DNB311 FINAL DDR

E-SKATEBOARD

AWARENESS & SAFE INTEGRATION INTO THE TRANSPORT NETWORK

CRUISE EBOARDS

Final DDR

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Week 1

Week 1 Lecture Notes

Tips and hints:

- Research report and final design are the major submissions
- AI use throughout semester - Provide an academic statement for each submission, further providing a statement of what aspects of submission AI was used in.
- Research forms the foundation for this project, while ideating/sketching/ modelling takes up the second aspect, finally finishing with presentation - Convince the client through an engaging presentation which sells the idea and justifies why it for one works but also why it is needed.
- We want to see evidence of active prototyping and ergonimics - Test ideations/prototypes on peers, take photos and note down findings. From these findings the project can be adpated and developed based upon the new ideas.
- Make executive decisions based on conflicting ideas given by tutors - This is professionalism and should be taken upon ourselves so we can improve our own skills of decision making in design.

Key figures:

- Jane Goodall - Environmentally conscious
- Dieter Rams - Attention to detail
- Mira Murati - Pragmatic Visionary - Practical and philosophical
- Albert Einstein - Captivated/ing - Be passionate about what you do
- Daniela Paredes Fuentes - Business minded
- Malala Yousafzai - Social conscious

Key areas of this unit:

Conscientious - Pragmatic - Visionary

Industry needs:

- Visualisation (sketching)
- Aesthetics
- CAD
- Research
- Presentation/communication
- Graphics
- AI
- Hands on capability
- Initiative autonomy
- Professionalism
- Attitude
- Time management
- Adaptable

Skills:

- Model making
- Sketchibg/Vis
- Graphics
- Communication
- CAD

Attributes:

- Initiative
- Professionalism
- Engagement
- Insightful
- Analytical
- Detailed

Week 1 Lecture Notes (Continued)

Why focus on attributes:

- Designers have mastered product development to an extent where new chairs or mobile phones need to be produced. Rather a new type of critical thinking is required which challenge complex design problems and ultimately improve the human condition.
- As a new designer launching into the world of design it is crucial that we become leaders who challenge the established ID landscape.

Who is the competition:

- Benchmark yourself against other designers on different levels. What are you aiming for? What can you achieve, and who can inspire you?

Notable institutes for good design:

- RMIT
- Monash Design
- UTS
- Loughborough
- CCS Design
- RISD

Final semester:

- Design industry
- Develop your own business
- Higher degree research - PHD
- Enter a competition - Good Design, DAA, etc.

Capstone overview:

- The capstone unit is built upon earlier ID units drastically extending the application of research processes to the design of products.
- While this is independent the unit relies on passion, determination, leadership, and self driven design work.
- The project as a whole will grant us with an opportunity to manage and lead a large self driven project were we learn and grow as designers.

Unit and learning objectives:

- Coherent and advanced knowledge of principles
- Research and applied design methods
- Advanced level of critical thinking
- Inter-disciplinary, ethical, legal, governance, and scholarship
- Advanced integration of various design factors, strategies and principles
- Leadership and professionalism

Unit overview:

- UCD/HCD
- Research
- Communication
- CAD
- UX
- Manufacturing
- Materials
- System thinking
- Complex reason

Week 1 Lecture Notes (Continued)

Engage with industry experts, consult potential employers, invite external partners to exhibition.

Notable dates:

- Research Report: Week 7 Friday (24hr extension)
- Initial Concept Presentation and Submission: Week 8 Friday
- Final Presentation: Wednesday 29th October

Assessment:

- Research report and initial concepts = 40%
- Final design and DDR (Folio) = 60%
- Final design presentation
- Website
- Exhibition

Major project:

- What is the context I want to explore.
- Think about people, activities, context, technologies, systems - build out brain dumps.
- Self initiated project
- Scientific led discoveries
- Industry linked

We will need to have access to at least two of the following three groups:

- Experts in the field
- End users
- Secondary/tertiary stakeholders

Project direction tips:

- By the end of this week it would be ideal to have 2 or 3 fairly thought out design directions.
- These directions should be supported by research and the literature behind the area.
- The area should not be over saturated in terms of what is already on the market and should also avoid being targeted if there is very minimal information.

Research report:

Literature review -
- Academic articles
- Categorised key themes
- Keep a rigorous record

Explore existing concepts and ideas (Benchmarking) -
- What currently exists
- Current solutions that are performing poorly
- Novel design opportunity
- Keep a good record (images, source, etc)

Week 1 Studio 1

Feedback from Raf

I spoke to Raf upon conclusion of the Week 1 Tuesday Lecture as I had immediate interest in the Centre of Accident Research and Road Safety Major project area. In particular I was drawn to the wearable technology for pedestrian safety while using micro-mobility devices (e.g. , e-scooters, and e-bikes). While I wanted to maintain a handful of open ended design directions Raf directed me to emailing the project lead Professor Ronald Schroeter so that I could organise a meeting and gain more insight on the topic.

Feedback from Chris

I approached Chris for advice on my design directions to ensure that they were feasible areas to continue researching in. He explained that with my ideas it is important to maintain an open ended direction for the time being implementing research/mind maps for each area. Until further on in the week I should remain open to direction change.

Week 1 Overview

What do you want to improve during this semester?

- CAD/Solidworks skills.
- Manufacturing skills.
- Creating realistic renders.
- Confidence and ability to maintain motivation.

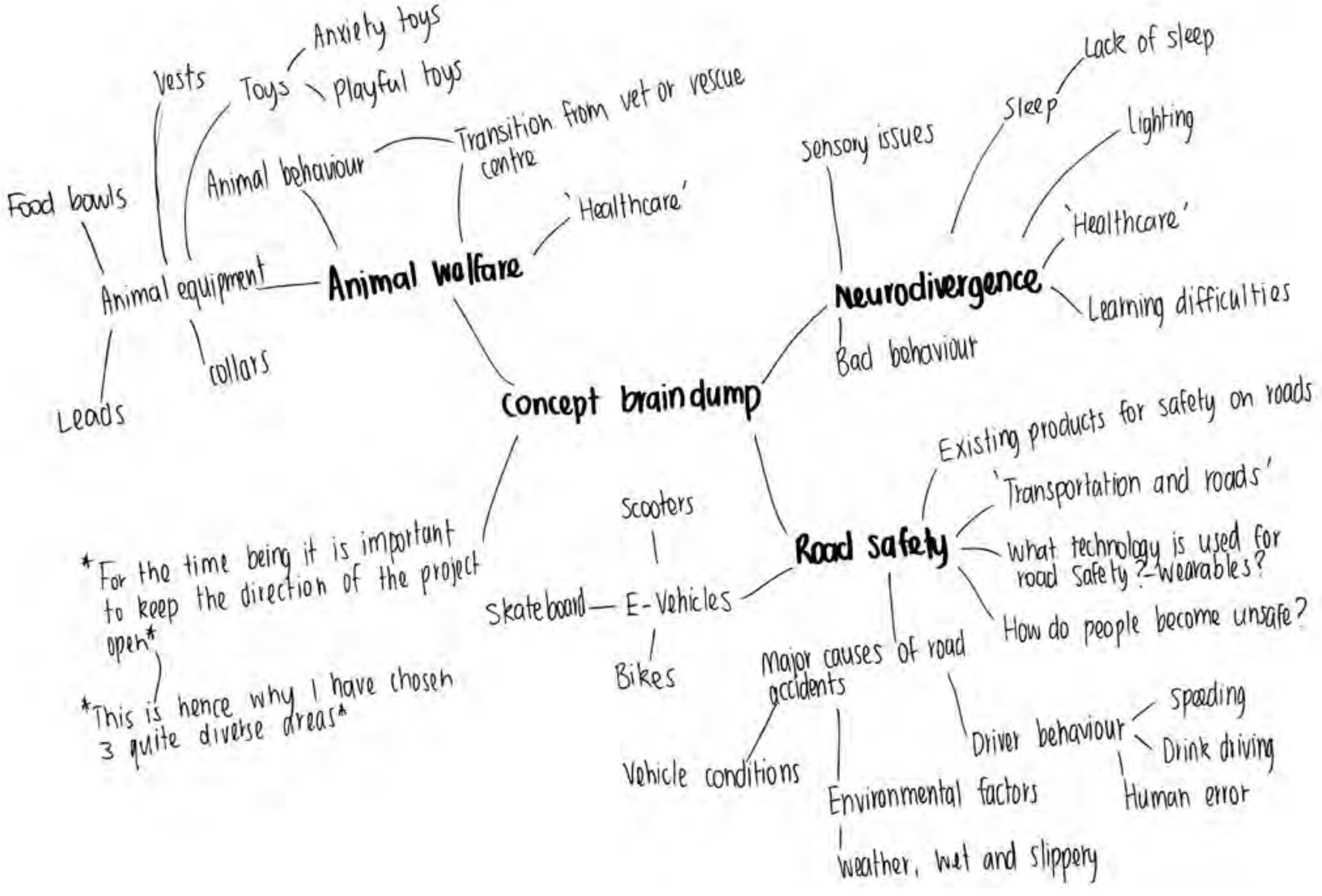
What do you want to achieve by the end of the year?

- I want to produce a detailed solution to the best of my ability. I think I would be happy if at the end of the day I attempted this project to the best of my ability.

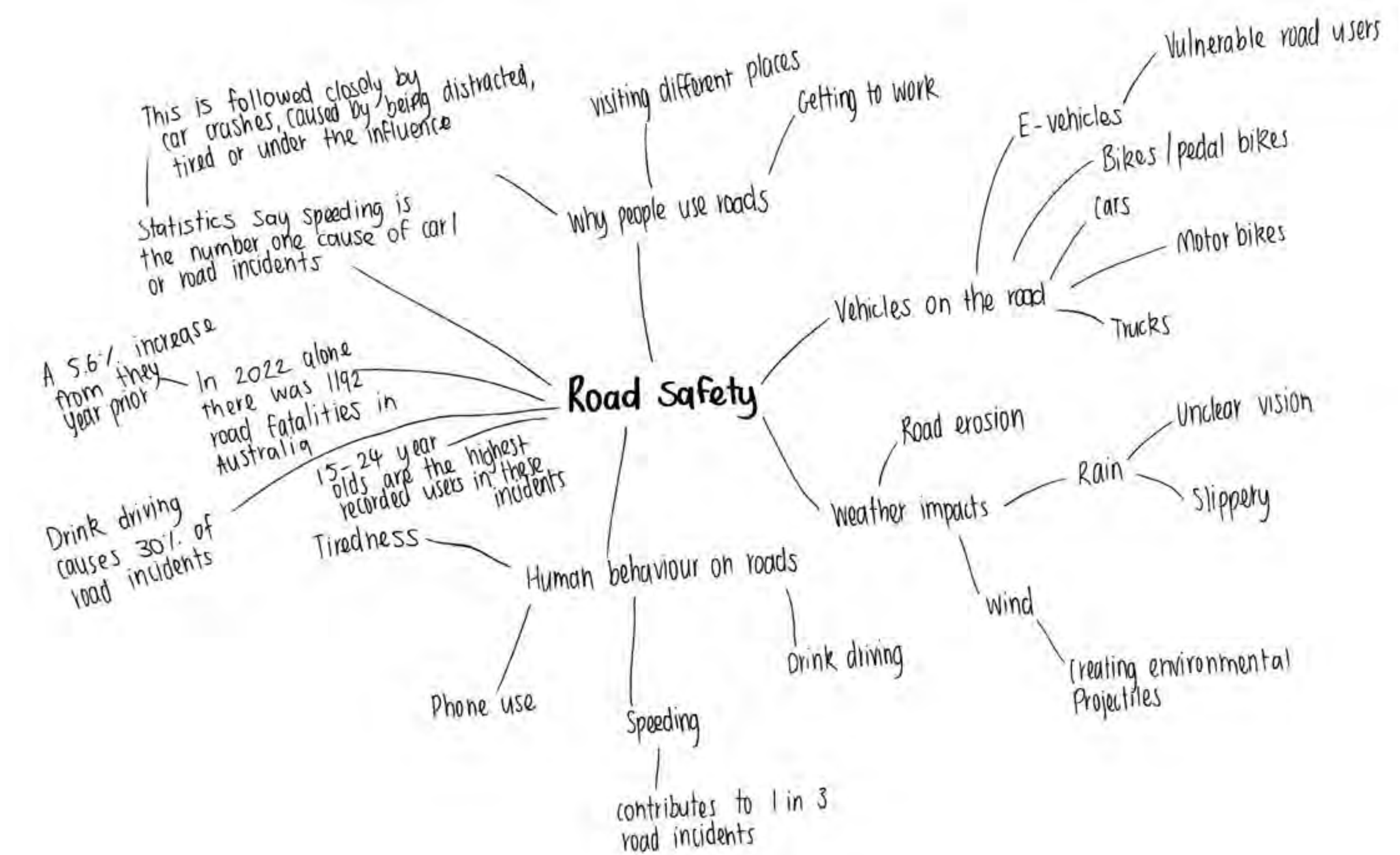
How will you use this project and the knowledge learnt throughout to position yourself in the future?

- Ensure my direction for this project aligns with something I have interest in and could possibly get me into a similar job.
- Utilise my time so I can proudly present my work in a future design portfolio.
- Contact experts or people involved in the industry of choice.

Concept Exploration



Concept Exploration



Concept Exploration

Major Project: CARRS Q, wearable for pedestrian safety - What is already known...

Regulations/ rules for micro-mobility devices

Provided by Prof. Andry

E-skateboards are allowed on footpaths (< 12 km/h)

Bike shared paths and roads without lane markings where speed limit < 50 km/h

Specifically Andry has requested or has stated the project looks into e-skateboards in particular

The project is about designing a wearable to increase micro-mobility vehicle safety

I began by emailing Prof. Ronald Schroeter who is an expert researcher in this field

He directed me to a collegue. Prof. Andry Rakotonirainy

Andry was the individual who came up with this unique idea of increasing e-skateboard safety

Current situation for e-skateboarders

Limited indication devices

Vulnerable

Limited light presence

e-skateboards don't have bells to alert presence

Andry stated that he has to verbalise his presence when pedestrians cannot see him

Stakeholders

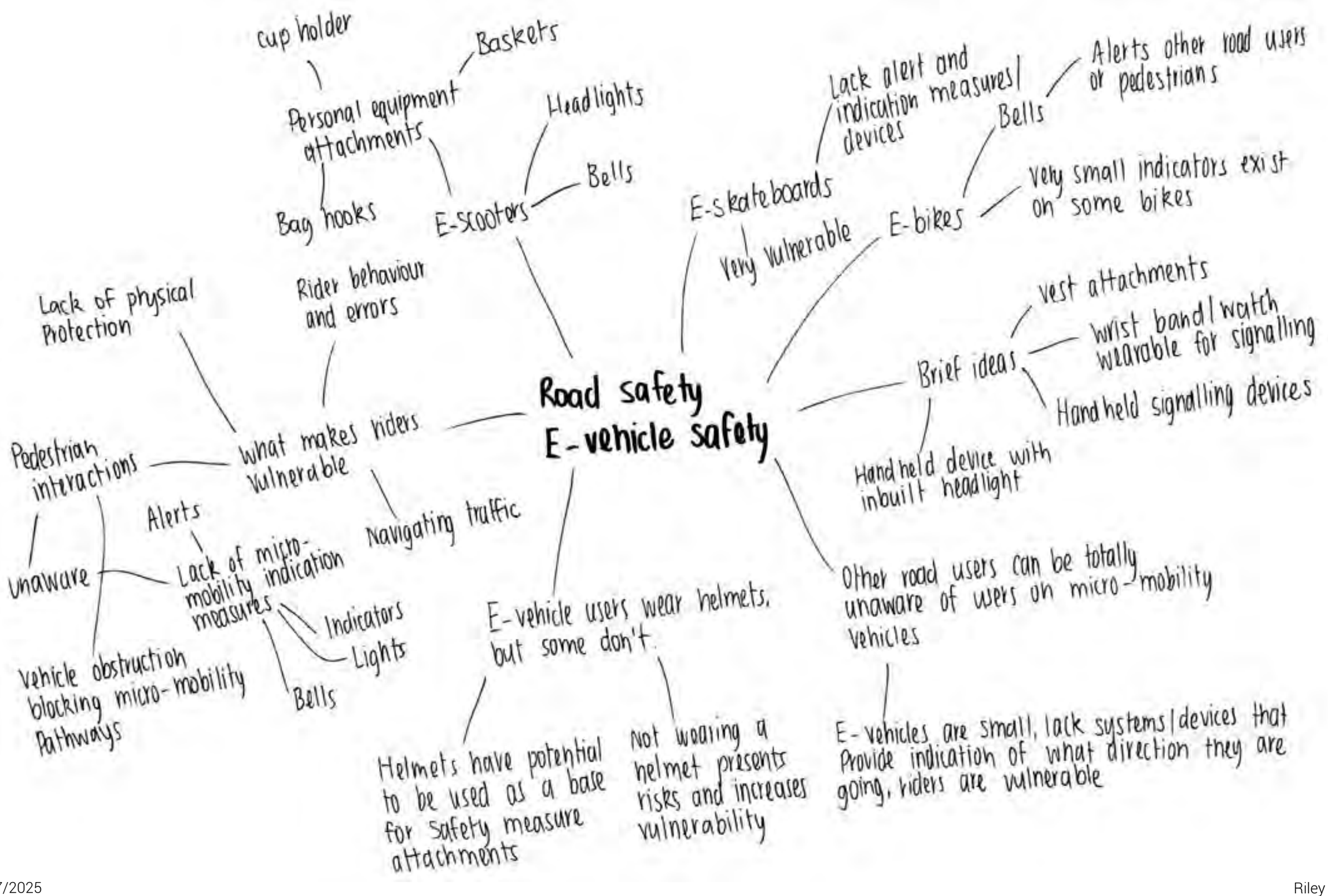
Ronald Schroeter Prof., Researcher

Andry Rakotonirainy Prof., researcher, e-skateboard rider, end user

Rides his skateboard from time to time

Adam Cowan e-scooter rider end user

Concept Exploration



Research

Understanding road safety statistics in Australia

https://roadsense.org.au/understanding-road-statistics-aus/

Australian Road Crash Statistics

- Around 64% of Australians over the age of 18 who hold a driver's license have been involved in at least one car accident.
- In 2018–19, 39,755 people were hospitalised due to road accidents, representing a 16.2% increase in serious injuries between 2012 and 2018. By 2019, this figure had risen to 39,866.
- Speeding remains the leading cause of road accidents, followed by driver distraction, fatigue, and alcohol consumption.

