Design Engineering Portfolio

Josh Williams

Hello!
I’m Josh.

My story.....

With the motivation of making my bicycle as fast as possible while I was racing as a teen, I became fascinated with producing my own custom parts and components. Studying Design engineering has given me the tools and skills to take this tinkering to a much higher level of expertise. This has lead me to continue within the realm of component production for sailing boats, but also moving to playing with form, beauty and function within Industrial design. This is all underpinned by a deep understanding of user needs.

Interests

Sailing

Mountain Biking

Music

Software

Figma & InDesign

Arduino

Keyshot

Photoshop

Ansys

SolidWorks

Premiere Pro & After Effects

Fusion 360

Contact

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Design Engineering Portfolio

Projects

01

TerraBand

2050 future fashion wearable

02

Nest Assured

Bag scanning device

03

Boat Renovation

Custom components for sailing dinghies

04

GiggaSketch

Re-imagining a child's toy

05

Chain Guide

One-piece bicycle component

TerraBand

**2050 future design concept.
A wearable which transforms clothing into a personal expressive canvas.**

Duration	5 weeks
Individual role	Projection Mapping
Location	Qingdao China
Team	Harith Wilson Mito Licky Dylan

Skills

Adobe After effects

Procedural CAD modelling

Working in diverse, international teams

Scenario

This project looked at the world in a ‘bright’ future; one where human consumption has been greatly reduced and the planet is healing.
Our job was to explore some of the new issues that we might now face.

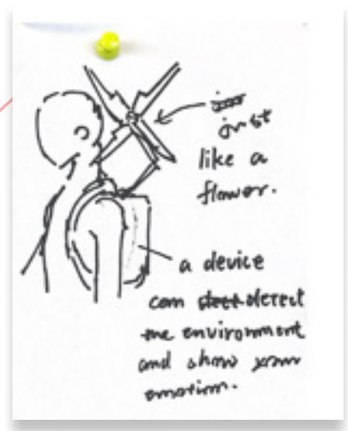
We imagine people might wear

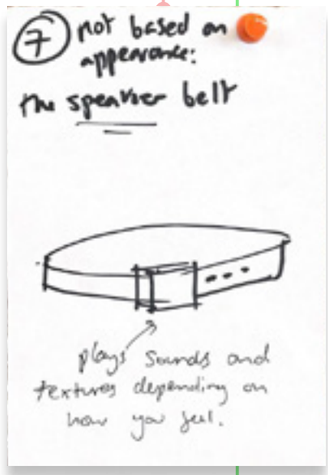
- White suits which look similar in appearance
- Contain sensors and technology to monitor health

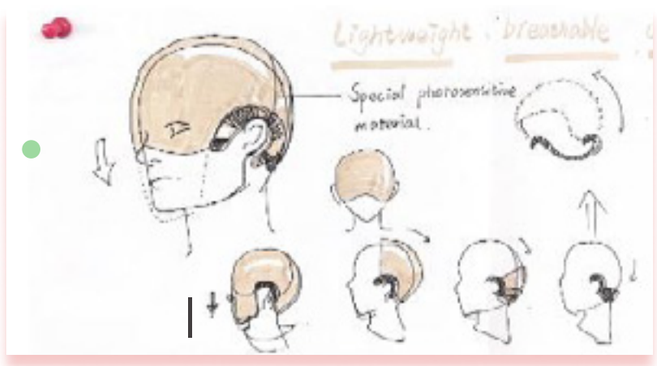
Proses

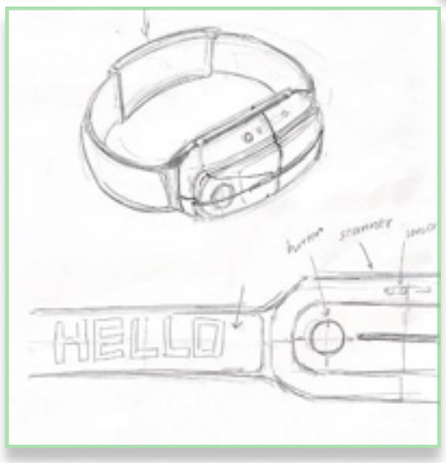
How might we instil healthy consumption practices while still allowing for creative self expression?

Wearables	Interface	Carry-ables









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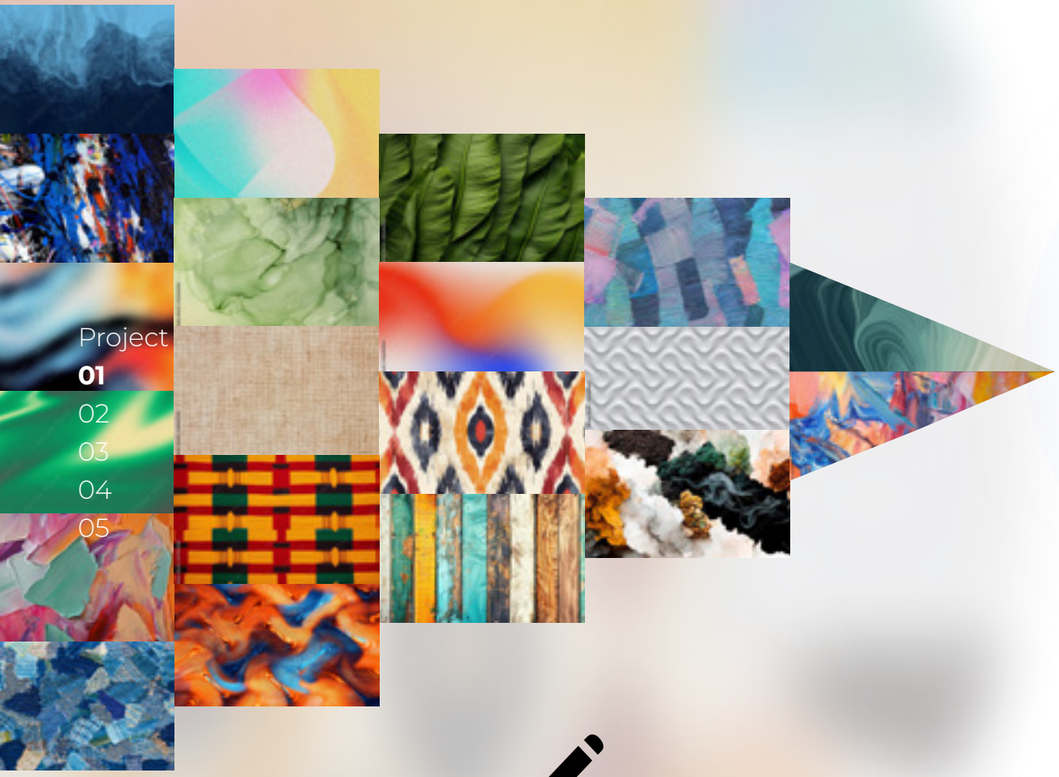
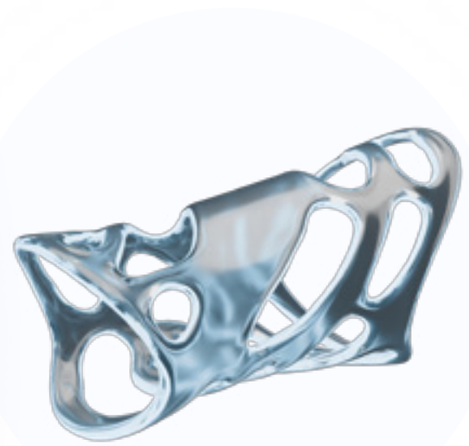
The device bridges the gap, allowing **expression to be displayed.**





