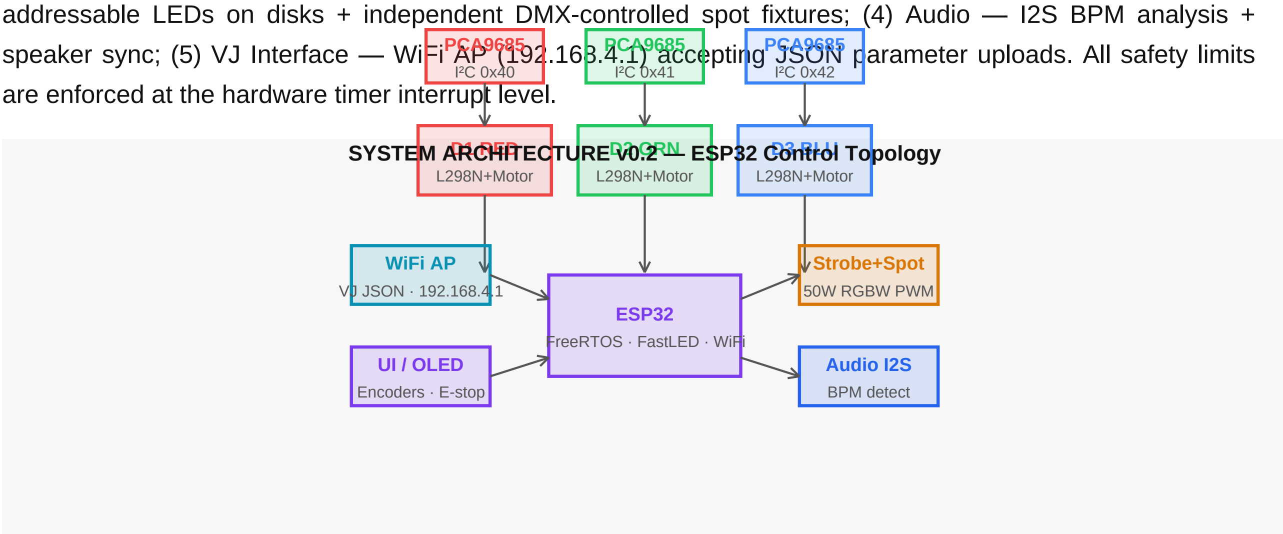

Figure B: System architecture v0.2. ESP32 coordinates disk drive, arm extension (PCA9685 per hub via I²C slip ring), lighting, audio BPM, and WiFi VJ interface.

4.3 Disk Array — Physical Configuration

All three disks are vertical — spinning in their own vertical plane, face-on to the observer. Each uses a 12V geared DC motor (10–15 kg-cm torque) with L298N PWM driver, a 6-wire gold-contact slip ring (continuous rotation), and a hub plate carrying SK6812 RGBW LEDs. Disk 1 (60 cm diameter, 4-arm Archimedean logarithmic spiral): CW, 5–12 RPM default 6 RPM. At 6 RPM × 4 arms: f_{eff} = 6.4 Hz (theta). At 10 RPM: f_{eff} = 40 Hz (gamma). Disk 2 (45 cm, 3-arm spiral): CCW, 5.35 RPM default (0.35 Hz moiré beat with D1). Disk 3 (30 cm, hexagonal lattice + radial spokes): CW, 1–3 RPM. Arm construction: aluminium extrusion outer tube (fixed) + sliding inner rod. SG90 micro-servo at hub drives rack-and-pinion, extending from ~10 cm to ~35 cm per arm.

4.4 Volumetric Arrangement — Staggered Depth Planes

The key geometric innovation of v0.2: each disk occupies a different (Z, Y) position, creating a physical 3D volume of overlapping patterns rather than a flat coaxial stack. Nominal positions: D1 at Z=0, Y=low (~80 cm from ground); D2 at Z=–18 cm, Y=mid (~135 cm); D3 at Z=–36 cm, Y=high (~185 cm). From ~100 cm viewing distance all three disks overlap in the observer's visual field. The staggered arrangement creates physical 3D moiré: the interference patterns shift as the observer moves laterally, creating genuine parallax depth cues in addition to the 2D moiré beat. This significantly increases perceived visual complexity without increasing the flicker frequency of any individual component.

