

Arsenio Andrea Meomartino

Design Engineer at Spentys — I build the computational systems that turn 3D body scans into individualised, manufacturable devices, from scan to production file.

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📍 Brussels, Belgium



PROFILE

Engineer who designs.
Designer who engineers.

I hold a B.Sc. in Materials & Nanotechnology Engineering from Politecnico di Milano, an M.A. in Product Design from ELISAVA Barcelona, and an M.C. in Parametric Design and Digital Fabrication from Controlmad.

Currently at **Spentys** in Brussels, I develop patient-specific orthopaedic devices from 3D body scans, automate computational workflows in Grasshopper/Rhino, and design new products from clinical brief to production file.

My edge is the overlap: I can evaluate a material at the molecular level, model it parametrically, and prototype it — then hand over a validated design file to manufacturing.

ACHIEVEMENTS

2024 **European Product Design Award** 1st Place
Medical Category

2024 **Braun Prize Award** 1st Place
Hipcare — Paediatric Hip Orthosis

2023 **SABIC Circul-A-Thon** 1st Place
Circular Economy Innovation

2023 **BASF Forward Award** Semifinalist
Sustainable Materials

EXPERIENCE

Nov 2023 – present

Spentys

Brussels

Design Engineer

- Patient-specific orthoses modelled from 3D scans
 - Parametric systems in Grasshopper + custom C# components
 - Scan-to-production automation, delivered as web configurators
-

Jun – Sep 2023

Lowpoly

Madrid

Industrial Designer

- Computational furniture design (chairs, lamps, tables)
 - Recycled / food-waste derived material pellets
 - Robotic arm (ABB, KUKA) path automation
-

Feb – Jun 2023

Freelance

Barcelona

Automotive Designer

- Parametric surface patterns for automotive components
-



01

Hermes & Zeus

Articulated dynamic AFO — full parametric system, scan to print

100% automated in Grasshopper



02

AFO

Patient-specific shells, UV-mapped graphics, lattice night splint

40% automated in Grasshopper



03

SMO

Supramalleolar orthoses — hindfoot control, ankle left free

80% automated in Grasshopper



04

Hipcare

Paediatric hip orthosis — European Product Design Award 2024

10% automated — hand-modelled

01 / HERMES & ZEUS



Hermes & Zeus

An articulated dynamic ankle-foot orthosis built as a **system**, not a model: one Grasshopper definition takes a leg scan and returns a print-ready, assembled device — shank, footplate, hinges and straps included.

Parametric System

Scan-to-Production

C# / RhinoCommon

Mesh Processing

Hinge Mechanism

Web Configurator

In production

THE PROBLEM

Every patient gets a different scan, but the device still has to assemble: hinge axes must land on the anatomical joint, the footplate must meet the shank, the straps must clear both. Hand-modelling each one does not scale past a handful of patients.

THE APPROACH

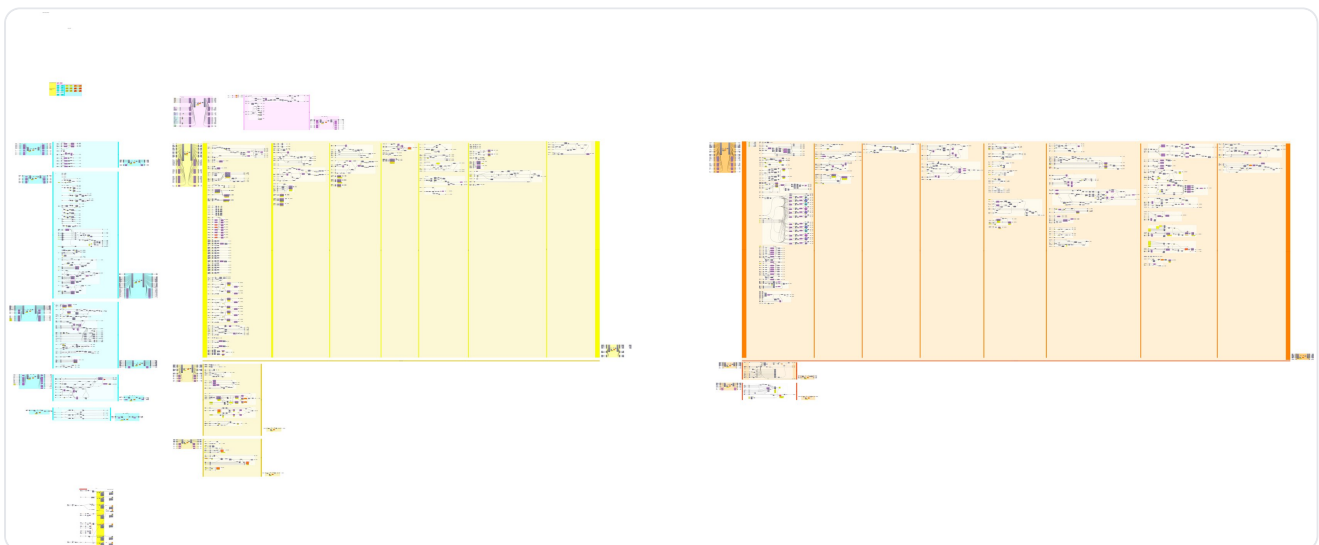
Anatomical landmarks are extracted from the mesh, the base geometry is segmented, remeshed and offset to wall thickness, and every module then rebuilds itself against those references. Where stock components stopped, I wrote custom C# ones — and the whole definition ships as a configurator the team runs without opening Rhino.