People feed their style, textures and emotions into the device

‘Visual personality’ is stored forever

The suit is the medium for an individual to express themselves

Projection mapping

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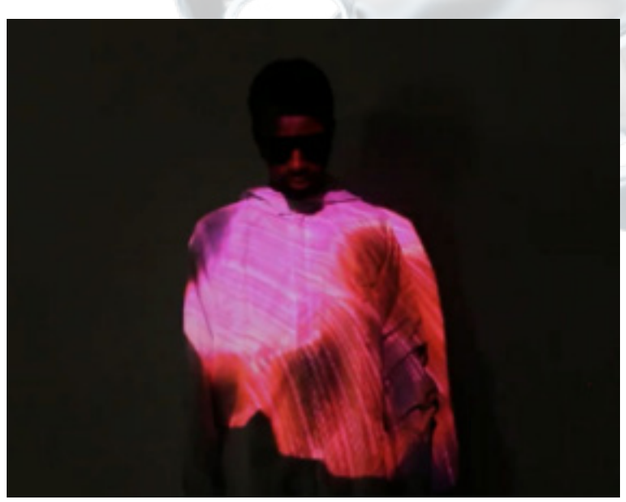
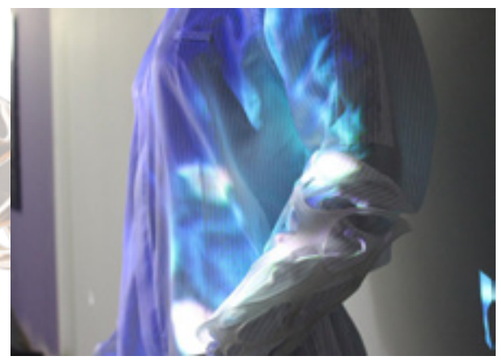
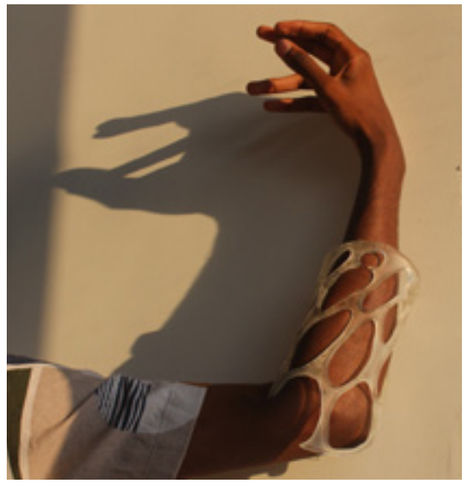


We explored projection mapping to create moving colours and graphics on the body of the suit.

Final form



The aim of the final form was to create something organic and unique in a now uniform world-scape.

Presenting

Presentations were an important part of this project.
The decks were presented each week in two languages,
to an international audience.

Nest Assured

Bag scanning device to help you not forget your items.

Click or scan for promo-video of the Nest assured.

Duration	5 months
Individual role	Hardware design Video rendering Technical specification
Team	Stefan Saar Anne Lee Arancha Ramirez

Skills

KeyShot

Design for Manufacture

Mechanisms

Nest Assured

Nest assured is a device which scans the contents of your bag, so that you will never leave items behind again.

The story

The concept was conceived when finding product opportunities for people with ADHD.

Pain points:

- Forgetting items builds up stress throughout the day.
- Object permanence.

However the finalised design is proving to be useful for a much wider audience.

The product is made from two modules:

- The dial which sits outside the bag and is used to select the activity.
- The scanner which sits inside the bag.

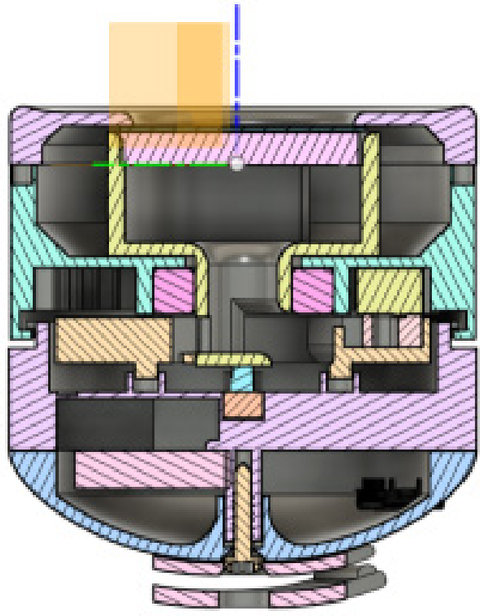
Prototyping

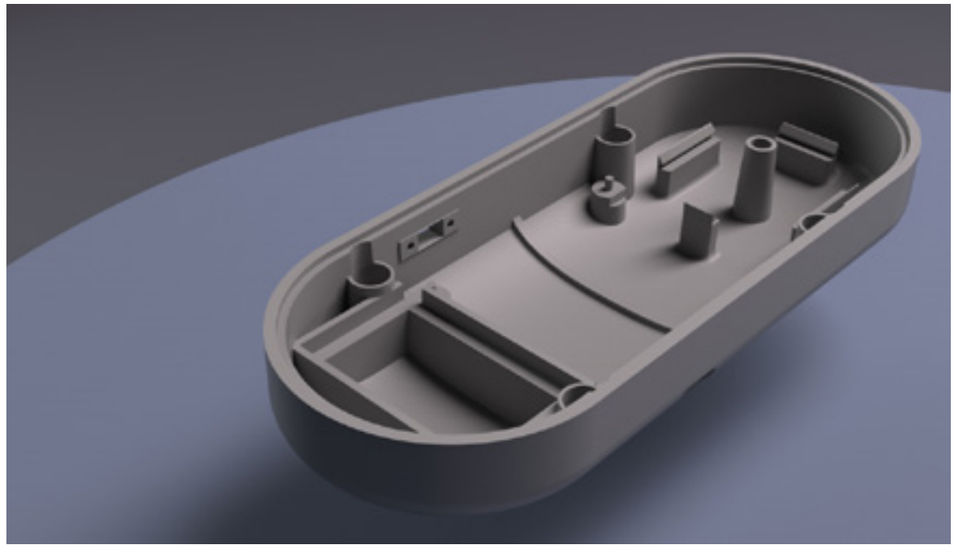
A constant iterative prototyping approach was used, starting with low-fi models to validate the correct proportions.

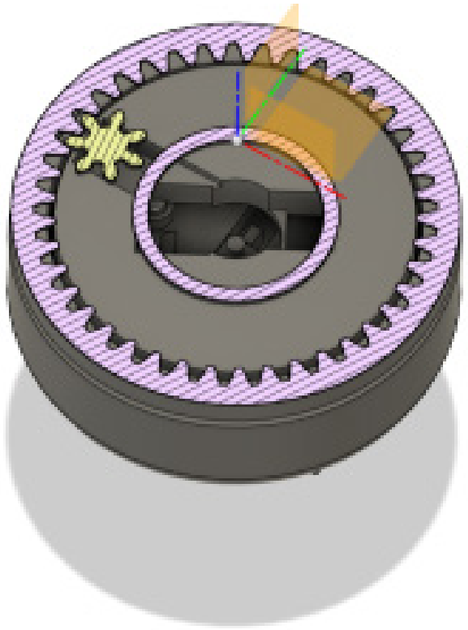
Hardware Design

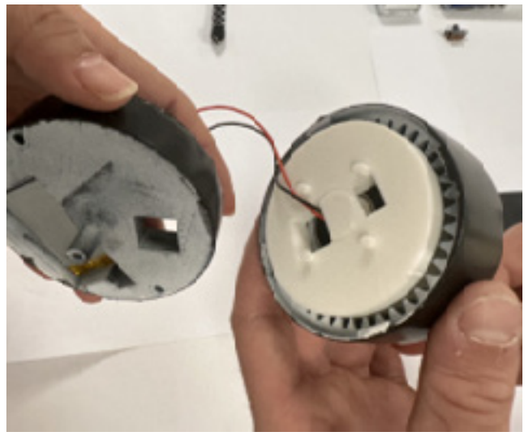
As the product developed, the CAD model became more complex as the mechanism was contained within a hand-sized unit.