Australian Road Fatality Statistics

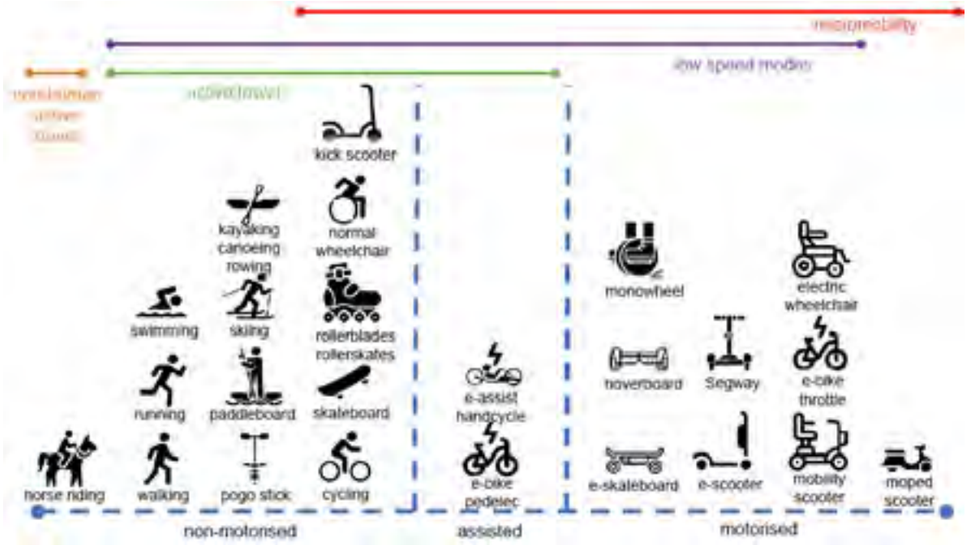
- In 2022, Australia recorded 1,192 road deaths – a 5.6% increase compared to 2021. However, fatalities have generally declined over the past decade, dropping from around 1,300 to approximately 1,100 per year.
- In March 2023 alone, 107 people died on Australian roads – 2.3% higher than the average for March across the previous five years.
- Globally, road fatality rates among 15–24-year-olds are around 50% higher than for other age groups.
- Drink driving is responsible for roughly 30% of fatal crashes in Australia, with more than 1 in 4 victims (drivers and passengers) recording a blood alcohol content (BAC) above the legal limit.
- Police reports suggest that speeding is a factor in around 1 in 3 fatal accidents, though this is likely an underestimate.
- In 2021, 163 people were killed in crashes involving heavy vehicles, accounting for 15.4% of all road fatalities.

What is micromobility?

https://imoveaustralia.com/topics/micromobility/#challenges

Micromobility relates to smaller, lightweight vehicles that are designed for active mobility on public roads and shared spaces. They are accessible for private use or even in public environments where the devices can be hired and shared.

Types of micromobility devices



What are the benefits of micromobility?

- Making active transport a regular mode of mobility will greatly reduce carbon emissions
- Active transport can reduce congestion on roads – reduced travel time, and fuel bills
- In terms of urban sprawl micromobility can create safer and more sustainable cities especially in major city centres – congestion and parking build up can be reduced, and motor vehicle related road accidents can be minimised to protect the livelihood of pedestrians and active transport users.
- These devices are cheaper to maintain, and easier to park and store.

Research

What are the challenges of micromobility?

- There are greys areas when it comes to e-device regulations as each Australian state currently possess differing policies making it extremely hard to enforce onto the public. In the states of New South Wales, South Australia, and the Northern Territory it is illegal to ride privately owned devices outside of private property.

- In Queensland and Victoria e-devices must not exceed top speeds of 25km/h to be road legal and can only be used on roads that cater for speeds of 60km/h (Victoria), and 50km/h (Queensland).

- National laws also state that e-bikes must be operated only using pedal power as it is unsafe to be throttle controlled. This ensures speeds can be kept under the legal limit when riding in public spaces.

- Helmet use has also shown concerns as current enforcement is lacking. This is shown in the statistics of serious head injuries to Australian citizens using e-devices.

- Footpath use is also restricted in some states as it creates potential hazards for other active mobility users. E-device specific road marking, and path locations are a result of these concerns to normal footpath use.

- At this point in time Australia remains a car centric culture seeing longer commutes and travel time in most areas. But there is an urge to implement more appropriate protocols for safer and sustainable active mobility use.

Research

E-micromobility is booming, but so are injuries

https://lens.monash.edu/@politics-society/2025/02/19/1387291/e-micromobility-is-booming-but-so-are-injuries

E-scooters, bikes, and skateboards are contributing $728 million to the Australian economy and more each year – This is directly from vehicle purchases and rentals.

Prevalence of injuries

Monash University's Accident Research Centre's (MUARC) investigated the prevalence of death or injury related occurrences revolving around micro-mobility devices.

In a span of 5 years these devices contributed to 14 deaths just in Australia. Half related to e-bikes. Additionally, between 2017 to 2018, and 2022 to 2023, 2778 injuries were reported to have been caused by the micro mobility vehicles. 1680 were e-scooter related injuries, 534 were e-bikes, and 564 were from self-balancing devices such as e-skateboards and one wheelers.

The injuries caused by each of these e-micro mobility modes were found to be more prominent in males, rather than females. Teenagers and young adults aged between 15 to 18 were also recorded as the most affected user group in this field presenting concern for young individuals.

Fractures were identified as the highest occurring e-micromobility injuries which is **more than half of self-balancing device injuries, and a third of e-scooter and bike injuries.**

Upper body injuries were reported as the most common seeing it impact **36% of e-scooter** injuries, **33% of e-bikes**, and **64%** of **self-balancing devices. Fractures to the wrist, forearm, or hand** were significantly more common than any other type of injury.

Professor Berecki-Gisolf further highlights the **importance of wearing a helmet when using an e-micromobility device** as **head and neck injuries** were also recorded as relatively high reported injuries. Accidents affecting these areas of the body have the **highest risk of fatality and are classified as severe injuries.**

Alcohol involvement was recorded as one of the major influences for these accidents seeing **27% to 41%** of cases affected, with **71%** in admitted patients.

Recommendations addressing the rise in e-micromobility related injuries

- Infrastructure development
- Increase in community education and awareness campaigns – age limits for e-micromobility device use
- Regulation awareness
- Increased Police enforcement of regulations

Research

The 30kmh revolution: Rethinking speed for safer, happier streets

https://lens.monash.edu/2025/02/17/1387331/the-30kmh-revolution-rethinking-speed-for-safer-happier-streets

Similarly, to 50km/h residential area speed zones, 30km/h zones are becoming more popular due to their cost effectiveness and impacts of increasing safety and liveability of pedestrians as well as other road users. However, Australia is seemingly falling behind in this great movement to minimise road incidents, and the importance of providing measures of protecting active mobility has never been greater than now.

Zones of importance

Implementing these zoning regulations in pedestrian heavy areas has influence on creating more inviting streets and ensuring walking and cycling becomes a more attractive form of mobility. Reducing zone speeds equates to a more people-friendly environment and promotes a more connected and socially comfortable space for people to thrive in.

Cases conclude that surviving a collision with speeds of 50km/h or more is only 10%, while 30km/h speeds increase the rate of survival to 90%.

Victorian speed policy is lagging behind

Key government partners in Victoria Australia were interviewed by Monash University on the implementation of 30km/h zones but it was revealed the state and country as a whole is severely lacking in the drive to execute this opportunity. Toronto was a major comparison when conducting these interviews revealing they are well ahead of Australian speed regulations seeing safer communities in pedestrian heavy areas.

Shifting gears: How do we shift people from private cars to walking and cycling?

https://lens.monash.edu/@medicine-health/2025/04/07/1387432/how-do-we-shift-people-from-private-cars-to-walking-and-cycling-heres-what-the-evidence-suggests

Motor vehicles are responsible for 1.3 millions lives worldwide and cause 102 million injuries. Car dependency is forever changing societies physical and mental health through the horrific nature of accidents and plethora of mental issues. Additionally urban sprawl is dearly affected, and environmental consequences are continuously becoming more prevalent.

Researchers at Monash University are urging for a safer, more environmentally friendly approach to road and mobility use to ensure the longevity of human lives. They insist these measures are vital in making a meaningful impact:

- Infrastructure changes (for example, protected bike lanes, low traffic neighbourhoods)
- Policy changes (30km speeds)
- Financial incentives (e-bike purchase subsidies)
- Rewards schemes (such as September and Biketober)
- Resource provision (Lime bike-share scheme)
- Campaigns (More than a cycling campaign)
- Disincentives (road-user charging)
- Community events (National ride2school day)
- Educational programs (bike repair workshops, Wheel Sisters)

Infrastructure is critical for creating an enabling environment

Monash Universities studies reveal that people's thought of taking up active transport is tarnished by the thought of safety particularly around motor vehicle traffic and high congestion pedestrian areas. Protected bike lanes and traffic calming infrastructure were critical in promoting longer participation and use of active mobility. Controlled and separated environments can drastically influence peoples potential of taking up some sort of active mobility says Monash University researchers.

Research

e-Mobility Safety and Use

https://www.qfcc.qld.gov.au/sites/default/files/2025-06/Inquiry-into-e-mobility-safety-and-use-in-Queensland-%28Principal-Commissioner%29.pdf

Queensland Family and Child Commission states that there is a need for a renewed understanding of how young people use e-mobility devices. Additionally, current Australian regulations around micromobility have caused confusion and consequently resulted in misuse of these devices seeing helmets not worn when riding, speeding, and use of devices on restricted roads. The commission is highly concerned with the over-representation of young e-device riders, and it is clear through the uprising of serious head injuries and hospitalisation that new processes and products are needed in this field.

Other dangers connected with micromobility devices

- Inconsistent helmet use
- Gaps in safety education
- Lithium ion battery fires
- Improper charging

Benefits of e-mobility

Sustainability transport opportunity – e-mobility offers a low emission alternative to using transport.

Affordability and accessibility – Young people are able to access a more affordable mode of transportation and maintain it for long periods due to its costs effective nature.

There is great opportunity to enhance transport accessibility, environmental sustainability, and public health outcomes. Micromobility devices can:

- Help address congestion
- Reduce transport related emissions
- Improve connectivity – urban and suburban environments
- Provide low-cost mobility option

Safety issues and fatalities

Risks and challenges – Micromobility devices pose emerging safety challenges especially for young adults and children stemming from lack of supervision, not using a helmet, high speed environments, and limited regulation of device capabilities.

Data limitations – There are a lot of grey areas effecting safety planning – a result of current frameworks and enforcement of regulations.

Collective effort – The Australian government must communicate with the transport department to provide effective solutions to this field and further increase the welfare of all road users – pedestrians, personal vehicle users, and micromobility users.

Road incident and injury data reveals the ever present statistic that young children are becoming the most vulnerable active mobility users. Falls and collisions are the most common cause of severe trauma to the neck, head, spine, and internal organs.

The Queensland Ambulance Service stated that 341 e-scooter incidents involved users aged between 0 to 17 years of age in the span of 1 year.

Emergency department data from Queensland injury Surveillance Unit showed that 66% of injuries in kids between 0 to 11 and 92 % of injuries in kids from 12 to 15 involved e-scooters, or some sort of active mobility device.

Effectiveness of current enforcement

Queensland Police issued over 8000 infringements to active mobility riders. The most common violations were:

- Failure to wear a helmet
- Unsafe road conduct – speeding, riding on restricted roads or paths
- Carrying passengers

Week 1 Studio 2

Introduction from Raf and Marianella
Do not fixate on a single brief it is preferable to leave a handful of oppportunities open to consider so that we don't get stuck later. Whilst it is good to think about ideas/solutions right now it is also ideal to keep it low profile and very concept based. At this point in time we should be researching and nailing down a brief and direction. Any current concept ideas should be put onto a page and left for later to be viewed.

Conversation with Anton

I showed Anton my current work (Research document, conversations with Professor Andry and further work done in my ddr), and followed it up by explaining to him my current directions - Animal welfare, and road safety. Anton was happy with my current decisions and work made up until this point.

To conclude our discussion I highlighted my connection with professor Andry and the scope i was looking at with micromobility devices and their safety on the road. Anton told me to be clear and ensure my own thoughts were being spoken in the meeting with Professor Andry. Overall he liked my current status on the project and told me to keep researching away so that I could ensure transport/e-mobility was my best foot forward.

I thought that Anton's feedback was extremely helpful and it allowed me to take a step back and ensure I wasn't leaving anything out of my progress.

Expert Meeting Notes

25/07/25 I had a meeting with Prof. Andry a researcher at the CARRS-Q research precinct. This was an extremely insightful and rewarding experience to be apart of due to the sheer fact Andry was so knowledgeable and likeable.

I approached this meeting with the intent of hearing his own e-skateboarding, and cycling experiences as well as his thoughts on my own research and initial concept ideas. Andry was kind enough to let me do some brief testing on his e-skateboard which is used as a major researching tool in the CARRS-Q facility.

The following is the information I gained from this meeting:

- Bells are a necessity for e-bikes, and some e-scooters - It's a legal requirement to be able to make your presence easily known when using shared spaces like footpaths and roads.
- However, Professor Andry explained that there is a grey area with some e-scooters and all e-skateboards. In particular he explained that there is no current way of using a bell on a skateboard. This is a result of:
- No handle bars or foundation to easily place the bell.
- The current setup for riding an e-skateboard requires the use of a tricky hand remote. This controls acceleration, and breaking but also requires an additional button to be held in order to operate either function.
- The manufacturers of the e-skateboard had no input on how a bell would be implemented as they were lost with ideas (Gold Coast manufacturers).
- E-skateboards are equipped with breaking lights that glow from the back in a bright red - observed to be clear to see when lights were on.
- E-skateboards can legally be ridden on roads with no lane markings - but there is constraint when roads are marked with lines (highways, main roads etc.)

The following areas are some more key points we believed could greatly impact the direction of the project:

- Maintaing a balance an use of the controls whilst also keeping a level head to view pedestrians and road users - when riding an e-skateboard.
- How do we implement a control that doesn't make the existing setup harder?
- Voice activated alert system to notify presence
- Patents around the area - existing research, project etc.
- Devices that check body movement and decides a result - checks movement of skateboard
- False positive - no pedestrians there and it might make a noise without needing too
- Test prototype on potential users - distribute a questionarire to users - What sounds it should make, how should it look etc. **Result:** Generate a survey to send out to end users and potential active mobility users.
- I also mentioned to Andry that when designing for an e-skateboard there are many similar factors which could have potential benefit on other micromobility devices as well. We both agreed that eventually the future product could be used in many applications of active mobility.

The next steps after the meeting:

- Continue researching the transport field - look into voice activation, and anti-collision technology - look into each micromobility device in further detail.
- Generate surveys to gain information from end users.

Week 1 Reflection

In summary, week 1 was a massive week of establishing a solid foundation in moving forward with the capstone project. Initial stages consisted of brainstorming direction idea - this was at first a challenge for me as the breadth of the project is large and could consist of any topic area. However, with some desisive researching and inspiration from the scientific projects I was able to settle in on transport as a topic area. Additionally, I had also noted down animal welfare and neurodivergence as potential topic areas as well.

From this point I began some base research within the transport topic specifically as this intriguied me the most. Followed by this I reached out to CARRS-Q at QUT Kelvin Grove to gain more information on what micro-mobility in particular looked like. This was undoubtably a great step in my progress at it opened a new path of thinking.

With the help of Anton, Chris, and in particular Raf I was able to further extend my thinking towards the micromobility area which has really set me up in a great place for week 2.\

With some initial research and expert contacting already done, work done in week 2 should consist of further researching, meeting with my field expert more in depth and touching base with the tutors to ensure I am maintaing good progression.

Week 1 Research Summary

Week 1 Research Summary

Understanding road safety Statistics

- 64% of users (skateboards) experienced an accident at least once
- 3975S people hospitalised
- Driver distraction and speeding are major causes of accidents
- 107 people have died
- 15-24 reports the highest rates of accidents

Road safety E-vehicle safety

- Vest attachments
- Vulnerable
- Lack indicative/ sound measures
- Handheld device with lights
- Brief ideas
- Headlights/ body lights
- Wrist band/ signalling
- Skateboards
- small indicators
- Bikes
- Bells
- Pedestrian interactions
- What makes riders Vulnerable
- Navigating traffic
- Lack of visibility devices
- lights
- Bells

What is micromobility

- Small lightweight vehicles designed for active mobility

Micromobility is booming but so are injuries

- Infrastructure challenges
- Awareness + visibility
- Fractures were recorded as the highest occuring injury
- Education/ regulation
- wrist, forearm, and hand

e-mobility safety and use

- Inconsistent helmet use
- Gaps in safety education
- Battery failures
- Improper charging
- Address congestion
- Sustainable transport mode
- Improve connectivity

Week 2

Week 2 Lecture Notes

Tips and hints
- Do not begin research until instructed to do so
- Do not conduct research on children (under 18)
- Do not conduct research research on anyone who cannot consent
- Observational research is okay if done correctly
- Research and practice how to conduct research (actually doing it)
- Start doing some brief sketching
- Learn how to best conduct a survey which will have impact
- Reference interviews, conversations, and meetings
- Have a project synopsis document by Friday
- Come back to research when prototyping

What and why
Theory and Practice - Combinding both

What is the value you are gaining from this experience?
- Philisophy (Persepctive)
- Thinking (Process)
- Approach
- Technique
- Skills

What works for me?

Why
- Designing for people
- Cradle to Cradle
- Design like you give a damn - Cameron Sinclair
- Design for society - NIgel Whitelev
- The Politics of the Artificial - Victor Margolin

Design processes
- Deal with complexity
- Iterative
- User focused
- Systems focused
- Visual communication
- Reframes problem
- Visionary

Overview of future weeks
Week 1-8 Design research and direction
Week 8-14 Design development and refinement

Week 8: Concept, features, technical
Week 10: Prototyping, user testing, ergonomics, technical
Week 11:

Double Diamond method
Discover - Define - Develop - Deliver
Problem - Definition - Solution

Design process
Ideo: Feasibility, viability, useability/desirability

Feasibility - Technology
Viability - Business
Human values - Useability/desirability

What is the point?
Understand how you do what you do
Process will become one of the most important aspects of the project later on

Qualitative research
Inquiry into phenomena usually based on building complex, holisitc picture:
- Words, images, descriptions
- Reporting detailed views of informants/participants
- Conducted in natural settings

Week 2 Lecture Notes (Continued)

- Reality constructed by the individuals, multiple realities
- Value-laden biased
- Emerging design-categories identified during research process
- Context-bound
- Reliable verification
- Centres on Research Question

Quantitative research
- Composed of variables
- Measured with numbers
- Analysed with statistical procedures

- Reality is objective and singular
- Value-free, unbiased
- Static design-categories isolated before study
- Context free
- Accurate and reliable through validity and reliability
- Centres on Hypothesis

Research question
Research will be guided by your research question. The RQ may evolve over the course of the research, which is ok but it is important to begin now

Exploratory
Relatively little is known about the research topic
Impacts,
“understanding robot/human interaction”
“How do users perceive xyz”
“What are the motivations to use”

Explanatory
Understanding the causes that lie behind phenomena - focus on qualitative analysis of multiple interconnected factors that have influenced a particular group or area.