HOW IT WAS BUILT

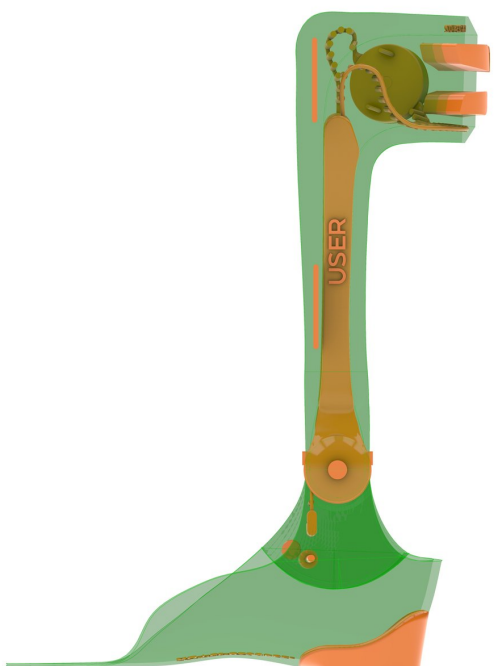
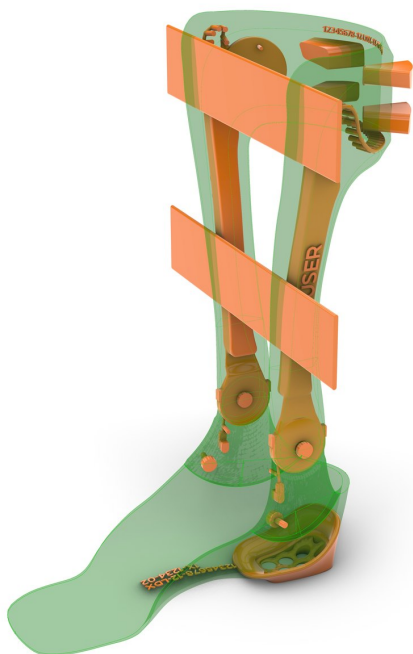
- Automated workflow — Grasshopper + ShapeDiver **100%**

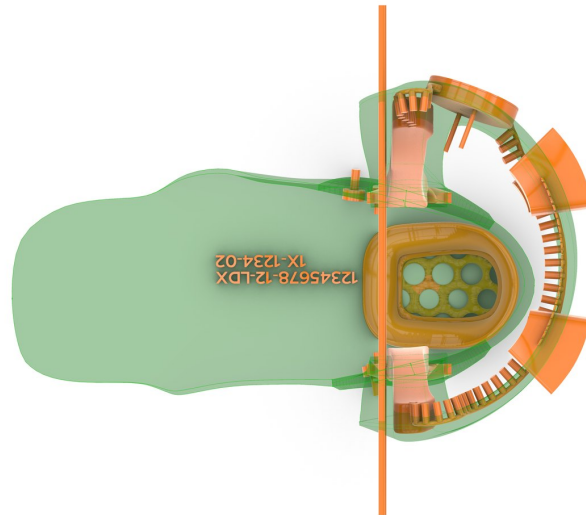
No hand-modelling in the loop: a new scan goes in, a valid device comes out.