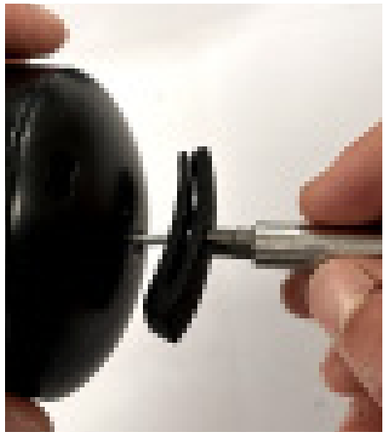
Design for manufacture in the form of injection mould-able parts and snap fittings was also heavily considered.

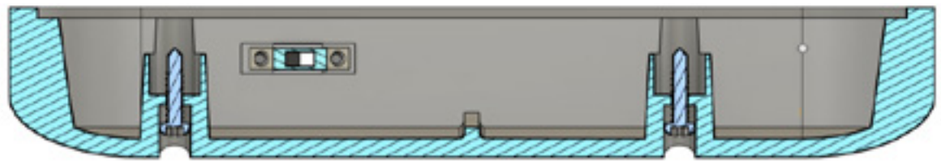








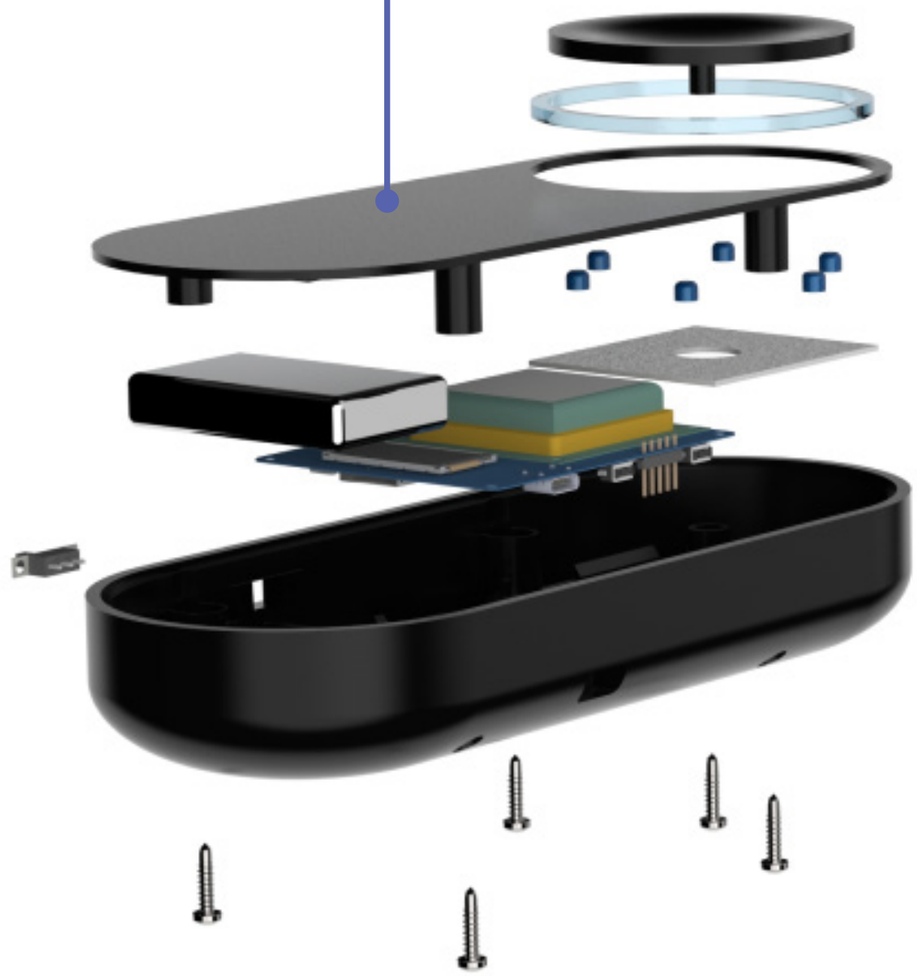




Exploded Views

The two modules wirelessly communicate with each other. The challenge was to fit all of the components and mechanical systems into the smallest space possible.

Scanner module



Controller module

Final form

Boat Renovation

Saving six Firefly team racing boats from the scrapyard, while developing custom parts and components.

Duration	2 months
Year	2024
Partner	Henry Hollingworth

Skills

Fibreglass Repairs

Component redesign

3D printing with different filament

The ‘project’

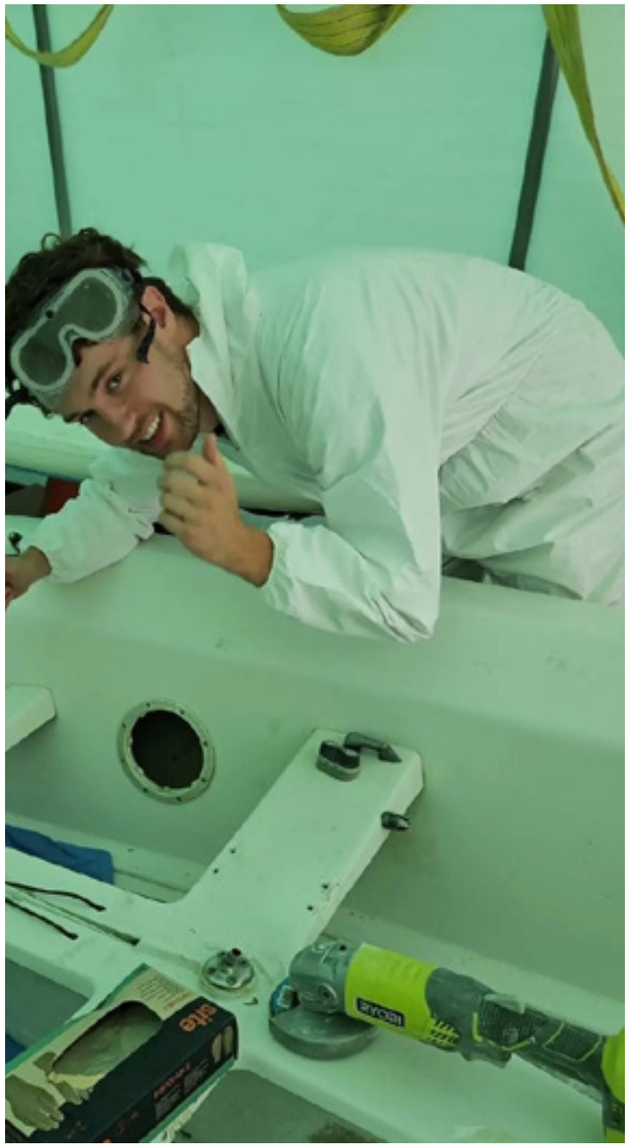
FireFly sailing boats were originally designed in 1946.

