

ASSIGNMENT 7

PROTOTYPE DEVELOPMENT AND SHOWCASE



Group 4

Caragh Conway,
Diarmuid Deeney Curran,
Eva Toal,
Finn O'Connor,
Labiba Mansur,
Rian Geraghty-McDonnell,
Shane McDermott



Recap

Background

Prototype
Video

Design
Process

Prototype
Breakdown

Modeling

Final
Prototype

Our Mission Statement:

“To enhance cyclist safety by developing an intuitive alert system that detects approaching vehicles, providing timely warnings to cyclists without causing distractions. By increasing situational awareness and visibility on the road, we aim to empower cyclists with a safer, more confident riding experience.”



Our Product

The Problem



Over 70% of surveyed cyclists reported listening to music while cycling, which compromises a crucial sense for safety.

Our product tackles this challenge by using vibrations to enhance safety while cycling and enjoying music.

This innovation stands as the key unique selling point of our product



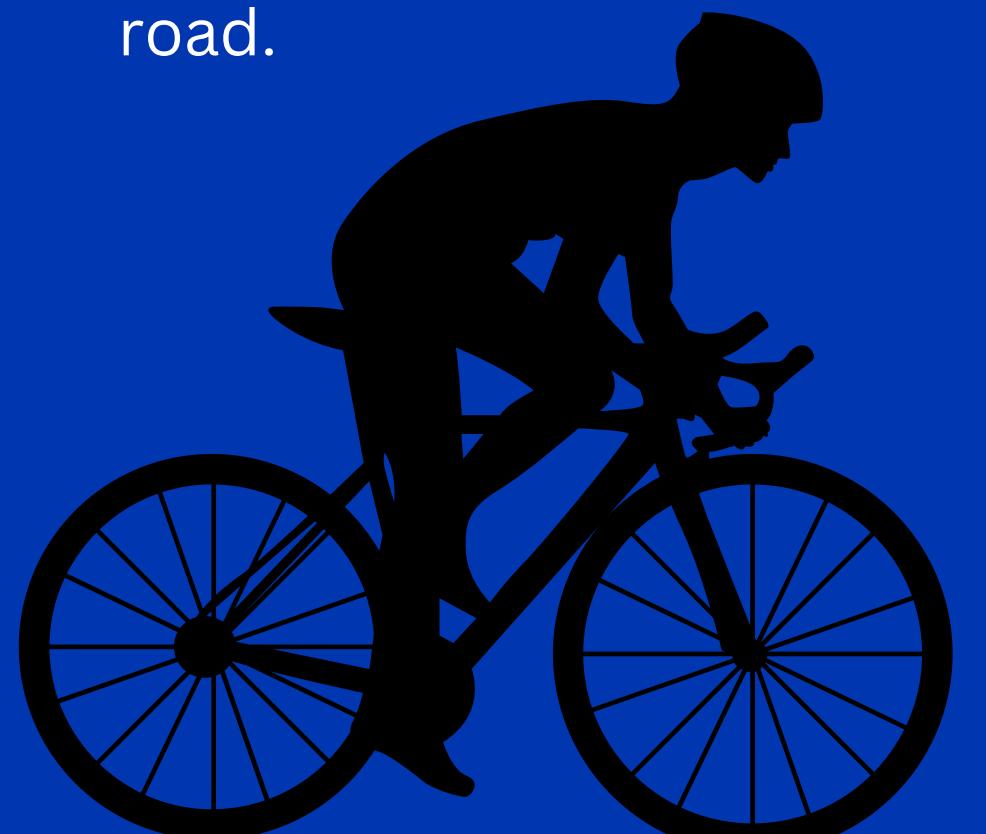
Our Product

What is Echo Eye?

A Small, lightweight device that attaches to the handlebars and rear end of a bike, just beneath the seat.

It senses when a vehicle is within a certain distance from the rear of the bike it notifies the cyclist with a vibration of the handlebars.

This allows the cyclist to be notified that a car is approaching them without them needing to be focusing their vision elsewhere than the road.



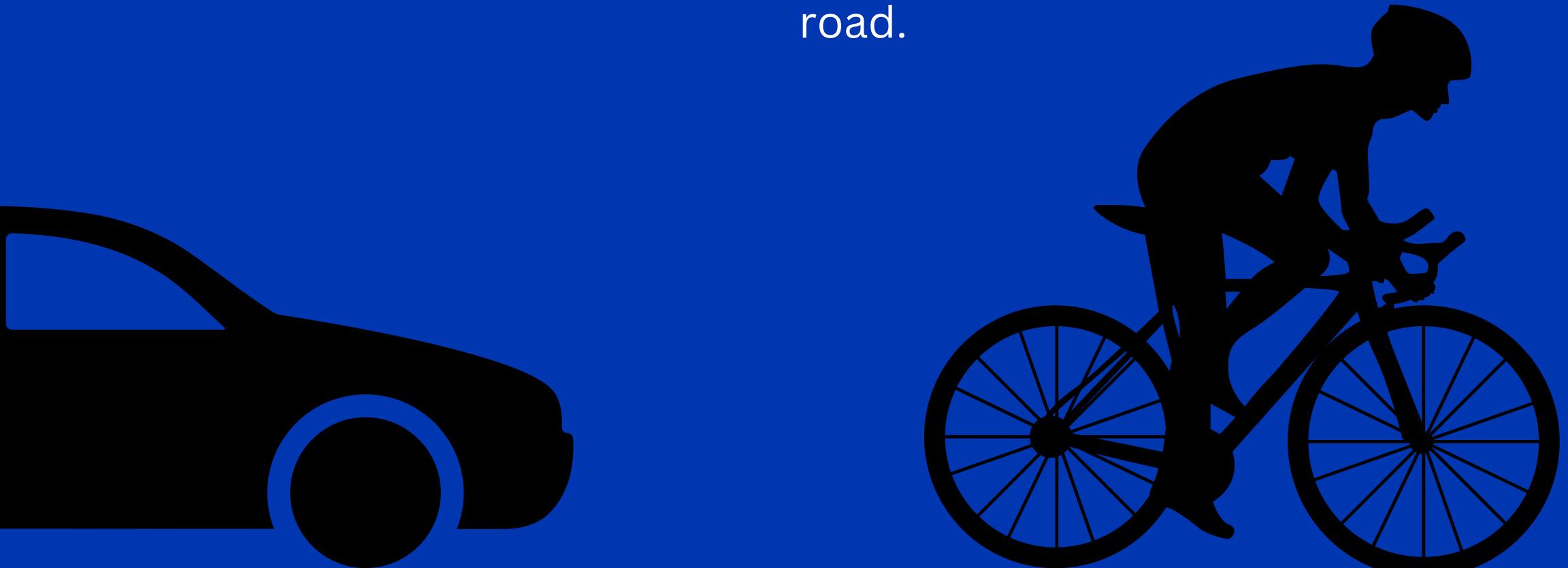
Our Product

What is Echo Eye?

A Small, lightweight device that attaches to the handlebars and rear end of a bike, just beneath the seat.

It senses when a vehicle is within a certain distance from the rear of the bike it notifies the cyclist with a vibration of the handlebars.

This allows the cyclist to be notified that a car is approaching them without them needing to be focusing their vision elsewhere than the road.



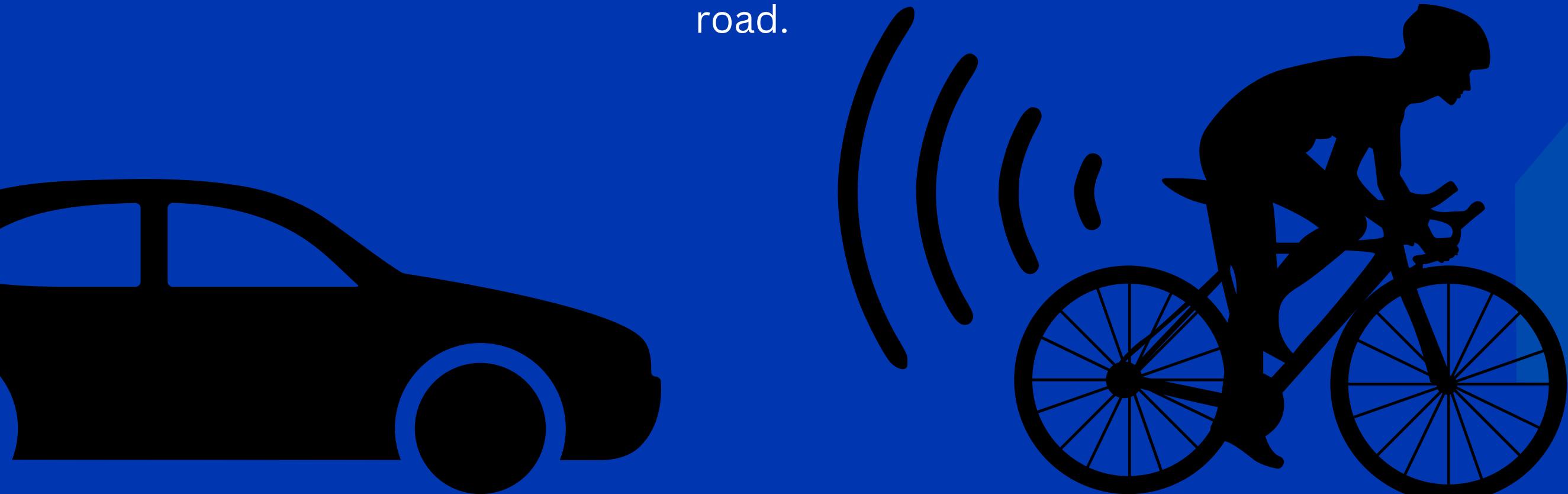
Our Product

What is Echo Eye?

A Small, lightweight device that attaches to the handlebars and rear end of a bike, just beneath the seat.

It senses when a vehicle is within a certain distance from the rear of the bike it notifies the cyclist with a vibration of the handlebars.

This allows the cyclist to be notified that a car is approaching them without them needed to be focusing their vision elsewhere than the road.



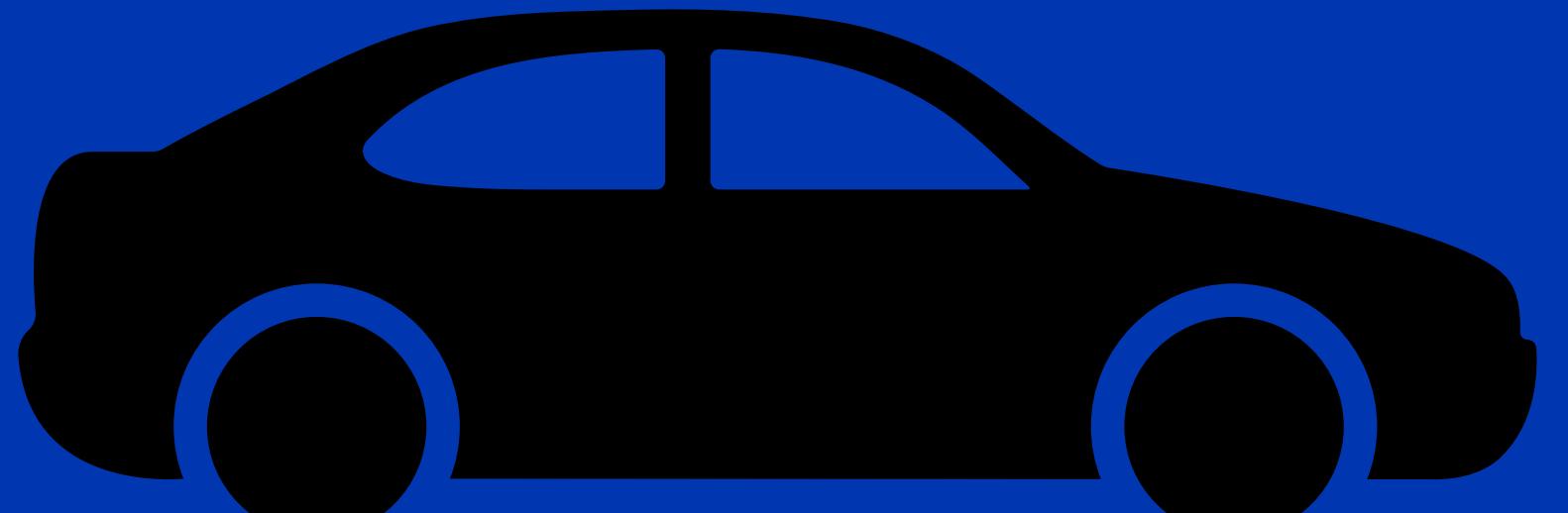
Our Product

What is Echo Eye?

