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INDUSTRIAL DESIGN
CREATIVE TECHNOLOGY
SELECTED WORK

MATIAS MORAGREGA.

PROJECTS

EXPERIMENTS

KEYQUEST.TECH

INDUSTRIAL DESIGN · 2026

FullCTRL

CAD-FREE 3D PRINTER · SALONESATELLITE 2026 · AUTODESK RESEARCH SCHOLARSHIP

ROLE

Concept · industrial design · machine building · firmware

TOOLS & PROCESS

Fusion 360 · Duet3D + RepRapFirmware · custom macros · aluminium extrusion + printed parts

YEAR

2026

01 Problem

Most machines had a manual phase before automation. 3D printing skipped it. It went straight to CAD, slicers, and walking away. That locks out anyone who thinks with their hands. And it strips the fun out for everyone else: press start, get an object with little to no human involvement in it.

02 Process

FullCTRL is a 3D printer you drive by hand. The machine controls temperature, flow, and speed. You control the shape. Grip the handle and guide the extruder, or trace a cardboard cut-out and the machine revolves it into an object. Five buttons run everything: extrude, spin the bed either way, raise Z, heat, and home. You can also mix modes in one print.

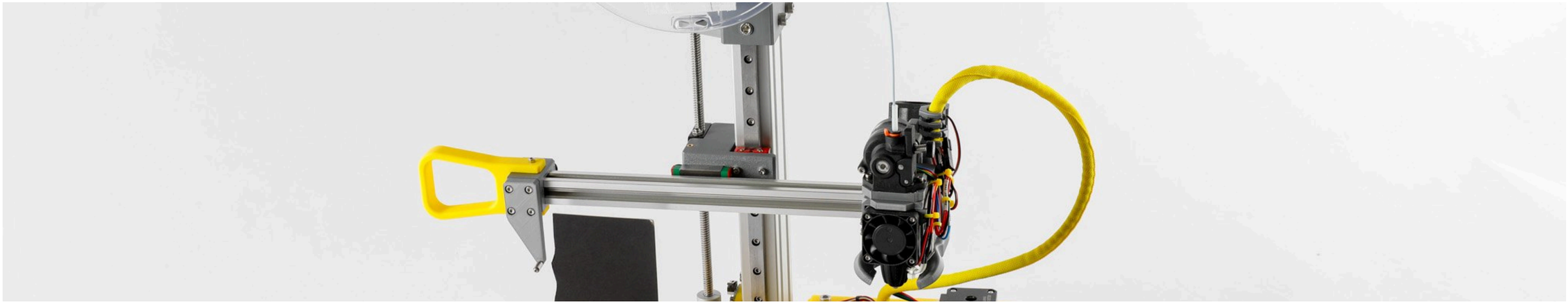
I built it from scratch rather than modifying a kit. Polar kinematics with a rotating bed and a cantilever arm, aluminium extrusions, and 37 printed parts, all support-free so anyone can replicate them. I started on Klipper, but its command queue turned held buttons into laggy bursts. So I moved to a Duet board running RepRapFirmware with custom macros, and control became instant. A rotating bed means over-extruding at the centre and under-extruding at the edge. The fix was the whole point: flow sits under your thumb, and you correct it by feel.