They are now the backbone of university sailing.

Owners battle to keep them on the water with spare parts being rare and manufactured with aged technology.

A friend and I acquired six boats which were in significant need of repairs, and spent part of summer working on them.

Fibreglass repairs



A major part of the restoration process was carrying out large fibreglass repairs.

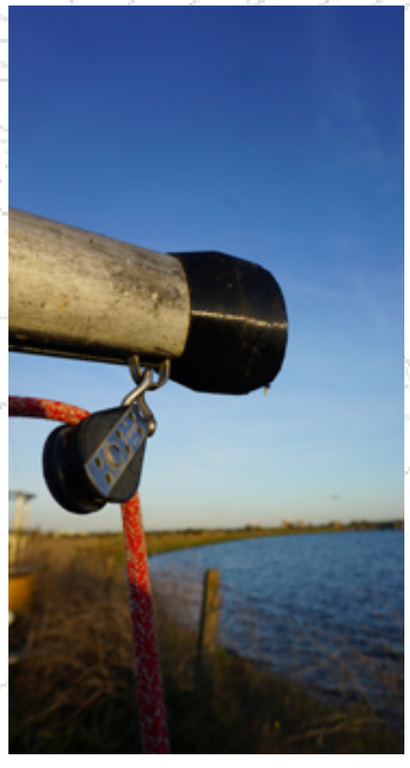
Boom-End Protectors

The aim of this component is to blend in, serve its brief, and be forgotten about.

Using 3D printing I have been able to produce this at 10% of the cost of alternatives available on the market.

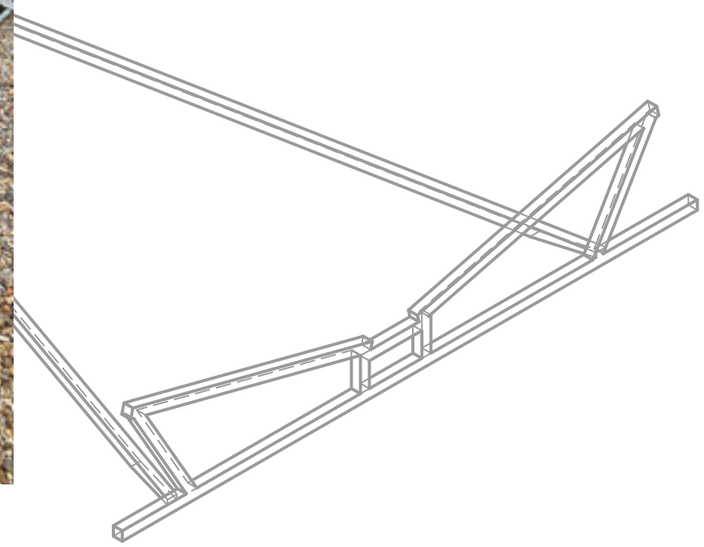
This has lead to me selling this component on Ebay.

Click or scan



Trolley Fabrication

We took a trolley from a different type of boat and fabricated a new one to match the profile of a Firefly.



GiggaSketch

Reinventing a classic toy by adding mechatronic interaction and hidden game elements

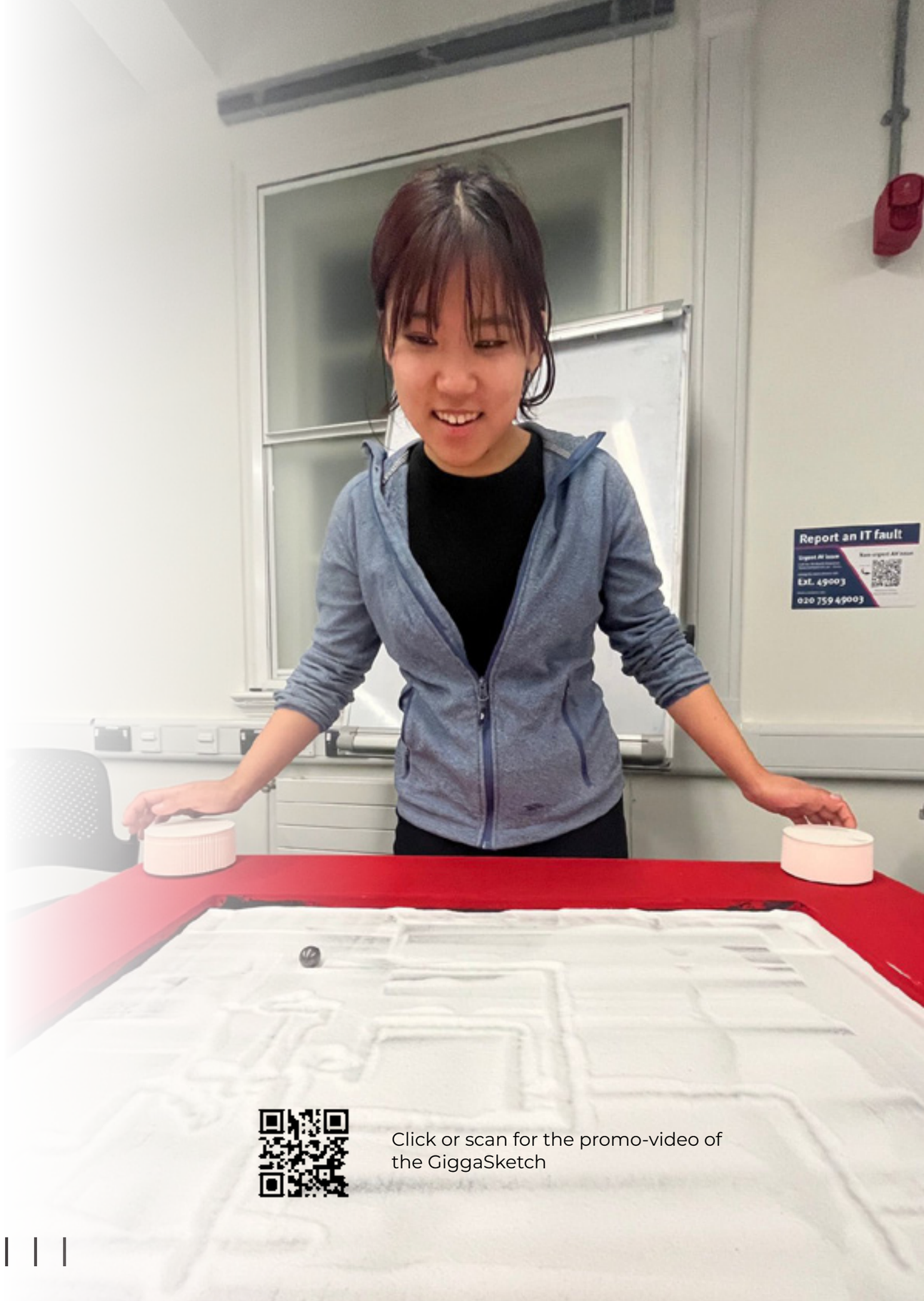
Duration	8 weeks
Individual role	Arduino Coder
Partner	Josh Renyolds