A Small, lightweight device that attaches to the handlebars and rear end of a bike, just beneath the seat.

It senses when a vehicle is within a certain distance from the rear of the bike it notifies the cyclist with a vibration of the handlebars.

This allows the cyclist to be notified that a car is approaching them without them needed to be focusing their vision elsewhere than the road.



ECHO
EYE



Recap

Background

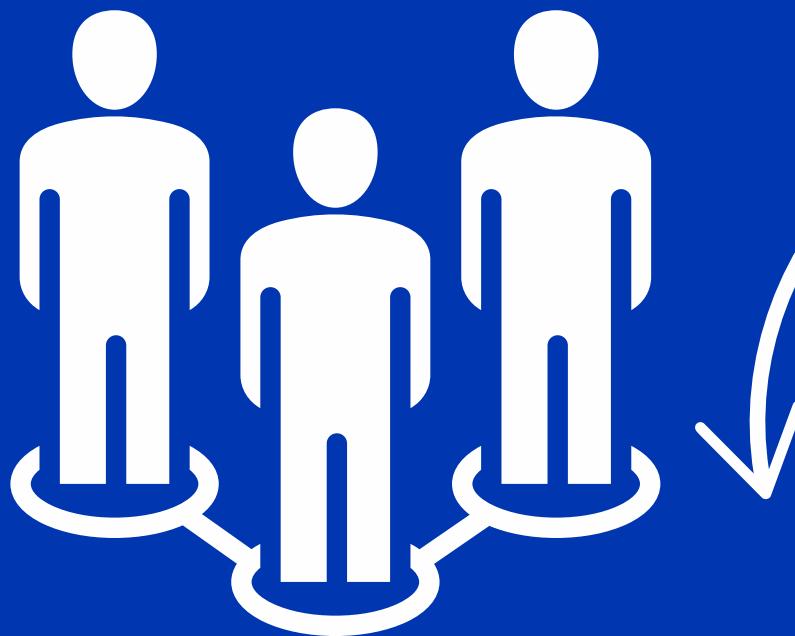
Prototype
Video

Design
Process

Prototype
Breakdown

Modeling

Final
Prototype



Stakeholder Interviews

Cyclists are uneasy from the proximity of cars so knowing if one is close would be helpful to react accordingly

Don't have to wear it

What drove us to choose this concept idea?

” Helps cyclist react without having to look away from the road ”

Recap

Background

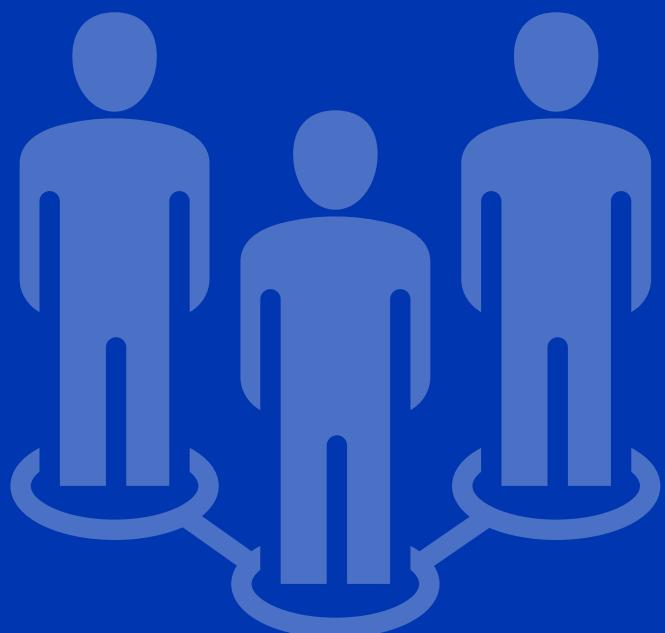
Prototype Video

Design Process

Prototype Breakdown

Modeling

Final Prototype



Stakeholder Interviews

Cyclists are uneasy from the proximity of cars so knowing if one is close would be helpful to react accordingly

What drove us to choose this concept idea?

“Helps cyclist react without having to look away from the road”

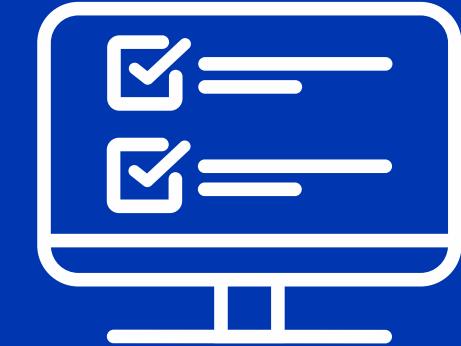
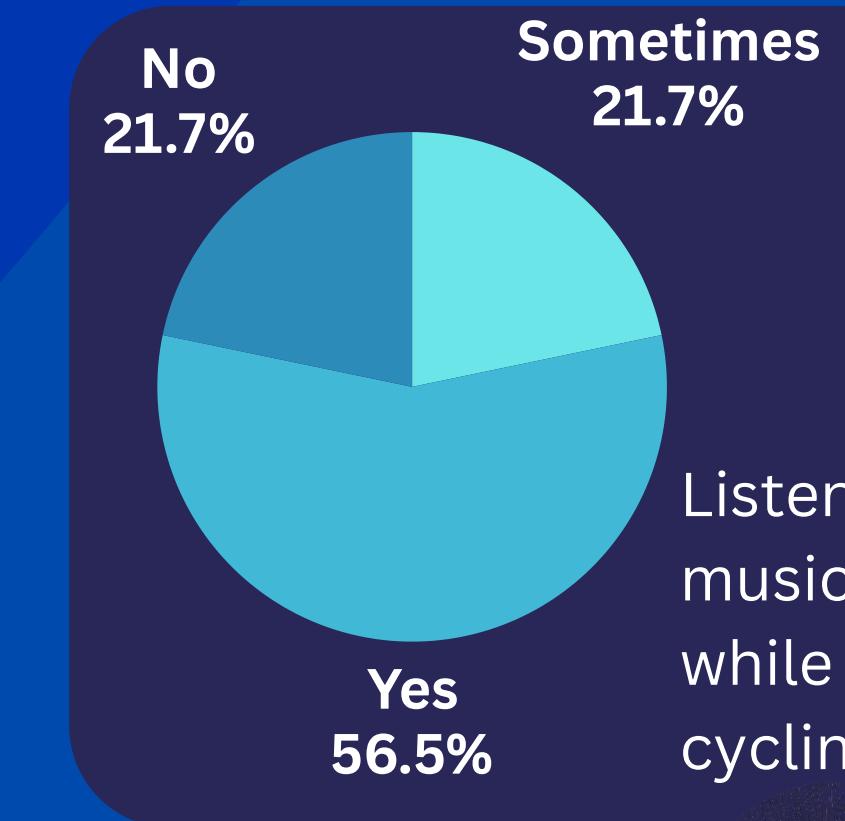
“Don’t have to wear it”

“Traffic is muted”

“I find it challenging to be fully aware of my surroundings”



Deaf or hard of hearing individuals don't feel safe while cycling along busy roads