THE DEFINITION



↑ click to zoom — three macro-groups, left to right: landmark extraction & base-mesh preparation, footplate & thickness modules, rivet / anchor positioning.





Technical views straight out of the definition – the assembly, the hinge indexing and the parts as they go to the printer.

TECHNICAL HIGHLIGHTS

Input

3D leg scan (mesh)

Custom components

C# — RhinoCommon

Delivery

ShapeDiver web configurator

Toolchain

Rhino 8 / Grasshopper

Geometry pipeline

**Landmarks → segments → quad remesh
→ features population → final device**

Output

Print-ready parts + assembly





Why it matters here — this is the part I care about: not automating a drawing, but building a system that survives contact with real production data and keeps producing valid, manufacturable geometry on inputs nobody has seen yet.



Pediatric AFO

A family of ankle-foot orthoses generated from the patient scan — rigid shell, hinged variant and a perforated night splint — where fit, stiffness and *appearance* are parameters of the same model.

Ankle-Foot Orthosis

Scan-to-Device

UV Texture Mapping

Lattice / Perforation

Additive Manufacturing

Mass Customisation

Product family

THE PROBLEM

An AFO supports the ankle through the gait cycle — but it is also worn all day, in public, often by children. Devices that fit badly or look clinical get left in the wardrobe, and a device nobody wears treats nobody.

THE APPROACH

The shell rebuilds itself on each scan, and its outer surface then doubles as a design canvas: graphics are UV-mapped onto the double-curved shell without distortion, and openings are placed where stiffness allows. Same geometry, same clinical function, a device the patient picks.

HOW IT WAS BUILT

■ Automated workflow — Grasshopper 40% ■ Manual modelling 60%

The shell and its graphics are modelled by hand; fit, trim lines and patterning are generated.

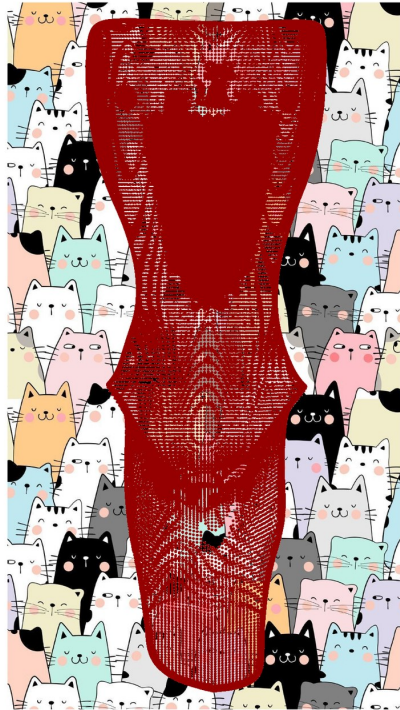
VARIANTS





Rigid shell • anterior-panel variant • night splint – worn overnight to hold the ankle in neutral dorsiflexion, perforated to stay breathable and light.

TEXTURE APPLICATION



FLAT ARTWORK → CURVED SHELL

The shell is unrolled to a flat parameter space, the artwork is laid out on it, and the result is mapped back onto the double-curved surface. The print stays continuous across the curvature — no seams, no stretch at the ankle.

It is the same operation a knitted upper needs: a 2D pattern that has to land correctly on a 3D last.

TECHNICAL HIGHLIGHTS

Device

Ankle-Foot Orthosis (AFO)