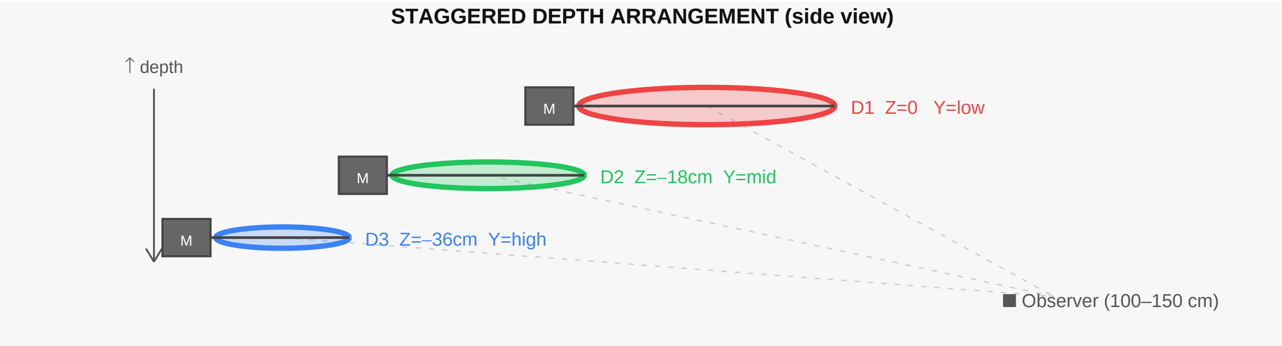

Figure C: Staggered depth arrangement (side view). Each disk at different Z and Y. Observer (right) sees all three disks overlapping in their visual field.

4.5 Extendable Arms — Radial Position Actuators

Each skeletal arm is a two-part aluminium extrusion: a fixed outer tube and a sliding inner rod. An SG90 micro-servo at the hub drives a rack-and-pinion gear, extending arm reach from ~10 cm (fully retracted) to ~35 cm (fully extended). The PCA9685 16-channel I^2C servo driver sits on each rotating disk hub, communicating via the SDA/SCL channels of the existing 6-wire slip ring (Rings 5 & 6 — no additional wiring required). I^2C addresses: 0x40 (D1), 0x41 (D2), 0x42 (D3). This transforms each disk from a fixed geometric pattern into a low-resolution radial display capable of 8 named configurations, plus continuous interpolation between them via the VJ JSON interface.

Pattern vocabulary: (1) Standard cross — all arms equal mid-extension; (2) Compact cross — all arms retracted; (3) Diamond star — alternating long/short arms; (4) Breathing pulse — BPM-synchronised extension cycling; (5) Implicit spiral — progressive extension 30°/arm increment; (6) Iris close — sequential retraction; (7) RGB overlap — disks coordinated for maximum visual overlap zones; (8) Lissajous lock — integer RPM ratios (2:3:5) produce stable standing figures.