Online Surveys

ECHO EYE

Recap

Background

Prototype
Video

Design
Process

Prototype
Breakdown

Modeling

Final
Prototype

Poster & Presentation



Caragh



Eva

Tasks required to make
the prototype

Schematic &
Sketching



Finn

Coding



Rian

Hardware



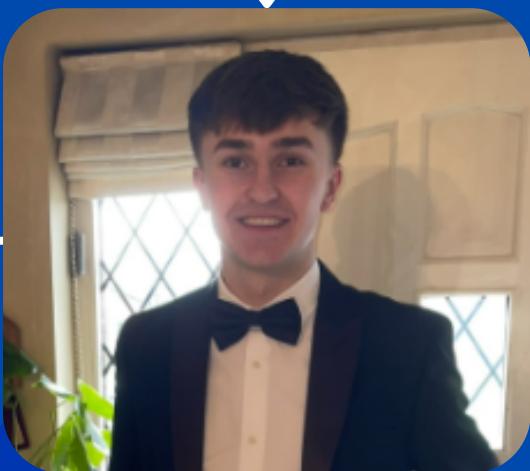
Diarmuid

3D Printing



Labiba

Computer Aided
Design



Shane

ECHO
EYE

Recap

Background

Prototype
Video

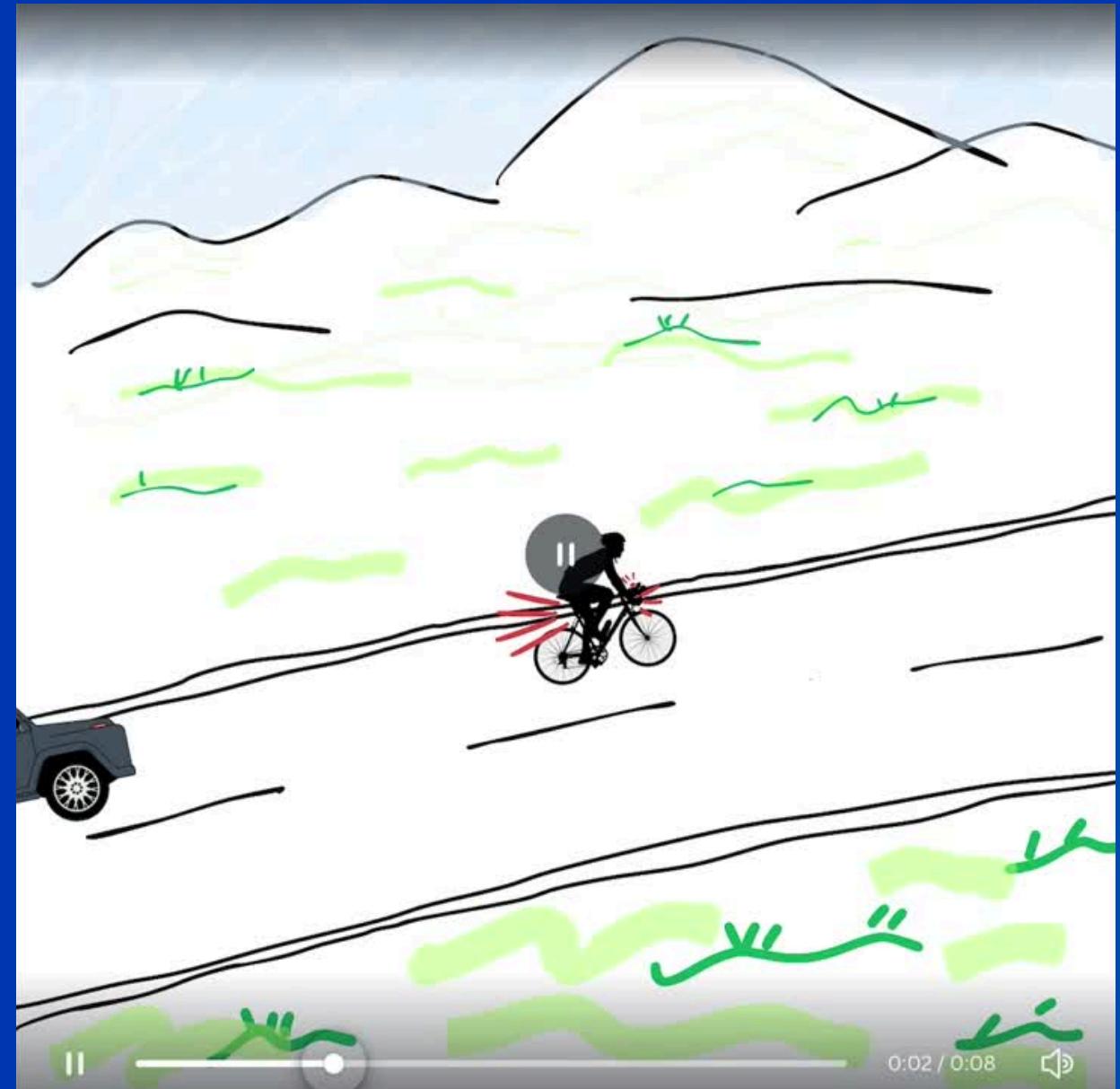
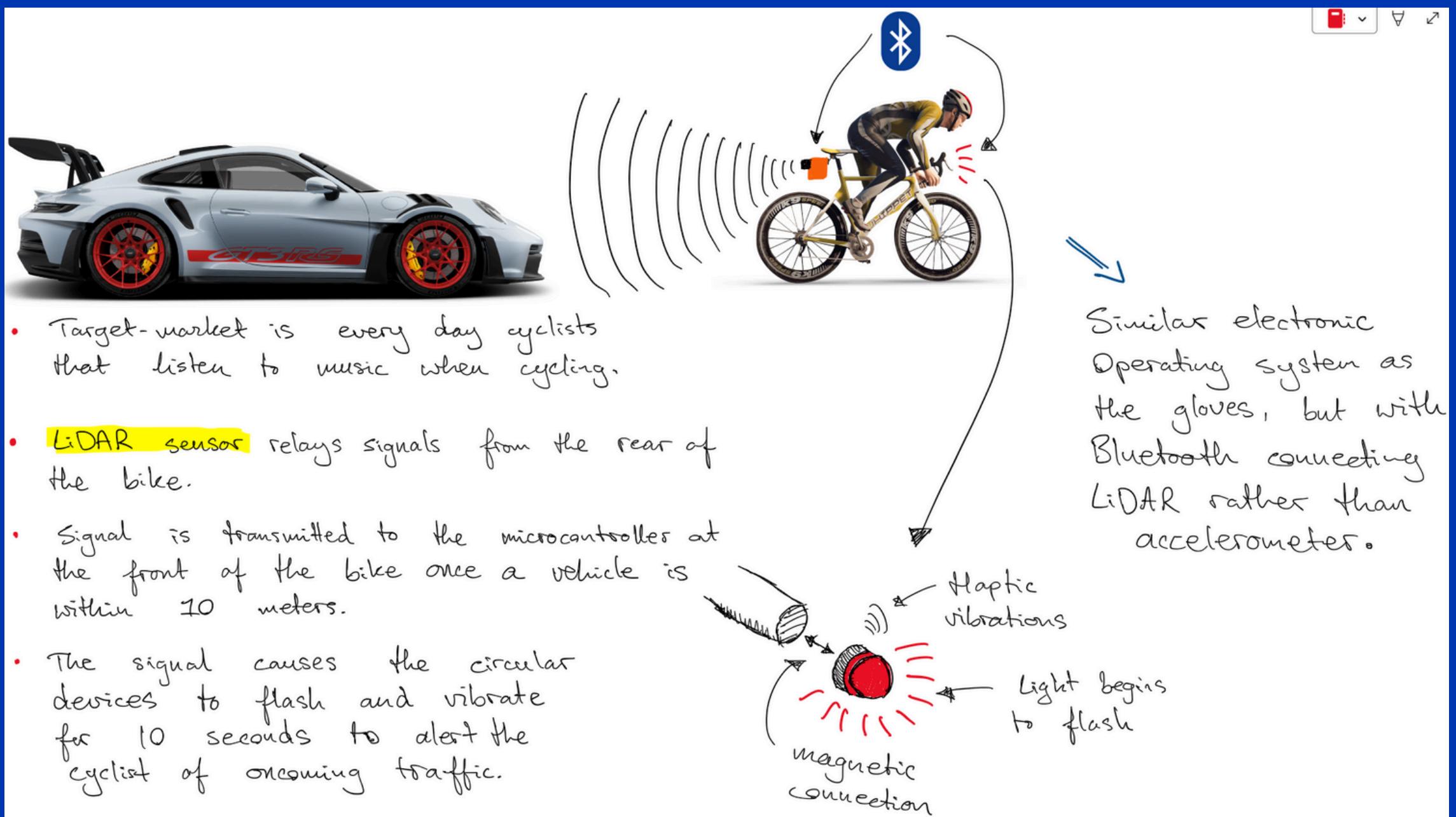
Design
Process

Prototype
Breakdown

Modeling

Final
Prototype

Development of Ideas



ECHO EYE

Recap

Background

Prototype
Video

Design
Process

Prototype
Breakdown

Modeling

Final
Prototype

After we carried out market research we found the Garmin Varia was a product already on the market most similar to our concept idea

What is the Garmin Varia?

Rearview radar with an integrated bike light. Paired to a compatible smartphone or Edge® to alert cyclists of vehicles approaching from behind



Lacking Features of Garmin Varia

- The cyclist is required to look down at the handlebar-mounted screen to check for approaching vehicles, creating a distraction
- The Varia is very costly with a retail price of €200
- The product only functions with a second device that receives the information sent by the sensor
- This separate receiving device, costing €300, as it isn't compatible with smartphones.
- Product is inaccessible to individuals with visual or hearing impairments due to its reliance on specific sensory feedback.