Variants

Rigid · anterior shell · night splint

Lightweighting

Perforation / lattice patterning

Input

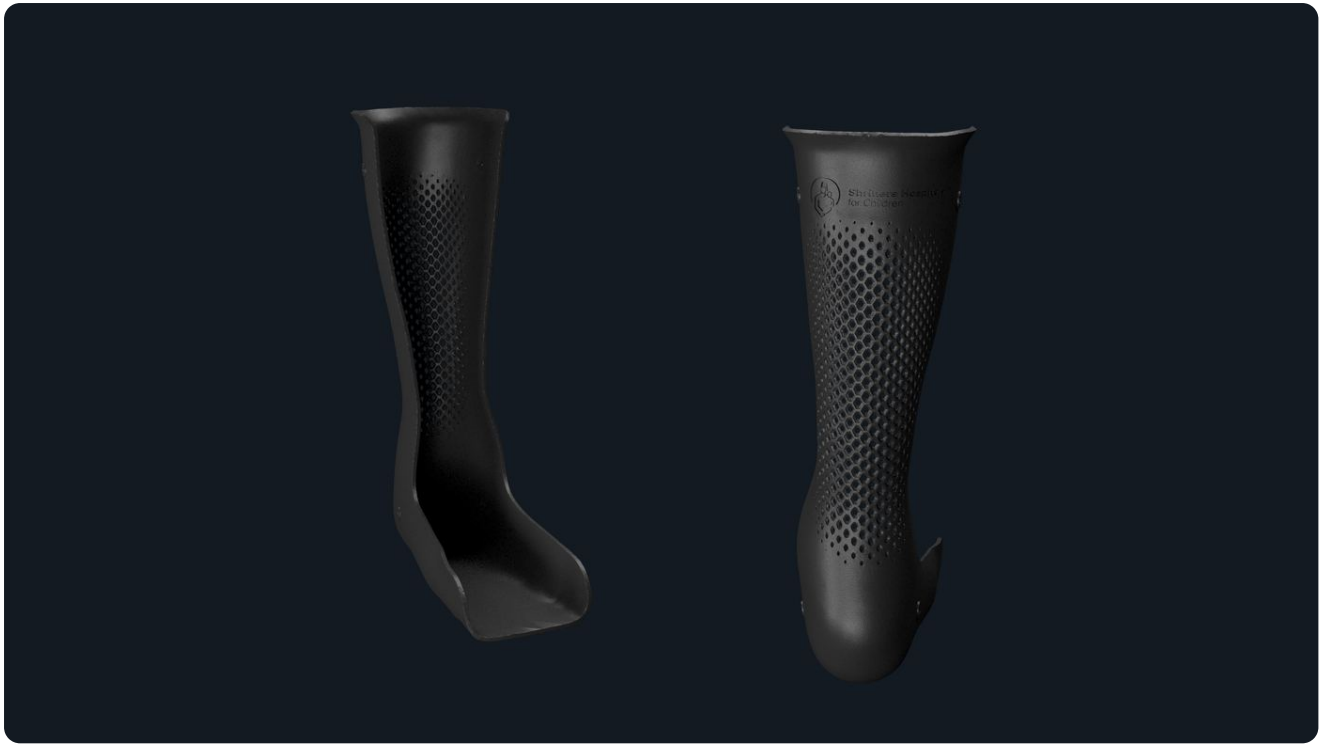
3D lower-leg scan

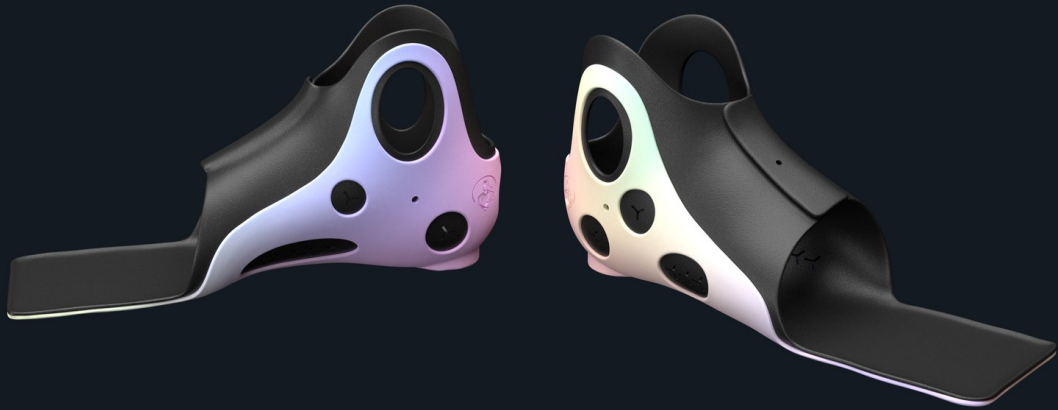
Surface

UV-mapped graphics, per patient

Design tool

Grasshopper / Rhino





Supramalleolar Orthoses

A low-profile shell that controls the hindfoot while leaving the ankle free — the smallest device that still does the job, generated per patient.

SMO

Paediatric

Foot & Ankle Geometry

Trim-Line Control

3D Printed

Parametric Fit

Product family

THE PROBLEM

Children with flexible flatfoot or low muscle tone need frontal-plane control of the hindfoot — but a full AFO blocks the ankle they still need to develop. Too much device is its own failure mode.