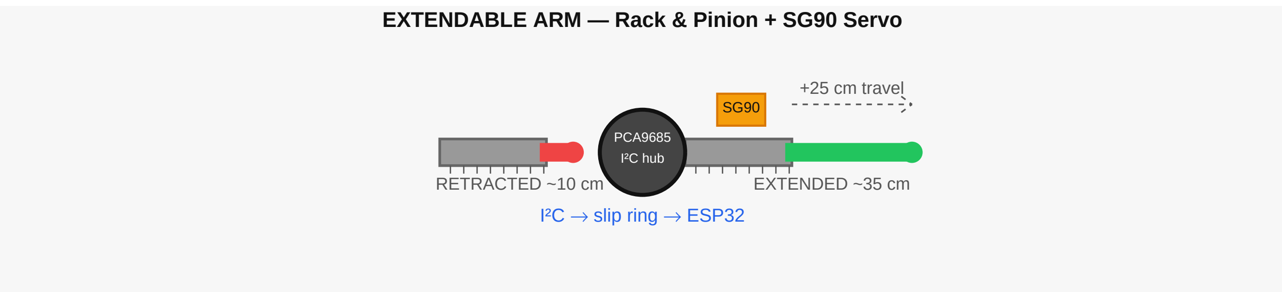

Figure D: Extendable arm mechanism. Fixed outer tube (grey) + sliding inner rod (coloured). SG90 servo + rack at hub. PCA9685 I^2C driver on rotating hub, signal via slip ring.

4.6 RGB Chromatic System — Additive Colour Mixing

Each disk is assigned a primary colour channel: D1=RED, D2=GREEN, D3=BLUE. SK6812 RGBW LEDs allow any hue per disk. From the observer's position, the three staggered disks overlap in visual space — their LED arm trails mix additively via persistence-of-vision in the observer's visual cortex. This produces: D1+D2 overlap = yellow; D2+D3 = cyan; D1+D3 = magenta; D1+D2+D3 = white. The VJ interface exposes disk_color (hex RGB) and disk_arm_ext[] (0.0–1.0 per arm) as independently controllable parameters, enabling full chromatic composition at the scene level.

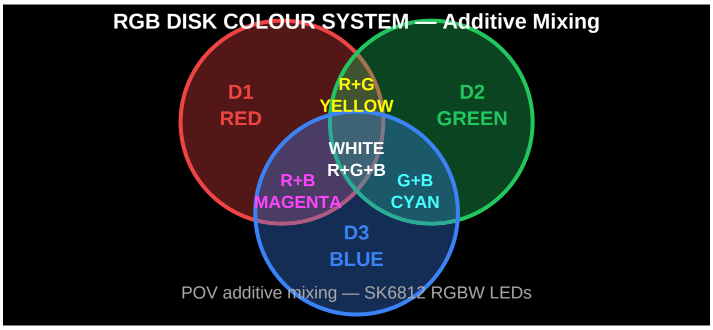

Figure E: RGB additive mixing from three staggered disks. Persistence-of-vision in observer's visual cortex produces subtractive-apparent colour zones.

4.7 The Affect Map

Five built-in presets target distinct neural/phenomenological states through coordinated manipulation of disk speeds, arm extension patterns, strobe parameters, spot light colours, and audio BPM coupling.

Preset	Band	RPM	Strobe	BPM	Arm Config	Target State
Alpha Bloom	α 8–13 Hz	8–12	0.5 Hz	80–100	Standard cross	Flow · open awareness
Theta Dive	θ 4–8 Hz	5–7	0.3 Hz	60–75	Breathing pulse	Hypnagogic · creative depth
Oceanic	θ/δ border	3–5	0.1 Hz	50–65	Diamond star	Boundary softening
Gamma Flash	γ 30–100 Hz	10–14	2–4 Hz	130–150	Lissajous lock	Insight · peak presence
Integration	α+θ+γ	6–9	off	70–90	Iris (slow)	Memory consolidation

Table 1: Affect map — preset parameters and target neural states.

5. VJ / DJ CONTROL INTERFACE

The ESP32 WiFi access point (192.168.4.1) hosts a lightweight web interface accepting JSON preset uploads and real-time parameter modulation. v0.2 extends the JSON schema with disk_color (hex RGB) and disk_arm_ext[] (0.0–1.0 per arm, interpolated between keyframes) in addition to the original speed/strobe/audio parameters.