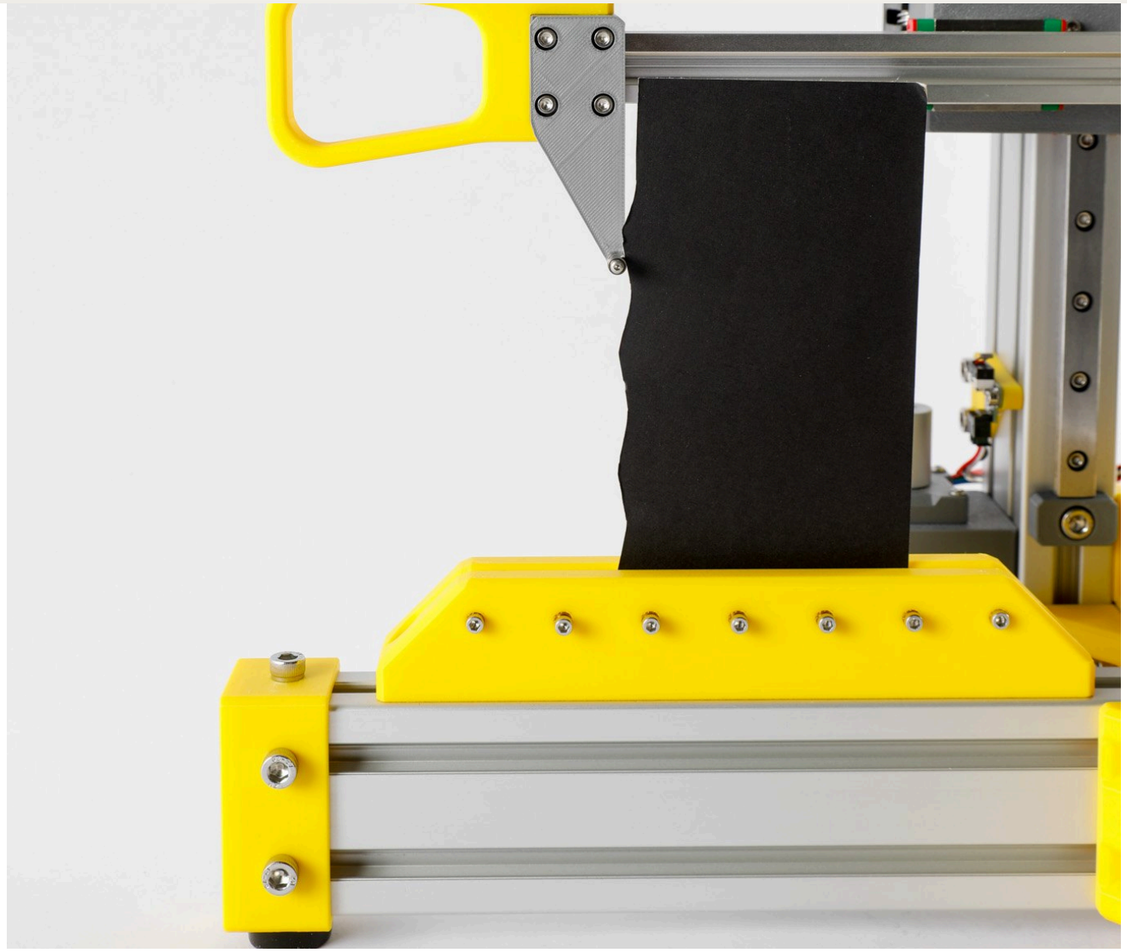
03 Outcome

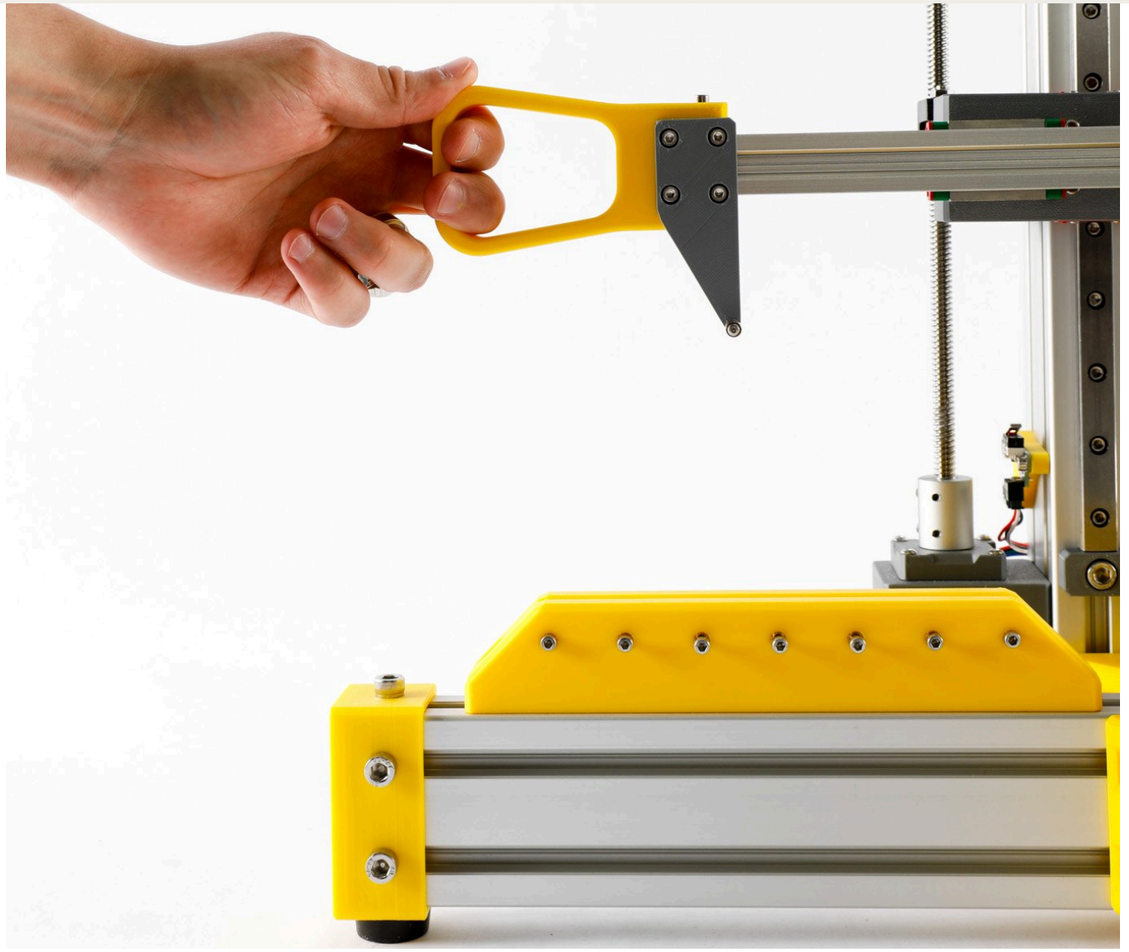
FullCTRL showed at SaloneSatellite during Milan Design Week 2026 and earned an Autodesk Research Scholarship. The feedback confirmed the thesis: people are kinda tired of push-button manufacturing.

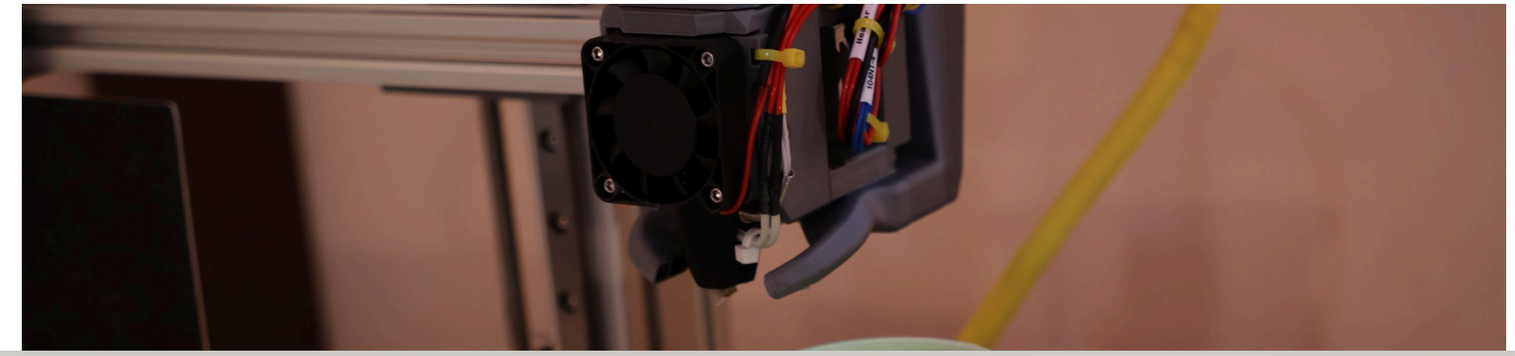
04 What's next

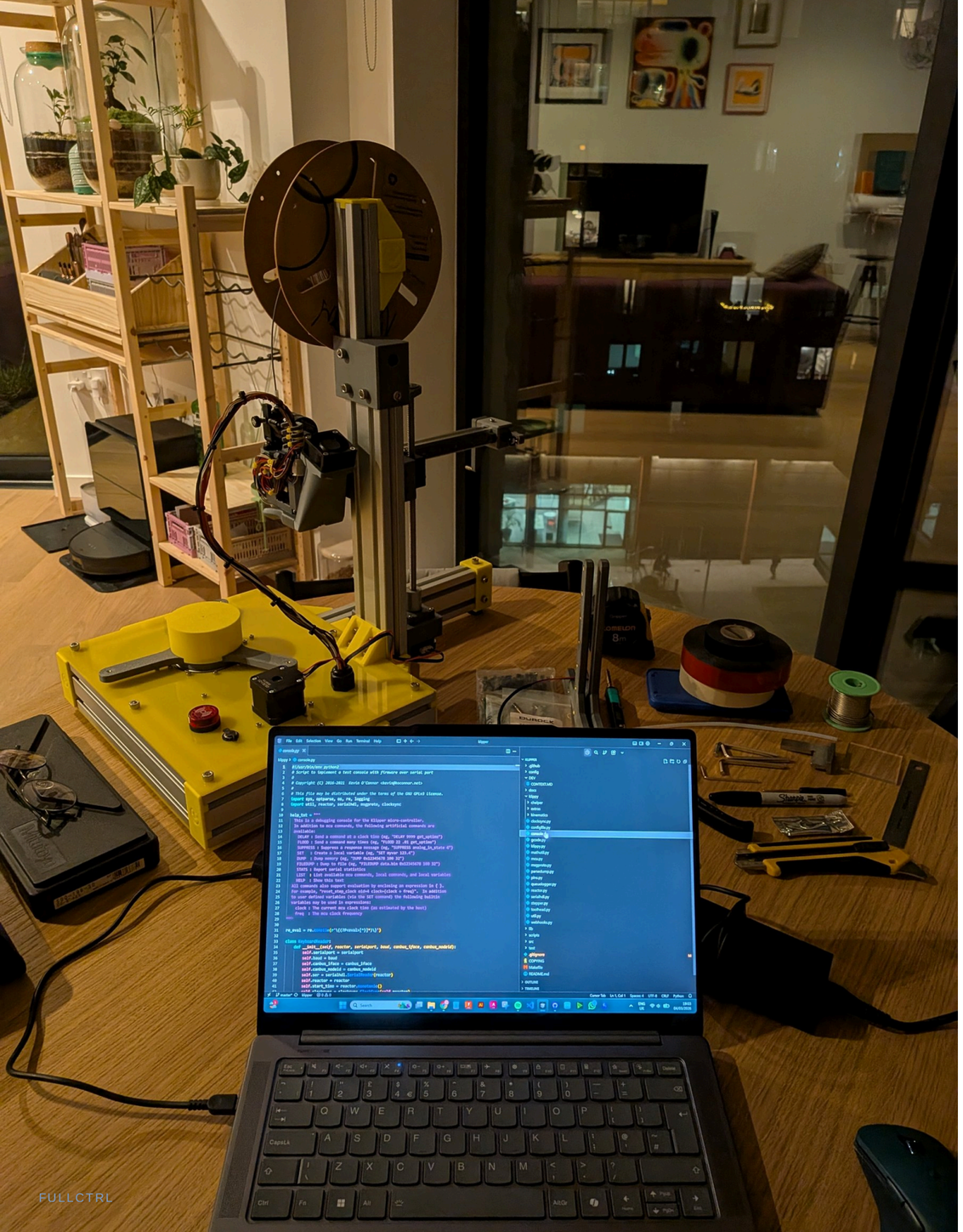
The polar bed was the right first move, and it's also the ceiling. Symmetric shapes only, and steep overhangs need tuning. So the next revision would be Cartesian. Same hands-on control, on individual axes. Any shape, not just symmetric ones. I'd also like to try clay extruders. The design is open source in the meantime.