THE APPROACH

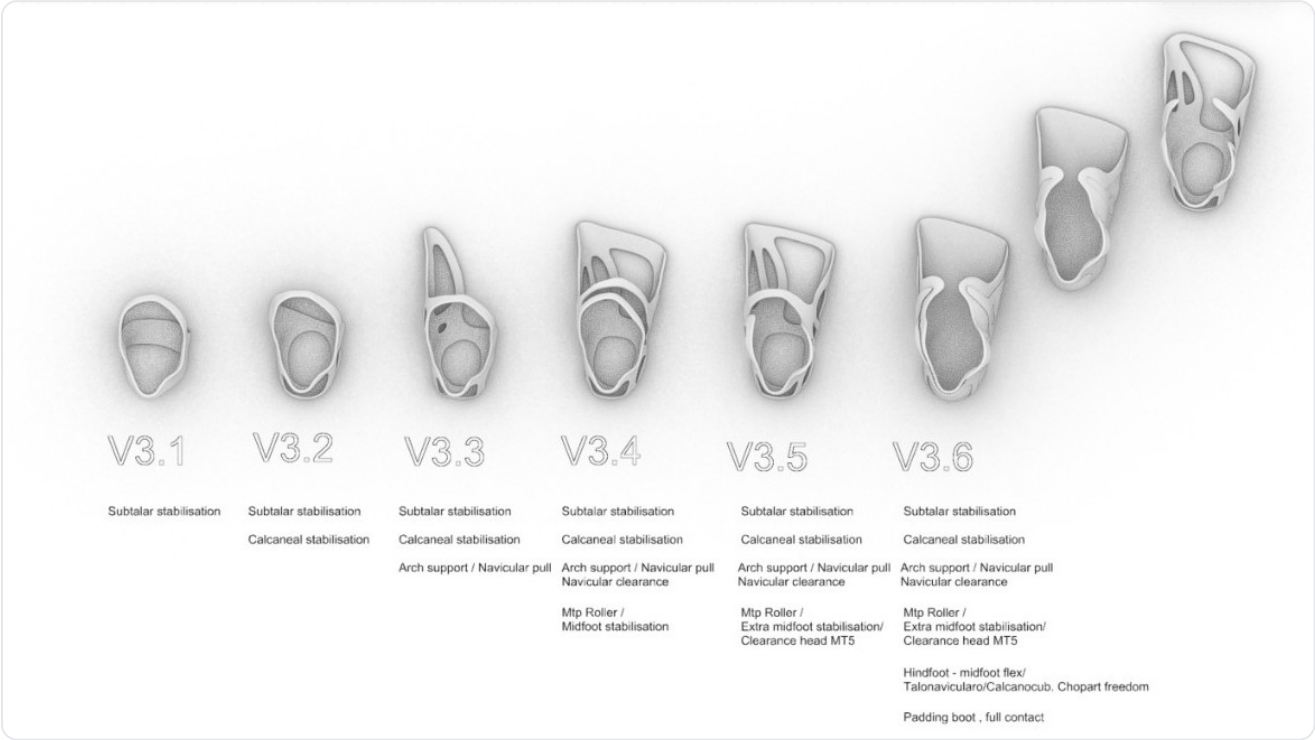
The shell wraps just above the malleoli and stops there. Trim lines, window openings and wall thickness are sliders on a scan-driven model, so a clinician's adjustment is a parameter change — not a remodel.