ECHO
EYE

Recap

Background

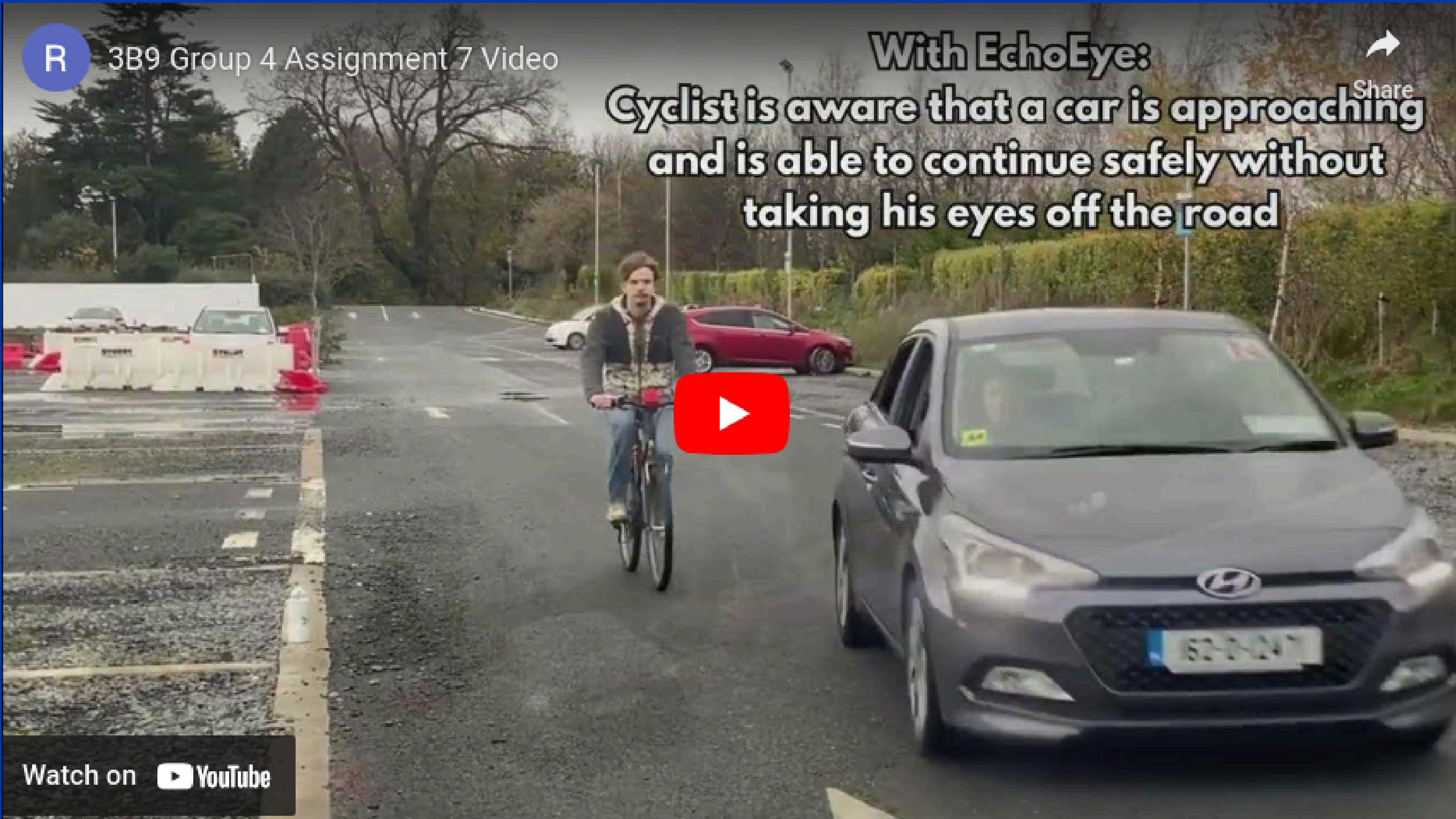
Prototype Video

Design Process

Prototype Breakdown

Modeling

Final Prototype



ECHO
EYE

Recap

Background

Prototype
Video

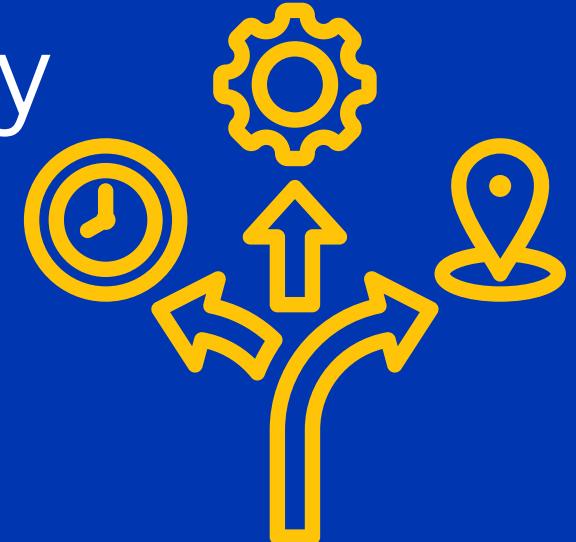
Design Process

Prototype
Breakdown

Modeling

Final
Prototype

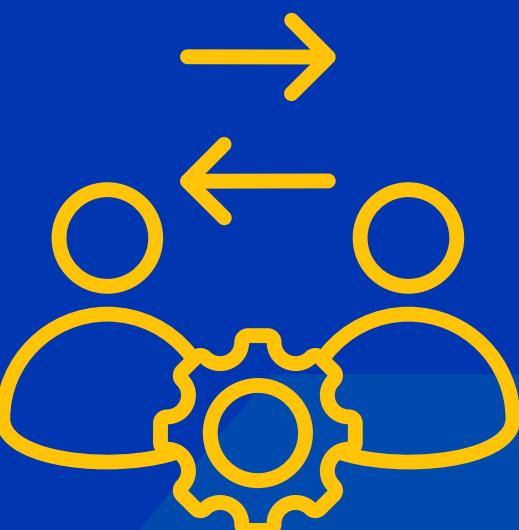
Flexibility
in use



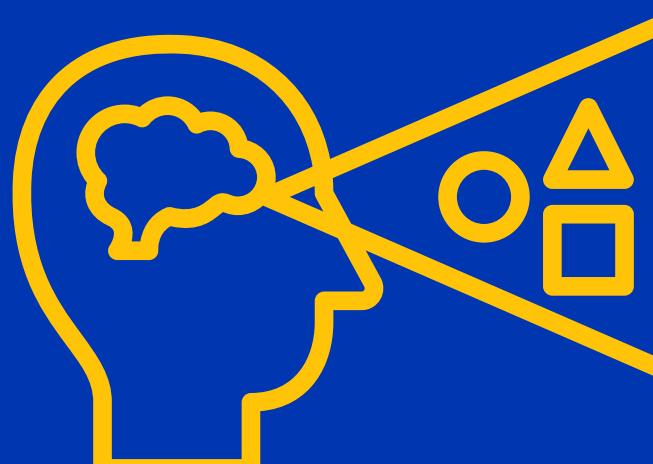
Simple &
Intuitive



Size & Space for
Approach and Use



Tolerance
for Error



Perceptible
Information



Equitable Use



Low
Physical
Effort
**ECHO
EYE**

7 Universal Design Principles

Recap

Background

Prototype
Video

Design Process

Prototype
Breakdown

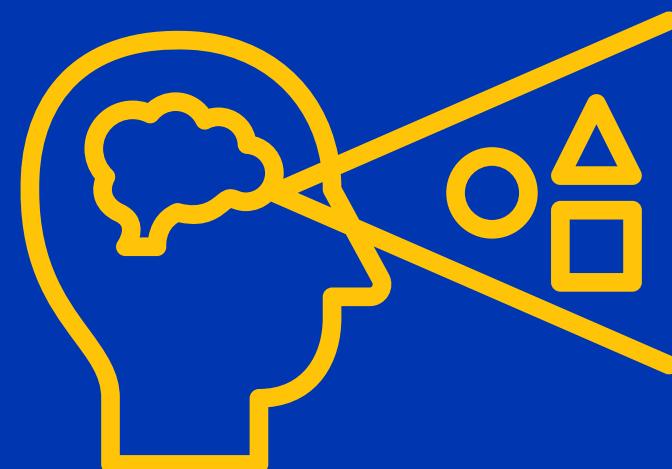
Modeling

Final
Prototype

Simple &
Intuitive



7 Universal Design Principles



Perceptible
Information



Low
Physical
Effort

**ECHO
EYE**

Recap

Background

Prototype
Video

Design Process

Prototype
Breakdown

Modeling

Final
Prototype

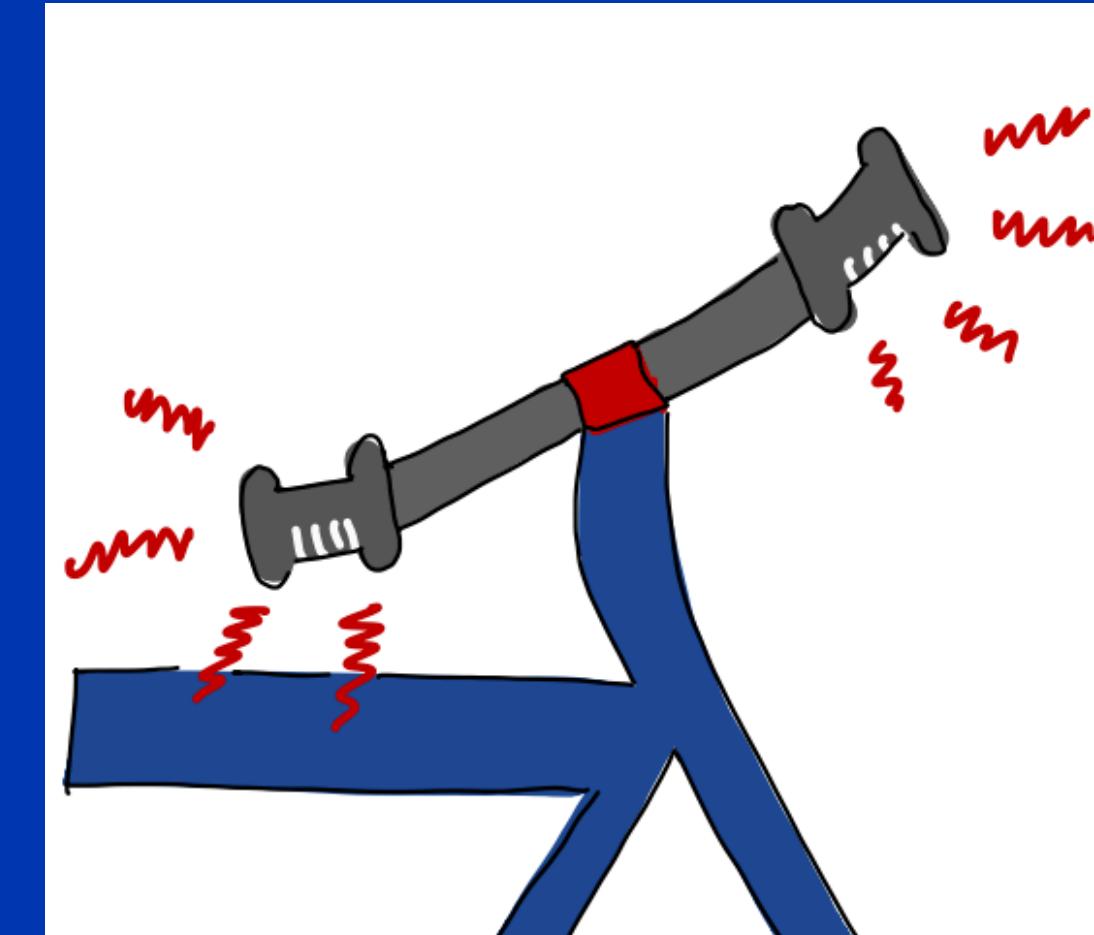
Simple &
Intuitive



As the users priority is the road they **do not need to concentrate on any other device** to notify them about approaching vehicles

No language requirement of the user as the vibration is a universal signal to alert the cyclist

There is **no need for any technical knowledge** of how the sensor works, they simply just mount the device to the rear of the bike



ECHO
EYE

Recap

Background

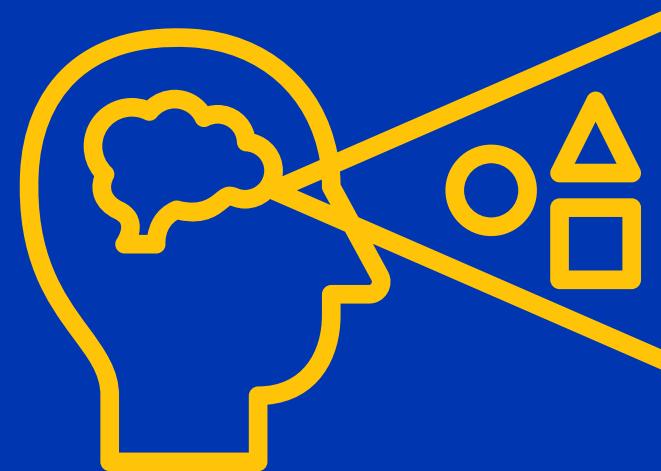
Prototype
Video

Design Process

Prototype
Breakdown

Modeling

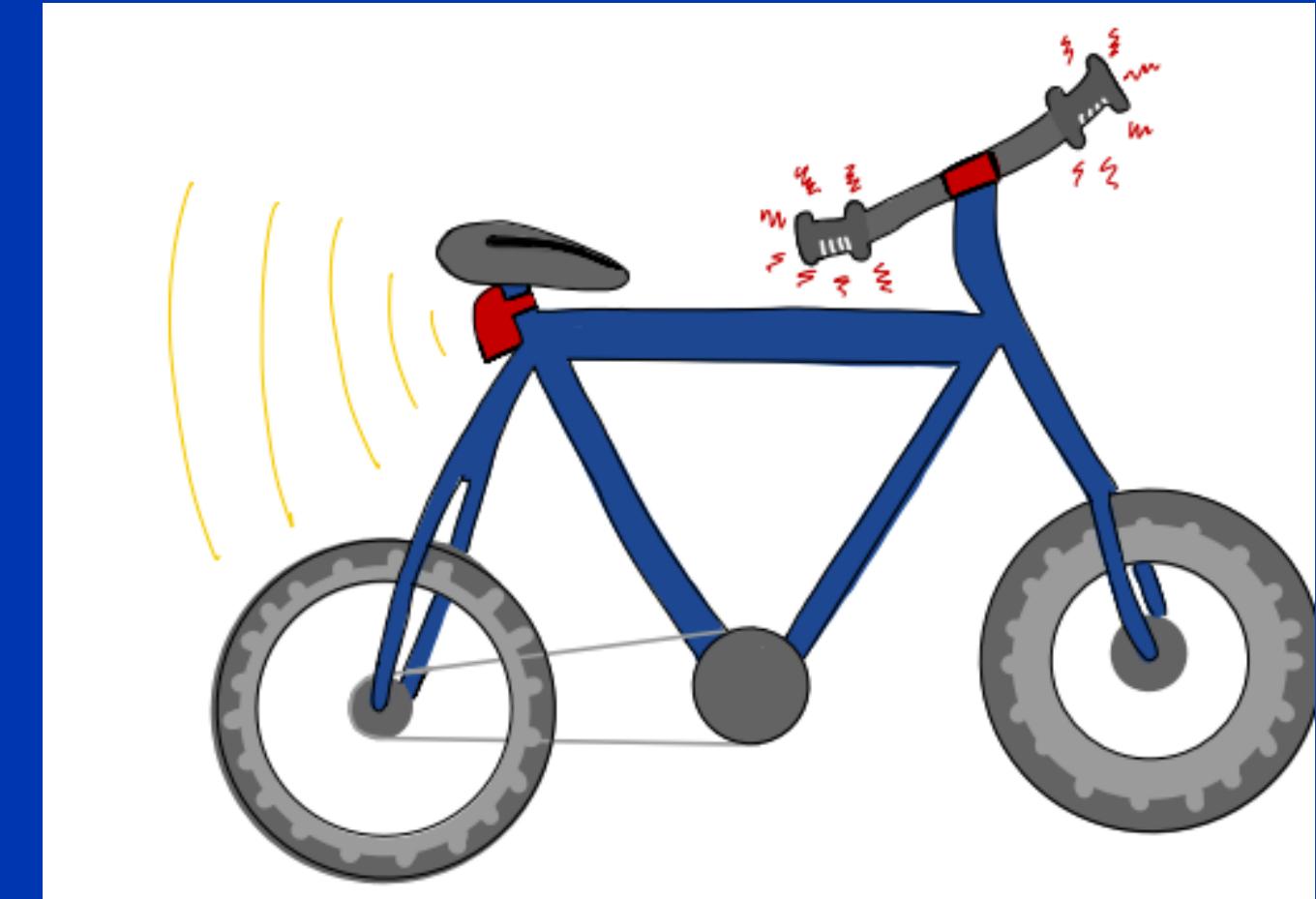
Final
Prototype



Perceptible Information

The **system fits the cycling environment**, where maintaining focus on the road is crucial and visual distractions could pose safety risks

Alert is straightforward and unambiguous, allowing the cyclist to understand the warning without needing to interpret complex signals or information.



Tactile feedback, accommodating cyclists who may have hearing impairments or need to keep their focus on the road.