Extended VJ JSON Schema (v0.2):

```
{ "name": "rgb_bloom", "duration_s": 600, "keyframes": [ { "t": 0, "disk1_rpm": 12, "disk1_color":
"#FF2200", "disk1_arm_ext": [1.0, 0.4, 1.0, 0.4], "disk2_rpm": -9, "disk2_color": "#00FF44",
"disk2_arm_ext": [0.8, 0.8, 0.8], "disk3_rpm": 15, "disk3_color": "#0044FF", "disk3_arm_ext": [0.3,
1.0, 0.3, 1.0, 0.3, 1.0], "strobe_hz": 0.5, "spot_rgb": [80, 20, 120], "transition_s": 4.0, "curve":
"ease_in_out" } ]}
```

New parameters: disk_arm_ext[] — per-arm extension ratio 0.0 (fully retracted, ~10 cm) to 1.0 (fully extended, ~35 cm); disk_color — hex RGB for SK6812 hue assignment per disk. Transition interpolation applies to arm positions as well as RPM and colour.

6. SAFETY FRAMEWORK

6.1 Photosensitive Epilepsy

Photosensitive epilepsy (PSE) affects 3–5% of the population and is triggered by raw strobe frequencies in the 3–30 Hz range (peak risk 15–20 Hz). Flashy Flesh firmware implements a hardware timer interrupt capping raw strobe at an absolute maximum of 4 Hz — this limit cannot be bypassed by UI or software commands. Default public mode: 0.1–2 Hz. Operator mode: 0.1–4 Hz. Effective neural entrainment frequency is achieved via disk geometry (N arms × RPM / 60) rather than strobe rate, retaining full neurological efficacy within the 4 Hz constraint.

6.2 Consent Protocol

All users provide informed consent via an illuminated physical button (red LED, IP67-rated). A 3-second hold is required to activate — preventing accidental triggering and ensuring intentional engagement. Accompanying A4 laminated signage lists exclusion criteria: (1) epilepsy or history of seizures, (2) photosensitive conditions, (3) pregnancy, (4) current psychiatric medication, (5) recent head injury.

6.3 Session Design

Default session length: 10 minutes with automated 2-minute gradual fade-out. The standing format is intentionally lower-immersion than supine devices. Emergency stop: simultaneous depression of both rotary encoders triggers immediate motor and LED cutoff (full blackout under 50 ms). Operators carry a wireless key fob. Post-session: optional 5-minute integration mode (amber lighting, slow disk, no strobe).

7. OPEN SOURCE

All Flashy Flesh intellectual property is released under permissive open-source licences: MIT Licence for all firmware; CERN-OHL-P for all hardware designs. The GitHub repository at github.com/huximaxi/fleshy-flesh-machine contains: disk geometry files (SVG/DXF/STL), KiCad circuit schematics, complete assembly guide with BOM, community JSON preset library, operator training guide, and signage templates. Estimated prototype build cost: €1,900–2,100 in components, €500 fabrication, €60–105 additional for PCA9685 servo drivers and SG90 servos for arm extension. Total: €2,460–2,705 for a fully working volumetric prototype.

7.1 Codex Mechanicus

The repository includes three HTML da-vinci style illustration folios documenting the machine geometry, material options, and design evolution: Folio I–II (codex-mechanicus.html): physical geometry, disk orientation, motor-behind-disk configuration, material options A (skeletal) and B (acrylic), and control architecture. Folio III (codex-folio-3.html): volumetric staggered arrangement, extendable arm mechanism, RGB chromatic system, pattern vocabulary (8 configurations), and extended VJ JSON API. Both are live at github.io/huximaxi/fleshy-flesh-machine/

CONCLUSION

What This Is

Flashy Flesh v0.2 is a fully specified, open-source volumetric light sculpture: three counter-rotating LED disk arrays at staggered depths (Z=0/–18/–36 cm), each with independently extendable skeletal arms (10–35 cm via SG90 rack-and-pinion servos), RGB colour channel assignment (D1=RED, D2=GREEN, D3=BLUE), and moiré interference geometry grounded in Klüver form constants and photic driving research. The VJ JSON API is live. The Codex Mechanicus illustration folios are live. The firmware architecture is specified. The target is Modem Festival, Croatia, July 2026. Build cost: approximately €2,400–2,700 in components and fabrication.