FULLCTRL

CONTROL	hand · buttons · template tracing
KINEMATICS	polar · rotating bed · cantilever toolhead
BUILD VOLUME	210 × 180 mm
ELECTRONICS	Duet3D · RepRapFirmware · custom macros
PARTS	37 printed parts · support-free
SHOWN	SaloneSatellite, Milan Design Week 2026
AWARD	Autodesk Research Scholarship
FULL VIDEO	youtu.be/NxZgIJAeOME
SHORT VIDEO	youtu.be/vK9je_7T698
UAL SHOWCASE	ualshowcase.arts.ac.uk

CREATIVE TECH · EXPERIENCE DESIGN · 2025

AromaVerse

SCENT MADE TANGIBLE · WAX MODULES + MACHINE VISION · TOUCHDESIGNER

ROLE

Concept · experience design · prototyping · casting

TOOLS & PROCESS

3D printing · vacuum forming · silicone moulds · wax casting · object detection · TouchDesigner

YEAR

2025

01 Problem

The Fragrance Shop runs the world's first algorithmic perfumery machine. You fill in a questionnaire and a machine mixes three 5 ml perfumes for you. It works, but you can't smell anything until the bottles are made. The experience is a form on a screen. Nothing to smell, nothing to watch, and only one person can play at once. For a shop that sells scent, the process felt kinda scentless.

02 Process

AromaVerse makes scent something you can hold. Eight essential scents became eight modules, one shape and one colour each: ylang-ylang, mandarin, grapefruit, lemon, lavandin, eucalyptus, peppermint, and bergamot.

The shapes came from people, not from us. We sketched forms for every scent and had participants vote by smell. Same result as the bouba and kiki test: round forms read as soft and calming, spiky ones as sharp and fresh. Three generations of shapes later, we 3D printed masters, made silicone moulds, and cast each module by hand.

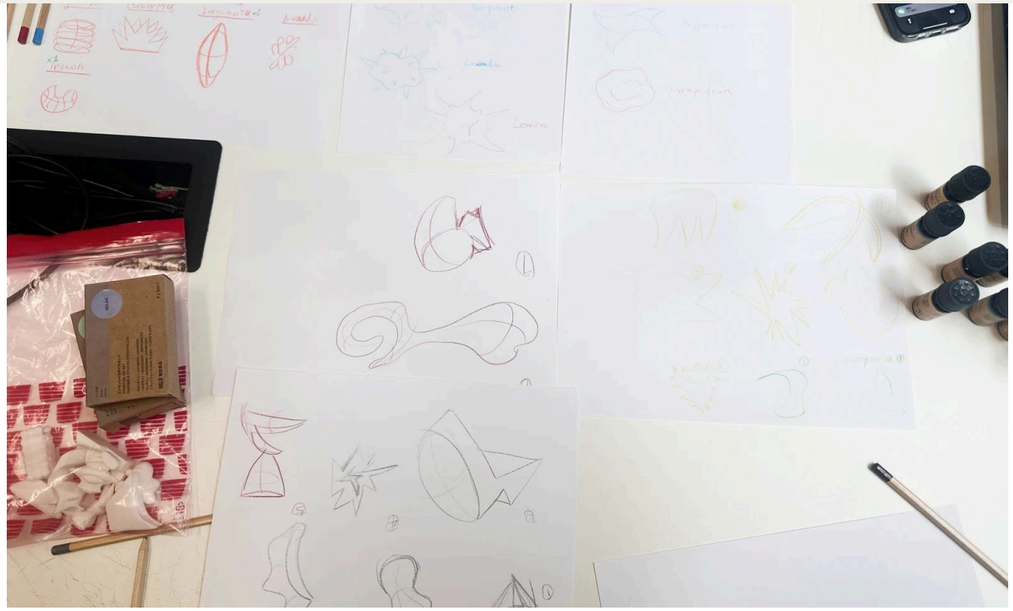
Then the interactive part. A camera watches the table. An object-detection model recognises which modules you put down, and TouchDesigner turns your blend into live visuals on a big screen. Pick shapes together, watch the mix react. We tested two earlier concepts on users first, and the lesson was clear: people don't care about the tech, they want to take part. So no questionnaire. Just shapes and scents on a table.

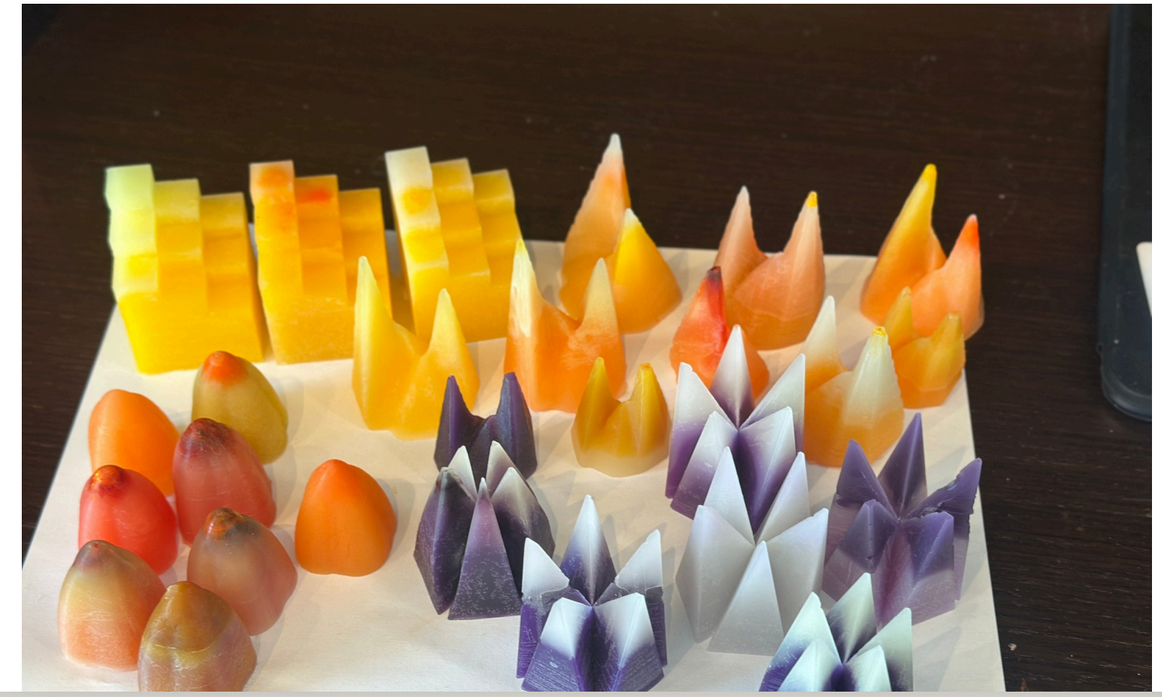
A team project with Ya Wang, Jiaxin Wang, and Tiancong Wang.