The **feedback is immediate and localized to the handlebars**, ensuring the cyclist quickly understands the alert and its relevance

ECHO EYE

Recap

Background

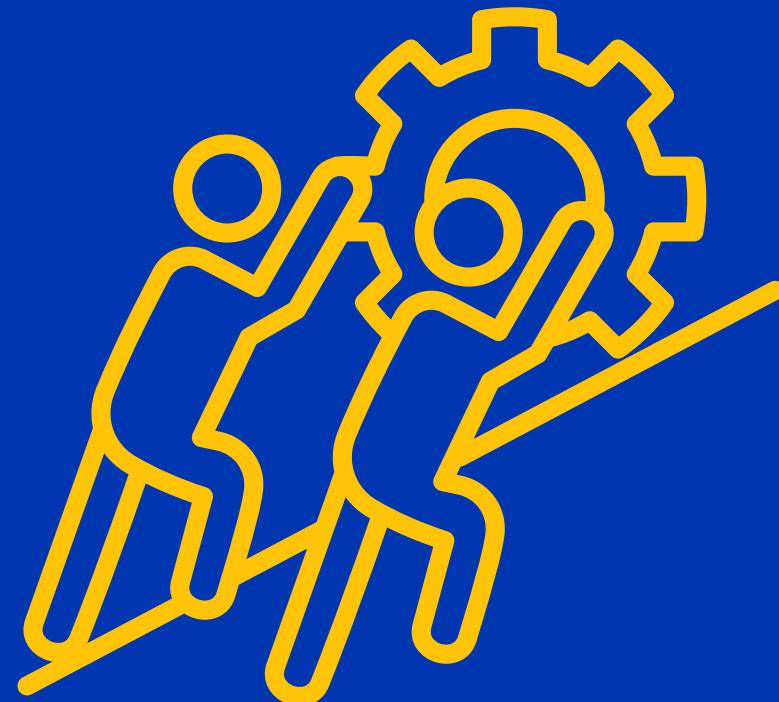
Prototype
Video

Design Process

Prototype
Breakdown

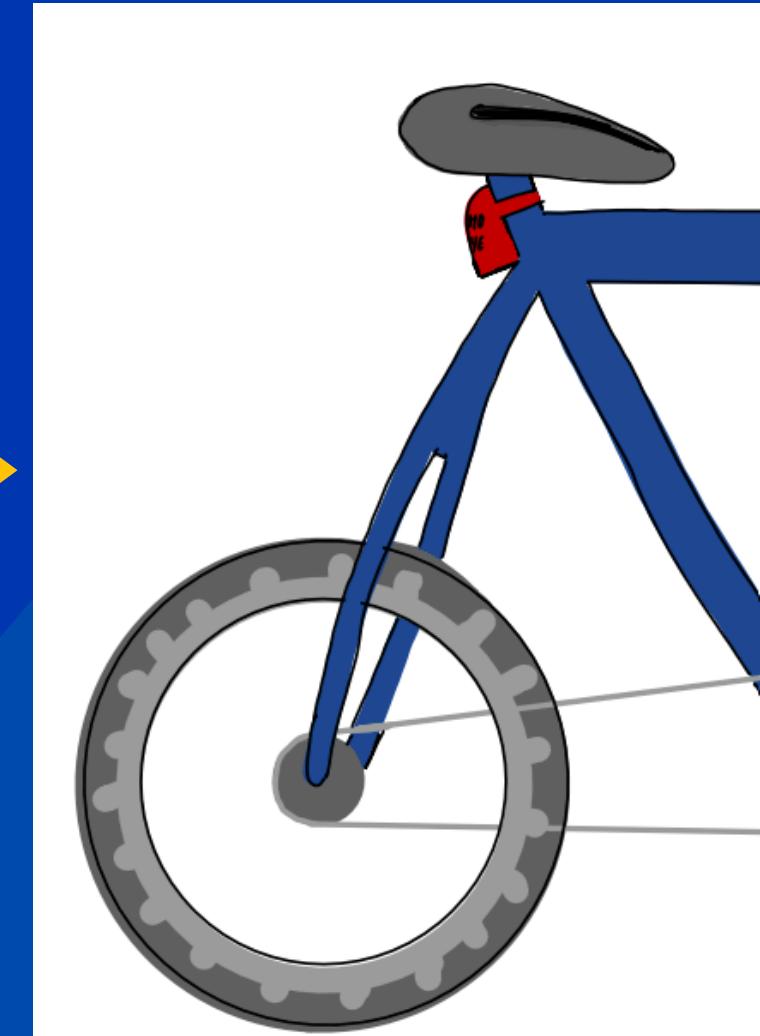
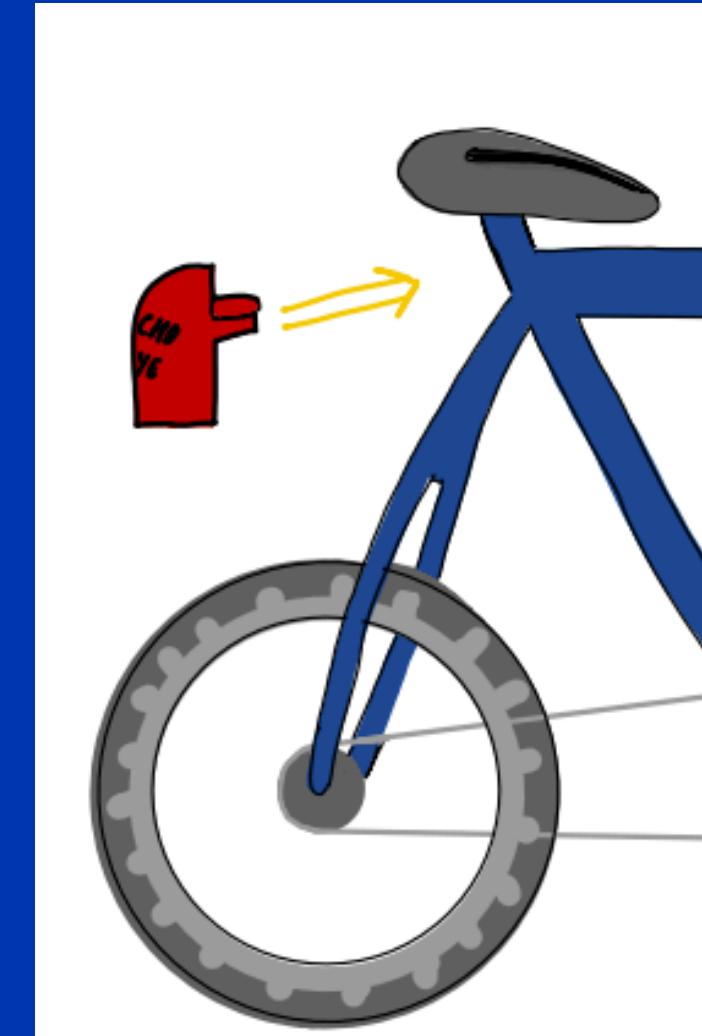
Modeling

Final
Prototype



Low Physical Effort

Device does not interfere with the bike's normal operation or cyclist's pedaling.
Maintains an ergonomic riding experience



The device is lightweight and designed to attach easily beneath the bike seat, requiring **minimal strength to set up**

The handlebar vibrations are passively received by the cyclist, **eliminating the need for deliberate physical interaction**, such as looking at or adjusting the device while cycling.

ECHO EYE

Recap

Background

Prototype
Video

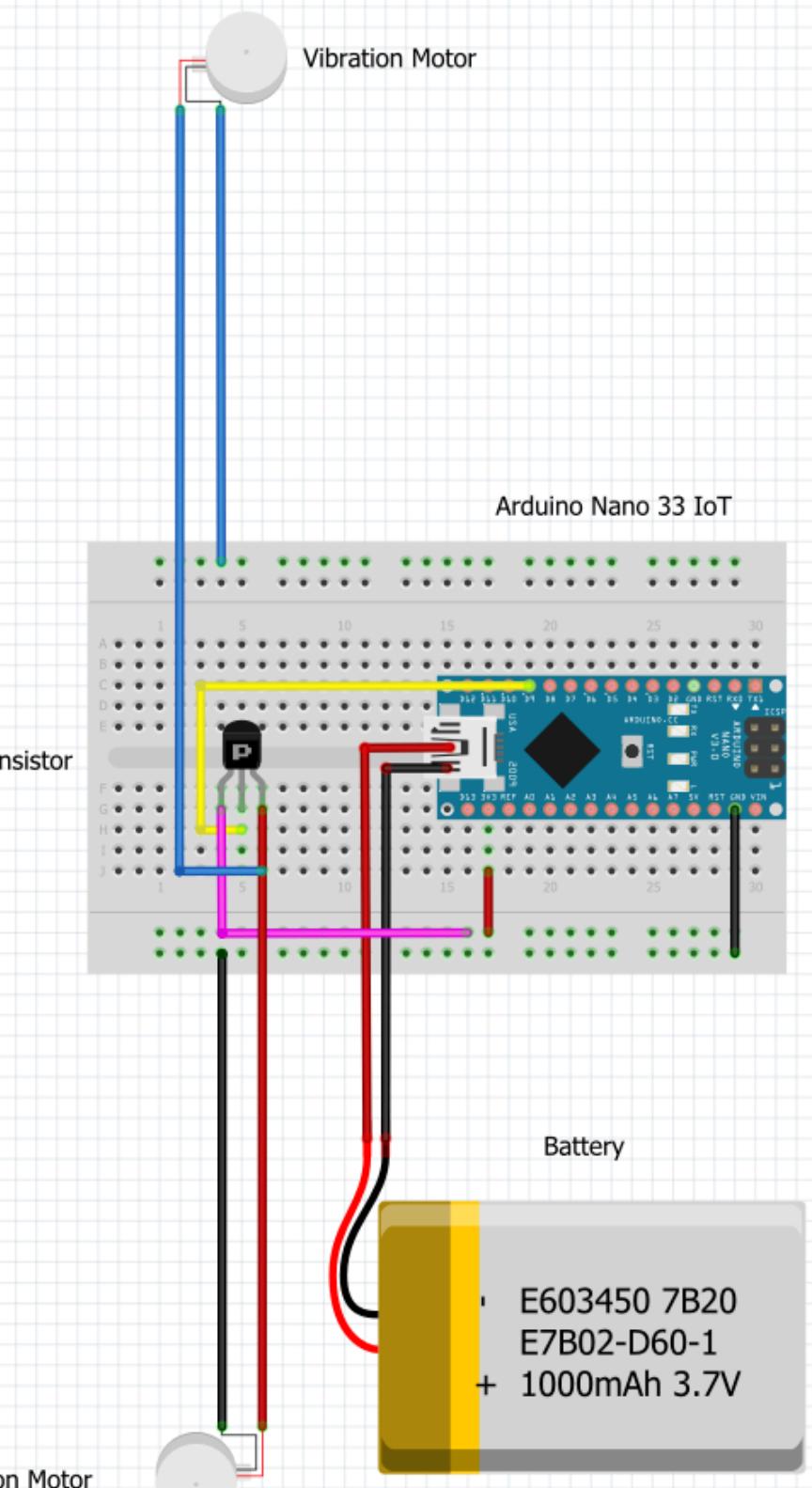
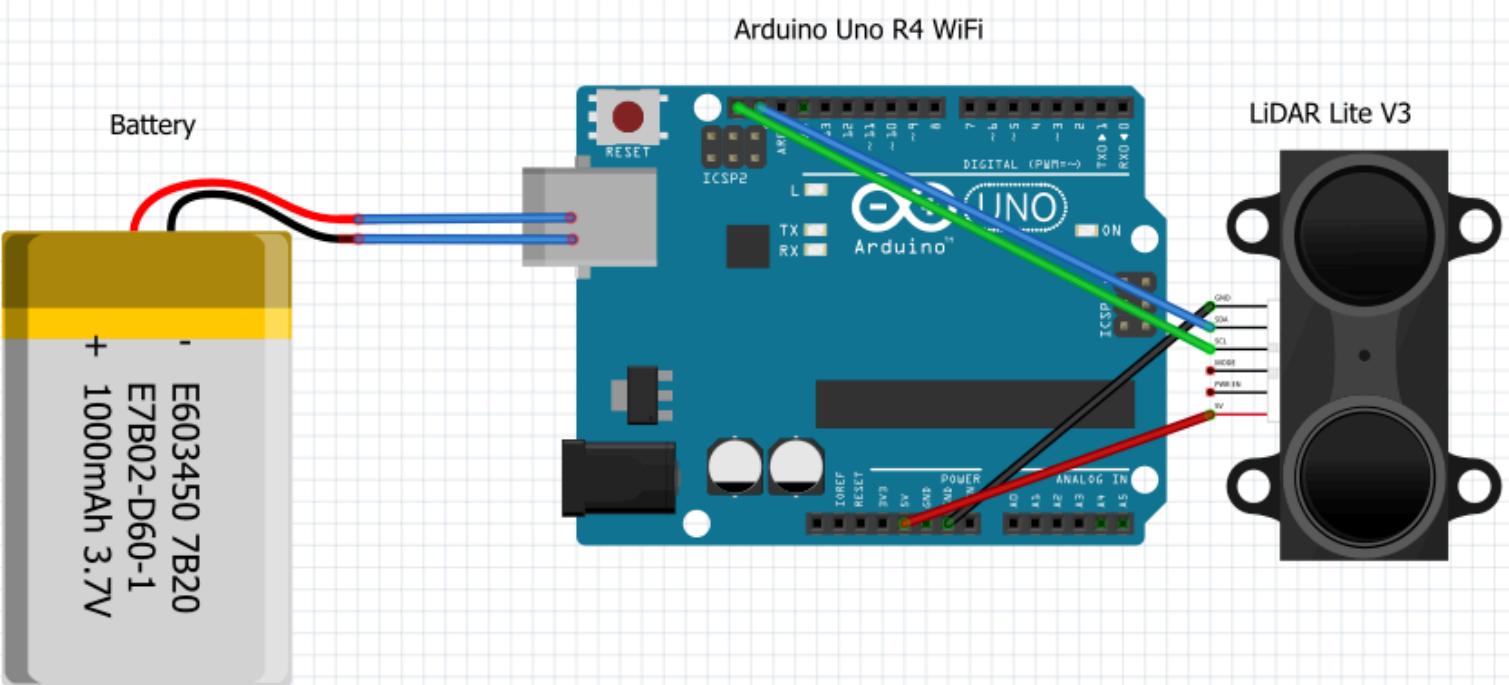
Design
Process