“Why do some students excel in”
“Why do e-riders do certain things”
‘What factors contribute to imrpoved emotional”

Descriptive
Document/record what is happening - document phenomena of interest
“What are the experiences of disabled users in

Predictive
Start from the phenomena of interest an investiage what ramifications it might have in the future

“How might AI impact the future of design ideation”
“What are the long term effects of”

What: What is it that we are doing (exploring, understanding, clarifying, comparing)

Who: Be specific of who it is you are researching (people with disibilities, healthcare workers, manufacturing workers)

Where: Specify the context, location (in Australia, manufacturing industry, care homes, hospitals)

Qualitative research
- Rich, complext data
- Fewer participants requried
- Helps understand meaning
- The why, not just what or how

Event sampling
Completed at one given time (factors like mood, behaviour, setting, time may affect this)
- Useful but limited
- Limited reliability

Week 2 Lecture Notes (Continued)

Retrospective sampling
Asking people about an experience that has happened (a persons memory)
- Very simple
- Memory bias

Repeated sampling
Conducting sampling over different periods (morning, afternoon, night)
- Strong technique
- Reliable

Methodology
- Qualitative methods
- What research question are you answering?
- How does your experiment answer this?
- Triangulation (2 or more methods)
- Participants
- Conduct pilot study
- Represent methodology graphically

Write this up as you go - consider how the experiment is being designed, how am I recruiting people, the steps on how you are undertaking experiment.

Methods
- Qualitative methods
- Interviews (Structures, semi-structured, unstructured)
- Surveys
- Observations
- Think/Talk-Aloud protocols
- Focus groups

Consider how these methods apply to the specific stakeholders, people or communities.

Sampling
Interviews/focus groups: 2-3 participants
Survey: 5-10 (short answer survey)
Observations: 1-3 (depending on length)
Observations and concurrent protocols: 1-2

What do you need to do
- Research your topic (article, resources)
- Benchmark existing products/concepts
- Decide how you will conduct your research
- Reach out to participants
- Conduct research (Log of data)

Info and consent
- Need to acquire consent from your participants in the form of clear agreement and keep forms

Next week
- Data analysis
- Research report

Thoughts
Have running design idea, inspiration, and sketching pages to jog the brain

Week 2 Studio 1

Feedback from Raf
Raf “It is great that you are keeping the project so open and not being confined to what the research experts are laying out”. Raf mentioned that while I have communicated to Andry about the project and he has given his thoughts and feelings, he likes that I am still open to digging into other micromobility issues.

I spoke about my current feelings toward the project in regard to Andry wanting it to be a simple bell/alert design. However, I made it clear that my direction remains broad and includes a bigger scope of what the micromobility sector is: e-scooter, bikes, skateboards, helmets, relfectors, vests, throttle devices,

Raf found it interesting that current devices used for accelerating, or braking an e-skateboard are quite complex. It requires a finger on an activation button and then either the brake or the accelerator. I further mentioned that due to this I would focus on researching devices that are hands off and more so directed towards sensor activated

Moving forward Raf suggested looking into these
- Look into Flock design - bike laser projector RMIT
- Look into helmet lighting design

The whole system does not have to be figured out to it’s entirety.

Week 2 Studio 1

Page on do’s and don’ts of what you want the project to be

I don’t want to redesign a scooter

I want to lean more into attachable devices, wearable devices, safety devices that can benefit the individual rider and people around them.

Helmet reflectors

What can we put a device/piece of equipment on riders?
- Vests
- Helmets
- Shoulder, knee, elbow pads

Can it attach to one of these pieces of equipment?
Can it attach to the mobility device?

Currently e-skateboards have no reflective elements, and current lighting situated at a low level - Break lights are a few centimeters from the ground and come from under the board. Human eye level is much higher then that - unless you are looking from a distance you would not be able to easily see if an e-skateboard is breaking.

Reflective elements also contribute to riding safety

Why am I choosing micromobility over normal vehicles and transportation?

- Voice activation technology
- Anti-collision technology
- Detection technology
- Laser/hologram technology
- Predictive technology
- Review resources from Andry
- Friday meeting with Andry
- Discuss progress...
- Ask him about the skateboard in more detail
- Features, feet placement etc.

Contacting Industry Experts

Riley Dagg

To: Andry Rakotonirainy

Tue 29/07/2025 1:15 PM

Good afternoon, Professor Andry

In relation to the discussion we had last Friday, I was wondering if you had access to any useful resources that would benefit the researching component of my project.

Any resources around transport, transport planning, vehicle or micro-mobility related accidents, and micro-mobility would be great.

Kind regards

Riley

Andry Rakotonirainy<r.andry@qut.edu.au>

Reply Reply all Forward

To: Riley Dagg

Tue 29/07/2025 1:27 PM

Cc: Ronald Schroeter <r.schroeter@qut.edu.au>

Hello Riley

Have a look at some discussion
https://www.reddit.com/r/ElectricSkateboarding/comments/iltqao/horn_or_bell_for_skateboard/
and existing approaches
https://www.starpath.com/skatersbell/

Law about bell for PMD – looks like e-skateboard are actually exempted from a bell due to the absence of handlebar
https://streetsmarts.initiatives.qld.gov.au/pmd/tools-tips/

old info about crashes
https://www.abc.net.au/news/2022-01-27/escooters-eskateboard-injuries-rise-queensland/100782894

Hope these helps
What times Friday are we meeting ?

Andry

Research

Street Smarts – Tools and Tips

https://streetsmarts.initiatives.qld.gov.au/pmd/tools-tips/
(Source provided by Professor Andry)

Following these rules can significantly reduce the chances of you or someone you know being involved in a crash. Fines and injuries could be the result of poor decision making when using the road.

Current laws and tips for PMD riders

Children and under 16s

- Personal mobility devices should only be used unsupervised if the user is 16 years or older. Children between 12 to 15 must be supervised by a mature adult if they are riding any type of PMD.

Safety equipment

- Helmets must always be worn and secured appropriately – fines will apply if a helmet is not worn or is showing signs of defection
- PMD's with handles or frames must be equipped with front and back facing lights. E-skateboards are currently a grey area because they only have a deck.
- PMD's with handlebars must also have a working bell.
- All personal mobility devices must have working brakes.

Where to ride

- Footpaths, shared paths, dedicated bike paths or bicycle lanes on footpaths.
- Dedicated bike paths – Maximum speed on these paths is 25km/h.
- On road bike lanes where the speed limit applying to the road is 50km/h or less – Maximum speed for PMD's remain 25km/h.
- Bikes lanes separated from the road – Separation may include concrete kerbing, bollards, or median strips.
- Local streets where the speed limit is 50km/h and features no dividing centre lines.
- Ensure a safe distance is kept from other road users.
- Alert other road users when necessary

Speeding

- The speed limit for all personal mobility devices is 25km/h.
- While some private devices do not have speed restrictions built in, the same rule still applies.

Using mobile phones

- Mobile phones must not be used while riding, this is for the safety of the rider and other road users around.
- It is illegal to hold you phone or have it rest on any body part while riding a PMD.
- Mounting a phone to the frame or handlebars of a PMD is allowed but must only be used for hand free applications.

Intoxication

- It is illegal to ride under the influence – drugs or alcohol.
- Alcohol is present in almost one third of people who are seriously injured riding e-scooters.

Doubling

- It is illegal to carry passengers as PMD's are designed for solo riding only.

Risky behaviour – careless riding and not giving way

- Always give way to pedestrians and ensure the path is shared. PMD riders must follow the same road rules as any other road users.
- Riders must indicate when changing direction – Hand signals or in built indicators are satisfactory.
- Ducking and weaving are unsafe activities and should not be practiced.
- Careless riding laws now apply in Australia.

Crash obligations

- If involved in a road incident the rider is required to remain at the scene to provide assistance.
- On the spot fines can apply when riders to not comply with these rules.
- The lithium battery within an electric device may become damaged in an accident – this can cause serious fire risks.

Research

Riding two abreast and towing

- A rider may rider alongside on other rider travelling on the same road and in the same direction.
- Riders must not be towed by another vehicle, or hold onto the back of another vehicle
- A 2m distance must be kept between the rider and any vehicles in front.

How to park

- Designated e-mobility parking areas.
- Kerbside parking, position PMD upright.
- Do not block paths
- Keep clear of: Crossings and kerb ramps, access points and emergency exits, tactile ground surface indicators, loading zones, taxi zones, and bus stops, as well as fire hydrants and mailboxes.

Increase in personal mobility device accidents across Queensland

https://www.abc.net.au/news/2022-01-27/escooters-eskateboard-injuries-rise-queensland/100782894

A hospital in Queensland stated that personal mobility devices are having major impact toward services all across the state. Ambulance services are reporting a significant rise in PMD injury related accidents over recent years.

In 2021 on its own there were at least 100 emergency department presentations for PMD related accidents commonly seeing people in their 30s or 40s seriously injured, and other cases being people between 18 to 27 years of age.

“The problem with them is in the wrong hands they can be very fast and quite dangerous.”

“We have people coming off them and hurting themselves and poor pedestrians being hit by people riding them.”

“Often these patients require hospitalisation and surgical intervention.”

People impacted by these incidents were commonly suffering serious head injuries due to the collisions. “I think it’s generally the younger people, but often using them recreationally on the weekend.”

Orthopaedic fractures were also a commonly recorded injury seeing broken arms, legs, and some serious injuries to the head.

Not wearing a helmet can be a seriously consequential decision which could see riders experiencing life threatening injuries.

Transport Minister Mark Bailey stated that Queensland currently has double the national average of mobility device users.

In a roundtable meeting including trauma experts, disability experts, pedestrian groups, cycling groups, police, and the users it was reviewed whether or not bells, horns, indicators, lights, and reflectors should be made mandatory on all personal mobility devices.

Additionally, regulations to infrastructure were also explored highlighting key areas like the use of PMD’s on paths, and bike paths.

Hospitals seeing more personal mobility device accidents and serious injuries

https://pmc.ncbi.nlm.nih.gov/articles/PMC8047950/

The National Library of Medicine has conducted a study revealing that the following factors are most commonly being seen as major causes for personal mobility device accidents:

- Collisions: Occurs when PMD riders collide with fixed objects like walls, poles, fences, or parked vehicles or rather when they hit other road users – this generally happens due to speeding, user or road user awareness (poor signalling or user/pedestrian vision), and crowdedness.

Research

- Falls: Frequently occur when PMD users lose balance, slip, or ride over uneven surfaces. Falling can also occur from having to break suddenly when other road users are unaware of the riders presence.

- Traffic Incidents: Crossing roads or using bike lanes can result in traffic collisions with other road users like cars, buses, trucks, or other smaller devices.

- Speeding and unsafe usage: Excessive rates of speed or engaging in activities unsafe for the road can significantly increase the risk of injury or being involved in an accident.

- Alcohol consumption: Riding under the influence significantly increases the risk of being involved in accidents.

- Lack of helmet use: It is a legal requirement to wear helmets, but some riders choose not to equip one before riding. This is evidence of why a significant portion of accidents result in serious head injury.

Specific influences for personal mobility device incidents

- Other road users being unaware of a personal mobility device riders presence – a result of poor PMD lighting, reflection, visibility, or signalling.

- PMD's lack sufficient features to make themselves more noticeable through light, reflection, or noise related elements.

- Personal mobility devices are significantly behind in these crucial safety features and while e-scooter, and e-bikes possess some of them to an extent e-skateboards are greatly left behind.

Submission to the inquiry into e-mobility safety and use in Queensland

https://documents.parliament.qld.gov.au/com/SDIWC-1AF9/IQ-3C82/submissions/00000665.pdf

Queensland Parliament's study reveals that road users have mixed feelings regarding their awareness and perception of personal mobility device riders as current technology and vehicle features are severely lacking.

While acknowledgment of PMD users is not entirely removed there is still major concern around the safety of all road users. This is in regard to blind and low-vision pedestrians. Issues include:

Silent operation and high speeds

- PMD's can be difficult to detect especially at high speeds and in the dark.
- Factors like poor device lighting, reflectors, signalling devices, and other high visualisation elements.

Obstructive parking

- PMD's are often parked incorrectly blocking paths, and access points ultimately creating hazards.

Lack of awareness and consideration

- Personal mobility device riders may be unaware of their surroundings and even be oblivious to the effectiveness of their own equipment.

- This generally includes the devices lighting system and how much area is lit up, the devices sound system (bells, speakers etc.) and how good it is at alerting other road users, the devices reflective features

Research

Forward collision avoidance technology

https://www.tmr.qld.gov.au/safety/vehicle-standards-and-safety/vehicle-safety/forward-collision-avoidance-technology

What is forward collision avoidance technology (FCAT)

FCAT is a developing technology integrated into vehicles to sense users and objects in a close proximity. The system is designed to react when there is potential risk detected in its area. This includes:

- Priming brake system
- Warning the driver
- Applying gentle or more aggressive braking

How it can help avoid a crash

- Warning the driver of a potential accident threat when on roads or in traffic. The FCAT system is designed to reduce the vehicles speed if there is no response to the warnings.
- Emergency stopping if pedestrians or other road users are unavoidable – Due to them walking out in front or not giving way.
- Preventing stationary vehicles from colliding with other vehicles.

Technologies like detection range and responsiveness are currently being developed. There is potential for long range adaptive cruise control settings as well as a short range wide angle pedestrian detection system.

Economic benefits

- 20 to 40% reduction in number of fatalities and severe crashes
- 30 to 50% reduction in all injuries

What is voice recognition and how does it work?

https://www.techtarget.com/searchcustomerexperience/definition/voice-recognition-speaker-recognition

Voice activation is a system that allows machines to understand and interpret spoken directions fulfilling them precisely to what the intended function should be.

This system allows users to seamlessly interact with the technology through voice command enabling a hands free approach to achieving an activity. It requires the user to train the system in order for it to either recognise a certain voice or understand a specific sentence through speech recognition. The two are interchangeable but have slight differences in the voice and speech aspects.

How does voice activation work?

Analog audio is converted into digital signals which can be deciphered through a digital database of words and phrases. So, when a user expresses a certain set of words or phrases the system checks the databases and analyses any matching elements. This dictates whether the user will be successful in commanding the system to fulfil its intended task.

Voice recognition uses

- Virtual assistants: Siri, Alexa, and Google are all prime examples of virtual assistants allowing users to transcribe voice to text, set reminders, search the internet, or play music.

- Automated phone systems: Used to direct callers through the phone and refer them to corresponding sectors.

- Smart devices: Users can control their smart home using voice recognition.

- Bluetooth: Vehicles use voice recognition to allow drivers to maintain attention on the road. The system can be used to control music, calling, or directions etc.

Voice recognition advantages

- Users are able to multi-task by speaking directly to the system.

- People with vision conditions or affected visually by the environment can still utilise the voice activated technology.

Research

- Technology can decipher commands efficiently producing accurate results.

Voice recognition disadvantages

- External noises can interfere with voice detection.
- Systems can still make errors despite the rising increase in accuracy and efficiency.
- Similar sounding words can cause the system to misunderstand the direction or command.

Your ride, your style, your way
https://ridelumos.com/

“You can communicate your intentions to drivers and people around you” – Forbes

Product ranges
- Commuter
- E-bike
- MIPS
- Smart bike lights

The Lumos smart safety system
Visibility – Predictability – Safety

Smart lights and smart helmets – Working in harmony as a singular unified ecosystem.

Protect yourself on the road – Be seen while you ride.

Know that drivers can see you – Lumos have integrated LED lights that are powerfully bright and stand out.

Tell drivers where you’re going – Communication is a priority on the road, miscommunication can lead to serious concequences – Signal your turns, help drivers help you.

Firefly smart bike lights pair with the helmet LED setup to really help you stand out.

Reviews of Lumos gear
- I feel safer and more visible on the road with other vehicles
- Great safety features, innovative and easy to use
- Bright lights and aesthetic design

The products and technology


Lumos helmet


Firefly LED’s


Rear bike signal LED’s

Making you more predictable
Misunderstandings can cause accidents, so make your **intentions known** to avoid collisions.

Signal your turns. **Help drivers help you**

Extend light spread, making you more noticable and prompting drivers to provide extra space for your safety.

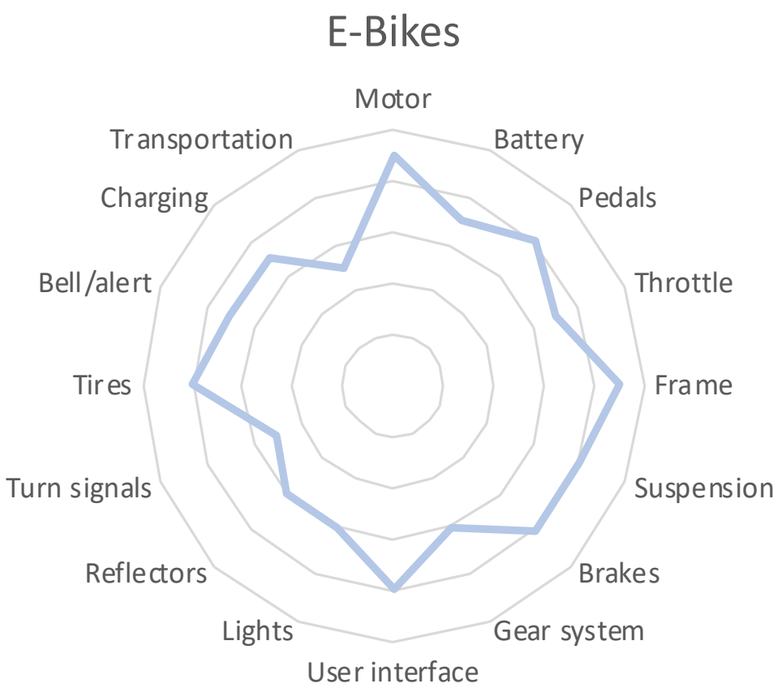
Existing Products

Existing E-Bikes

Current E-Bike Equipment:

- Helmets
- Knee, shoulder, and elbow pads
- Smart watches (Device connectivity for navigation, etc.)
- Reflective vests

	Motor	Battery	Pedals	Throttle	Frame	Suspension	Brakes	Gear system	User interface	Lights	Reflectors	Turn signals	Tires	Bell/alert	Charging	Transportation
E-Bikes	9	7	8	7	9	8	8	6	8	6	6	5	8	7	7	5



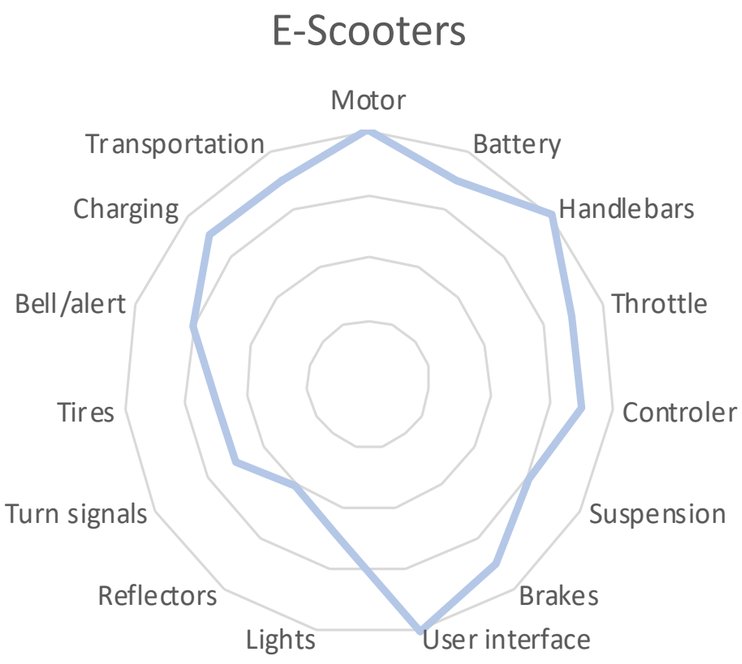
Existing Products

Existing E-Scooters

Current E-Scooter equipment:

- Helmets
- Knee, shoulder, and elbow pads
- Smart watches (Device connectivity for navigation, etc.)
- Reflective vests

	Motor	Battery	Handlebars	Throttle	Controler	Suspension	Brakes	User interface	Lights	Reflectors	Turn signals	Tires	Bell/alert	Charging	Transportation
E-Scooters	8	7	8	7	7	6	7	8	5	4	5	5	6	7	7



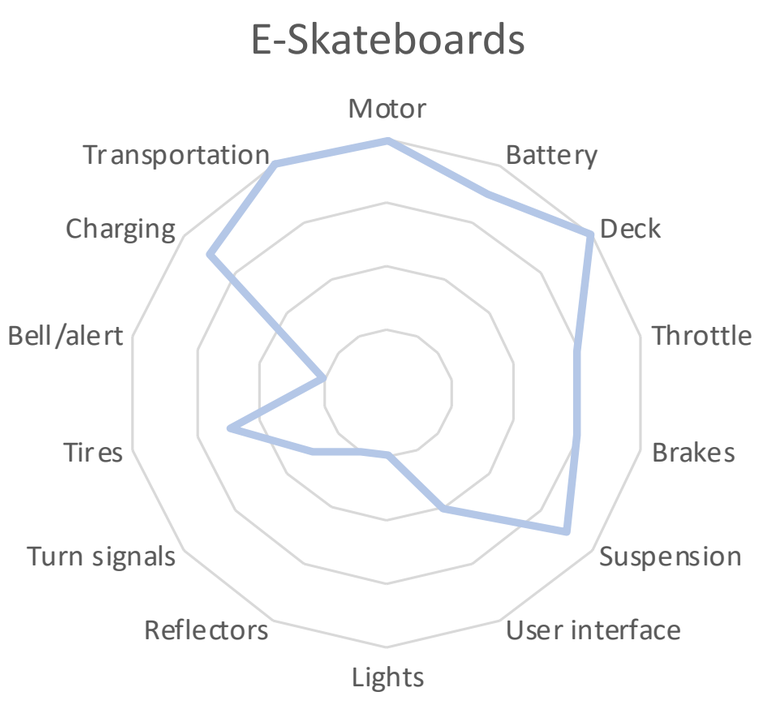
Existing Products

Existing E-Skateboards

Current E-Skateboard Equipment:

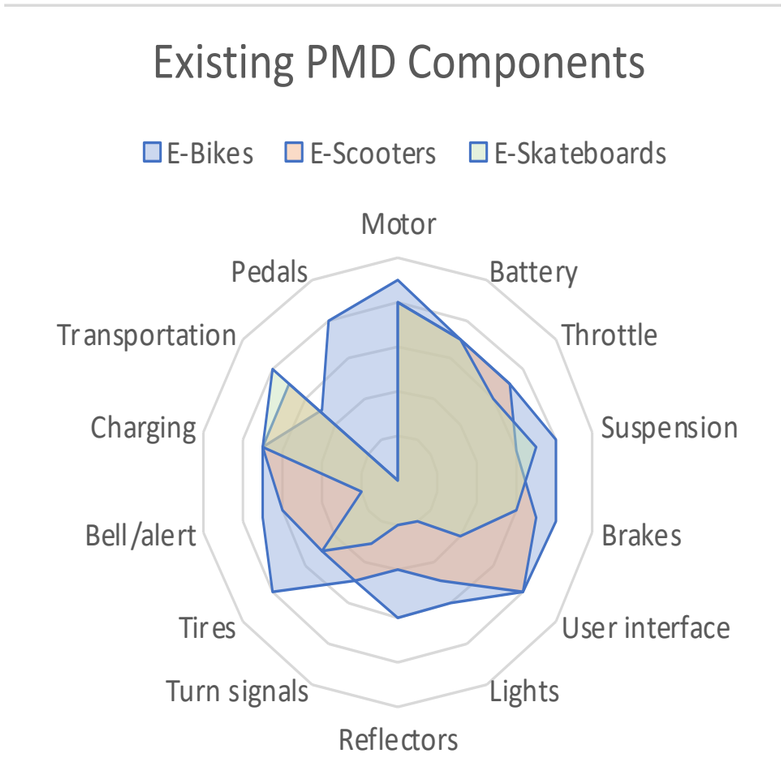
- Helmets
- Knee, shoulder, and elbow pads
- Smart watches (Device connectivity for navigation, etc.)
- Reflective vests

	Motor	Battery	Deck	Throttle	Brakes	Suspension	User interface	Lights	Reflectors	Turn signals	Tires	Bell/alert	Charging	Transportation
E-Skateboards	8	7	8	6	6	7	4	2	2	3	5	2	7	8



Existing Products

	E-Bikes	E-Scooters	E-Skateboards
Motor	9	8	8
Battery	7	7	7
Throttle	7	7	6
Suspension	8	6	7
Brakes	8	7	6
User interface	8	8	4
Lights	6	5	2
Reflectors	6	4	2
Turn signals	5	5	3
Tires	8	5	5
Bell/alert	7	6	2
Charging	7	7	7
Transportation	5	7	8
Pedals	8	0	0
Deck	0	0	8
Frame	9	0	0
Handlebars	0	8	0



Product Benchmarking

	Helmet	Pads	High-vis Vest	Gloves	Wrist Guards
Description	Light weight, breathable helmets made from high strength plastics, inner foam layers and a range of adjustable features. This includes versatile BOA fit systems, and straps. 	Shoulder, knee or elbow padding built for impact protection and reducing serious injury. Padding is made of high strength polymers, plastics, and rubber further providing durability. 	Designed to provide high visualisation when riding PMD's in various settings. Each vest features materials that are made to be light in weight and breathable. 	Semi-ventilated, impact protection gloves are made to reduce injury through strong polymer materials and layered rubber pads. Additional velcro strapping makes for greater ease of use. 	Ergonomic, adjustable, and impact protection wrist guards designed with flexible polymers that last. Great for learning to ride and riding with confidence. 
Protection Level	8	7	3	8	6
Durability	7	8	6	8	7
Ergonomics	7	6	9	9	7
Accessibility	8	7	8	7	6
Ease of Use	9	7	10	10	8
Awareness	6	3	10	2	2
Functionality	9	8	9	8	6
User Satisfaction	8	6	7	8	5

(PMD PPE Benchmarking, Riley Dagg, 2025)

Product Benchmarking

	Bell	Lights	Reflectors	Braking	Throttle	Signalling
Description	Easy fit, lightweight, and water resistant bells are a priority feature for e-bikes and scooters. Great for alerting people. 	Easy to install lights, suitable for any weather providing decent light range. 	Lightweight, plastic reflectors that are great for providing close ranged safety. 	High quality plastic and aluminium bike brakes are ideal for PMD riding and ensuring devices brake effectively. 	Plastic and rubber based devices which are designed to be generally ergonomic for use. 	Generally easy to fit indicators which are made from plastics and contain small LED's. They provide small indication. 

E-bike technology	Bell	Lights	Reflectors	Braking	Throttle	Signalling
Ease of Use	10	8	9	7	8	6
Functionality	7	7	6	8	8	6
Accessibility	7	7	6	10	10	7
Ergonomics	6	5	4	7	7	6
User Satisfaction	6	7	7	8	8	5

E-scooter technology	Bell	Lights	Reflectors	Braking	Throttle	Signalling
Ease of Use	10	9	7	8	8	5
Functionality	6	5	6	9	10	5
Accessibility	8	4	6	9	9	4
Ergonomics	6	7	4	7	6	5
User Satisfaction	5	4	6	7	7	4

E-skateboard technology	Bell	Lights	Reflectors	Braking	Throttle	Signalling
Ease of Use	3	4	5	6	6	2
Functionality	5	5	3	8	8	2
Accessibility	2	6	5	9	9	4
Ergonomics	4	5	4	8	8	2
User Satisfaction	2	5	4	8	8	2

(PMD Technology Benchmarking, Riley Dagg, 2025)

Week 2 Studio 2

Conversation with Marianella

I spoke to Marianella about filling out the project synopsis form and initially questioned her on the feasibility and depth of my current project outline and topic. She expressed that my current topic or idea as a whole might be too narrow and therefore negate depth in my project outline. This would also limit my ability to conduct extensive research which covers a plethora of areas.

With this in mind, she said it would be great to mind map all the areas I had explored: Safety, awareness, visibility, protection etc. and see where I can take the ideas and if possible form the into more developed topic sentences.

Direction within and after studio

- Have meeting with Professor Andry
- Mind map all key words and areas again in my chosen field
- Map out where similarities are and how I can expand my current project scope so it is more developed.

Ethics

Professional - Instill values when doing research. People may be unaware that you should be applying an ethical approach to researching but as professionals we should always be

Collecting data from people - Treat it ethically

Academic honesty
Plagirism is the presentation of the work, idea or creation of another person. It is failure to acknowledge the use of ideas of other authors.

Do not copy and paste AI responses or paragraphs from literature.

Using someone elses idea is not academic dishonesty unless you acknowledge the source of the data
List the full reference in a list at the end of the assignment

Read Scholarly writing document

QUT is committed to the highest standard of integrity in research. The University expects all members - staff, students, and researchers to comply. The QUT Code of Conduct for Research forms an integral part of the University's research governance framework and promotes ethical research behaviour within the comunity.

- Honesty - undertaking, and reporting of research
- Rigour - undertaking, and reporting of research. According to standards and at a certain level of quality. Accurate and consisten information distribution
- Transparency - declaring interests, and reporting research methodology, data and findings
- Fairness - in the treatment and recognition of others
- Respect - for the participants of research and the broader community
- Recognition - Aboriginal and Torres Strait Islander peoples are engaged in the research if it has significant effect to them
- Accountability - development, undertaking, and reporting of research
- Promotion - responsible research practices

Info and consent

You must acquire consent from any participants with clear agreement

Must complete
- General consent form (Signed as consent from participant)
- Recruitment flyer document (Information form to be read)
- Relevant method form (Explaining surveys)

Complete if necessary
- Recruitment email information - emailing or using social media to reach participants
- Image release form - if taking photos/videos

What you need to do

- Provide consisten information to participants.
- Information is to be used for the purpose of research and only in this project.
- Participants involvement does not hinder relationship with QUT in any way.
- Involvement in voluntary and they are free to withdraw when they choose. Do not ask why they withdraw, just accept it then and there.
- Ask if the participant understands all information - have them agree in written form.

Expert Meeting Notes

01/08/2025 I had another meeting with Professor Andry at the CARRS-Q research facility on QUT Kelvin Grove. This was a follow up meeting where we touched base on my progress and shared any new thoughts we had.

The outcome of the meeting was very positive as I was able to take away new useful information on what areas I could further develop and what elements would benefit including in the project scope.

Connective technology

- GPS tracking
- Bluetooth singal based connectivity through people phones - when a PMD user wants to alert pedestrians they can send a singal through their device which will buzz on people's phones (if the person has the correct software).
- Look into Covid times when companies tried something similar to this.

Equipment and technology

- Helmet or other equipment attachments.
- Bluetooth helmets - signal based gear that can sense surroundings.
- Wearable devices - What devices do PMD riders currently use
- DFRobot - Programming technology like sensors and LED's.

Project considerations

- How do people react, look at human behaviour and why people do what they do. What actually causes an accident. What do people want.

Direction considerations

- Current elements considered: Connectiveness, safety, awareness, visibility
- What I should look into: Comfort, ergonomics, useability, intuative to use

Project Synopsis Drafting

Project Topic
Personal mobility device awareness and safe integration

Key Words
Road safety, safe integration, technology, awareness, visibility

Project Contact + Email
Professor Andry Rakotonirainy
r.andry@qut.edu.au

Participant Contacts
PMD users, transport/micromobility experts, CARRS-Q researchers

Project Outline
With the rapid growth of micro-mobility in Australia there is an increasing need to address the safety of these devices within shared spaces and when used on the road. Currently PMD's (personal mobility devices) are responsible for a large number of road related accidents and are commonly impacting young and mature adults. These individuals experience a range of injuries from fractures, concussions, and in more serious cases life threatening injuries which can impact the users life.

It has also been observed that the field lacks adequate protective and alerting equipment for riders. This limits their ability to effectively communicate or signal other road users while ensuring their own safety.

With this in mind, the project aims to use insights gained by industry experts and mass surveying to implement an intuitive design solution. Ultimately improving the awareness and visibility around PMD users so that micro-mobility can be better integrated into transport networks within the future.

Tentative Research Question
- What role does pedestrian and active transport awareness play in the safe integration of micromobility devices?
- What are the primary instigators for micromobility accidents on Australian roads and shared spaces?
- What are the current limitations of pmd visibility and awareness and how does it affect other road users?

Important Elements
- Ethics Agreement
- Ethics Documents
- AI Agreement
- Authenticity Agreement
- Referencing
- Raw Data

Week 2 Research Summary

Week 2 Research Summary

Hospitals Seeing more Personal mobility device accidents

- Collisions: colliding with fixed objects or moving vehicles/pedestrians
- Falls: Lose balance, uneven surfaces
- Traffic incidents: crossing roads or using shared spaces can result in road accidents
- Lack of helmet use: Legal requirement
- Speeding: Excessive speeds create unsafe environments

Street Smarts - Tools and Tips

- Helmet
- Handle and framed devices must have front and back lights
  - Also must have a working bell
- Must have a working break
- Speed limit, 25 Km/h
- No phone use
- No doubling
- Cannot ride intoxicated

Collision avoidance technology

- warns rider/driver
- Priming break System
- Gentle or aggressive braking

emobility safety and use in Queensland

- PMD's can be hard to detect as they are quiet
- Poor device lighting, reflectors, signalling, and other visibility elements
- unawareness from both riders and pedestrians

Voice recoghition

- Allows machines to understand and interpret spoken directions

Benchmarking

- Standard equipment - Helmets, pads, gloves, vests
- Lumos
  - Takes riding to the next level with modular lighting

Week 3

Week 3 Lecture Notes

Proejct synposis
The research question does not need to be set in stone at this given point. Be flexible for now and adjust it when needed

Tips and Hints
- Be aspirational
- Push yourself
- What is the innovation in your design?

For this week and next
- Research your topic
- Project synopsis
- Benchmark existing products
- Read carefully on how to conduct methods
- Decide how research will be conducted
- Prepare ethics forms

Why research?
- Helps to identify the problem we are trying to solve
- Identifes areas in a certain field which need help being solved
- Can help to justify the direction of a design solution for a specific area
- Identify the value or meaning

Objectives
Strategic position of human centred design

Benchmarking
Involves the process of measuring products, services, and processes against competitors.

It is not just about reviewing other products, it is a rigorous process

Why?
- Identify strengths and weaknesses of ideas
- Set aims/objectives/goals and track progress
- Identify innovation against industry standard
- Learn from the best in the industry
- Avoid recreating existing products
- Stay competitive

How?
- Determine product category/technology
- Determine the products already in the context
- Collect relevant images
- Collect information about products
- Identify functions, features, aesthetics, form, style, price
- Identify similarities
- Identify gaps
- Generate a visual representation - Radar, table, or matrix graph

Benchmarking criteria
- Durability
- Price
- Quality
- Usability
- Aesthetics
- Ergonomics
- Technology

Week 3 Lecture Notes (Continued)

Alternative research methods
You can use youtube or publically accessible videos to gain research

Surveys
Always need to inform people about the interview, what the data is used for, make sure they provide confirmation they understand this and provide consent.

Methods
Qualtrics
QUT Key Survey
Survey Monkey
Google Forms

Tips and Hints
- Define a clear purpose/goal for the survey
- Specific and broad questions
- Basic demographic questions (age bracket (18-25), experience)
- Mix of quantitative and qualitative questions
- Likert scales, answer check box, allow other
- Allow for short answers or for open ended questions
- 5-10 minute survey is sufficient
- Don’t ask leading questions (Do you like this)
- Avoid absolutes (always, never, all)
- Don’t ask two questions in one

Interviews
One participant asks questions and the other provides answers. It is usually conducted as a one on one but can be altered to support multiple participants if that is viable.

Methods
- Structured
- Semi structured,
- Open ended

Tips and Hints
- Define a clear purpose
- Build rapport
- Ask basic demographic questions
- Talk less and listen more
- Prompt interviewee
- Prepare to handle unexpected emotions
- Not too long
- Transcribe interview (otter.ai, Dragon Anywhere, descript)

Observations
In research, observations are a research technique where youn observe participants and phenomena in their most natural settings

Methods
Naturalistics
Participant
Structured
Archival - Accessible public videos (youtube etc.)

Tips and Hints
- Determine what to observe and why
- Establish recording method
- Collect basic demographic questions
- Provide clear instruction
- Record descriptions, context, process - image ethics form
- Try asking participants to conduct talk/think-aloud protocol
- Don't make the observation too long because it will be impossible to decipher
- Video, audio, notes

What you need to do
- Select which two methods you will utilise (minimum two)
- Design and develop those methods
- Generate consent forms

Week 3 Studio 1

Conversation with Raf

Directional audio - Targets someone infront or behind the device rider

Vibration technology - How can vibrational tech promote safer roads and allow active mobility goers to be more aware of their surroundings?

Connectivity through an app - Vibrates in users phones when a personal mobility user wants to signal their position

Sound - how do people perceive sound? What sounds do people like? How do we integrate this into a bell alert system.

Running - Path seperation for all different active mobility - shoved into one space for runners and walkers. This can disadvantages runners in particular if walking pedestrians are slow or blocking the lane. Runners could like the idea of a vibration app that notifies the presence of PMD users so that the runner can use different lanes.

Identifying Research Methods

Interview Research Method

Potential interviewees
- Andry Rakotonirainy
- Ronald Schroeter

Required forms
- Interview Consent Form
- Interview Participant Information Sheet

Survey Research Method

Potential participants
- CARRS-Q, Andry, Ronald

Required forms
- Recruitment Email
- Recruitment Flyer
- Survey Consent Form
- Survey Participant Information Sheet

Observsation

(maybe) Goodwill Bridge: Observe micromobility users

Beam shield technology video
Videos and photos from people’s experiences on reddit forums

How will I implement my survey and reach people

- Google forms will be used as the priamry survey application
- Reddit and other notable forums will be used to reach people
- I will ask Andry and his colleagues where I can find people who may be able to provide important responses
- Andry may be able to send my survey to companies with knowledge on my field.

Research

Beam launches trial of pedestrian shield, powered by Drover AI technology “Path Pilot”
https://www.ridebeam.com/newsroom/beam-to-launch-trial-of-pedestrian-shield-powered-by-drover-ai-technology-pathpilot

Beam’s pedestrian shield safety device can detect road and pavement surfaces, as well as adjust speeds accordingly. The micromobility company is partnered with Drover AI to produce groundbreaking technology that increases the safety of pedestrians and personal mobility device users. At this current stage the technology is only target at e-scooters.