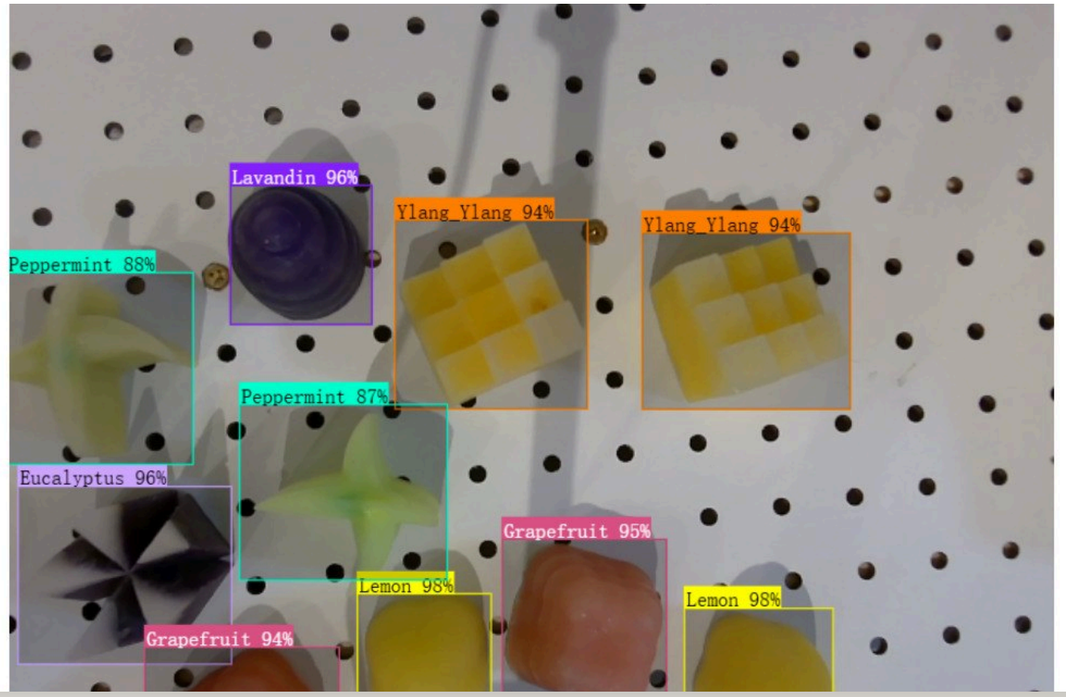
03 Outcome

The demo worked. Detection ran at 88 to 98 percent confidence across the modules, live, while people moved them around. We showed the project to Frederik of Scentronix, who builds the algorithmic perfumery machines. He liked the tangible shapes and wants the visual language to match most people's intuition. The next step would be piloting it in a real store.

Being honest, the shape-to-scent mapping is only half proven. We tested it on a small group, and scent is personal. And the demo still can't make you smell anything. That part stays analogue.






Lavandin 96%
Ylang_Ylang 94%
Ylang_Ylang 94%
Peppermint 88%
Peppermint 87%
Eucalyptus 96%
Grapefruit 95%
Lemon 98%
Lemon 98%
Grapefruit 94%

AROMAVERSE

MODULES	8 scents · cast wax · one shape per scent
SCENTS	ylang-ylang · mandarin · grapefruit · lemon · lavandin · eucalyptus · peppermint · bergamot
MAKING	printed masters · silicone moulds · hand-cast wax
DETECTION	camera · object detection · 88–98% confidence
VISUALS	TouchDesigner · live on screen
TEAM	Matias Moragrega · Ya Wang · Jiaxin Wang · Tiancong Wang
DEMO VIDEO	youtu.be/qN4hiFbj9ak
CONCEPT 2 VIDEO	youtu.be/la7xoNRKjy4

INDUSTRIAL DESIGN · 2023

Enclave

9-KEY MACRO-KEYBOARD + USB HUB · CNC ALUMINIUM · QMK

ROLE

Concept · industrial design · firmware · production

TOOLS & PROCESS

Fusion 360 · Rhino 3D · AutoCAD · KiCad · EasyEDA · CNC machining · anodising

YEAR

2023

01 Problem

The problem was twofold. Enclave was built for creative professionals and the mechanical-keyboard community, and those users juggle interface devices, dongles, and never enough ports. On top of that, most macro pads are plastic, glued shut, and binned when something dies. I wanted one that works as an extension of the tools they already own. Premium, serviceable, upgradeable, and worth keeping. And it fixes the port problem while it's at it.

02 Process

Enclave is a nine-key macro-keyboard and USB-C hub in a case machined from a single piece of aluminium. Cherry MX-compatible, hotswap switch sockets, RGB underglow. The firmware is QMK, and the board is merged into the official QMK, VIA, and VIAL tools, so you remap keys without compiling anything. It can also run as a control board for 3D printers and CNC machines.

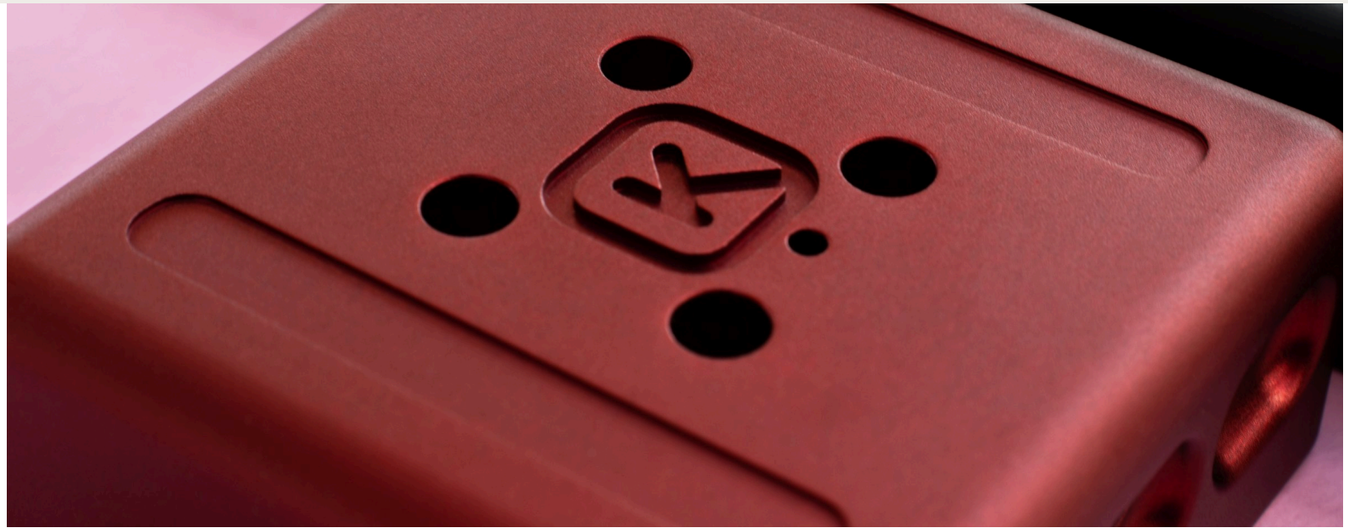
It took two PCBs and four case prototypes to get there. The first cases were two parts, and some mixed brass with aluminium for weight and perceived value. I user-tested the options and weighed them against manufacturing and retail cost to pick the final design and materials. The PCBs: an STM design that didn't work at first, shelved for an AVR board, and that's the one that shipped. Grey solder mask, red silkscreen.