Prototype Breakdown

Modeling

Final
Prototype

Fritzing Diagram



ECHO
EYE

fritzing

Recap

Background

Prototype
Video

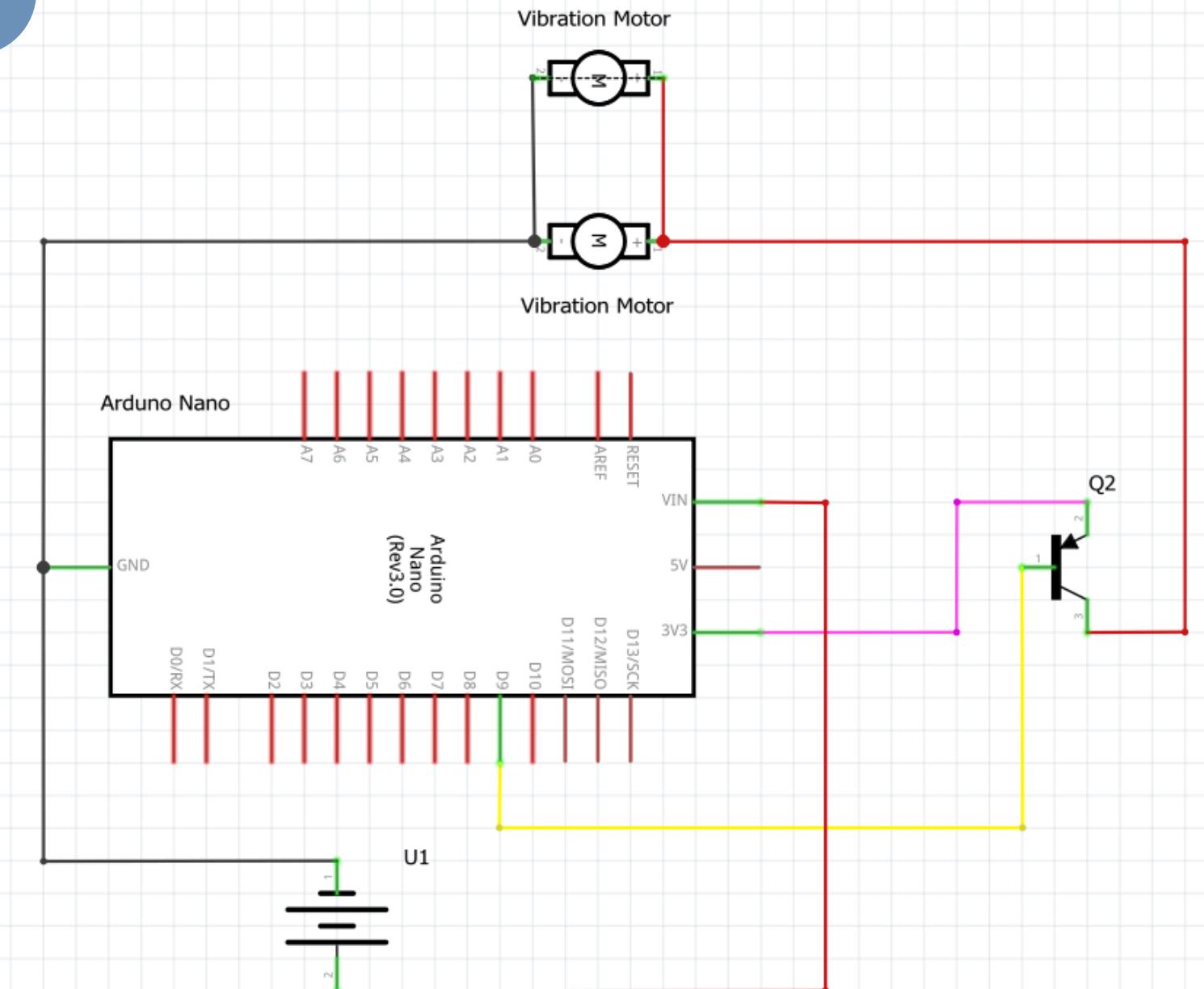
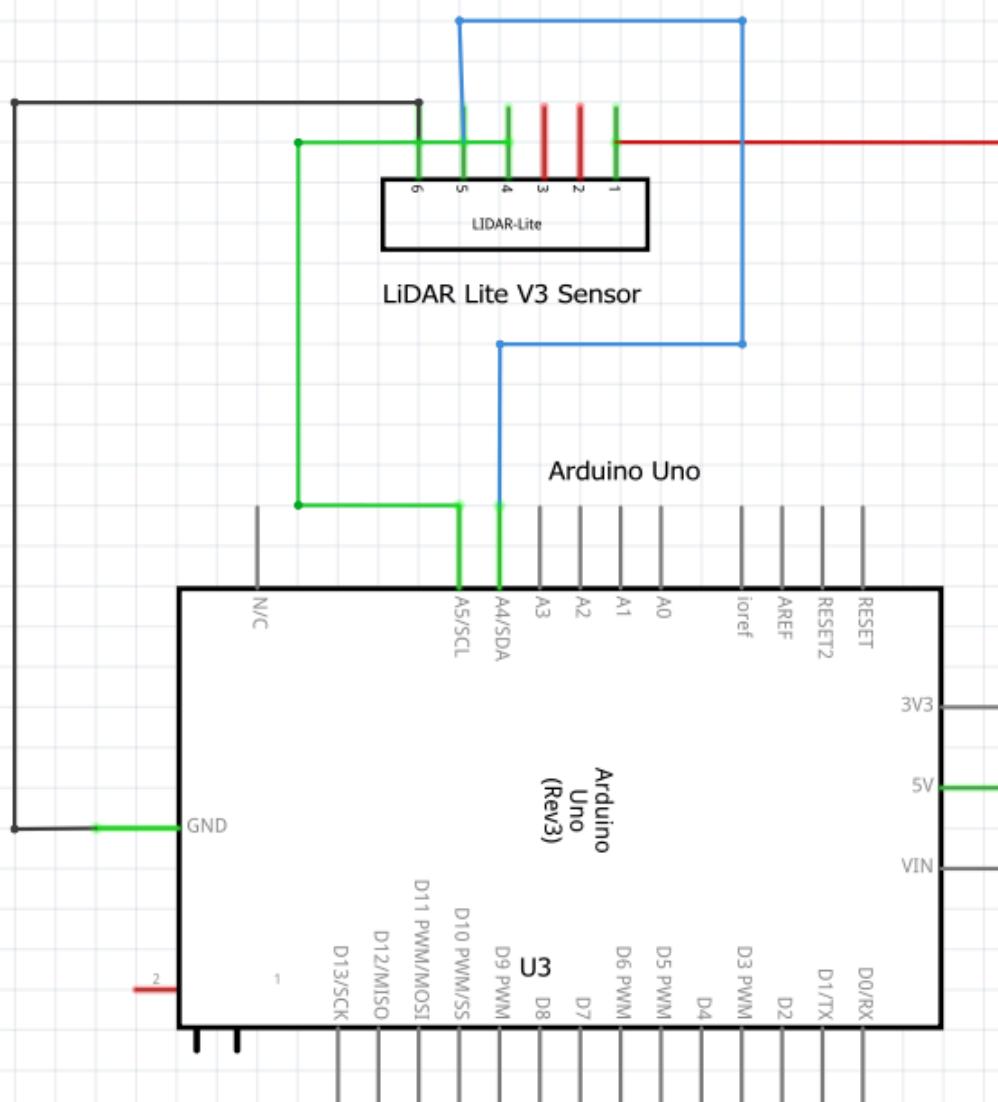
Design
Process