HOW IT WAS BUILT

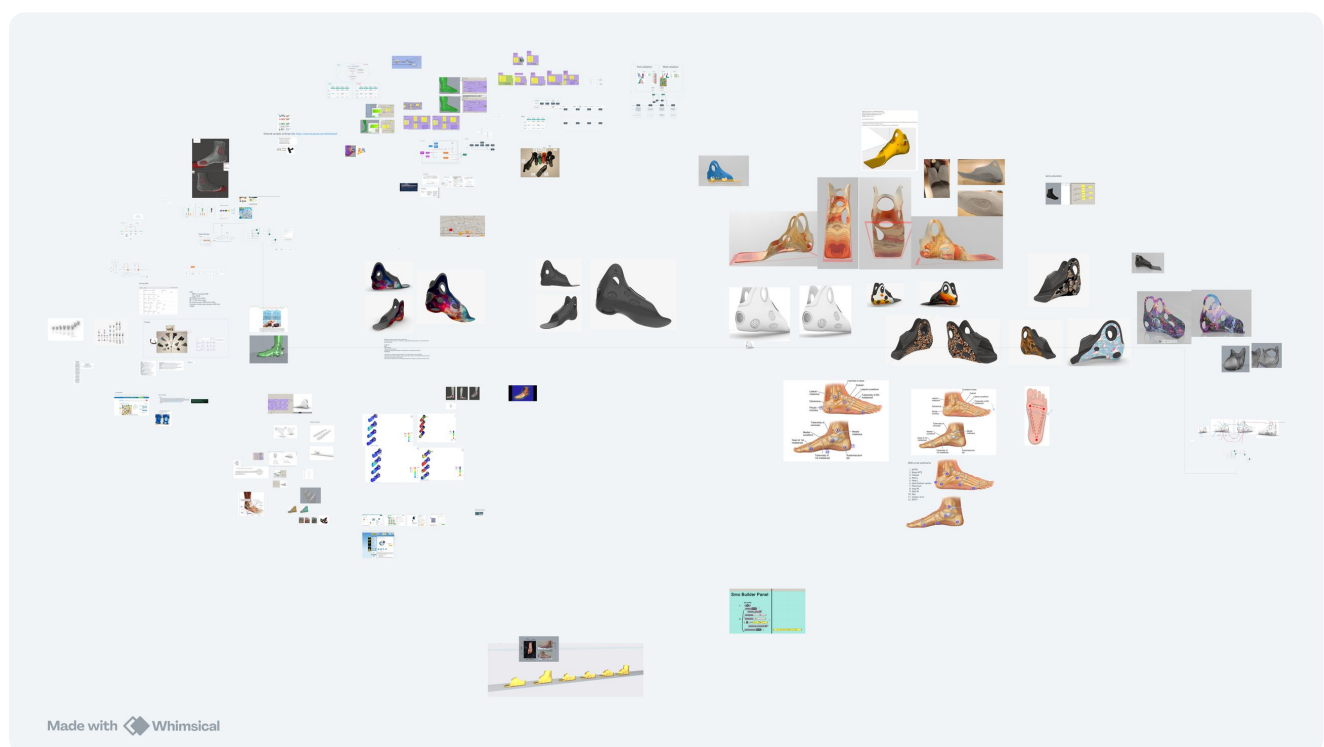
■ Automated workflow — Grasshopper 80% ■ Manual modelling — Rhino SubD 20%

Mostly generated; the organic shell transitions are refined by hand in SubD.

RESEARCH & ITERATION



↑ click to zoom — six generations, each adding exactly one control: subtalar stabilisation, then calcaneal, arch support with navicular pull and clearance, MTP roller and midfoot stabilisation, MT5 head clearance, and finally hindfoot-to-midfoot flex — talonavicular / calcaneocuboid, Chopart freedom — with a full-contact padding boot. Nothing was added that could not be justified biomechanically.



Printed test shells · the research board behind the form – footwear, lasts and gait references.





Extended footplate · short shell – same model, different parameters.

TECHNICAL HIGHLIGHTS

Device

Supramalleolar Orthosis (SMO)