The machine does not guarantee altered states. It creates conditions — high-symmetry geometry, rhythmic photic entrainment at safe frequencies, audiovisual BPM coupling, physical 3D moiré in the observer's visual field — within which the observer's own nervous system does the work. Every festival deployment is an experiment. Every preset is a hypothesis. Every new community contribution narrows the uncertainty.

The Next Frontier

The SK6812 RGBW LEDs are individually addressable — each of the ~12 LEDs on each of the ~4–6 arms of each of the 3 disks is independently programmable for full colour and brightness. The static D1=RED / D2=GREEN / D3=BLUE channel assignment in v0.2 is one compositional strategy among many, chosen for clean additive RGB mixing in the overlapping staggered depth zones. But the same hardware supports full dynamic per-LED animation: BPM-synchronised radial colour pulses (colour fires from hub to tip on every kick drum), rotation-locked POV painting (knowing disk angle via AS5600 encoder, specific angular zones of the visual field can be colour-painted), cross-disk chromatic choreography (three disks cycling through complementary hue rotations), and Lissajous colour lock (at integer RPM ratios 2:3:5, the geometric lock is made visible by a coordinated colour state snap across all three disks simultaneously).

The gap between a geometric entrainment tool and a fully programmable live-performance light sculpture is one firmware update and a hall-effect position encoder per disk. The v0.3 roadmap: (1) AS5600 magnetic encoders for real-time disk angle feedback; (2) per-LED colour animation engine with BPM sync; (3) POV painting mode (arbitrary 2D patterns written in air via persistence-of-vision); (4) cross-disk choreography API in the VJ JSON schema. The hardware is already capable. The software is the next build.

Invitation

Flashy Flesh is community property. Clone the repository, build the machine, deploy it, and share what you find — preset sequences, mechanical improvements, encoder integration, festival deployment observations. Every data point refines the design. The machine is an instrument for exploring the edges of ordinary experience. Use it with care, with consent, and with aesthetic seriousness. github.com/huximaxi/fleshy-flesh-machine

8. REFERENCES

1. Carhart-Harris, R.L. et al. (2017). Psilocybin for treatment-resistant depression: fMRI-measured brain mechanisms. Scientific Reports, 7, 13187.
2. Carhart-Harris, R.L. et al. (2022). Trial of psilocybin versus escitalopram for depression. New England Journal of Medicine, 384, 1402–1411.
3. Carhart-Harris, R.L. & Friston, K.J. (2019). REBUS and the anarchic brain. Pharmacological Reviews, 71(3), 316–344.
4. Johnson, M.W. et al. (2020). A randomized study of different musical genres for use in psilocybin therapy. Psychopharmacology.
5. Johnson, M. (2019). Neural annealing: Toward a neural theory of everything. OpenTheory.net.
6. Gómez Emilsson, A. (2020). The Symmetry Theory of Valence: 2020 overview. QRI Blog. qri.org.
7. Klüver, H. (1928). Mescal: The Divine Plant and its Psychological Effects. Kegan Paul.
8. Zheng, L. et al. (2022). Gamma oscillations and application of 40-Hz audiovisual stimulation to improve brain function. Frontiers in Human Neuroscience, PMC9759142.
9. Taylor, R.P. et al. (2011). Perceptual and physiological responses to the visual complexity of fractal patterns. Nonlinear Dynamics, Psychology, and Life Sciences.
10. Doblin, R. (1998). Dr. Leary's Concord Prison Experiment: A 34-year follow-up study. Journal of Psychoactive Drugs, 30(4).
11. Herrmann, C.S. (2001). Human EEG responses to 1–100 Hz flicker: resonance phenomena in visual cortex. Experimental Brain Research.
12. St. John, G. (2012). Global Tribe: Technology, Spirituality and Psytrance. Equinox Publishing.
13. Höller, Y. et al. (2024). Binaural beats and entrainment: Systematic review and meta-analysis. PLoS One, PMC10198548.
14. Carhart-Harris, R.L. (2019). How do psychedelics work? Current Opinion in Psychiatry, 32(1), 16–21.
15. Gysin, B. (1960). Dream Machine: Prototype description. Unpublished manuscript.