Prototype Breakdown

Modeling

Final
Prototype

Electronics Schematic



fritzing

ECHO
EYE

Recap

Background

Prototype
Video

Design
Process

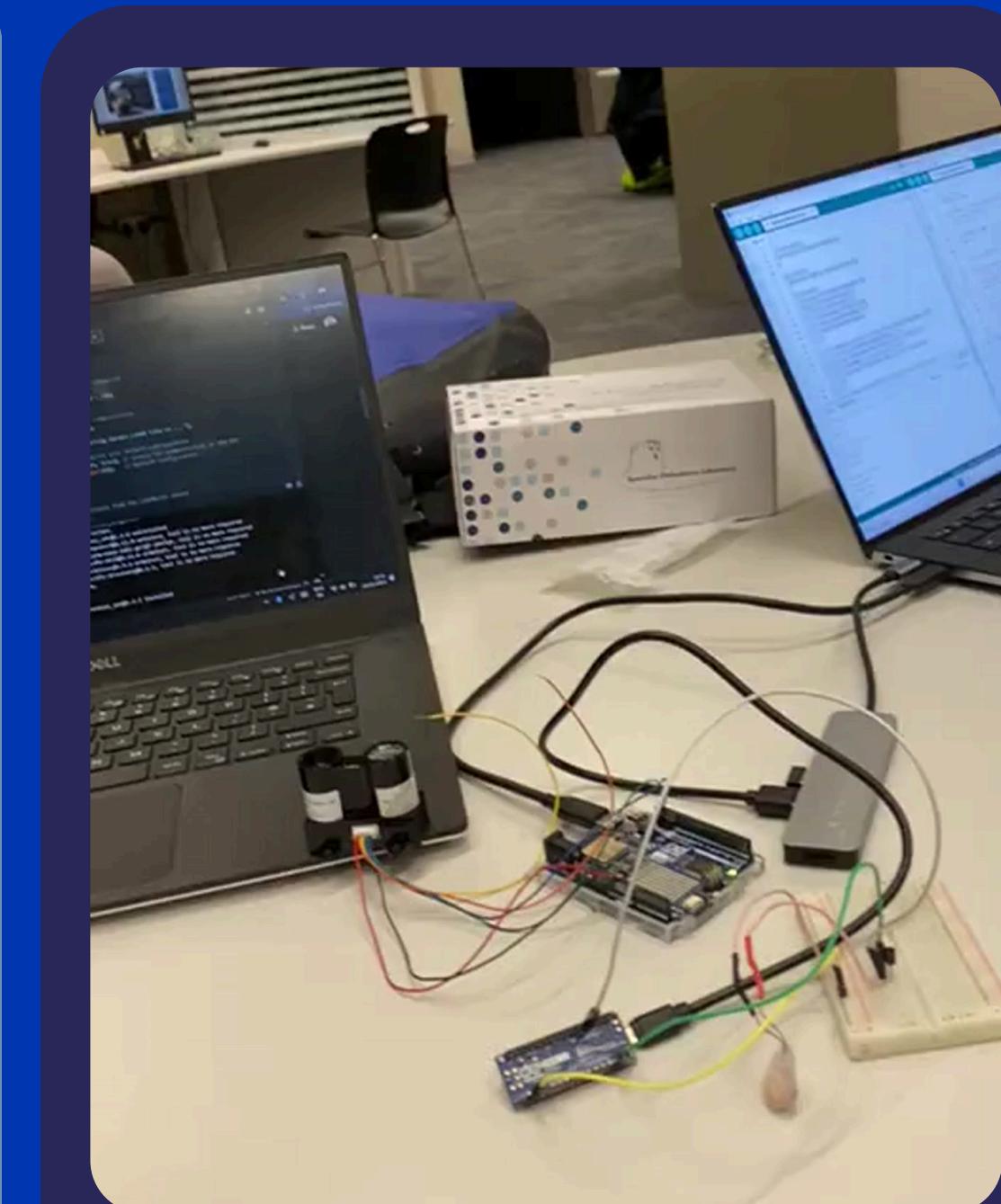
Prototype Breakdown

Modeling

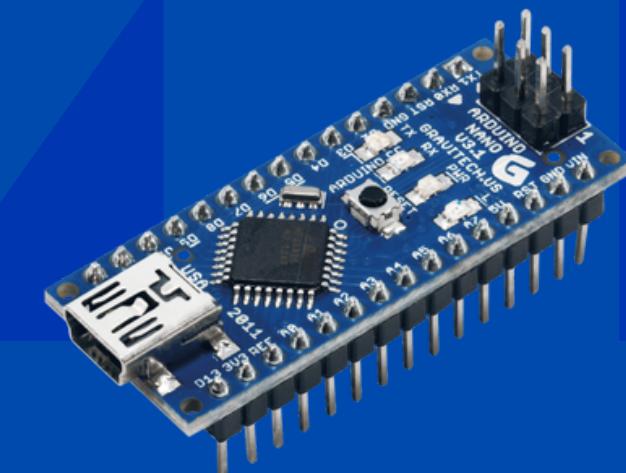
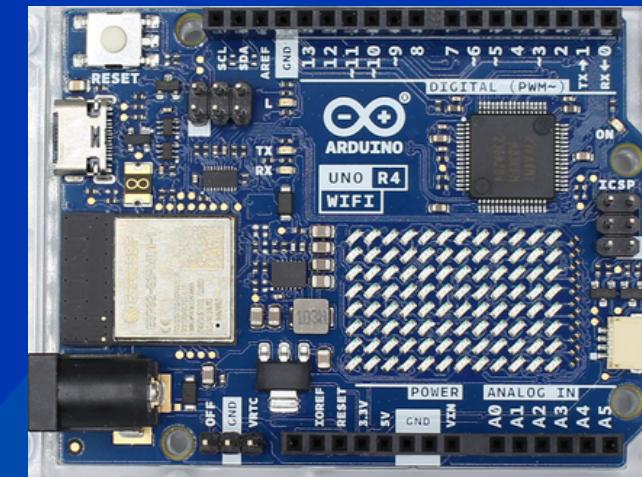
Final
Prototype

How It Works:

- The device uses **two Arduino microcontrollers**, powered by rechargeable battery packs, to **send signals** between each other
- This is done through creating a **wireless network** through a **server** (Arduino Nano) and a **client** (Arduino Uno).
- The Uno is connected to the **LiDAR sensor**, while the Nano is connected to **two vibration motors**.
- The Uno constantly relays data to the Nano. When the Nano receives **LiDAR data** that is **within a specified threshold** (10m from a vehicle), the **vibration motors** are triggered.
- The **motors vibrate** until there is **no longer a vehicle** behind that is within the specified distance.