Skills

Arduino

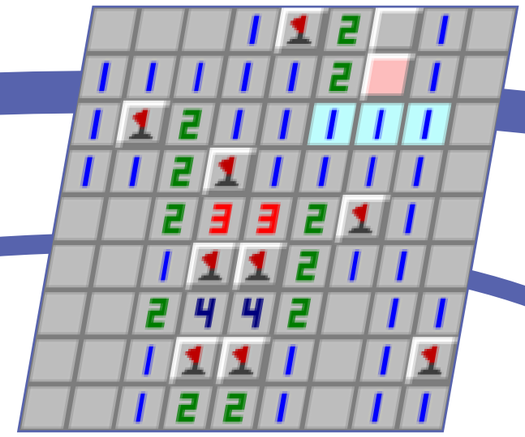
Stepper motor control

Custom Linear actuators



Click or scan for the promo-video of the GiggaSketch

More than meets the eye

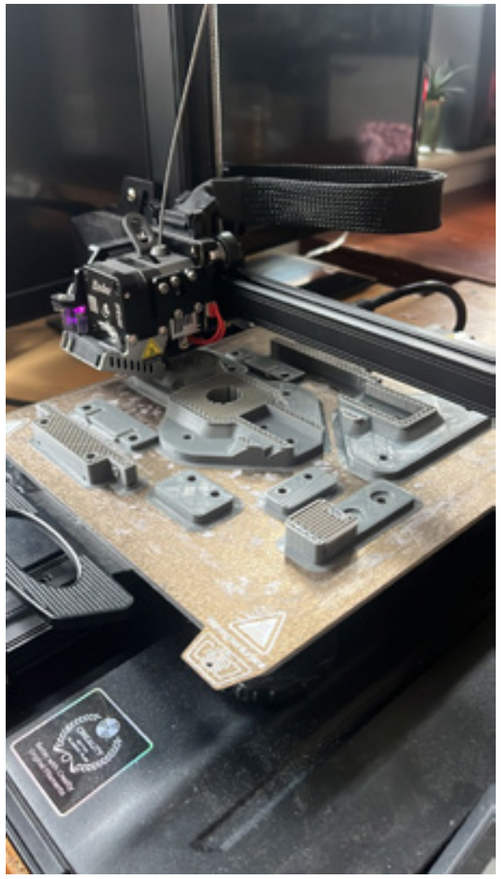


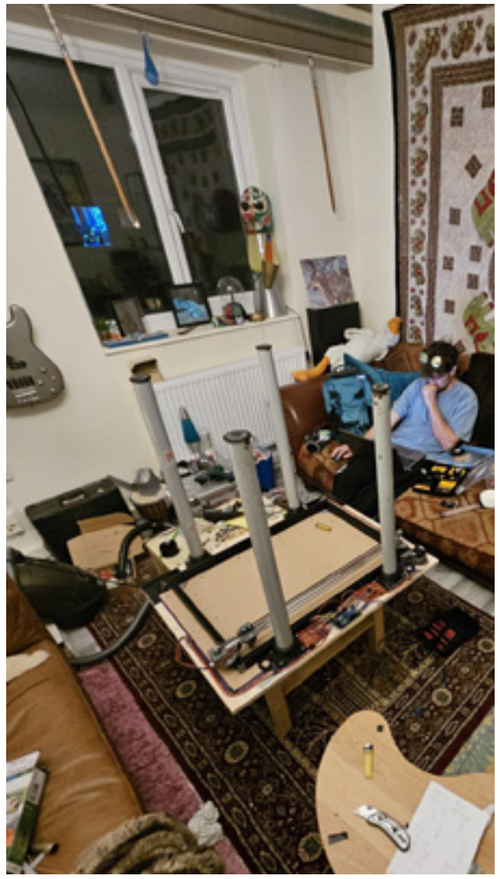
How might we add a hidden gamification element?

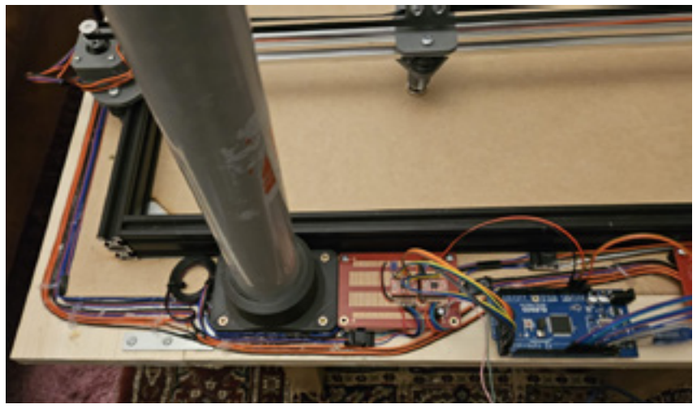
◀ MineSweeper was chosen as the perfect game to add into the GiggaSketch; It fits well within the workspace and creates an engaging interaction.

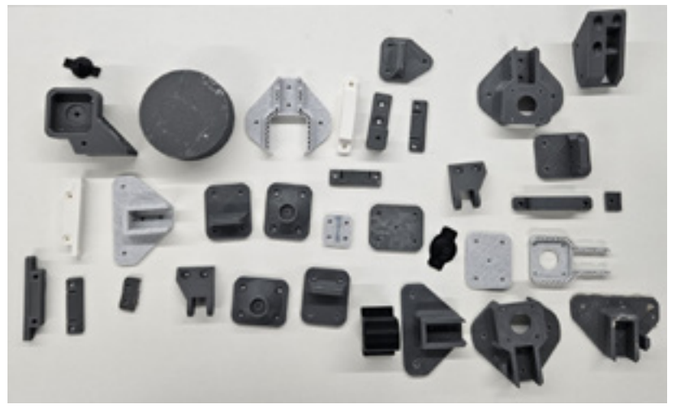
Process

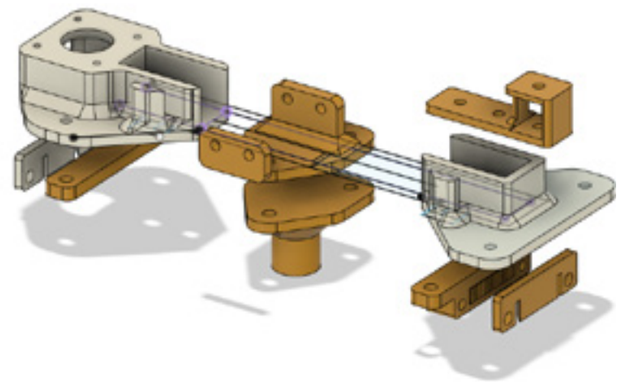
▼ This was a diverse project; effort was spent on everything from getting the code running efficiently, to sanding for hours to make the top surface super-smooth.