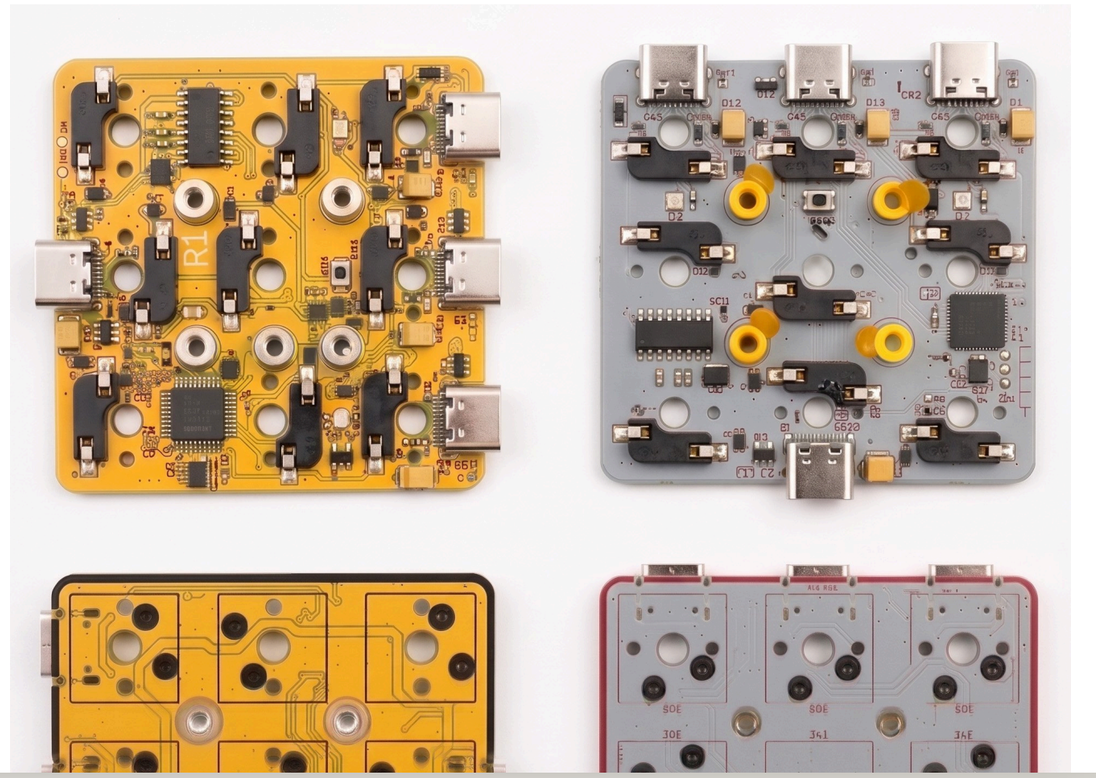
The adhesive feet are custom too. Cast silicone, in a colour picked to complement each anodising colour.

Machining and PCB fabrication ran through Elecrow. The silicone feet came from a manufacturer I found on Alibaba.

03 Outcome

Enclave started as my thesis project. A limited run sold through a community auction, and then the whole thing went open source under MIT: the one-part case STEP and drawings, both PCBs, the FR-4 plate, firmware, BOMs, and even the supplier list. Everything you need to build one without asking me. People used the hub more than I expected. Keyboards, drives, whatever else was on the desk ended up plugged into it. The dead STM board is in the repo too, labelled "use at your own risk".





ENCLAVE

KEYS	9 · Cherry MX · Kailh hotswap
MATERIAL	CNC aluminium · one-part case · anodised
ELECTRONICS	AVR (ATmega32U4) · USB-C · built-in USB hub · RGB underglow
FIRMWARE	QMK · VIA · VIAL · merged upstream
SOURCE	github.com/keyquesttech/Enclave
BEHANCE	behance.net/gallery/157961051

MECHANICAL ENGINEERING · 2023

RtV6

MODULAR SYSTEM · NOZZLE ADAPTER FOR 3D PRINTERS · MACHINED COPPER + TITANIUM · INDIEGOGO

ROLE

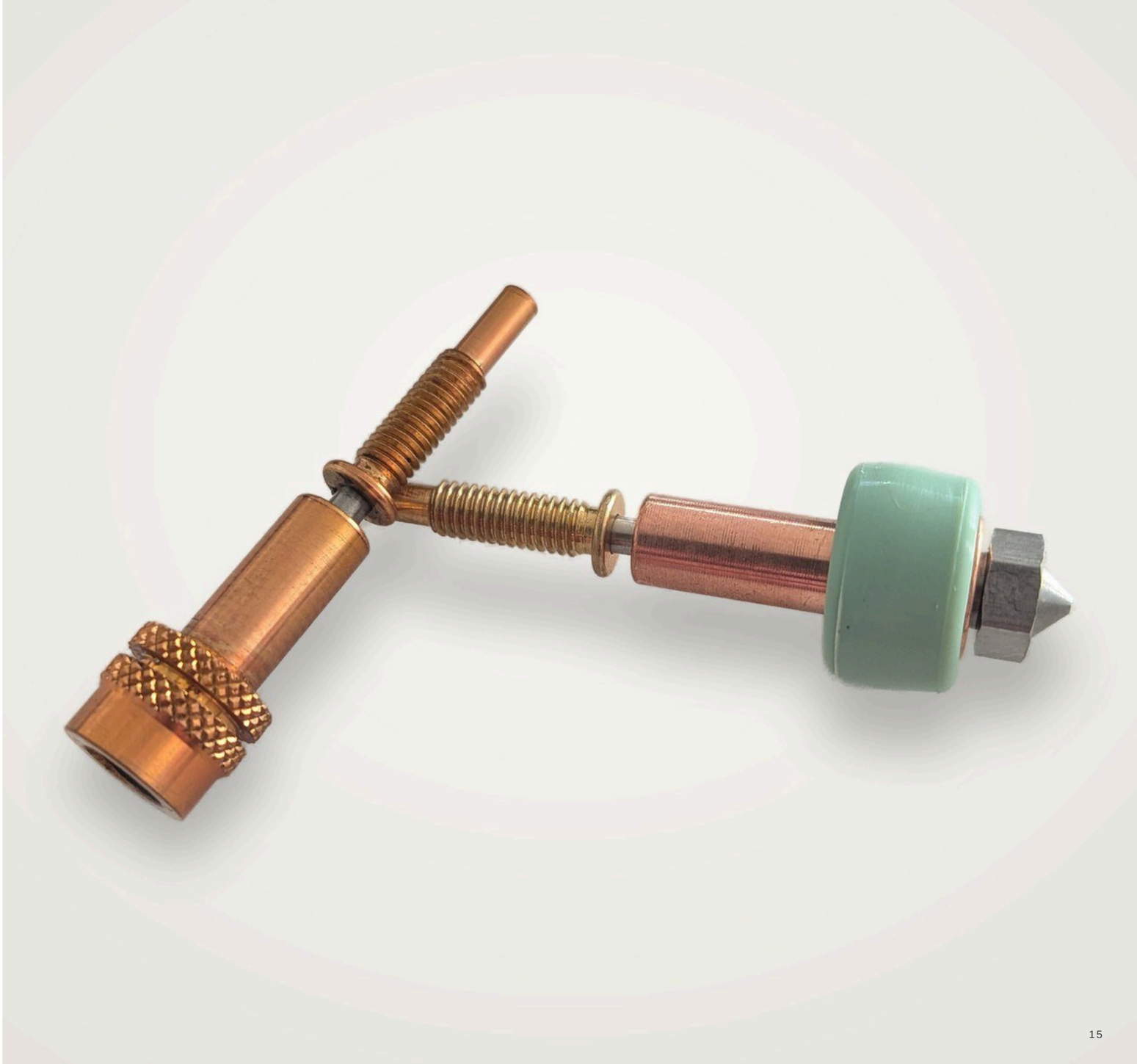
Design · prototyping · crowdfunding · fulfilment

TOOLS & PROCESS

CAD · machining · 3D printing

YEAR

2023



01 Problem

The modular quick-change hotend got one thing right. Nozzle swaps in seconds, no tools, no burnt fingers. But it locks you into its own nozzles. Standard V6 nozzles are everywhere, cost a fraction, and come in types the modular system doesn't offer. That gap felt worth closing.