Development of Prototype



ECHO EYE

Recap

Background

Prototype
Video

Design
Process

Prototype
Breakdown

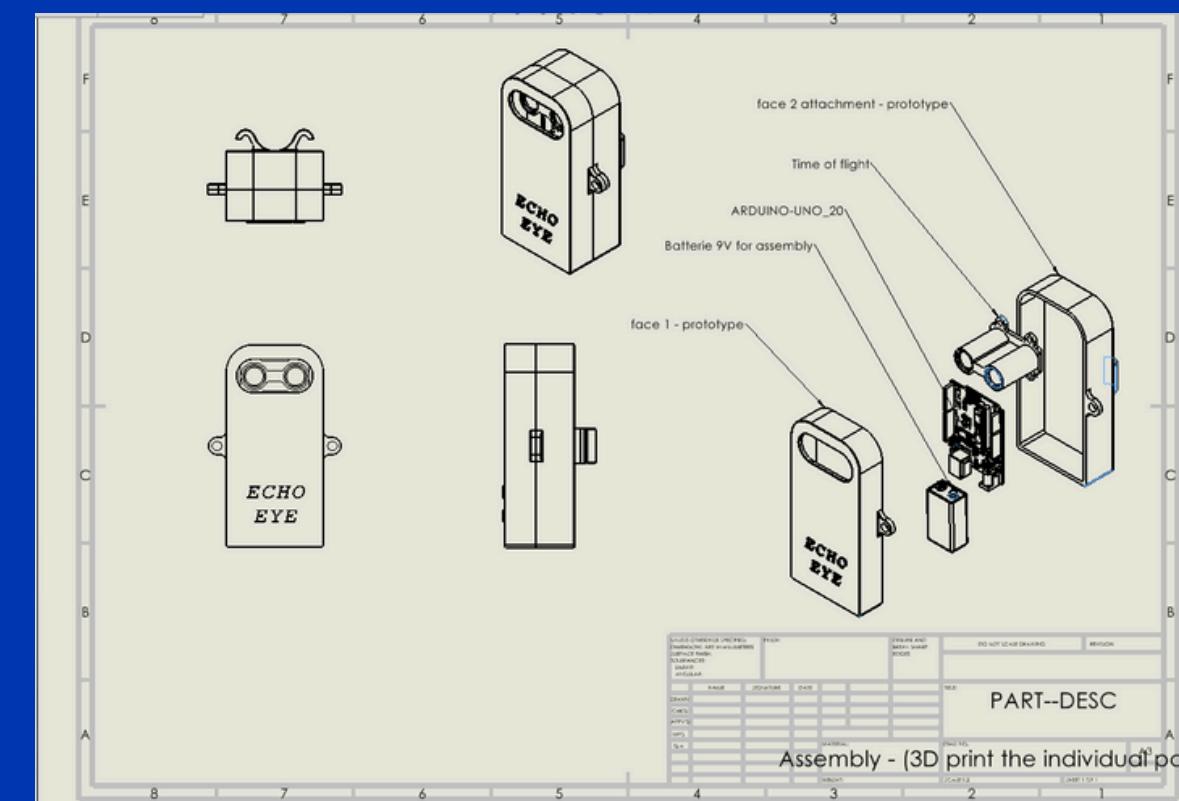
Modeling

Final
Prototype

Solidworks Model of Echo Eye



Drawing



Rendered Image of Mounted Components

ECHO
EYE

Recap

Background

Prototype
Video

Design
Process

Prototype
Breakdown

Modeling

Final
Prototype



Rear Component Exploded Video



Rear Mounting Setup



Solidworks Model
of Echo Eye



Front Component



360 Video of Front Component

Recap

Background

Prototype
Video

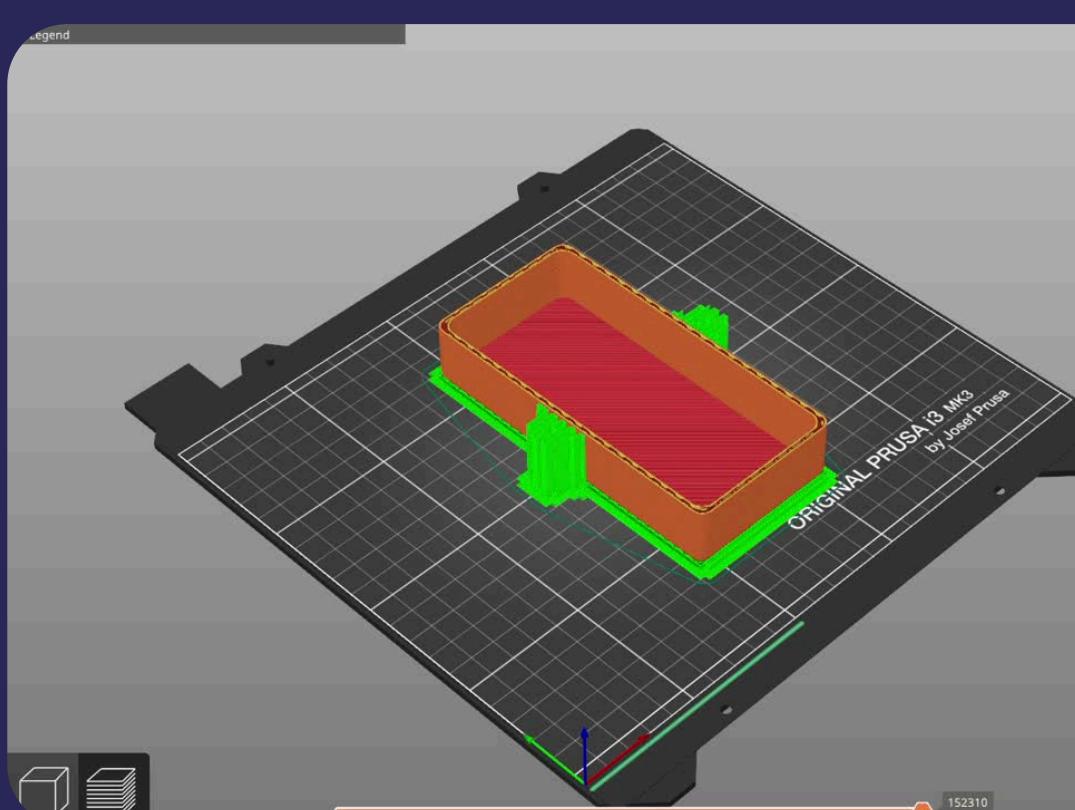
Design
Process

Prototype
Breakdown

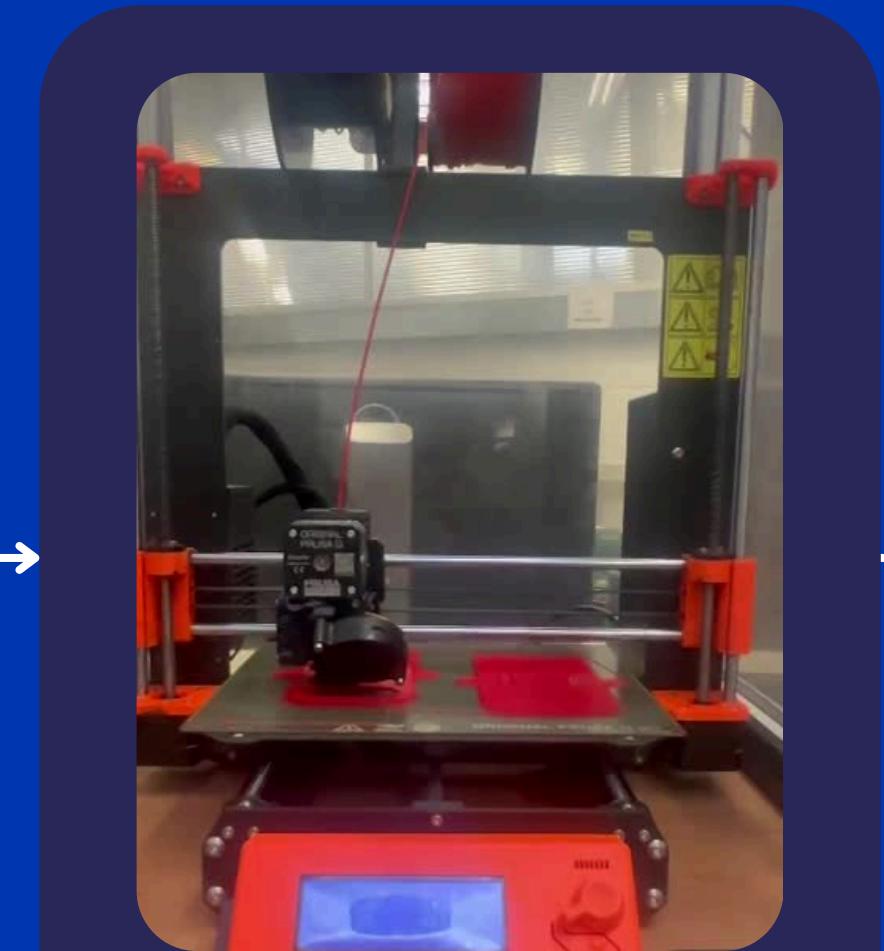
Modeling

Final
Prototype

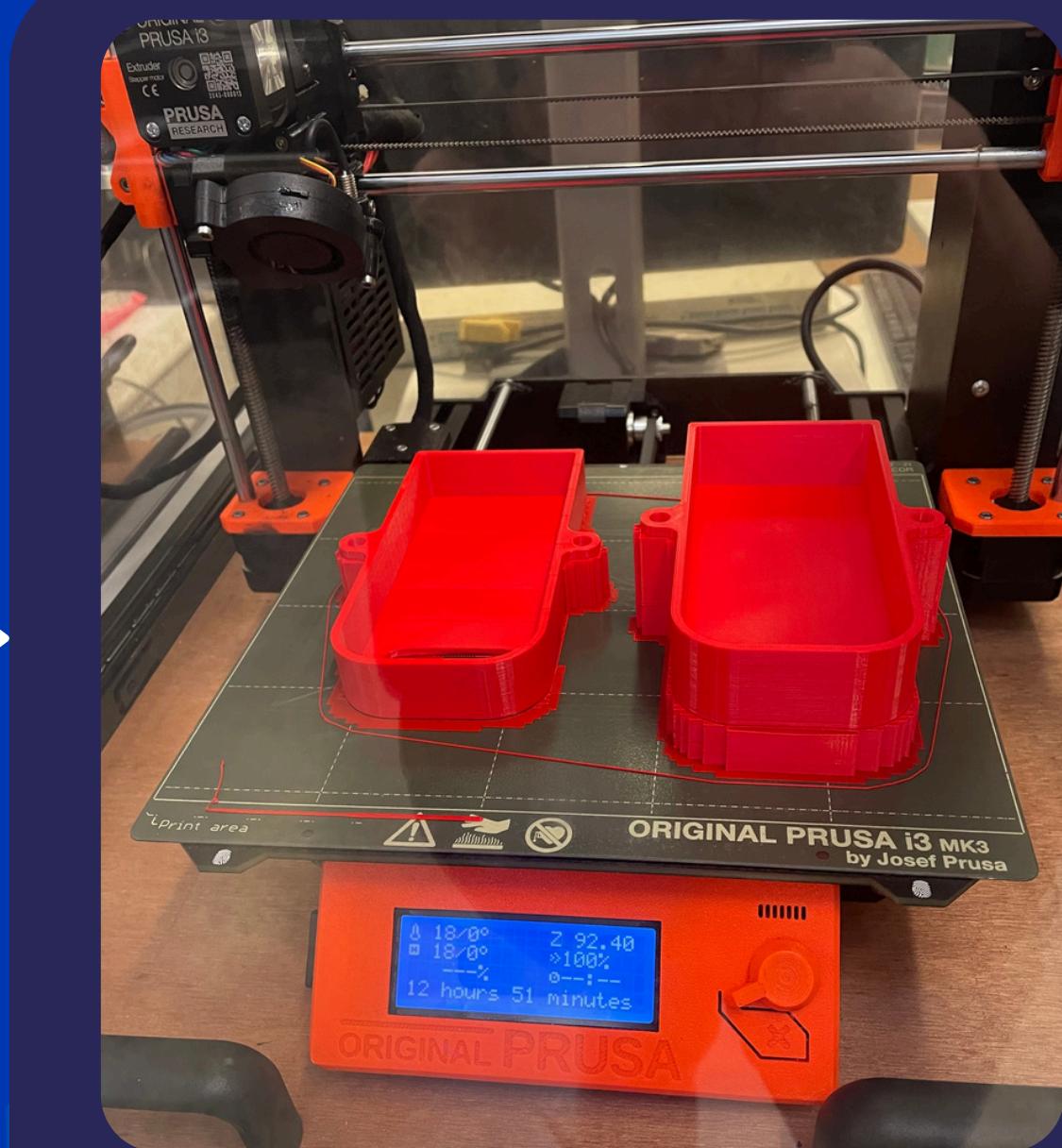
3D Printing process of Echo Eye



1. Preparing Model File



2. Printing Process



3. Completed Prints

**ECHO
EYE**

Recap

Background

Prototype
Video

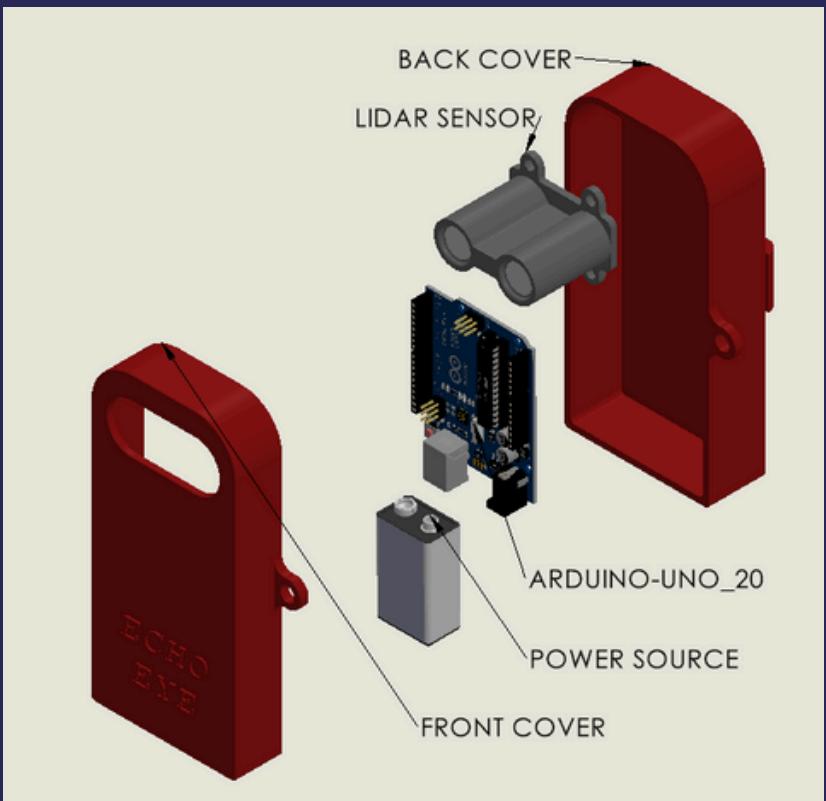
Design
Process

Prototype
Breakdown

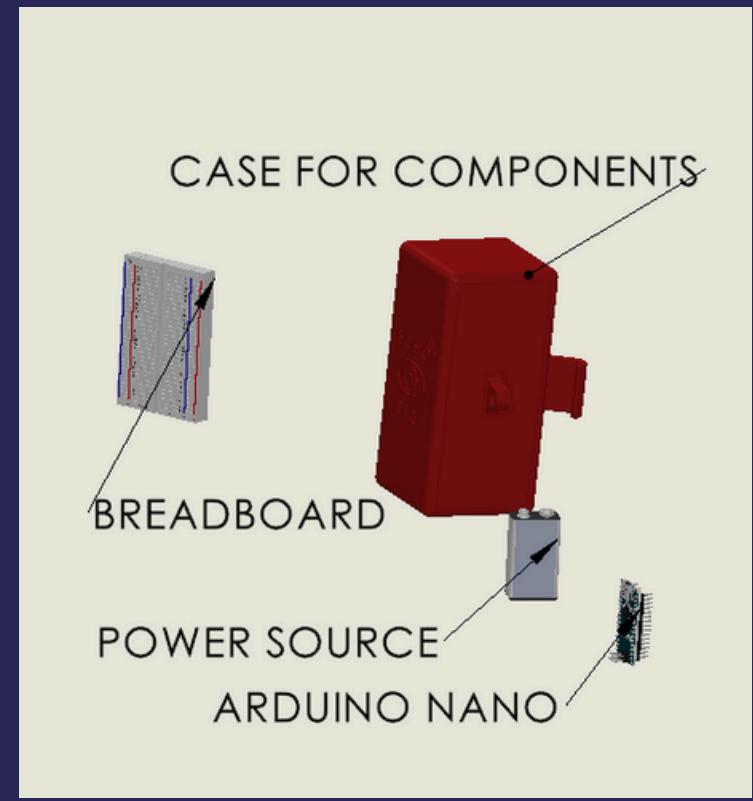
Modeling

Final
Prototype

4. Housing the electronics



Rear Component



Front Component

5. Final Assembled Prototype



ECHO
EYE

Recap

Background

Prototype
Video

Design
Process

Prototype
Breakdown

Modeling

Final Prototype

Final Prototype Mounted



Front Vibration Motor Setup

ECHO
EYE

Recap

Background

Prototype
Video

Design
Process

Prototype
Breakdown

Modeling

Final Prototype

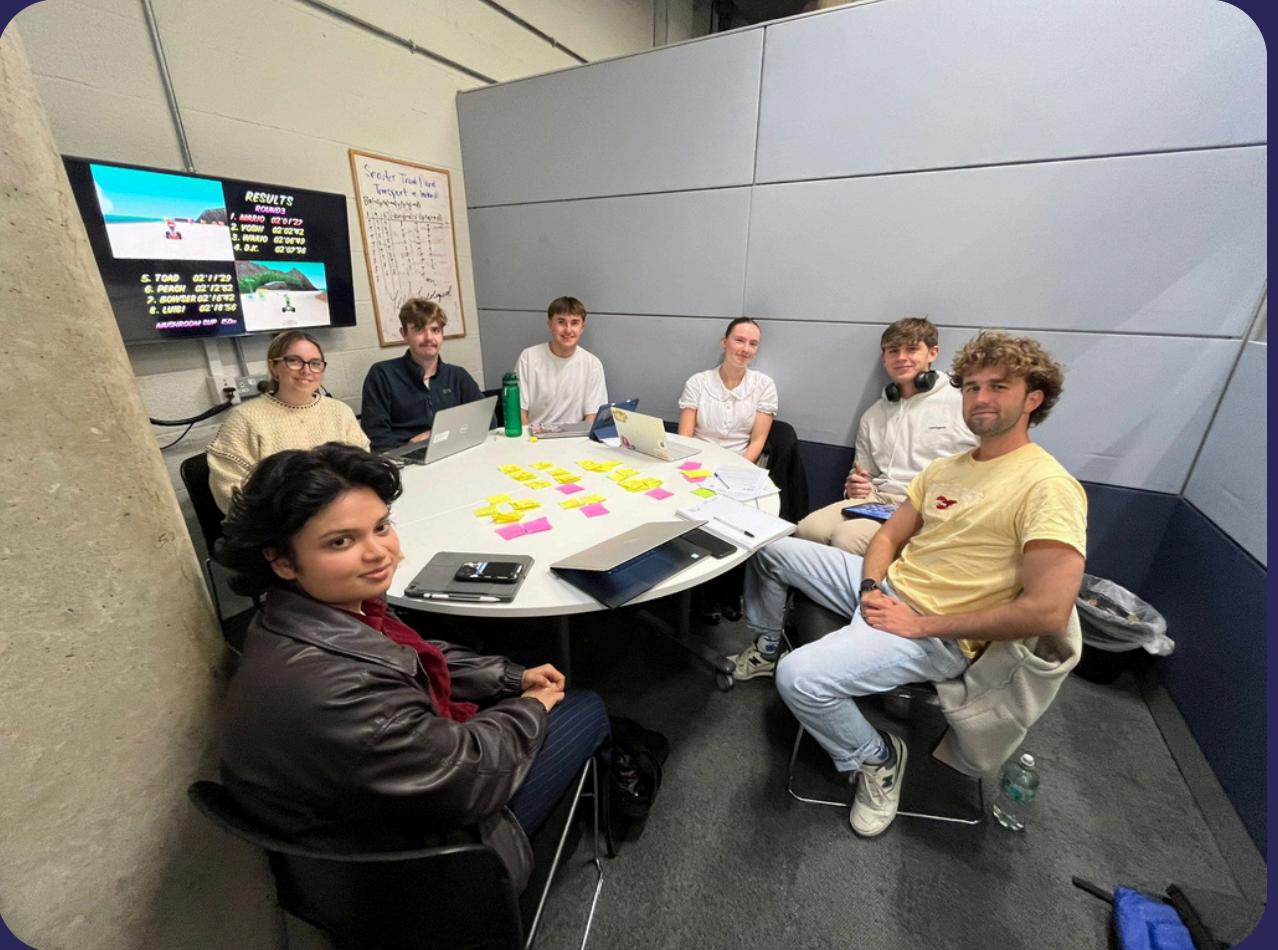
Ready for the roads!

*Diarmuid not included



Group 4

Caragh Conway,
Diarmuid Deeney Curran,
Eva Toal,
Finn O'Connor,
Labiba Mansur,
Rian Geraghty-McDonnell,
Shane McDermott



[Product Video Link](#)