The device is able to detect city infrastructure through the implementation of a loT module, making it a highly powerful AI tool. An onboard camera also allows the device to work in real time providing accuracy when detecting surrounding environments like sidewalks and bikes lanes. The technology is also capable of detecting restricted areas and speed limit zones making it easier to manage each states differing legislation around micromobility.

Beam and Drover AI are also developing a collision detection technology which targets pedestrian safety on footpaths. The device will be able to detect surrounding people and seamlessly slow the scooter down, preventing serious danger.

Although this advancement in micromobility sounds premium, there are also notable limitations. Beam has listed these areas as opportunities

- The device is not scalable meaning data can be unreliable as a scooter rider will experience different environments to another person.
- Pavement and pedestrian detection relies on GPS and map tracking. This requires all tracking and data to be fully up to date all the time.
- With the implementation of the onboard camera, it makes the process of detection and observation seamless, providing accurate mapping and positioning.
- Drover stated that their vision is to “enhance the safety and intelligence of shared micromobility vehicles for all stakeholders.”

Watch this video to learn more about the shield safety device – this video can be used as a form of **observation:**

https://www.youtube.com/watch?v=1RpBIq3_o9M

Product Benchmarking

	Lumos Commuter Helmet	Lumos Road Bike Helmet	Lumos Firefly	Lumos Firefly Mini	Rear turn signal mount
Description	An upper echelon bike helmet which is designed for mass customisation and the ability to stand out. This product features turn signals, long range visibility, brake lights, and waterproof material. 	A high range bike helmet designed to suit the everyday rider. The helmets integrated tech makes it highly usable on the roads and is a one size fits all product. 	Small, versatile, and great for simple visibility. The Lumos firefly LED's are an attachable device that provide effective lighting and awareness. 	Similar to the larger device, the firefly mini are a small alternative to its original counterpart. They are ideal for smaller mobility devices and are good for providing a visible lighting radius 	The rear signal mounting system is a versatile and in most cases an easy to use device that is great for making it clear where PMD riders are positioned. 
Price	$129.95 - $189.95	$39.99 - $74.98	x1 = $49.95	x1 = $34.95	$29.95
Lifespan	1-2 year warranty	1-2 year warranty	35hr battery life	14hr battery life	1 year warranty
Cost	2	4	4	4	5
Usability	8	8	7	7	6
Functionality	9	9	7	7	6
Durability	6	6	6	6	6
Aesthetics	8	8	8	8	7
Ergonomics	8	8	7	7	7
Technology	10	9	8	8	9
Quality	9	9	7	7	7
Transferability	5	5	4	4	3

Product comments

Lumos Commuter Helmet

- Great technological features
- Too expensive for the average person
- 1 hit to the helmet can break it – high cost and great features / possible short lifespan.
- Can be transferred into use with other devices like e-scooters and e-skateboards.
- But the technology becomes limited as the helmet cannot be controlled from the separate device usually equipped to bike handlebars. Scooters lack handlebar space, and skateboards only have a deck.

Lumos Road Bike Helmet

- Good technological features
- Middle of the range cost – can still be quite expensive for the average person to purchase
- 1 hit to the helmet can break it – high risk / high reward
- Can be transferred into use with other devices like e-scooters and e-skateboards
- But the technology becomes limited as the helmet cannot be controlled from the separate device usually equipped to bike handlebars. Scooters lack handlebar room, and skateboards only have a deck.

Lumos Firefly

- Can be paired with other Lumos technology devices and used in a highly effective way
- Small and breakable – bumps to the LED could break it easily
- Very expensive for 1 light, even more so for a pack of 4
- Only accommodates for e-bikes
-

Lumos Firefly Mini

- Can be paired with other Lumos technology devices and used in a highly effective way
- Very small and breakable – bumps to the LED could break it easily
- Very expensive for 1 light, even more so for a pack of 4
- Only accommodates for e-bikes

Rear Turn Signal Mount

- Technologically very effective
- •mproves visibility and indication from the behind – if used on low riding devices it can be difficult to see the setup
- Can be very difficult to mount for any bike type, especially if your bike is lower to the ground or has a unique build
- Only accommodates for e-bikes

https://ridelumos.com/collections/bike-lights/products/lumos-firefly-rear-turn-signal-mount

Product Benchmarking

	Bike Bells	Smart Bike Helmets	Indicating System	High-Vis Vest	Shield Technology
Description	A modified piece of equipment that is originally made for bikes and some scooters. The bell is simplistic and easy to use but lacks overall quality and ergonomics. There are also no distinct ways of equipping this in a skateboard setup.	Superior helmets provide a technological advancement to riding a device. High end plastics and polymers makes these helmets durable, and the addition of different tech increases its functionality.	A small, easy to use device which can be purchased for a reasonable price and attached to many micromobility devices. The technology allows riders to stand out in various settings.	Lightweight, breathable and highly altertive with the use of a bright aesthetic and reflective material. High-vis vests are great for standing out and have an ease of use as they can be slipped on.	An advanced loT technology which allows riders to feel safe around pedestrians. It has road and surface detectability, as well as adjustable speed safety. The device only accessible when hiring a public scooter.
Price	$5 - $30	$74.98 - $189.95	$40 - $150	$5 - $15	N/A
Lifespan	1-5 years	3–5 years	3 years	1 year	2-5 years
Cost	10	5	7	10	7
Usability	7	8	8	8	7
Functionality	6	8	6	7	8
Durability	6	7	7	7	7
Aesthetics	5	9	8	7	8
Ergonomics	6	8	7	7	6
Technology	3	9	9	4	9
Quality	4	8	7	7	9
Transferability	4	10	4	10	5

Product comments

Bike Bells
- Affordable and easy to setup for bikes and scooters.
- Lacks aesthetic and overall quality.
- Lacks transferability into micromobility devices that do not have frames or handlebars.
- Lacks technological advancement.
- Pedestrians may perceive the bell sound as annoying – need for a change in sound.

Smart Bike Helmets
- Superior products in the micromobility market possessing advanced technology.
- Capable of providing safety to the users head, alerting other road users, and emitting light in the riders general proximity.
- Made to a really high quality using durable materials like strong plastics and polymers.
- Downside is that these products are a lot more expensive than regular helmets making it hard to access for some users.

Indicating Systems
- Generally, pretty affordable for the average user, there is a cheaper or more expensive range which grants the user ability to choose what is preferable to them.
- The devices are easy to setup as newer e-scooters and bikes are designed to accommodate indicator builds.
- The device lacks transferability as skateboards have been left behind in this aspect due to there being no great area to apply the device too. Having indicators too low on a skateboard also contributes to poor road safety as they are hard to see.

High-vis Vest
- Lightweight, easily accessible, and super affordable for the average person.
- Vests are generally pretty durable but in accidents involving grazing or pulling against the material could cause damage to the equipment.
- Normal vests lack adaptability and tech advancements, but overall, they are functional in terms of general intended use.

Shield Technology
- Highly advanced technology in the micromobility field. Although a newly developed product the safety shield has great functionality for its intended uses.
- Currently the device is designed for e-scooters on their own so transferability into other devices needs more development.
- The device is not a purchasable item, rather it can be used when an e-scooter is hired in public area (Beam scooters).

Research

People's experience when riding personal mobility devices

https://www.reddit.com/r/ElectricSkateboarding/comments/iltqao/horn_or_bell_for_skateboard/

Train horn!

Uses a whistle that can be placed around your neck, the user finds this a pretty effective but alarming way of getting people to move out the way.

Amazon sells electric whistles, the user keeps it in their hand while riding.

A group of users implemented a bike bell into their setup by placing it on their gloves or skateboard remote. They said that people will have a natural reaction to hearing a bike bell and move out the way without looking, whereas if it were another sound the pedestrian would look back and have to process what the sound is.

One user mentioned that when riding they sprained their finger in a fall wearing the bike bell around their finger, so they had to move the bell to the top of their gloves.

I want a bell solution were you are able to hold the remote and bell in the same hand.

You could just shout louder... Or alternatively, you could wire a cheap horn to your riding setup.

I have thought about purchasing a louder horn because I have experienced people stepping out in front of me while riding. This happens on busy streets and most people are wearing their earbuds and are locked into their phone. Usually I can just buzz them while yelling but there has been many close calls.

Bluetooth speaker and music!

Music while riding a bike? Sounds lame to me.

Fatal crashes involving electric skateboards are increasing

https://www.reddit.com/r/ElectricSkateboarding/comments/1lgnxim/fatal_crashes_involving_electric_skateboards_are/

This research has been collected from people's own experiences via a reddit fo-rum.

E-Devices are getting cheaper and are more accessible than ever before. They honestly are not that safe at all; I had two really close calls which made me realise this.

My approach now is breaking not accelerating since the thought of having another accident with a car or other device users just makes me sick.

Readjusting speed and wearing a full set of protective gear has been my go to approach to riding now. Gloves, helmet, pads are some of the notable PPE. There are a lot of people riding these devices, but majority do not wear helmets.

Electric skateboarding is easy, until you find out the hard way. Every crash is an emergency room visit.

Protective gear should be enforced among PMD riders and instructional videos or resources need be given to people wanting to get into riding. Currently there are no outstanding and truly consistent laws around PMD's contributing to the large number of accidents and injuries.

Generally, I've noticed accidents happen when there are more people around and the roads, and paths are super busy.

I have four cracked helmets to remind me of how lucky I am after experiencing an accident while riding my PMD.

Research

What are haptics? Meaning, types and importance
https://www.spiceworks.com/tech/tech-general/articles/what-are-haptics/

“Technology that transmits tactile information using vibrations, touch, and force feedback”. This technology is becoming more common has it provides benefits in enhancing interactions with humans.

Allows a virtual reality systems experience to be perceived as real when interacted with by humans.

Touch stimulates receptors in the human body and a sensation is determined based on the relationship the brain has with the experience.

Audio and graphics also stimulate senses of sound or sight.

Types of haptic technology

- Graspable - Standard form of haptic technology that has kinesthetic feedback. This haptic type increases immersion through vibrations, movements, and resistance most effectively in activities that requires the use of a joystick or operating robotics.

- Touchable - Smartphones are a primary example of touch based haptic technology allowing users to gain stimulation through tapping, rotations, and other user movements.

- Wearable - Deriving from the sensation of contact, pressure, vibration, and even temperature can stimulate users in wearable devices. Virtual reality is a developing space for wearable tech seeing gloves mimicing real world sensations.

Feedback types

- Force feedback - Indicates the direction of applied power in active and resistive devices.

- Vibrotactile feedback - Applied pressure to the human skin and targets receptors that stimulate the human body. Mobile phones, controllers, steering wheels, and wearables are common devices using vibrotactile feedback providing an ease of use, and power.

- Electrotactile feedback - Electrical impulses that imapct receptors. Sensations generally happen through voltage, current, waveform, material, contact force, and electrode size.

- Ultrasonic tactile feedback - Uses high frequency sound waves to generate subtle feedback.

- Thermal feedback - Devices have the ability to sense heat patterns within the human body and administer haptics based off changes.

Based on modality

- Vibration - Vibrations convey information and specific intent of an activity or operation.

- Kinesthetic - Stimulate movement, mass, and shape.

- Button - Simulated buttons mimic the familiarity of mechnical counterparts doing so through audio or feedback leverage. This replicates the feeling of what a mechanised button would feel like.

Importance

In the autmotive field haptics have future potential to enhance usability of features within a range of elements. User interfaces like steering wheels, pedals, seatbelts, dashboards, seats, and even equipment have a foundation for haptic technology to be integrated.

Research

Pedestrian auditory perception of approaching vehicles from behind in shared space: the impact of quiteness of electric vehicles
https://www.sciencedirect.com/science/article/pii/S2352146524001285

Key words: Pedestrian safety, auditory perception, shared space, detection distance.

Aduitory detectability in electric vehicles going low speeds has presented concerns about the safety of pedestrians and other users in shared spaces. Auditory perception when coming from behind a vehicle is a vital element in the prevention of road incidents between pedestrians and vehicles.

Factors like background noise, vehicle type, and vehicle direction are all aspects which contribute to auditory perception.

What was studied
Electric vehicles are alot quieter than standard motor vehicles raising the concern that pedestrian safety is at stake. There is concern that pedestrians cannot hear these vehicles approaching particularly in shared zones.

Studies have looked into how prepared and aware pedestrians are when a vehicles are approaching from behind in varying conditions like type of vehicle, background noise, kind of manoeuvre, and the direction of the approach.

Methods
- In a controlled environment vehicle noises were recorded in a carpark space, and background noise in a normal shared area.
- Within the study participants listened to a range of sound cues
- Measures included: Direction rate, direction determination, and direction distance.

Key findings
- **Detection issues:** Most sound cues were missed during high background noises.
- **Direction accuracy:** Participants within the study were able to accurately identify the direction a vehicle was approaching in.
- **Detection distance:** Distance had significant impact on the way vehicles were detected.
- **Safety margin:** Detection of vehicles would happened before stopping. For electric vehicle however, detection was much more difficult showing that pedestrians may only detect the EV when it’s too late.

Conclusions and implications
- While having quiet vehicles creates less noise pollution there are evident concerns around the safety of pedestrians in shared areas. Particularly when other factors like background noise are within the picture.

- Warning mechanisms may need to be implemented into existing EV devices so that low noise vehicles can continue to be created.

Week 3 Studio 2

Conversation with Raf

Your user group could be anyone over 18 who has interest or involvement with micromobility.

Listing a brief job title or user description does not create a risk of identification.

What experience is the product allowing for, it shouldn't just be a basic solution. What else can it do and what does it allow the user and surrounding people to think or feel?

My benchmarking is lacking concepts, look into bike concepts. Regardless of if they are fully developed or not there should be something I can take away from benchmarking these products/technologies.

- Flock is a great example

Snowballing - When I deploy a survey I could include a sentence at the end asking the participant to pass the survey on to other people they think would benefit the collection of more research.

Research

Light up your legs, be seen sooner

https://projectflock.cc/?srsltid=AfmBOorqgu5izTDpi8XTWHM0pftcp-kA_YyD1792v623uIy7giF0vKZZ

Biomotion bike lights – Lights that boost cyclist visibility by highlighting human motion

Brighter isn't always better
The idea is to make you the most visible thing on the road not just your bike.

Bright lights definitely increase visibility, but they also can cause obstruction or startle to other road users. Instead biomotion technology

From dusk till dawn rain, hail, or shine
The Flock is designed to perform in every condition

It has a long lasting battery being able to stay active for 100 hours, ensuring its protective glow stays active for as long as possible. The use of dynamic lighting gives riders a commanding presence when on the road. The intent is to ensure their safety at all times and remind other road users of their presence.

The ease of use of this product is second to none with a versatile mounting system. In particular the design uses a multi seat post mount making it highly adaptable to most seat frames. Additionally, Flock uses an intuitive twist clip action which promotes a single motion attachment, or detachment.

Key features
- Battery gauge
- USB-C rechargeable
- Multi seat post clip
- Biomotion lighting and rear LED

Pedal with peace of mind
Biomotion lighting can be detected 5.5 x sooner than normal lights making it an unmistakable design.

08/08/2025

Flock's vision

Cyclist deaths on Australian roads have doubled over the last 3 years. The number 1 cause of crashing comes from a rear collision with a motor vehicle.

Flock wants to "Contribute to improved road safety by using innovative product design to mature interactions and reduce death and injury." Flock is starting with cyclists indicating there is more to come.

Bright lights for projector friendly bike lovers

https://www.yankodesign.com/2012/11/26/bright-lights-for-projector-friendly-bike-lovers/

This bike concept features a red beam signalling system allowing the bike rider to display a 1 metre safety zone. When wanting to indicate your intended direction the projector will display arrows to the side giving other road users clear visualisation of where the rider is going.

This concept is also easy to use as it features a clasp which can be hooked onto the users bike. Additionally, this concept comes in a small compact build, and has a great functionality.

Research

Bike Beam Projector

https://bicycledesign.net/2015/02/min-keun-kwons-b-bike-beam-projector/

This bike concept connects to the users bike and uses a smartphone to project imagery, videos, or information into the directed area. This creation has many uses, but it is primarily important for keeping the rider visible and other road users aware of their surroundings.

With the ability to project almost anything bike riding can become more approachable to newer riders, and opens the door to immense creativity.

While there are many projecting alternatives, the lead designer of this concept created small caps which can be placed over the top of the projector allowing pre-made images to be seen through the light.

This concept is particularly interesting for its uniqueness and ability to create a more inviting environment bike riders whilst ensuring their safety is a top priority. In turn, the idea should keep other road users attention focused and significantly minimise cyclist casualties and injuries.





Blaze laser light

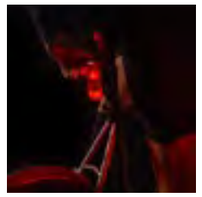
https://www.kickstarter.com/projects/embrooke/blaze-bike-light

A bike concept that seamlessly integrates laser projection technology into bike riding to provide increased safety and awareness. This design is in response to the scary statistic that cycling is related to a high number of serious injuries or fatalities due to vehicles turning across an unseen bike.

To combat the risk of cyclists being hit by cars the design implements a front on LED projector which creates a highlighted symbol on the surrounding ground. To be precise the projection is cast 2 to 5 meters in front so that it is clearly visible to other road users. The idea is that the projection will alert drivers as they will be able to see the light before they turn across the cyclists path.

This design features: great power, a compact and lightweight build, an eco-friendly material finish, waterproofing, LED/projection brightness, adaptive mode settings, and an intuitive safety setting which means the device will only work when it is locked into the bracket.

Product Benchmarking

	Flock	Blaze	Bike Beam Projector	Bike Zone
Description	Flock allows bike riders to light up their legs and be seen sooner. This innovative bike design encourages safe bike riding and ensures that every rider can be seen by other road users. It uses LED lights to highlight the rider. 	A new, innovative bike concept that encourages bike riders and gives them a sense of safety. The design projects a bike symbol in the area in front of the bike giving other roads users indication of where the bike rider is heading. This is a design specifically for bikes 	A solution for increasing the visibility of bike riders in a fun, engaging way. This concept uses laser projection to emit pictures, videos, or information into the surrounding area. The intent is to give other road users indication of where they are. 	A laser projector design solution for increasing the safety of bike riders. This concept uses lasers to light up the area bike riders are travelling in giving other road users every indication of their whereabouts. 
Usability	7	6	7	7
Functionality	9	5	8	8
Durability	8	6	7	7
Aesthetics	10	8	8	9
Ergonomics	8	6	6	7
Technology	10	7	8	9
Quality	10	6	7	8
Transferability	3	3	2	4

Product comments

Flock Bike Concept

- Flock is designed with cutting edge technology making it one of a kind in its field and highly reliable for its intended use of making the rider stand out.
- The concept is specifically designed for bikes as it features an easy to use clasp mechanisms that is popped on or off in one motion.
- Other road users can be made more aware of their surroundings and use safer measures when sharing spaces with bikers.
- As mentioned Flock is currently only designed for bikes making the products transferability to other transport modes limited at this point in time.

Bike Beam Projector

- The bike beam projector is a highly creative design concept as it allows the user to project a range of user inspired art or pre-made safety projections.
- The intent is to make other road users more aware through the colourful and creative imagery projected from the device.
- There are inherent safety issues though as the projections can be distracting for the rider or other road users. This could lead to more dangerous accidents.