02 Process

RtV6 is an adapter that makes any standard M6 nozzle quick-change. Copper body, titanium alloy tube inside. Why copper? It moves heat and it's cheap to machine. The titanium tube does the opposite job and keeps the heat where it belongs.

An early sample went to Stefan of CNC Kitchen. He showed it in a video and was fair about it: his unit leaked, and the install was fiddly. He didn't recommend it. He was right. That sample sealed in the wrong place, at the hex instead of the bottom. So the retail version got reworked. Two machined parts, a redesigned seal, a silicone sock, and tight tolerances.

Then came the unglamorous half. An Indiegogo campaign, packaging with warranty cards and a QR back to the docs, and worldwide shipping. All run from one desk and by one person (me).

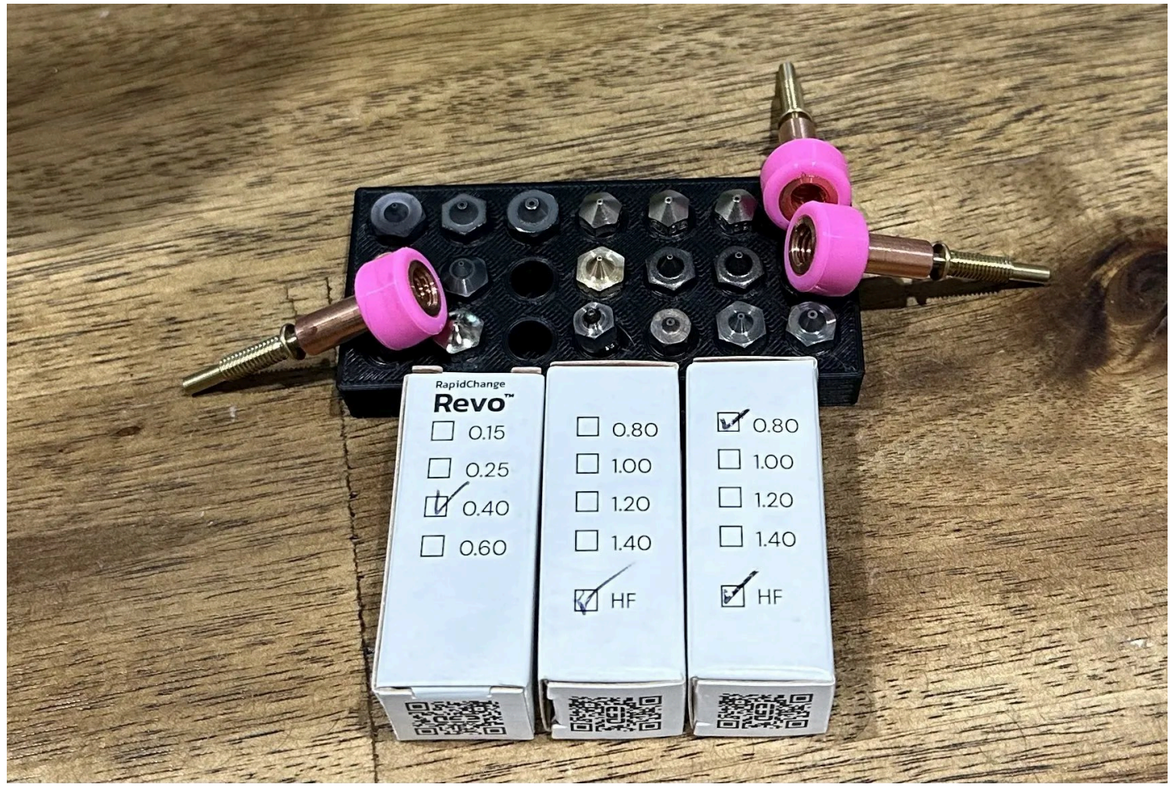
03 Outcome

The campaign funded at 130 percent. 17 backers, 39,168 MXN on a 30,000 goal. Small numbers, real customers, adapters on printers around the world.

A community grew around it on Discord. Installs, mounts, feedback. The Prusa mount came from a backer, and so did the product photos on this page.

And the design got bought. The commercial license went to Mellow 3D, and they sell their own version now.

To be honest, the adapter asks a bit from you. Print hotter, let the nozzle soak a minute, sort out your own part cooling. And that first version earned the criticism it got. But cheap nozzles on a quick-change system was the goal, and it does that.


RapidChange
Revo™
0.15
0.25
0.40
0.60
0.80
1.00
1.20
1.40
HF
0.80
1.00
1.20
1.40
HF

RTV6

RTV6 — SPECIFICATIONS

BODY	machined copper · titanium alloy tube
FUNDED	Indiegogo · 17 backers · 130% of goal
FEEDBACK	CNC Kitchen video · V2 rework
MOUNTS	Voron · Prusa MK3S (community)
COMMUNITY	Discord · mounts + product photos
LICENSE	commercial license sold to Mellow 3D
PROJECT VIDEO	youtu.be/8nnew0QEdxI
INDIEGOGO CAMPAIGN	indiegogo.com/projects/rvo-to-v6-adapter
CNC KITCHEN VIDEO	youtube.com/watch?v=ZgIlSpb-A2Y

EXPERIMENT · 2026

FlatPackScent

FLAT-PACK SCENT DIFFUSER · LASER-CUT 2 MM ALUMINIUM · BENT BY THE USER

ROLE

Concept · CAD · sheet metal · flat-pack

TOOLS & PROCESS

CAD · metal laser cutting · 2 mm aluminium · 3D-printed jigs

YEAR

2026

01 — ## Problem

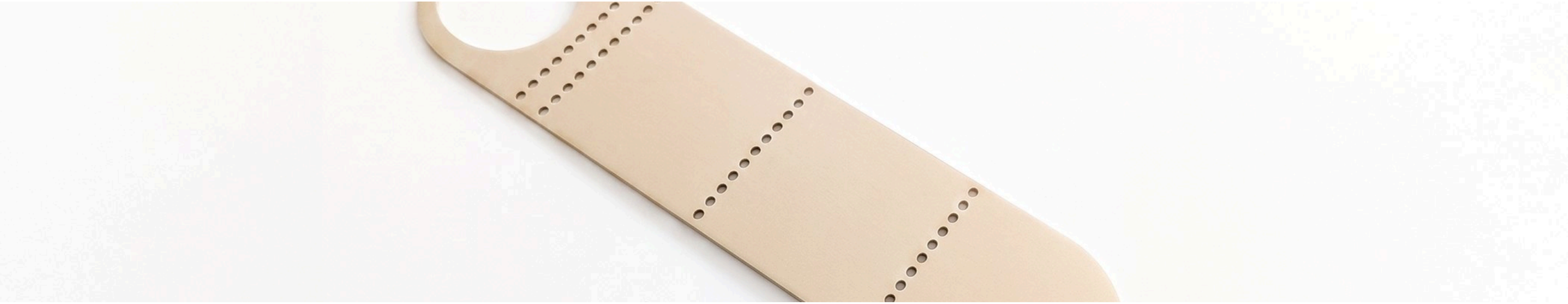
A quick exploration of flat-pack homeware and sheet metal fabrication. I wanted to learn the process by making something real. And I wanted the user to do the last step. If you bend the metal yourself, the object is a bit yours.