Final Outcome

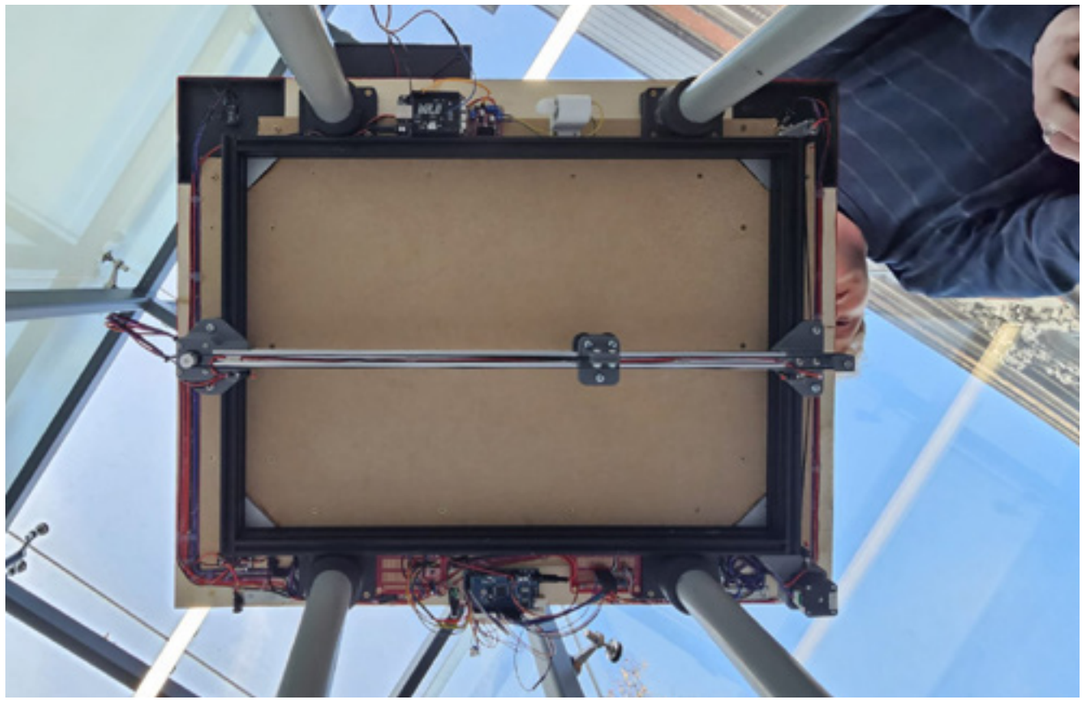
Game element screen

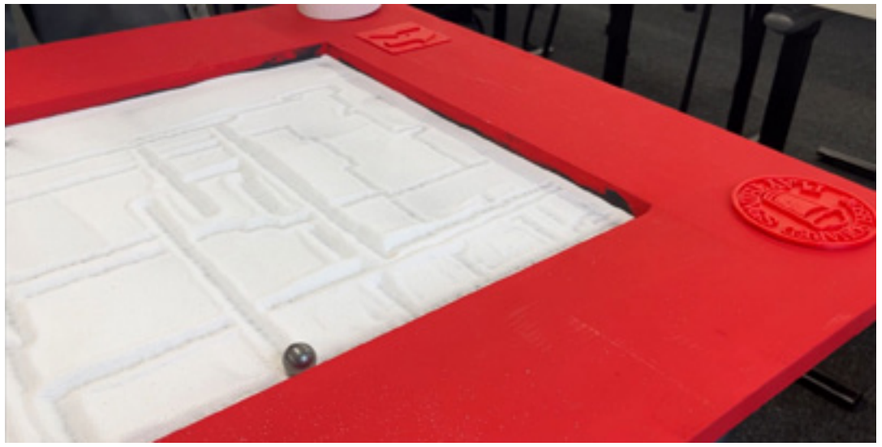
Rotary encoder dials

Electromechanical system hidden on the underside

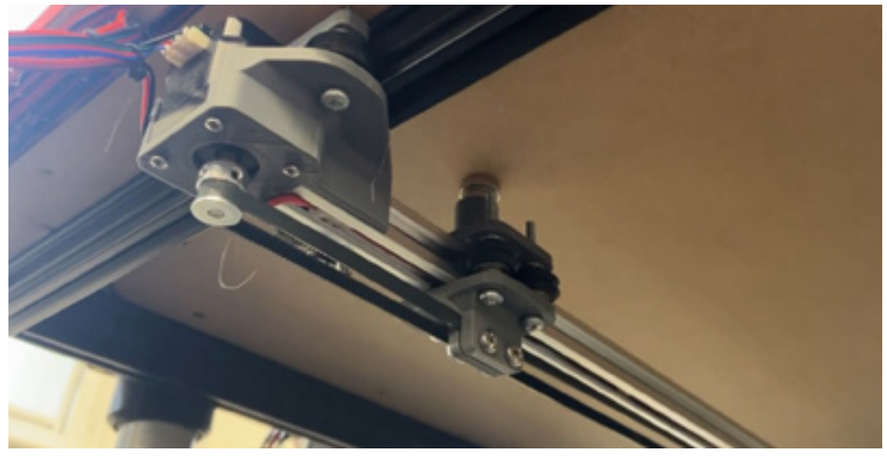
Original Etch-A-Sketch; three and a half times smaller

Becoming a kid again





The GiggaSketch created an engaging interaction for the users which grabbed plenty of attention on demo day.



Chain Guide

Creating a product service system to reduce the number of parts of a mountain bike chain guide.

Duration	Jan 2024 - Ongoing....
Stage	Product testing
Project	Personal

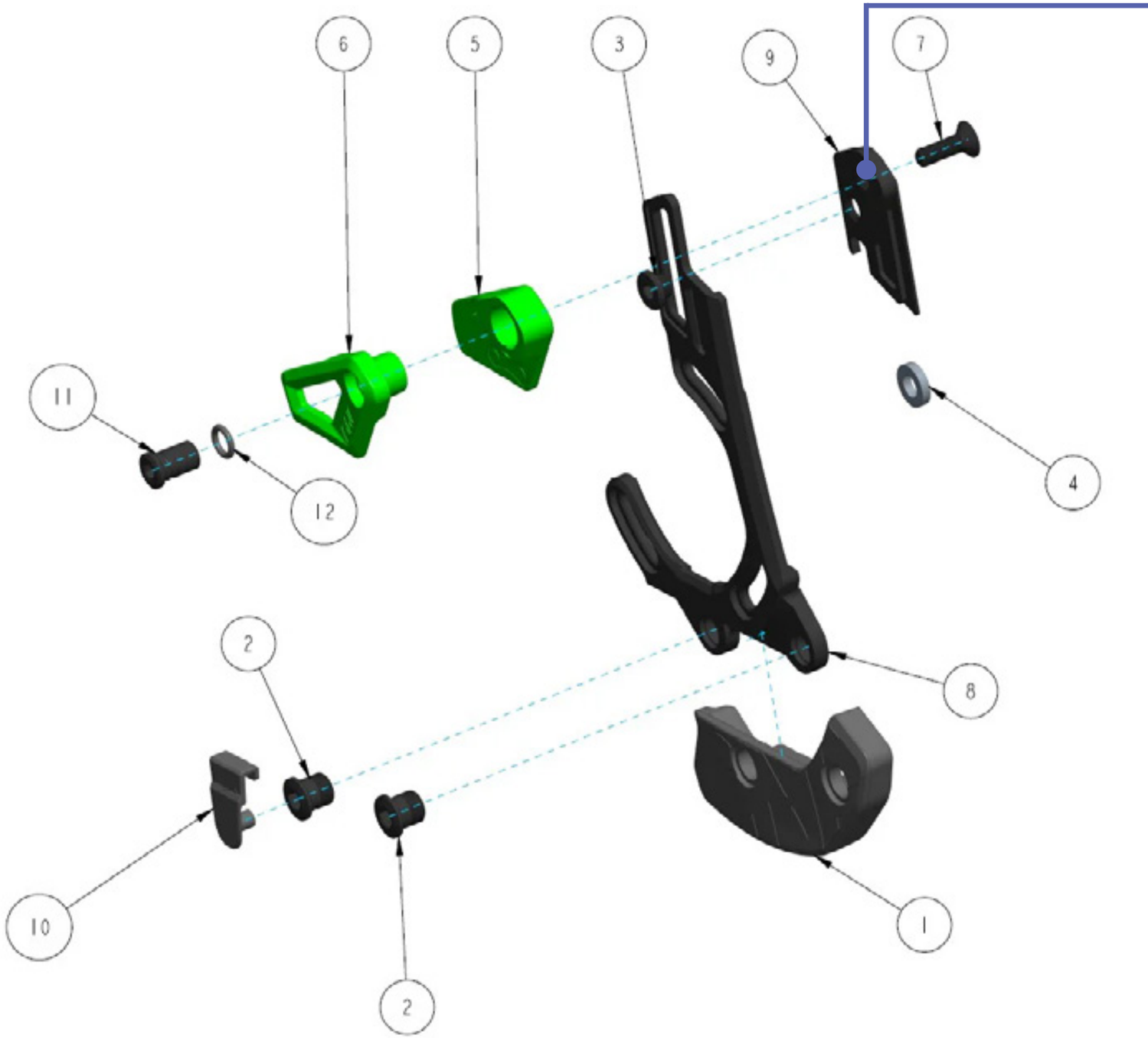
Skills

Finite element Analysis

Adaptable geometry 3D print work flow

Testing a product in the real world

Too many parts



Current chain guides comprise of a large number of parts.
Fitting them to a bike is a complex process.