Input

3D foot & ankle scan

Parameters

Trim lines · windows · wall thickness

Control

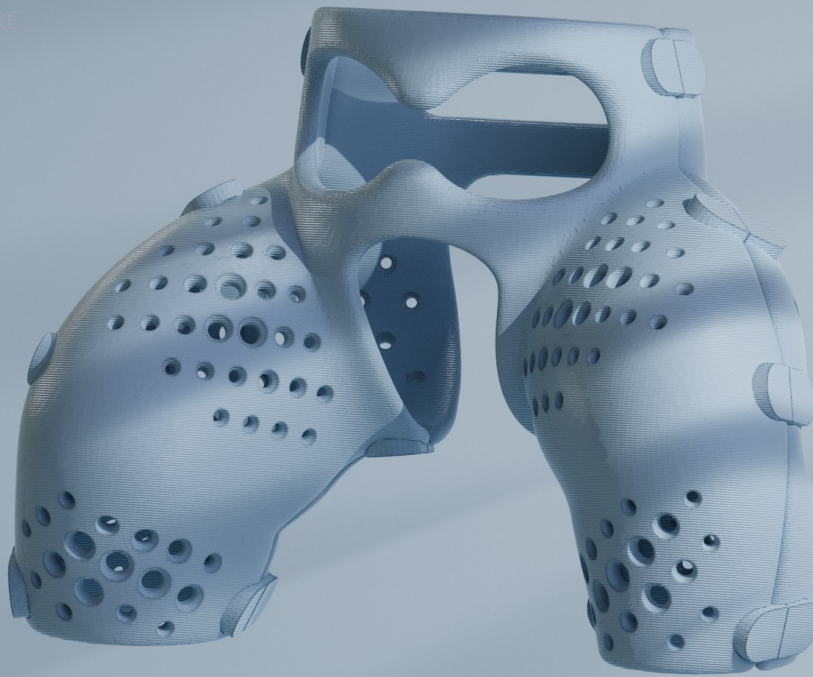
Subtalar, frontal plane

Trim height

Just above the malleoli

Design tool

Grasshopper / Rhino



Hipcare

Patient-specific 3D-printed orthosis for infants with hip dysplasia (DDH) — a lightweight, parametric alternative to the traditional plaster spica cast.

Paediatric Device

Hip Dysplasia (DDH)

3D-Printed Orthosis

PLA / Lattice Structures

Parametric Design

Digital Fabrication

Award-winning Prototype

THE PROBLEM

Developmental dysplasia of the hip (DDH) affects 1–3% of infants. Treatment requires 3–6 months of continuous immobilisation — currently achieved with heavy plaster spica casts that are painful to fit, prevent diaper changes, and cannot be adjusted as the baby grows.

THE SOLUTION

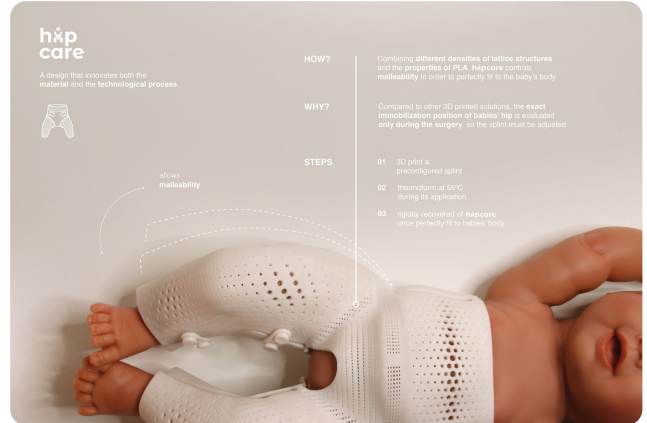
Hipcare is a parametrically designed, patient-specific PLA orthosis with variable-density lattice structures. It is 3D-printed per patient, softened at 50 °C for a precise fit, and features a clip system that allows diaper changes — all without removing the device.