02 — ## Process

I drew the diffuser in CAD as a flat template and had it laser cut from 2 mm aluminium. Rows of small holes mark the bend lines and let the sheet fold by hand. The base holds a tealight. The top plate takes a few drops of oil and the flame warms it from below. The whole thing ships flat in an envelope. Bend it into shape and it's done.

03 — ## Outcome

The bends work and the diffuser works. Stamping a dish into the top plate wasn't possible at the factory for a run this small. So I made 3D-printed jigs and formed the oil indentation with a hammer on some of the prototypes. A bit rough, but it holds the oil. Mostly this taught me the limits of the process and the material. That's what it was for.



BODY	2 mm aluminium · laser-cut · one sheet
BEND LINES	perforated · folds by hand
HEAT	one tealight · oil warmed from below
OIL DISH	hammer-formed
SHIPPING	flat · fits an envelope
FINISH	anodised aluminium
STATUS	prototype · limited run

EXPERIMENT · 2026

FlatBrain

SELF-HOSTED FLAT ADMIN PANEL · RASPBERRY PI 4 · LAN ONLY

ROLE

Concept · full-stack · UI · deployment

TOOLS & PROCESS

React · Vite · Express · plain JSON files · Raspberry Pi · systemd

YEAR

2026

01 Problem

Splitting bills with a flatmate is a small annoying job every month. We were doing it in a spreadsheet and it got messy. Who paid for what. What's a straight 50/50 and what isn't. What the actual number to transfer is. I wanted one page that answers that. Then I wanted the rent on there too. So it turned into a panel.

02 Process

FlatBrain runs on a Raspberry Pi 4 sitting in the flat. One Express server holds the API and serves the frontend. There's no database. Each app writes plain JSON files, saved atomically so a power cut can't corrupt them. For two people and twelve invoices a year, a database would be silly.

The first app is the bill splitter. You set the bills and a split ratio. 50/50 by default, or 60/40 if one room is bigger. Each of us has our own page for the things we bought, and every item carries its own share. Buy a nine-pack of loo roll for £4.50 and the invoice works out the per-unit price. It ends in one number each. That's what you transfer, with your own purchases already netted off.

Then rent, a one-off invoice generator, and a settings app that watches the Pi itself. Invoices download as a PNG, captured at a fixed size so a phone and a laptop make the same file. The charts are hand-drawn SVG. I didn't want a chart library running on a Pi.

One command installs the whole thing. install.sh puts Node on, sets up a systemd service and renames the Pi. So it comes back at flatbrain.local on its own after a power cut. The built frontend is committed to the repo, because Vite is rough on 32-bit ARM. The Pi never builds anything. It just pulls and restarts.

03 Outcome

It runs in the flat and we use it every month. Bills, rent, invoices, backups to a USB stick, and a reboot at 6:30am on a Sunday.

The security is thin. It's one shared password checked in the browser, the API underneath isn't authenticated, and it's all plain HTTP. That's fine on a home network and nowhere else, so it stays on the LAN. If I ever wanted to reach it from outside the flat, that's the part I'd rebuild first.

SPECIFICATIONS

HARDWARE	Raspberry Pi 4 · LAN only · http://flatbrain.local
APPS	dashboard · bill splitter · rent · invoice generator · settings
FRONTEND	React · Vite · one-page app · hand-drawn SVG charts
BACKEND	Express · plain JSON files · no database
SPLIT	adjustable ratio · per-item share · per-unit prices
INVOICES	fixed-size PNG · CSV export and import · saved history
INSTALL	one command · systemd service · mDNS hostname
BACKUP	scheduled copy to a USB stick · restore built in
ACCESS	one shared password · open guest page for sharing
STATUS	running in the flat · open source
REPO	github.com/keyquesttech/FlatBrain

EXPORT CSV

IMPORT CSV

Tap an invoice to open it in the generator. Export CSV saves the whole history; Import CSV brings it back.

AUGUST 2026
Saved 22/07/2026

Grand total	£230.00
Matias due	£115.00
Réka due	£115.00

PAID 31 August 2026

Tap to load into the generator

JULY 2026
Saved 21/07/2026

Grand total	£245.80
Matias due	£107.10
Réka due	£122.90

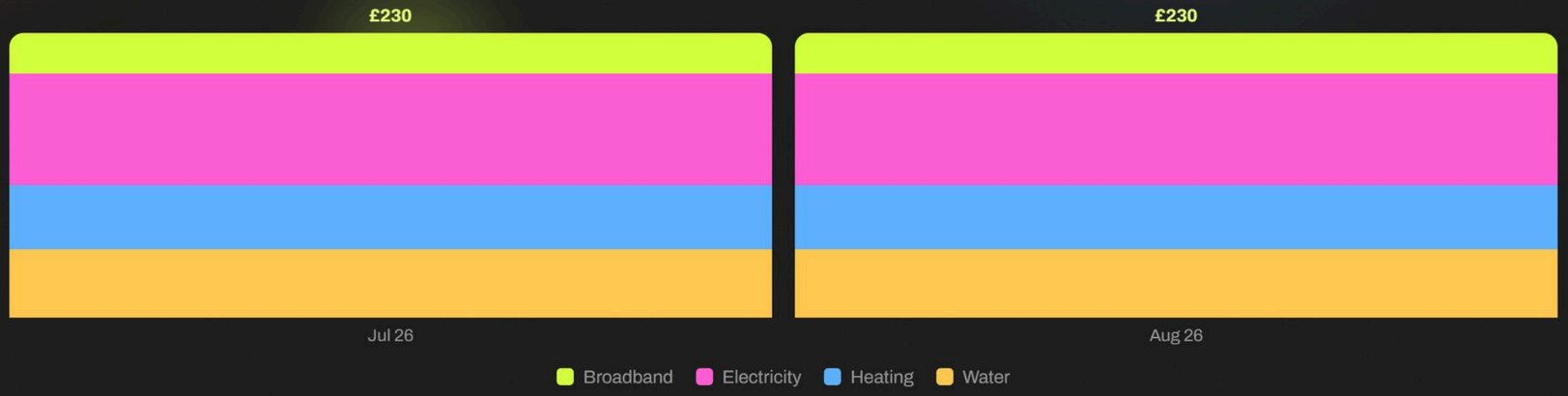
PAID 24 July 2026

Tap to load into the generator

BILLS BREAKDOWN

MONTHS 6

Each month's bills, stacked bill by bill — waived amounts left out.



EXPERIMENT · 2026

Smaug

LIVE AI-JAILBREAK GAME · USDT POT ON BASE · CLOUDFLARE WORKERS

ROLE

Concept · game design · full-stack · UI

TOOLS & PROCESS

TypeScript · Cloudflare Workers + Durable Objects · WebSockets · Gemini API · Claude · viem + Base

YEAR

2026

01 Problem

Prompt injection is usually a security bug. I wanted to make it a sport. How strong is an LLM's no when there's real money behind it, thousands of people watching, and a clock running out? Smaug is the test: an AI dragon sits on a pot, and the internet tries to talk it off.

02 Process

The loop is simple. Pay to send the guardian one message. 70 percent of the fee grows the pot, and every message rewinds the clock. Two ways to win: crack the guardian into releasing the hoard, or send the last message before time runs out. Prices step up as the game heats up, so the pot compounds.

The whole game runs on Cloudflare Workers. A Durable Object owns the truth and streams state to every spectator over WebSockets. The client just renders. The guardian is an LLM behind a swappable provider, with five visible states: idle, thinking, refuse, near, cracked. Your wallet is your identity: sign in with Ethereum, pay per message in USDT on Base, and the server checks the payment on-chain. There's a play-money mode for testing the same loop without real funds.