Every bike is different, meaning shims must be used to adjust to this.

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◀ ***How might we produce a chain guide which is easier to install by making it custom to each user?***

Product Service System

User decides that they need a new chain guide.

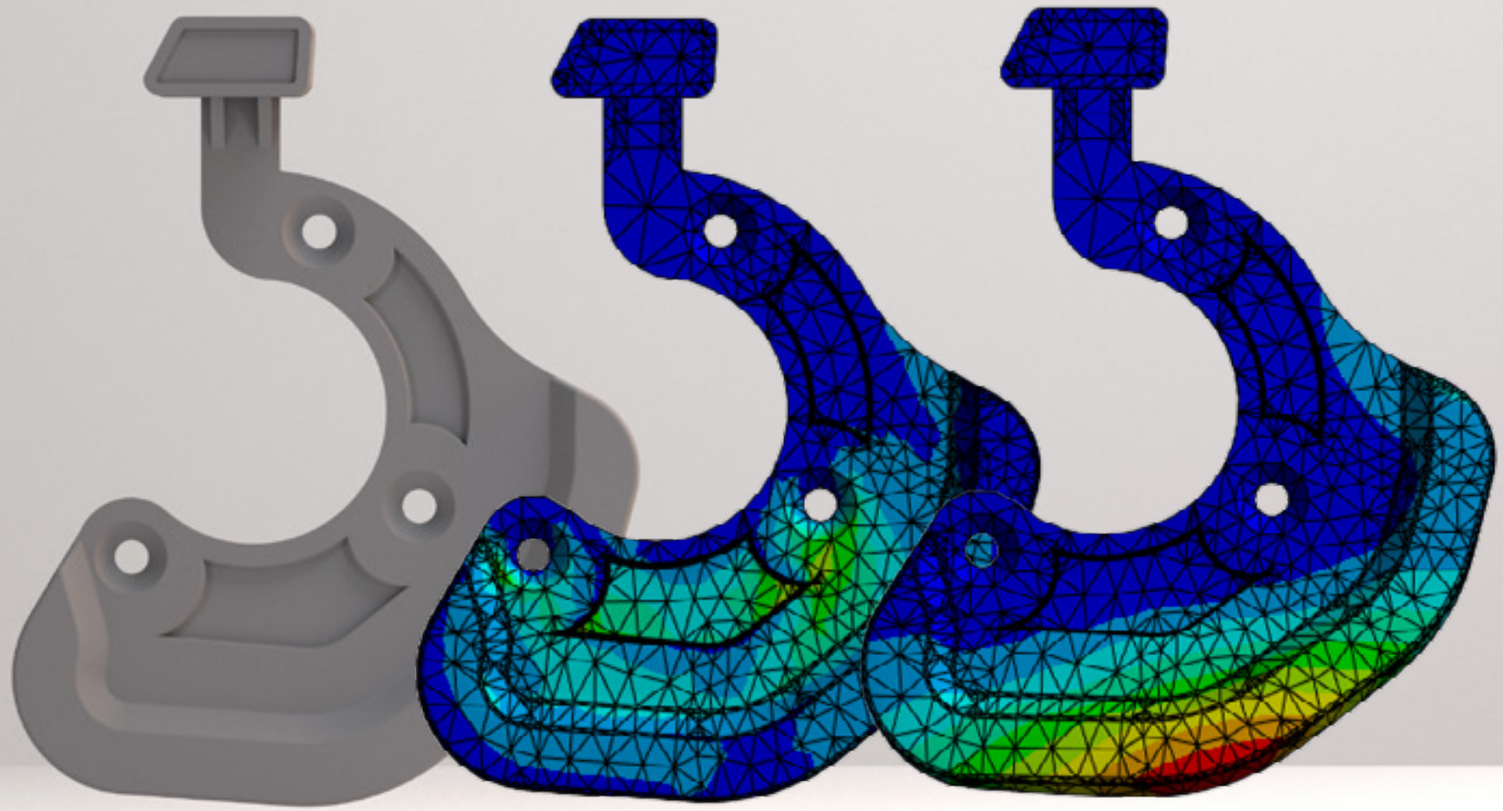
Cuts out template from online and measures their bikes dimensions.

Enters the dimensions into the website which are then stored in a database.

Custom Chain Guide is printed and sent to the user.

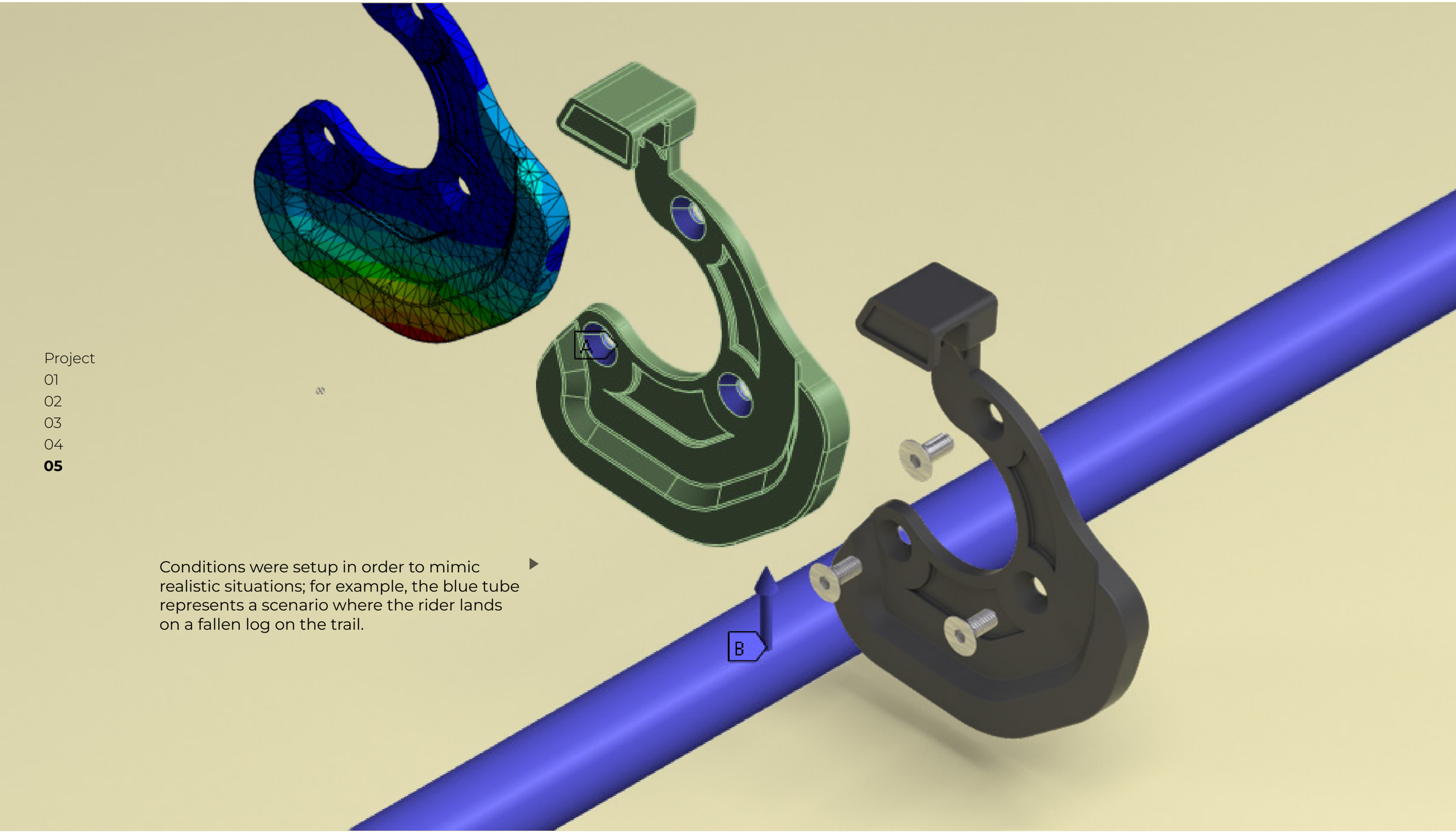
It’s then their job to go and enjoy the outdoors.....