Blaze Bike Concept

- The intent of this bike concept is to encourage people to use bikes and feel a sense of safety when riding in shared spaces.
- The use of laser projection technology allows the user to project a bike symbol out in front of their riding direction giving other road users indication of where they are going.
- While the concept is great in making users in front of the bike rider more aware so they don't cut them off the abilities of the technology is limited as the projection can only be seen from that one direction. The bike rider is still vulnerable from behind.
- The concept also lacks transferability into other transport modes as the device is placed on the handlebars of the bike.

Bike Zone Concept

- Bike zone uses cutting edge laser projection technology to create a reliable safety measure intended for bike riders.
- This concept is designed to project road safe laser projections which indicate where the rider is positioned on the road or path. The projections span 1 metre from every direction of the bike.
- Additionally, when the user wants to indicate the direction they are changing to, the lasers form an arrow to the directed side. This allows other road users to be aware of the riders intentions.
- This device is more transferable than the other concepts as the design uses a small, compact clasp which can attach to any shaft components featured in e-bikes or scooter. However, e-skateboards are still limited here.

Survey Development

Survey 1: General information regarding micromobility

1. Do you own or have you used one of these micromobility devices?
- E-Scooter
- E-Bike
- E-Skateboard
- Other

2. How often do you use the device?

3. Where have you used the device

4. How comfortable are you with riding your device?

5. Where do you normally ride the device?

6. What is the infrastructure and natural environment like around the areas you ride in?

7. Are there any features about the device that you think make it great?

8. Are there any features about the device that you think could use improvement?

9. Where have you seen other people riding these devices? (on roads, paths, bike lanes, specific areas etc.)

10. Are other riders easily identifiable?

11. Have you experienced an injury involving yourself or someone else riding one of the devices?

12. What was the extent of the injury you or someone else received?

13. Do you know what factors caused the accident?

Survey 2: Micromobility safety, and the primary instigators of accidents

1. In as much detail as possible, why do you think accidents occur involving personal mobility devices?

2. Have you seen or heard of any accidents involving personal mobility devices? Explain how they happened if so.

3. Have you ever experienced an accident involving one of these devices, either while you were riding one, or as a pedestrian?

4. How would you rate your experience riding a personal mobility device?

5. Have you ever used any personal protective equipment (PPE) while riding a personal mobility device? (Wrist guard, elbow pads, knee pads, helmets, safety vests etc.)

6. Do you think PPE plays a role in the protection of the user of the device? Are there limitations, or is the equipment satisfactory?

7. In terms of the each devices features (lights, indicating, steering, breaking etc.) are there any notable areas that could be improved or are they satisfactory in your opinion?

Expert Meeting Notes

Notes from meeting with Andry

Was the accident related to not being visible?

Why did this happen?

How would you approach it differently

Would you like a bell?

How could you improve your conspicuity. It is important to be seen

What do you think about e-skateboard conspicuity . How do you go about making yourself more aware

In the perfect world how do you want to make yourself more aware?

Ask pedestrians and other device users

What are you associated with?
Bikes
scooters
Pedestrian
E-skateboard

How are skateboards are perceived

Understand the perception of safety

Google bells with cyclists and e-scooters

Gradually enquire the need for a specifc thing, don’t just say they need it

Make the survey exciting. Lead to someting exciting

Survey Development

Personal Mobility Device Awareness and Safe Integration

The purpose of this survey is to identify viable opportunities, overarching issues, and stakeholder experiences relating to micromobility.

In particular, areas involving awareness and visibility as well as the safe integration of these devices will be thoroughly explored to ensure pedestrians, other road users, and the riders themselves feel a sense of safety and belonging in all environments.

1. What have you experienced and perceived micromobility through?
- E-Scooters
- E-Bikes
- E-Skateboards
- As a pedestrian or from a personal vehicle (car, truck, van etc.)

2. How safe do you generally think Australian roads are with personal mobility devices?

3. Do you think the riders themselves are safe on roads and paths?

4. What personal protective equipment do you wear as a personal mobility device rider?

5. Have you ever experienced an accident involving a micromobility device, whether you were riding one, viewing it happen, or involved in a different way?

6. How do you think this accident happened, what were the factors that could have caused it?

7. Did you sustain any injuries as a result of the accident(s)?

8. Would you approach the environment differently next time? How?

9. What do you think about personally mobility device conspicuity, are devices easy to see and hear as a road user or pedestrian?

10. How would you want to make yourself more conspicuous when riding a micromobility device?

11. How do you think e-skateboards are perceived by other road users?

12. Do you think e-skateboarders are conspicuous enough for roads and footpaths to be safe?

13. How could e-skateboards and the riders become more conspicuous?

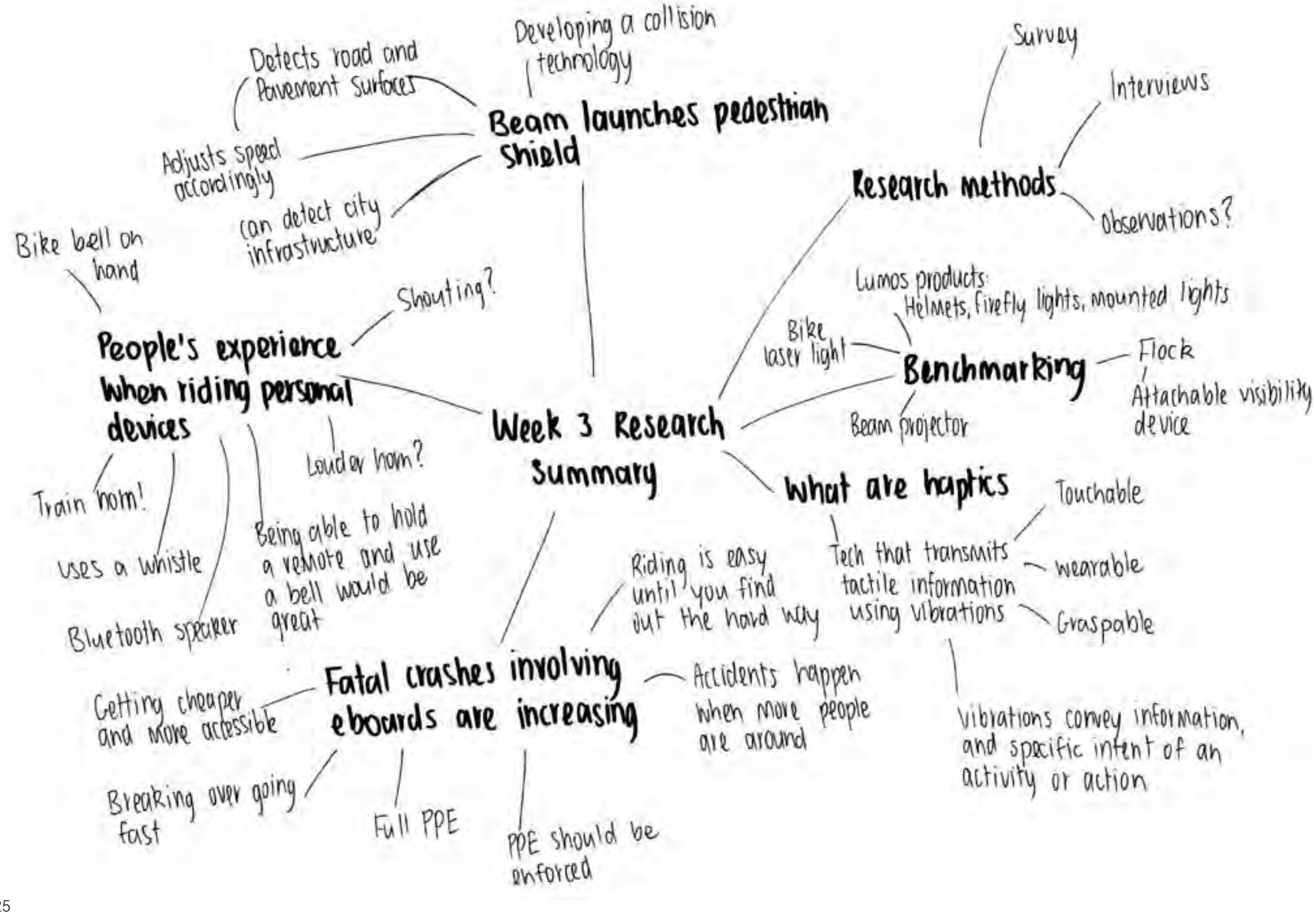
14. Do you think using a distinctive sound like a bell would help skateboards?

15. Are there any other specific elements that would make e-skateboarders more conspicuous?

16. If you were riding a personal mobility device would you feel comfortable wearing a new piece of equipment?

17. Are you conscious about standing out or do you think it is vital in ensuring your own and everyone else's safety?

Week 3 Research Summary



Week 4

Week 4 Lecture Notes

Data Analysis and Assessment 1

Tips and hints
Prepare all survey documents and have them ready to send out

Data analysis
Identify the variables in your collected data
- Age, consent, time of day, weather, experience, action, choices, preferences.

High level of control
- Survey
- Interview
- Observation

Low level of control

Quantitative data
Data collection - analysis - findings - writing results

Qualitative data
Data collection - analysis - findings - writing results - data sorting

Steps to consider
1. Get a sense of the whole - Jot down notes.
2. Pick one document and study in detail. Write thoughts.
3. Make a list of topics that have arisen. Cluster similar topics into lists and develop codes.
4. Take codes and go back to data. new codes and categories may arise.
5. Find descriptions for topics and turn into categories.
6. Make a final decision on abbreviation for categories.
7. Assemble data material belonging to each category and perform prelim analysis.
8. If necessary record your existing data.

Qualitative rigour and verification
- Systematic process
- Meticulous record keeping
- Collect quotes that reflect evolving narrative (to verify examples of coding)
- Identify themes that might be contrary to emerging themes
- Iteration of methods
- Consider having more than one researcher review
- Consider member checks - take back to participants to check
- Clearly identify the limitations of the study.

Be systematic and methodical

Question and data types
Levels of measurement
Nominal/categorical
- What is your design discipline
- How do you commute to work?
- What is preferred laptop brand?

Summarising
- Number of responses to each category
- Percentage of responses to each category
- Calculating mean and median is meaningless
- Sometimes makes sense to collapse categories.

Ordinal
Categories that have order
Distance between categories not known
- How often do you use the library?
- What size do you like to draw at?

Summarising
- Report similar to categorical
- Can collapse categories if appropriate

Week 4 Lecture Notes (Continued)

Interval/ratio
Ordered
Distance between response known
Numerical data
- Rating/likert scales
- Count data
- Most physical measurements

Summarising
- Reporting the number of repsonses
- Reporting percentage of responses
- Collapsing data
- Descriptive statistics
- Central tendency
- Viability

Central tendency
Describes a data set by typical value and distribution
- Mean - Average
- Median
- Mode - Most often response

Sentence
Requires short or long written response. Usually not categorical, ordered or able to establish distance between response.
- Principles of qualitative analysis apply
- Identify / codify keywords to convert to categorical data
- Count and report frequency of keywords.

Multivariate analysis
- Show comparisons, contrasts, differences
- Show causality, mechanism, structure, explanation
- Show multivariate data

Bivariate analysis
Relationship between two categorical variables

Crosstabulation: relationship between two categories

Calculate using
- Online survey software
- Manually sort/filter data using excel

Visualise
- Number/graphic matrix
- Bar graph
- Fineo diagram

Interviews
Codify themes and concepts that emerge
- Apply structure to the data
- Identify common themes
- Identify patterns and relationships

Two analysis methods:
- Content/thematic analysis
- Affinity diagramming

Content analysis
A structured approach used to identify meaning and patterns in textual information.

Content analysis requires coding
- Assigning categories or themes to the text
- A bit like annotating a document with comments

Week 4 Lecture Notes (Continued)

Developing a coding scheme, what code?
- Should link back to your research question
- Applying a coding scheme from an existing framework or method
- Deriving codes from concepts in the literature
- Developing your own codes inductively - open coding

Coding text
Coding schemes usually involve multiple levels
- Cateogry
- Code
- Sub code
- Provide an example explaining the code

Consider a mix of subjective and objective codes

Word
Nvivo
Otter.ai

Timestamping

Content analysis

Conceptual analysis
Analysing the frequency that coded concepts (themes, issues, words, phrases, etc.) appear in text.
- Frequency can be expressed as total number, probability, percentage.

Used for
- Exploring and identifying important concepts in the data
- Describing your data

Relational analysis
Relationships between codes can be inferred by proximity
- Two overlapping codes have a relationship
- Co-occurrence

Affinity diagramming
Using raw audio data
1. Start with raw audio recordings
2. As you listen through the recording, indvidual concepts are written down on post-it notes
   - Verbatim or paraphrased
   - Record participant and timestamps so you can find the quote later
3. Concepts are then arranged into themes
4. A different coloured post it note is then used to lable the themes

Reporting results
- Summary table identifying themes and related concepts
- Interpretation in text
- Supporting quotes

Data visualisation
Resources
- Flourish
- Datawrapper
- Tableau Public
- Flowingdata
- Data to viz
- Rawgraphs

Create custom graphs
- Adobe Illustrator
- Affinity Designer
- Powerpoint
- Keynote
- Miro

Week 4 Studio 1

Conversation with Raf

Get the new survey fully developed and sent away as quick as possible.

Look at QUT papers or studies on previous micromobility research.

See if you can find the primary researchers in these papers and potentially contact them for an interview.

Ask Andry if he has any colleagues that would be willing to participate in an interview and proceed by emailing them.

Identify any QUT academics that may have knowledge on the micromobility field and contact them for a potential interview.

Ensure to include a section in the survey inviting any survey participants to contact you back for an interview or additional quetions.

Survey Development

Section 1 of 6

E-Skateboarding - End User Research

This survey is intended to take 10 - 15 minutes to fill out. The insights from these questions aim to inform and give me a better understanding of how e-skateboarding is directly perceived in terms of safety, enjoyment, and the current use of technology or equipment.

This survey is intended for e-skateboarders or participants with e-skateboarding knowledge, but insight from other user demographics of the micromobility field are still welcome!

Outline of project:
The purpose of this research is to identify viable opportunities, overarching issues and stakeholder experiences relating to e-skateboarding. In particular, areas involving awareness and visibility as well as the safe integration of these devices will be thoroughly explored to ensure pedestrians, other road users, and the riders themselves feel a sense of safety and belonging in all environments.

My main goal through this research is to better understand how as a designer I can create a more connected and aware environment for e-skateboarding so that not only can it be enjoyed safely by the riders, it can also allow other road users and pedestrians to feel a sense of safety when sharing these spaces.

For more information see the Project Information sheet:
https://drive.google.com/file/d/1IEED2t7x0o0XETpm1qPjy4r-talxtbSQ/view?usp=sharing

I encourage you to complete as many questions as you can with honesty.

Thank you for participating in this research project.

By ticking the below boxes, you are indicating that you:

Have read and understood the information document regarding this research project.

Have had any questions answered to your satisfaction.

Understand that if you have any additional questions you can contact the research team.

Understand that you are free to withdraw without comment or penalty.

Understand that if you have concerns about the ethical conduct of the research project you can contact me on email at riley.dagg@connect.qut.edu.au

Agree to participate in the research project.

☐ I am 18 years of age or over

Do you give consent for this research project to use your responses anonymously? *

☐ I agree to allow my answers to inform this project

Section 2 of 6

About you

This section helps to better inform the findings of later questions

What is your gender? *

○ Female

○ Male

○ Other

Survey Development

What is your age? *

- 18 - 25
- 26 - 30
- 31 - 35
- 36 - 40
- 41 - 45
- 45 +

How often do you ride an e-skateboard? *

- Daily
- Weekly
- Fortnightly
- Monthly
- Less than monthly

What other personal mobility devices have you used? *

- E-Bike
- E-Scooter
- One-wheel devices
- Other
- None

Why do you ride your e-skateboard? *

- You ride to work
- You ride to a place of study
- You ride as a hobby or for enjoyment
- You ride for a new experience
- Other...

How long have you been riding an e-skateboard for? *

- <1 year
- 1 - 4 years
- 4 - 7 years
- 7 - 10 years
- 10 + years

What is your e-skateboarding skill level? *

	1	2	3	4	5	
Not very skilled	○	○	○	○	○	Very skilled

Survey Development

Section 3 of 6

Enjoyment

This section aims to understand why users ride e-skateboards and why they don't

What do you enjoy the most about e-skateboarding? *

Long-answer text

How much enjoyment do you get when riding an e-skateboard? *

	1	2	3	4	5	
Little enjoyment	○	○	○	○	○	A lot of enjoyment

How do these factors influence your perception and enjoyment of e-skateboarding? *

	Don't enjoy/Dislike	Neutral	Enjoy/Like
Pedestrian interaction	○	○	○
Other road user interacti...	○	○	○
Having to alert other roa...	○	○	○
Going fast	○	○	○
The risky nature of riding	○	○	○
Being able to learn som...	○	○	○
Being active/health ben...	○	○	○
Surrounding nature	○	○	○
Surrounding infrastructu...	○	○	○
Surrounding noise	○	○	○
Technicality of riding	○	○	○
Wearing PPE or other eq...	○	○	○

Survey Development

Are there any other factors you like about e-skateboarding? *

Short-answer text

Are there any other factors you dislike about e-skateboarding? *

Short-answer text

Are there any notable times when you thoroughly enjoyed riding your e-skateboard? *

Short-answer text

Are there any notable times when you disliked riding your e-skateboard? *

Short-answer text

Section 4 of 6

Safety and awareness

This section helps to understand safety processes and how safety is perceived when riding

What personal protective equipment or equipment do you use when riding an e-skateboard? *

- [ ] Helmet
- [ ] Gloves
- [ ] Shoulder pads
- [ ] Elbow pads
- [ ] Knee pads
- [ ] Shin guards
- [ ] Safety vest
- [ ] Protective boots
- [ ] Chest plate
- [ ] Additional light sources
- [ ] First Aid Kit
- [ ] Other...

Survey Development

How safe do you feel when riding an e-skateboard *

	1	2	3	4	5	
Not safe at all	○	○	○	○	○	Very safe

What makes you feel safe when riding an e-skateboard? *

Long-answer text

Have you ever experienced an accident riding an e-skateboard? *

- ○ Yes
- ○ No

Did you sustain any injuries because of the accident(s)? *

- ○ Yes
- ○ No

What type of injuries did you sustain? *

- ☐ Fracture/Break
- ☐ Concussion
- ☐ Scrape/Cut
- ☐ Bruising
- ☐ Swelling
- ☐ Dislocation
- ☐ None
- ☐ Other...

Have you ever seen an accident or emergency happen other than yourself being involved? *

- ○ Yes
- ○ No

Survey Development

Can you describe how your or someone else's accident(s) happened and how it proceeded? (or both) *

Short-answer text

What factors do you think contribute the most to e-skateboarding accidents? *

- [ ] Rider and skateboard visibility
- [ ] Careless driving by other road users
- [ ] Careless pedestrian behaviour
- [ ] Careless e-skateboarder behaviour
- [ ] Pedestrians not being aware
- [ ] Other road users not being aware
- [ ] Other...