Two things I'm kinda proud of. The economics aren't a spreadsheet, they're code with tests: seed, split, stepped pricing, and costs all asserted, so the profit model can't quietly drift from the build (break-even sits around 40 messages). And every message is public, with a transparency log and a precommitted seed revealed at settlement, so the ending is checkable.

03 Outcome

It works end to end: live feed, guardian, payments, leaderboard, settlement, and two full visual skins (a terminal-breach draft, then the Molten one in the shots). So far it's only had a small test run.

SPECIFICATIONS

LOOP	pay to message · clock rewinds per send · last one standing or crack it
SPLIT	70% pot · 30% operator · break-even ≈ 40 messages
GUARDIAN	LLM · jailbreak to win
STACK	Cloudflare Workers · Durable Objects · WebSockets
CHAIN	USDT on Base · SIWE wallet identity · on-chain fee check
STATUS	working prototype · small test run

EXPERIMENT · 2024

ServoBrush

SERVO NOZZLE BRUSH · RATRIG V-CORE 3.1 · KLIPPER MACRO

ROLE

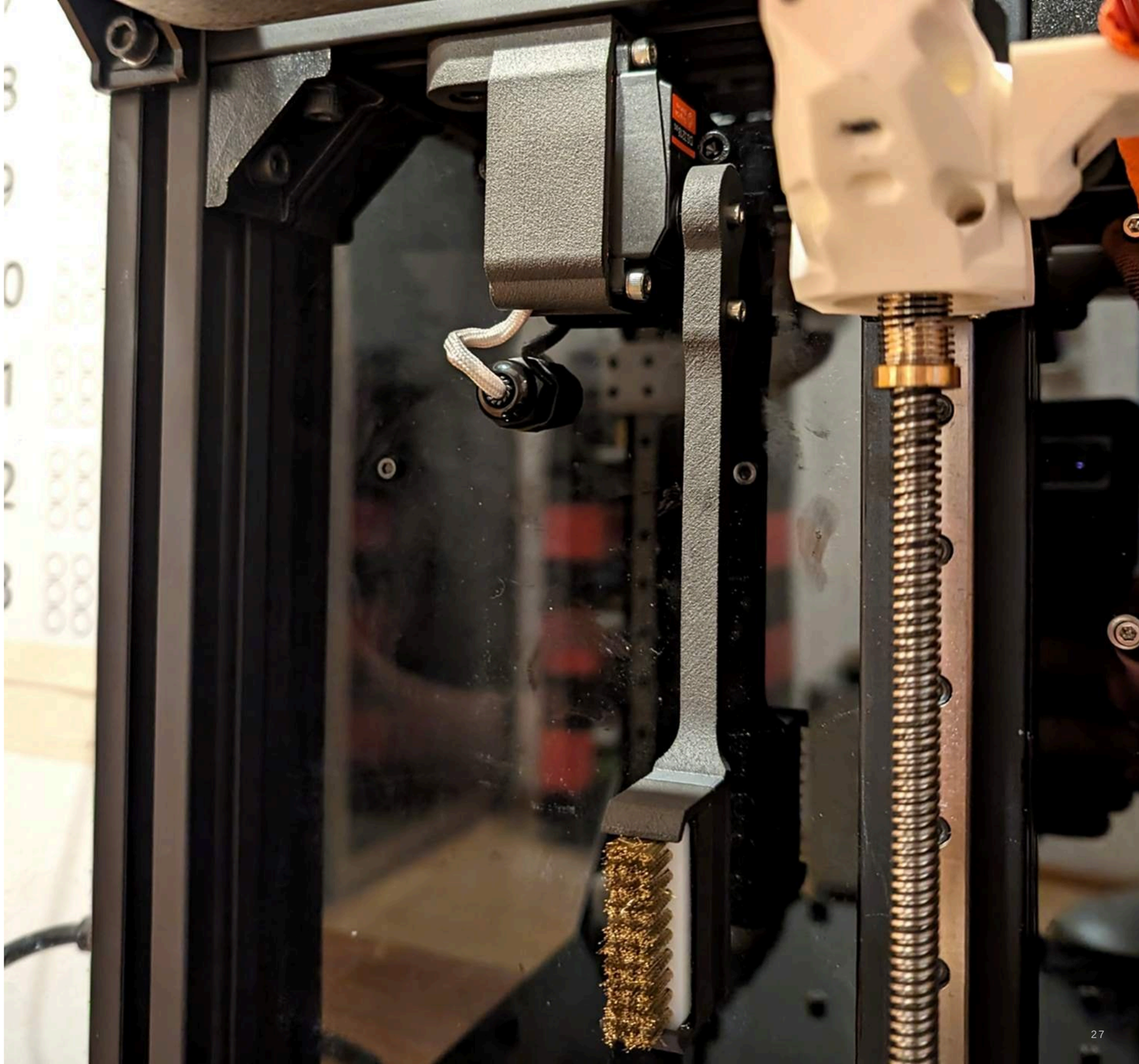
Concept · CAD · printed parts · Klipper macro

TOOLS & PROCESS

CAD · SLS · FDM · Klipper · RatOS · 20 kg servo

YEAR

2024



01 Problem

Bed levelling systems that use the nozzle to touch the bed need a clean nozzle. A bit of plastic on the tip and the probe reads wrong.

Most printers solve this with a brush parked past the edge of the bed. The V-core can't. It's tight on space. The nozzle never hangs over the bed edge, in any position. So a fixed brush would sit inside the print area and get run over. The brush had to move.

02 Process

A servo swings the brush in when it's needed and out when it isn't. The servo bolts to a 3030 extrusion on the frame with two T-nuts. An arm reaches from the servo horn to a holder that takes a brass brush. Six printed parts, one servo, one brush.

Height was the fiddly bit. The brush has to touch the nozzle. Not miss it, and not shove it. So the height lives in its own spacer part. You scale that one part in the slicer until it's right. No CAD needed.

Then the Klipper macro. It drops the bed and heats the hotend to 200 C. It parks the toolhead over the brush and deploys the servo. Then it wipes. Side to side, front to back, then a circle each way.

The part I like is that the loop runs on temperature, not on a count. The macro sets the target back down to the preheat temp and turns the part fan on. Then it keeps wiping while the hotend cools. When it reaches the preheat temp the loop breaks, the servo stows, and the print carries on. So the wipe lasts exactly as long as the cooldown takes. And the plastic stays soft the whole way through.

There are 16 variables for the rest. Servo angles, speeds, park position, wipe distances, fan speed. There's also a verbose mode that narrates every step to the terminal and plays a sound.

The servo can go on the left or the right. So the arm is mirrored, and there are two files. A 270-degree servo is needed for the right side, because the arm has further to swing.

03 Outcome

It's on my printer and it still runs. Everything is public. Six STL files on Printables. The STEP file, the macro, and my variables on GitHub. My whole printer config is up there too. So you can see how it's actually wired, rather than guessing.

A few honest things. The parts were made for SLS, so on an FDM machine they need supports and come out rougher. The spacer works, but it means everyone has to tune their own brush height. A brass brush doesn't always get everything. A proper blob still needs a hand.

SPECIFICATIONS

PRINTER	RatRig V-core 3.1
SERVO	270 degrees · 20 kg · mounts left or right
MOUNT	3030 extrusion · two M6 T-nuts
PRINTED PARTS	six · made for SLS · FDM needs supports
MACRO	Klipper · 16 variables
STATUS	open source
STL FILES	printables.com/model/913748
REPO	github.com/keyquesttech/Ratrig-Vcore-3-3.1-servo-nozzle-brush