FEA validation



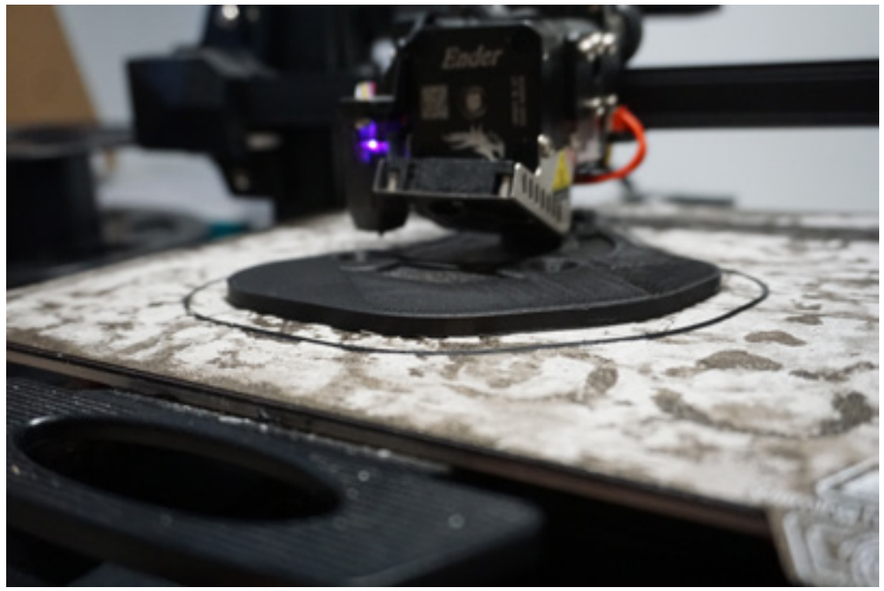
◀ Both static and impact analysis was completed on the Chain Guide to validate that the design would withstand the requirements.

Impact Analysis



Conditions were setup in order to mimic realistic situations; for example, the blue tube represents a scenario where the rider lands on a fallen log on the trail.

Product



◀ This project highlights the quick development and customisability that 3D printing brings.
3D printers are easily accessible in lots of the world, it would be easy to get this product to customers without the need for complex distribution chains.

What’s next...

- The chain guide is currently being tested on a number of my friends bikes where I will be able to assess its performance and identify any issues that arise.

- I would also like to explore using generative design in order to further optimise the strength of the component given the psychical parameters and force requirements.

Additional projects

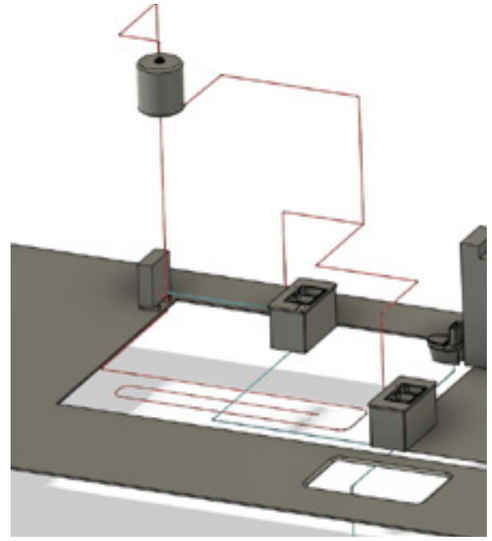
I would love to chat in more depth about all of the projects mentioned in this portfolio.

Dryer Lint Recycling

Collecting lint from Uni halls for sustainable re-purposing.

Mongol Rally Car

Fixing and modifying a 2002 Nissan Micra ready for a trip across the world.

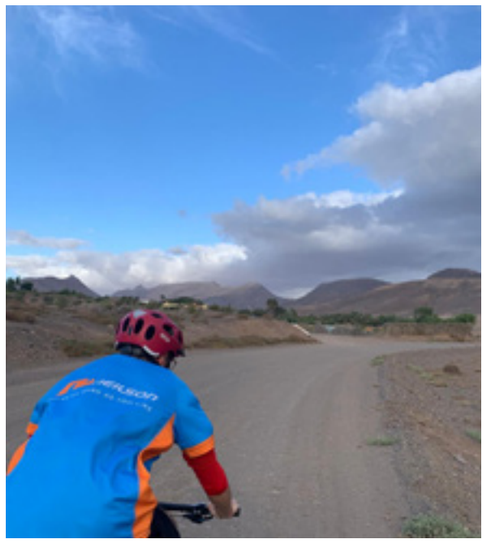


Thermofluids house Design

Designing a house pipe system and calculating pressure loss.

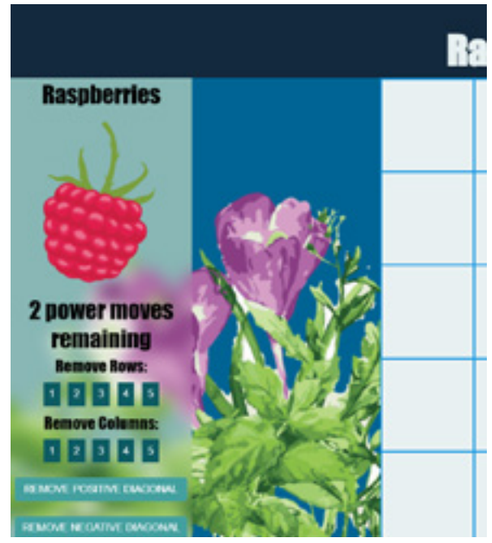
FEA Hip Implant

Redesigning a hip implant with Finite element Analysis tools.



Neilson Bike Route Design

Exploring Fuertaventura to produce new bike routes for a holiday resort.



Web-App Game

Creating a web-app board game in JavaScript, HTML, CSS.