Did the environment/weather impact the accident?

- ( ) Yes
- ( ) No

(If yes) What conditions were you riding in before the accident

- [ ] Early morning
- [ ] Late afternoon (Sun glare)
- [ ] Night time (Dark)
- [ ] Wind
- [ ] Rain
- [ ] Storm/heavy rain

Do you have any insight into why pedestrians or other road users may be unaware of an e-skateboarder? *

Short-answer text

Do you have any insights or experiences regarding the visibility of e-skateboards? *

Short-answer text

Survey Development

Are other road users/pedestrians easy to alert when needing to make your presence known?

- Yes
- No

What makes it challenging or easy to alert pedestrians/road users of your presence?

Short-answer text

How do you approach riding an e-skateboard to help prevent accidents from happening? *

Short-answer text

How aware and prepared do you feel about your own e-skateboarding safety? *

	1	2	3	4	5	
Not very aware	○	○	○	○	○	Very aware

From your own experiences, how aware and prepared do you think other road users or pedestrians are about e-skateboarding safety? *

	1	2	3	4	5	
Not very aware	○	○	○	○	○	Very aware

From your own experiences, how aware and prepared do you think other road users or pedestrians are about their own safety? *

	1	2	3	4	5	
Not very aware	○	○	○	○	○	Very aware

Survey Development

Section 5 of 6

Technology

This section helps to understand how technology is used and perceived

What types of technology do you use when you ride? *

- [ ] Smart Watch
- [ ] Personal Phone
- [ ] Headphones/Earphones
- [ ] Speakers
- [ ] Bell
- [ ] Lights
- [ ] Indicators
- [ ] Accelerator/Braking device
- [ ] Other...

Is some of the above technology not as accessible for an e-skateboard?

Short-answer text

Do you think any of the technology you didn't select would benefit rider visibility if it were accessible for your e-skateboard?

Short-answer text

Bells, lights, and indicators are commonly used in e-bikes/e-scooters. How could this help e-skateboards become more visible?

Short-answer text

How important are the selected technology to your e-skateboarding experience? *

	1	2	3	4	5	
Not important	○	○	○	○	○	Very important

Survey Development

How does your selected technology impact your e-skateboarding experience? *

Short-answer text

What positives are there with current e-skateboarding technology? *

Long-answer text

What limitations are there with current e-skateboarding technology? *

Short-answer text

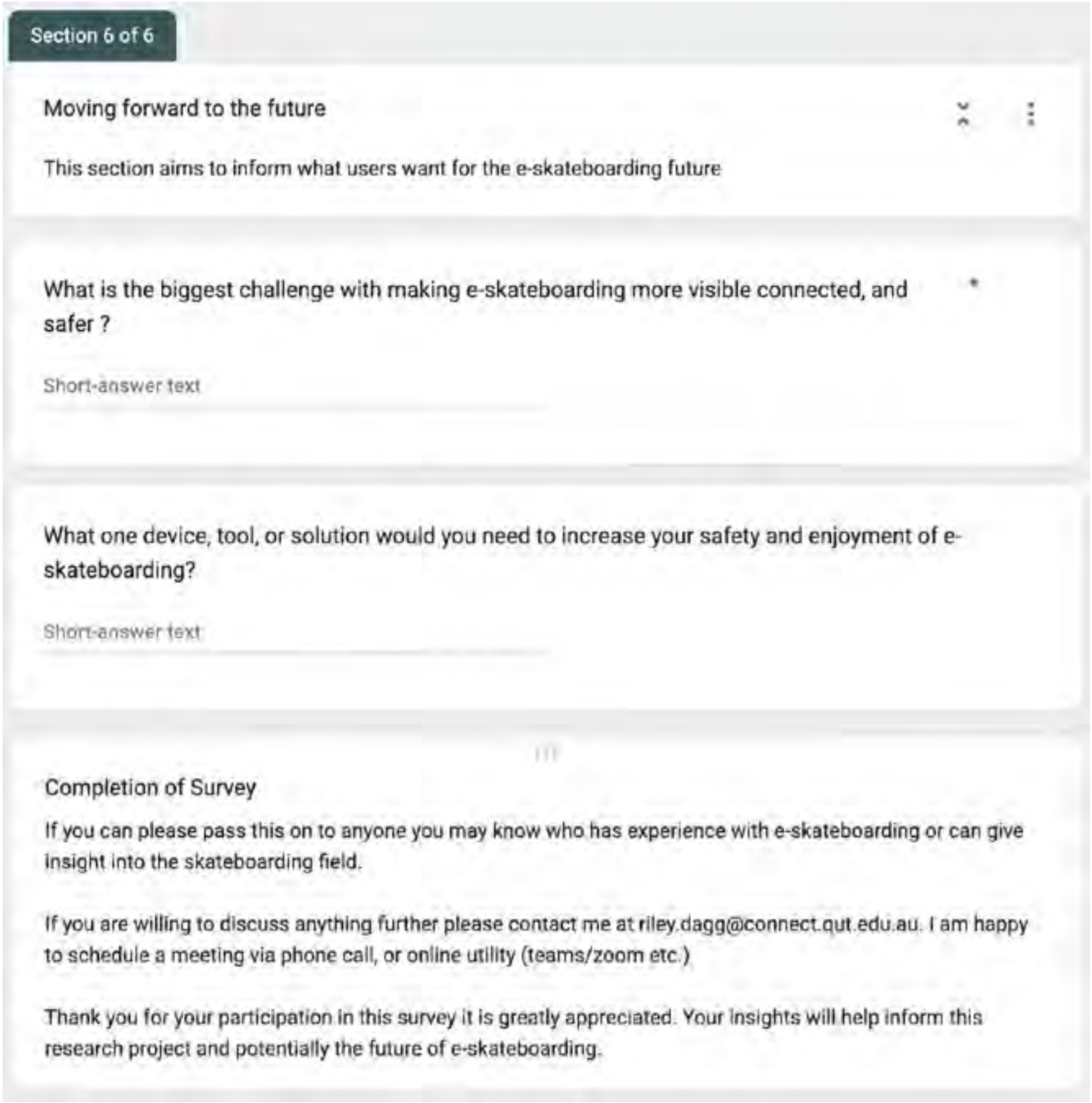
Do you face any challenges when riding due to a lack of e-skateboard technology? *

- Yes
- No

(If yes) What do these challenges include? *

- Being able to alert people
- Being able to give others indication
- Being able to stay visible
- Tracking statistics of ride
- GPS tracking
- Accelerating/braking
- None
- Other

Survey Development



Section 6 of 6

Moving forward to the future

This section aims to inform what users want for the e-skateboarding future

What is the biggest challenge with making e-skateboarding more visible connected, and safer ? *

Short-answer text

What one device, tool, or solution would you need to increase your safety and enjoyment of e-skateboarding?

Short-answer text

Completion of Survey

If you can please pass this on to anyone you may know who has experience with e-skateboarding or can give insight into the skateboarding field.

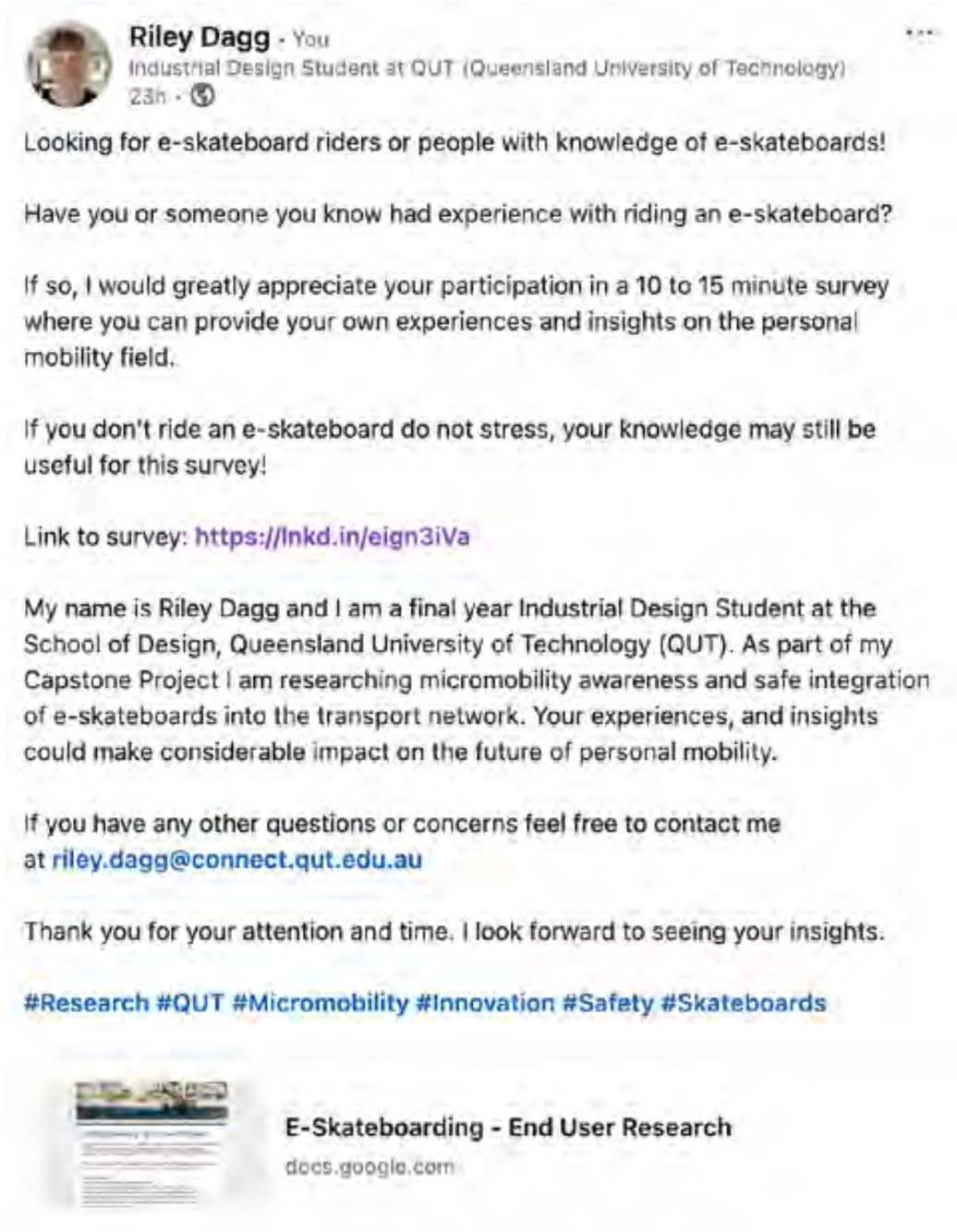
If you are willing to discuss anything further please contact me at riley.dagg@connect.qut.edu.au. I am happy to schedule a meeting via phone call, or online utility (teams/zoom etc.)

Thank you for your participation in this survey it is greatly appreciated. Your insights will help inform this research project and potentially the future of e-skateboarding.

Social Media Posts

Instagram Post

LinkedIn Post



Social Media Posts

LinkedIn Post x2

Survey Exchange | Find survey participants | dissertat...
Riley Dagg • You
1d • Edited •

Looking for e-skateboard riders or people with knowledge of e-skateboards!

Have you or someone you know had experience with riding an e-skateboard?

If so, I would greatly appreciate your participation in a 10 to 15 minute survey where you can provide your own experiences and insights on the personal mobility field.

If you don't ride an e-skateboard do not stress, your knowledge may still be useful for this survey!

Link to survey: https://lnkd.in/eign3iVa

My name is Riley Dagg and I am a final year Industrial Design Student at the School of Design, Queensland University of Technology (QUT). As part of my Capstone Project I am researching micromobility awareness and safe integration of e-skateboards into the transport network. Your experiences, and insights could make considerable impact on the future of personal mobility.

If you have any other questions or concerns feel free to contact me at riley.dagg@connect.qut.edu.au

Thank you for your attention and time. I look forward to seeing your insights.

#Research #QUT #Micromobility #Innovation #Safety #Skateboards

E-Skateboarding - End User Research
docs.google.com

Reddit Post

r/ElectricSkateboarding • 21 hr. ago
Weak_Payment_5766

E-Skateboard Research Project Survey

Discussion

Hey everyone,

As part of my final University design project I am sending out a survey to gain a deeper understanding of how people perceive e-skateboarding through enjoyment, safety, awareness, and the technology that may be used by riders.

I am using this forum as a platform to see if anyone would be interested in participating in this short 10 - 15 minute survey. There is no need to worry though, all responses are anonymous and no personal information is required. If you are after more information I have attached the project overview in the survey, as well as a participant information sheet.

If you are interested the link will be at the bottom of this post. I look forward to seeing what everyone thinks as I believe your insights could really help inform this project. Most of all thank you all for your time.

Link to survey: https://docs.google.com/forms/d/e/1FAIpQLSd46bExlxb4yaKdf68CqylbOweJR_ohOLY6PAJXct-2TLohtw/viewform?usp=header

Discord Post

riley04 Yesterday at 9:20 PM
Hey everyone, I found this server and wanted to see if anyone would be interested in partaking in a short survey I developed. This is for my final year university project around e-skateboards. If you wanna know more info you can find that linked within the survey. But yeah I just wanted to gauge any interest before I dropped the survey and to see if it was worthwhile. Thanks everyone!

riley04 Yesterday at 9:17 PM
https://docs.google.com/forms/d/e/1FAIpQLSd46bExlxb4yaKdf68CqylbOweJR_ohOLY6PAJXct-2TLohtw/viewform?usp=header
1
here is the survey if ya'll are interested!

Contacting Professionals

My name is Riley Dagg a final year Design student at QUT.

I am emailing to see if you would be interested in participating in a 30 - 45 minute interview for my Design Capstone project at QUT.

Outline of project:
The purpose of this research is to identify viable opportunities, overarching issues and stakeholder experiences relating to e-skateboarding. In particular, areas involving awareness and visibility as well as the safe integration of these devices will be thoroughly explored to ensure pedestrians, other road users, and the riders themselves feel a sense of safety and belonging in all environments. Insight into other aspects of micromobility is also welcomed.

My main goal through this research is to better understand how as a designer I can create a more connected and aware environment for e-skateboarding so that not only can it be enjoyed safely by the riders, it can also allow other road users and pedestrians to feel a sense of safety when sharing these spaces.

You may be interested in participating if:

- You use an e-skateboard / other personal mobility devices
- You have a strong connection to e-skateboards.
- You have insights or knowledge about e-skateboards / and or micromobility.
- You have experienced or perceived micromobility as a pedestrian.
- You have experienced an incident relating to your e-skateboarding device or another person's.
- You have your own thoughts or ideas regarding micromobility and its future.
- You know of other people who use personal mobility devices (e-scooter, e-bike, or e-skateboard).

For further details on this project or information on consent/privacy please see the attached interview participation sheet: https://drive.google.com/file/d/1Gul2skpxhcW4JgSG77Zd8TSB5W4UL-Vo/view?usp=sharing

Let me know if you would be interested in participating, so we can discuss an interview time. Thank you very much for your time.

Kind regards

Riley Dagg

RD Riley Dagg

To:

Thu 14/08/2025 4:03 PM

Does sometime between 10:00 am - 12:30 pm for a 30 minute block work for you tomorrow (Friday 15/08/2025)?

I am able to meet in person between these times tomorrow (Friday 15/08/2025).

I understand if this is late notice, we can push for next week if so. However, there is no preparation required on your end so I won't take much of your time.

Regards,

Riley

Reply Forward

Contacting Professionals

Good morning,

My name is Riley Dagg a final year Design student at QUT.

I am emailing to see if you would be interested in participating in a 30 - 45 minute interview for my Design Capstone project at QUT.

Outline of project:
The purpose of this research is to identify viable opportunities, overarching issues and stakeholder experiences relating to e-skateboarding. In particular, areas involving awareness and visibility as well as the safe integration of these devices will be thoroughly explored to ensure pedestrians, other road users, and the riders themselves feel a sense of safety and belonging in all environments. Insight into other aspects of micromobility is also welcomed.

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- You have a strong connection to e-skateboards.
- You have insights or knowledge about e-skateboards / and or micromobility.
- You have experienced or perceived micromobility as a pedestrian.
- You have experienced an incident relating to your e-skateboarding device or another person's.
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For further details on this project or information on consent/privacy please see the attached interview participation sheet: https://drive.google.com/file/d/1GuI2skpxhcW4JgSG77Zd8TSB5W4UL-Vo/view?usp=sharing

Let me know if you would be interested in participating. Thank you very much for your time.

Kind regards

Riley Dagg

Contacting Professionals

Full name *

Riley Dagg

Email *

riley.dagg@connect.qut.edu.au

Subject *

Other

E-Skateboard Interview

Message *

Dear who ever this may concern at the Evolve Skateboard company.

My name is Riley Dagg a final year Design student at Queensland University of Technology.

I am emailing to see if you would be interested in participating in a 30 - 45 minute

Attach Files

Attach up to 10 files. The maximum allowed size per file is 10 MB

Interview Participation Information.pdf ✓ Uploaded - 100% ×

Send

Contact us

Your request was sent!

We will reach out to you via email soon.

Leave Another Message

evolve SKATEBOARDS

Contacting Participants

Hi Riley,

ridden my Boosted Board for 7 years and 5,000km over that time.

I filled out your questionnaire that you posted on Reddit. Feel free to reach out to me if you have any questions to help you with your project.

Cheers

Thank you for contacting me after the completion of my survey, I really appreciate your involvement and willingness to reach out.

I have additional questions I would like to ask you if that is something you would be interested in participating in.

In terms of your participation in this interview it may involve an audio recorded / video recorded / or written answer format that will only take 20 minutes of your time.

If you choose the written format, it does not involve any form of face-to-face interviewing or video recording. This may be preferable to you due to time zones and the viability of being able to meet online. Written format would work by me sending you a question sheet where you can either send back your answers in a recorded audio format or alternatively written down in a word/pdf document.

The interview mode is entirely preference based and can be changed to suit your own needs and time.

Questions will include (but are not limited to):

- What are the biggest limitations with e-skateboards when comparing them to e-scooters or e-bikes?
- How do e-skateboard limitations impact the experience and safety of riding the device?
- What is the biggest challenge with making e-skateboarding more visible, connected, and safer?
- Why do you think pedestrians or other road users perceive e-skateboarder visibility or safety so poorly?
- What aspects make it difficult for other road users to be more aware of an e-skateboarder?

I kindly ask though that you read the participant interview information sheet before answering any questions. I will attach this within the email for your perusal. Finally, at the start of the question sheet it will ask for your consent in regard to involvement within this project. The consent requires you to have read the participation information sheet and agree to the dot points.

Participant Information Sheet: https://drive.google.com/file/d/14qvZvRYjJlDQUm4eb3g77AYFpTTdZF9/view?usp=sharing

Question and Consent Sheet: https://docs.google.com/document/d/1EF_55lXvs6hrhKVvC01QumoN9lKqi2SJ/edit?usp=sharing&ouid=117917403488650494392&rtpof=true&sd=true

If this is something you would be interested in then let me know and you are more then welcome to answer the questions!