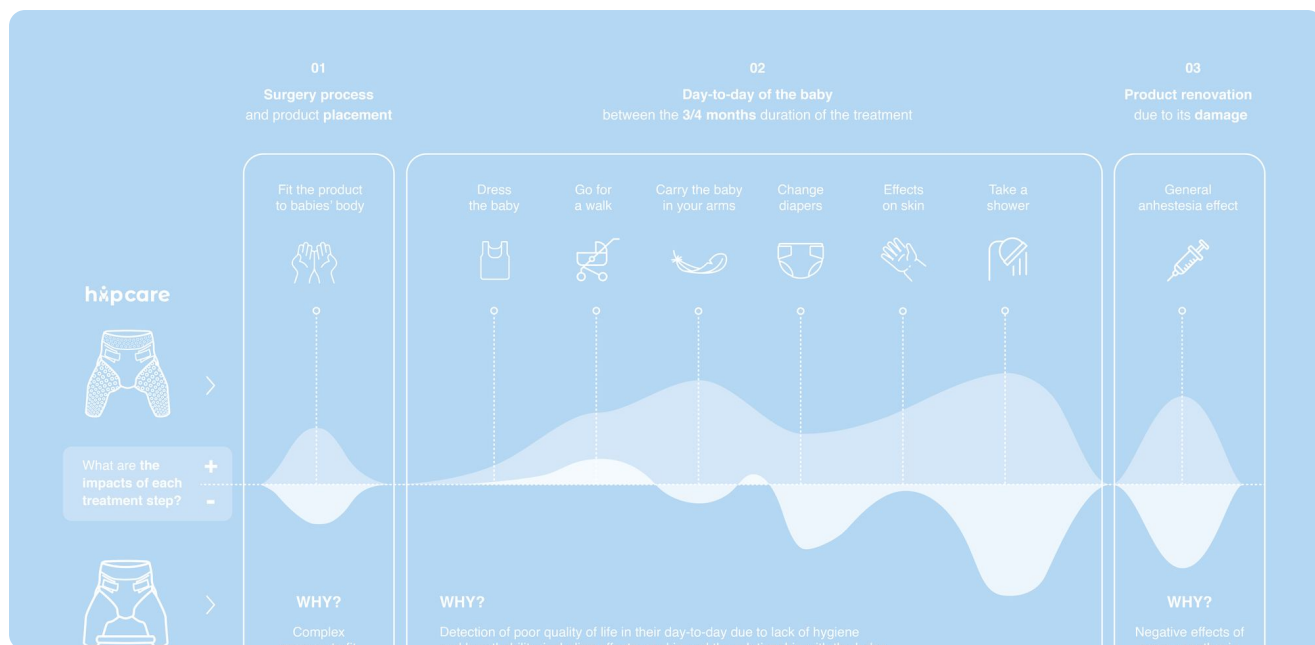
HOW IT WAS BUILT

■ Automated — lattice pattern in Grasshopper 10%

■ Manual modelling — Maya 90%

A student project, modelled by hand – the automation is the lattice. Six years later, project 01 is the inverse.





TECHNICAL HIGHLIGHTS

Material

PLA (biocompatible)

Compliance ref.

ISO 10993

Fitting method

Thermoplastic at 50 °C

Fabrication

FDM 3D Printing

Structure

Variable-density lattice

Design tool

Grasshopper / Rhino

WHAT IT REPLACES



TRADITIONAL SPICA CAST

- Heavy plaster — worn 3–6 months continuously
- Fitted under anaesthesia; cannot be adjusted as baby grows
- Prevents normal diaper changes and bathing
- No visual or tactile feedback on skin condition underneath

Hipcare replaces all of this with a single 3D-printed, patient-specific orthosis.



European Product Design Award 2024 — 1st Place

Medical Category — Hipcare paediatric hip dysplasia orthosis

Tools & Expertise

Four years of parametric design and digital fabrication, on top of a materials engineering degree — and the programming to push past what the stock nodes do. I write the components I need, and increasingly I build with AI models in the loop.

PARAMETRIC & COMPUTATIONAL DESIGN

Rhinoceros 3D — 4 yrs

Grasshopper — 4 yrs

Computational geometry

Design automation

Mass customisation

PROGRAMMING

Python

C# / .NET

RhinoCommon API

Custom GH components

REST APIs / FastAPI

Git

AI & AGENTIC WORKFLOWS

AI-assisted development

LLM tooling & agents

Claude Code

MCP integrations

Prompt engineering

GEOMETRY & SCAN DATA

Scan-to-CAD

Mesh processing / remeshing

Anatomical landmarking

Lattice & pattern generation

UV / conformal mapping

Reverse engineering

SIMULATION & OPTIMISATION

FEA / structural analysis

Topology optimisation

Simulation-driven design

Material selection (CES / Granta)

DEPLOYMENT

ShapeDiver — 2 yrs

Web configurators

Cloud parametric apps

CAD / 3D MODELLING

SolidWorks

PTC Creo

Autodesk Inventor

Maya

Blender

RENDERING & VISUALISATION

V-Ray

KeyShot

Technical visualisation

DIGITAL FABRICATION

FDM / FFF Printing

SLA / Resin

Laser Cutting

Robotic Arm (ABB, KUKA)

DfAM

MATERIALS & COMPLIANCE

Biocompatible materials

ISO 10993

ISO 13485

MDR

Materials & nanotechnology

DOMAIN

Orthotics & prosthetics — 3 yrs

Patient-specific devices

Medical device development

Product design

LANGUAGES

Italian — native

English — C1

Spanish — C1

French — basic

EDUCATION

2023

Controlmad

Madrid

Master Course — Parametric Design & Digital Fabrication

- 350 h · PanelingTools for Rhino certification

2022

ELISAVA — UPF

Barcelona

Master's Degree — Product Design & Development

2021

Politecnico di Milano

Milan

Bachelor's Degree — Materials & Nanotechnology Engineering

**Let's work
together.**

Open to roles in computational design engineering,
individualised product development, and scan-to-production
systems.

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