Thank you once again for your time, I greatly appreciate your involvement and can't wait to hear back from you!

Cheers

Riley

Week 4 Studio 2

Conversation with Raf

Raf reviewed my interview questions for my academic participants and the Evolve Skateboard company. His feedback was to split the questions into sections just like what I did for the survey questions (Experience, enjoyment, safety, awareness, and technology etc.).

Additionally, he added that a handful of interviews would be ideal (3) which is what I had planned out. He mentioned that in regard to interviewing Evolve Skateboards I could do that after the completion of all the other data. This way I could show them my findings and see if they had any insights on how I could go about developing a solution.

Raf was also impressed with the turn around I had with survey responses as I had only posted the survey 1.5 days ago. He said 30 responses should be a limit as anymore would just add unnecessary clutter.

The conversation concluded after I told him I was currently at the stage of starting the research report, and by the end of next week I would have most of the raw data collecte ready to analyse and implement into the research report.

Research

Fatal crashes involving electric skateboards are increasing
https://www.surfertoday.com/skateboarding/electric-skateboard-dangers

“The number of accidents involving electric skateboards has grown exponentially in the 2020’s”.

Electric skateboards were introduced in the 2010’s and became readily available for previously experienced four wheeled device riders. However, as more entered the market the increase in tragic electric vehicle accidents was exponential.

In the span of a few months at least six fatal accidents occured due to varying circumstances such as unaware rider/pedestrians, falling off, and colliding with different vehicles or objects.

Urgent changes
While the inherent issue is the skateboard riders as they are the ones experiencing injuries and fatalities, there is still concern for surrounding road users and pedestrians who share public spaces with riders.

Why e-skateboards could be dangerous
Studies have indicated that e-skateboards should be used supervised by experiences riders until the rider is comfortable and familiar with how the device operates. While experience can still contribute to accidents there is far greater chance of minimising risks and incidents with experience under the riders belt.

High speeds and sudden stop defects
There is concern around sudden stop defects as e-skates can reach speeds of 50km per hour. Recovering from a sudden stop is nearly impossible as the rider could be thrown from the board unexpectedly.

Minimal protective gear
Studies show that e-skateboarding lacks adequate equipment and technology to increase riding safety, unlike bikes and motorbikes.

These particular vehicles are enforced and supported by a range of protective equipment.

Poor visibility and lack of lighting
Many skateboarders partake in skating during low light environments that can increase lack of visibility around the rider. Currently there are limited devices that provide reflective, light based, or sound based features.

Insufficient regulation and rider training
There is significant grey area around these newer skatboard devices unlike bikes and scooters. While they are certainly more established with regulations skateboards are left in the dark with what is acceptable and the right way to go about riding and increasing safety.

Week 5

Week 5 Lecture Notes

A1: Part 1 and 2

A1 Part 1: Research Report
- Presented graphically well
- Has a clear heirarchy
- Images are referenced appropriately

- Word count (excludes, tables, graphs, appendix, and reference list)
- Authenticity statement (name, student number, data)
- AI use statement (how and where was AI used within the report)
- Raw data in appendix (transcriptions, codes, images of observations)

Layout of report
Introduction: 200 - 250 words

Background: 400 words

Benchmarking 400 - 600 words

Research 400 - 800 words

Analysis and findings: 400 - 800 words (report findings do not give meaning)

Discussion: 400 words (give meaning to findings)

Design implications: 400 - 600 words (what does it mean for design)

Conclusion 200 - 300 words

Include a brief introduction and summary of each section

2800 to 4000 words

Relevant literature and benchmarking
- Research conducted, written and summarised on chosen topic

Clarity and sophistication of study
- Use of reserach methods
- Relevance of findings to concept opportunities

Presentation

A1 Part 2: Concept presentation
- Presentation in small class groups
- At least five concepts developed
- Think of viable design opportunities that could lead the development of each concept

- 5 - 7 minutes max
- Brief summary of research (What did you do for primary research)
- Present initial concepts
- Concept images
- Key features, functions

- Problem
- Solution
- Context of use
- Design criteria

Initial concepts
- Quality and volume of initial concepts presented
- Resolution and level of details of concepts presented

Presentation
- Standard of visual presentation

Week 5 Studio 1

Conversation with Raf

- Survey finished
- Need to commence interviews
- Draft started for research report

By friday have at least 2 interviews done

Contacting Professionals

Good morning,

My name is Riley Dagg a final year Design student at QUT.

I am emailing to see if you would be interested in participating in a 30 - 45 minute interview for my Design Capstone project at QUT.

Outline of project:
The purpose of this research is to identify viable opportunities, overarching issues and stakeholder experiences relating to e-skateboarding. In particular, areas involving awareness and visibility as well as the safe integration of these devices will be thoroughly explored to ensure pedestrians, other road users, and the riders themselves feel a sense of safety and belonging in all environments. Insight into other aspects of micromobility is also welcomed.

My main goal through this research is to better understand how as a designer I can create a more connected and aware environment for e-skateboarding so that not only can it be enjoyed safely by the riders, it can also allow other road users and pedestrians to feel a sense of safety when sharing these spaces.

You may be interested in participating if:

- You use an e-skateboard / other personal mobility devices
- You have a strong connection to e-skateboards.
- You have insights or knowledge about e-skateboards / and or micromobility.
- You have experienced or perceived micromobility as a pedestrian.
- You have experienced an incident relating to your e-skateboarding device or another person's.
- You have your own thoughts or ideas regarding micromobility and its future.
- You know of other people who use personal mobility devices (e-scooter, e-bike, or e-skateboard).

For further details on this project or information on consent/privacy please see the attached interview participation sheet: https://drive.google.com/file/d/1BdylTMz8v1Ex6osGErRDF8Z6YR_2Eb0L/view?usp=sharing

Let me know if you would be interested in participating. Thank you very much for your time.

Kind regards

Riley Dagg, Industrial Design Student at Queensland University of Technology

Contacting Professionals

Hi

Thank you for agreeing to participate and help out with my capstone project, I appreciate it a lot.

I am available:

- Friday 22nd Aug (tomorrow) between 10:45 am and 4:00 pm
- Tuesday 26th Aug between 10:30 am and 1:00 pm
- Wednesday 27th Aug between 11:30 am and 4:00 pm
- Thursday 28th Aug between 10:00 am and 4:00 pm
- Friday 29th Aug between 10:00 am and 4:00 pm

Let me know if any of those times work for you!

In terms of meeting, we could use zoom, teams, or alternatively via a phone call. Whatever suits you an

Also as mentioned in the information sheet this meeting is intended to be recorded, let me know if this i
will attach a consent form within this email where you can agree or disagree to participation.

Interview Consent Form

Thank you once again Dr Buning, I look forward to meeting with you!

Regards,

Riley

Interview Questions (Participant)

Participant Questions

1. What are the biggest limitations with e-skateboards when comparing them to e-scooters or e-bikes?

2. How do e-skateboard limitations impact the experience and safety of riding the device?

3. What is the biggest challenge with making e-skateboarding more visible, connected, and safer?

4. Is there a lack of equipment or technology that would make e-skateboarding safer and allow other road users to be more aware of you? What?

5. Are there any notable aspects that an e-bike/e-scooter has that would benefit an e-skateboarder stay more visible?

6. Why do you think pedestrians or other road users perceive e-skateboarder visibility or safety so poorly?

7. What aspects make it difficult for other road users to be more aware of an e-skateboarder?

8. As an e-skateboarder how would you like to make yourself more visible to other road users?

9. Would you consider using a bell or some sort of sound system to alert other road users/pedestrians?

10. What do you think would be the impacts of using a sound system (bell/speaker) for alerting others?

11. Would sound be enough for alerting others and staying visible and heard or would you need something else as an e-skateboarder?

Interview Questions (Industry Experts)

Interview Questions

Experience

1. Can you tell me about your expertise in micromobility?

2. In that area how would you rate your level of expertise out of 1 to 5. 1 limited knowledge, and 5 being a high level of knowledge.

3. Would you be willing to provide a brief summary of your involvement with the micromobility field and what understanding you have about it?

   (This could include some projects you have worked on, or research you have done)

4. What aspects do you think people look for in a personal mobility device that make it a great quality device?

5. In your research what are the main features you look for or consider when looking at a personal mobility device?

6. How do you think these features impact the way the person uses the device?

7. How do you think these features impact the way other road users or pedestrians experience and perceive the device?

Safety, awareness, and technology

8. What are the biggest limitations with e-skateboards when comparing them to e-scooters or e-bikes?

9. How do you think e-skateboard limitations impact the experience and safety of riding the device?

10. What are the biggest challenges with making e-skateboarding more visible, connected, and safer?

11. Are there different aspects from other road users or pedestrian's perspectives that make awareness of an e-skateboarder difficult?

12. Is there a lack of equipment or technology that makes e-skateboarding safer and allow other road users to be more aware?

13. What do you think the impacts would be of using a sound system like a bell or speaker for alerting others road users and pedestrians?

14. Would sound be enough for alerting pedestrians and staying visible and heard or would e-skateboarders need something else to make reasonable impact?

Future thinking

15. As a micromobility researcher how would you go about informing manufacturers on the best ways to develop an e-skateboard, noting new ways of increasing visibility and safety?

16. Are there any features or technology currently not accessible you would inform manufactures about to increase the awareness and safety around e-skateboarding?

Interview Questions (Design Experts)

Interview Questions

Experience

1. Can you tell me about your expertise in micromobility?

2. In that area how would you rate your level of expertise out of 1 to 5. 1 limited knowledge, and 5 being a high level of knowledge.

3. Would you be willing to provide a brief summary of your involvement with the micromobility field and what understanding you have about it?

   (This could include some projects you have worked on, research you have done, or the personal transport unit).

4. What aspects do you think people look for in a personal mobility device that make it a great quality product?

5. What would be the main design features you look for or consider when designing a personal mobility device?

6. How do you think these features impact the way the person uses the device?

7. How do you think these features impact the way other road users or pedestrians experience and perceive the device?

Safety, awareness, and technology

8. What are the biggest limitations with e-skateboards when comparing them to e-scooters or e-bikes?

9. How do you think e-skateboard limitations impact the experience and safety of riding the device?

10. What are the biggest challenges with making e-skateboarding more visible, connected, and safer?

11. Are there different aspects from other road users or pedestrian's perspectives that make awareness of an e-skateboarder difficult?

12. Is there a lack of equipment or technology that makes e-skateboarding safer and allow other road users to be more aware?

13. What do you think the impacts would be of using a sound system like a bell or speaker for alerting others road users and pedestrians?

14. Would sound be enough for alerting pedestrians and staying visible and heard or would e-skateboarders need something else to make reasonable impact?

Future thinking

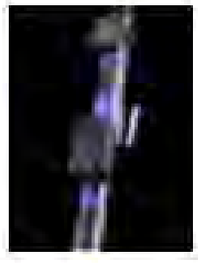
15. As a designer are there features or technology you would like to include in future manufacturing of e-skateboards to make them safer and allow the devices to stand out more?

16. Are there any features or technology you think currently aren't accessible for e-skateboards but would make a great impact in the future?

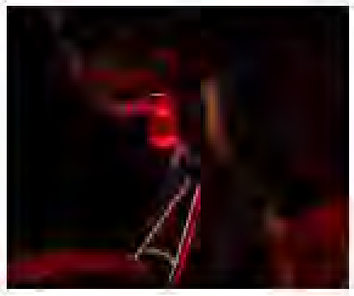
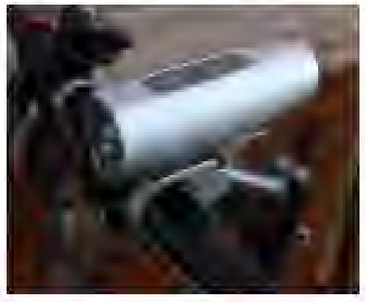
Product Benchmarking

	Lumos Commuter Helmet	Lumos Road Bike Helmet	Lumos Firefly	Lumos Firefly Mini	Rear turn signal mount
Description	An upper echelon bike helmet which is designed for mass customisation and the ability to stand out. This product features turn signals, long range visibility, brake lights, and waterproof material. 	A high range bike helmet designed to suit the everyday rider. The helmets integrated tech makes it highly usable on the roads and is a one size fits all product. 	Small, versatile, and great for simple visibility. The Lumos firefly LED's are an attachable device that provide effective lighting and awareness. 	Similar to the larger device, the firefly mini are a small alternative to its original counterpart. They are ideal for smaller mobility devices and are good for providing a visible lighting radius 	The rear signal mounting system is a versatile and in most cases an easy to use device that is great for making it clear where PMD riders are positioned. 
Price	$129.95 - $189.95	$39.99 - $74.98	x1 = $49.95	x1 = $34.95	$29.95
Lifespan	1-2 year warranty	1-2 year warranty	35hr battery life	14hr battery life	1 year warranty
Cost	2	4	4	4	5
Usability	8	8	7	7	6
Functionality	9	9	7	7	6
Durability	6	6	6	6	6
Aesthetics	8	8	8	8	7
Ergonomics	8	8	7	7	7
Technology	10	9	8	8	9
Quality	9	9	7	7	7
Transferability	5	5	4	4	3

Product Benchmarking

	Bike Bells	Smart Bike Helmets	Indicating System	High-Vis Vest	Shield Technology
Description	A modified piece of equipment that is originally made for bikes and some scooters. The bell is simplistic and easy to use but lacks overall quality and ergonomics. There are also no distinct ways of equipping this in a skateboard setup. 	Superior helmets provide a technological advancement to riding a device. High end plastics and polymers makes these helmets durable, and the addition of different tech increases its functionality. 	A small, easy to use device which can be purchased for a reasonable price and attached to many micromobility devices. The technology allows riders to stand out in various settings. 	Lightweight, breathable and highly altertive with the use of a bright aesthetic and reflective material. High-vis vests are great for standing out and have an ease of use as they can be slipped on. 	An advanced IoT technology which allows riders to feel safe around pedestrians. It has road and surface detectability, as well as adjustable speed safety. The device only accessible when hiring a public scooter. 
Price	$5 - $30	$74.98 - $189.95	$40 - $150	$5 - $15	N/A
Lifespan	1-5 years	3–5 years	3 years	1 year	2-5 years
Cost	10	5	7	10	7
Usability	7	8	8	8	7
Functionality	6	8	6	7	8
Durability	6	7	7	7	7
Aesthetics	5	9	8	7	8
Ergonomics	6	8	7	7	6
Technology	3	9	9	4	9
Quality	4	8	7	7	9
Transferability	4	10	4	10	5

Product Benchmarking

	Flock	Blaze	Bike Beam Projector	Bike Zone
Description	Flock allows bike riders to light up their legs and be seen sooner. This innovative bike design encourages safe bike riding and ensures that every rider can be seen by other road users. It uses LED lights to highlight the rider.	A new, innovative bike concept that encourages bike riders and gives them a sense of safety. The design projects a bike symbol in the area in front of the bike giving other roads users indication of where the bike rider is heading. This is a design specifically for bikes	A solution for increasing the visibility of bike riders in a fun, engaging way. This concept uses laser projection to emit pictures, videos, or information into the surrounding area. The intent is to give other road users indication of where they are.	A laser projector design solution for increasing the safety of bike riders. This concept uses lasers to light up the area bike riders are travelling in giving other road users every indication of their whereabouts.
				
Usability	7	6	7	7
Functionality	9	5	8	8
Durability	8	6	7	7
Aesthetics	10	8	8	9
Ergonomics	8	6	6	7
Technology	10	7	8	9
Quality	10	6	7	8
Transferability	3	3	2	4

Product Benchmarking

	Premium Helmet	Standard Helmet	Firefly LED's	Mini Firefly LED's	Rear Signal Mount
Description	An upper echelon bike helmet which is designed for mass customisation and the ability to stand out. This product features turn signals, long visibility, brake lights, and waterproof material.	A high range bike helmet designed to suit the everyday rider. The helmets integrated tech makes it highly usable on the roads and is a one size fits all product.	Small, versatile, and great for simple visibility. The Lumos firefly LED's are an attachable device that provide effective lighting and awareness.	Similar to the larger device, the firefly mini are a small alternative to its original counterpart. They are ideal for smaller mobility devices and are good for providing a visible lighting radius	The rear signal mounting system is a versatile and in most cases an easy to use device that is great for making it clear where PMD riders are positioned.

(Lumos Product Benchmarking, Riley Dagg, 2025)

Product Benchmarking

Week 5 Studio 2

Conversation with Raf

Richard Buning
Causual chat with him in the design stage

Observation
Good will bridge
Just observe no book or anything
How do people navigate

Week 6

Week 7

Meeting and Sampling Log

Date of Meeting	Week of Meeting	Brief Summary of Meeting
25/07/2025 Friday	Week 1	**Meeting with Professor Andry Rakotonirainy** Discussed scope of the project and an intended outcome. Explored current situation and first steps of research.
01/08/2025 Friday	Week 2	**Meeting with Professor Andry Rakotonirainy** Followed up on project progress highlighting areas to delve into next. Gained more information on Andry's thoughts.
08/08/2025 Friday	Week 3	**Meeting with Professor Andry Rakotonirainy** Shared progress on survey development Gained insight on where to improve survey, like what questions to ask, or how to frame certain questions
13/08/2025 Wednesday	Week 4	**Deployment of survey – Method 1** Developed a survey intended for current and aspiring e-skateboard riders. Insights from non-riders was also welcomed if the person had knowledge of the field – like academics or observers. Questions were formatted into groups of experience, safety/awareness, technology, and future thinking.
21/08/2025 Friday	Week 5	**Interview with Levi Swann – Method 2** Asked pre planned questions relating to research questions in a semi-structured interview setting, in person. Gained insight into the micromobility field and the implications of devices and technology
01/09/2025 Monday	Week 7	**Interview with Richard Buning – Method 2** Asked pre planned questions relating to research questions in a semi-structured interview setting via a Teams meeting. Gained insight into the micromobility field and the key gaps between scooters and bikes compared to skateboards. Insight into devices, equipment, and technology was also gained.

Week 7 Lecture Notes

Concept presentation
Friday 12th Sep from 1pm - 3pm Room B101 + B101A

- 5 - 7 min max
- Brief summary of research
- Key summary of results
- Present initial concept ideas in clean and attractive sketches and visuals (context, images, key features/functions, how it targets problems, opportunities identified.

Design process
- Finalising research section
- Transitioning from research into the design
- What do you want the solution to achieve
- Create some achievable goals and guidelines
- Technology behind the design

Inspiration
- Core77
- Yanko Design
- Dexigner
- Fast Co.
- Design Boom
- Wired Mag

UCD
- Emergency situation may make it hard to focus or perform
- Noisy environment people find it hard to communicate
- Low light people could have issues using equipment
- Assistive aids
- Temperature can impact peoples attention and movement

Guidelines and standards
Australian Consumer Product Safety System
https://www.pc.gov.au/inquiries/completed/consumer-product-safety/report

Product Safety Australia: Mandatory Standards
https://www.productsafety.gov.au/product-safety-laws/safety-standards-

Product Safety
https://www.accc.gov.au/business/treating-customers-fairly/product-

Standards Australia
https://www.standards.org.au/

International Standards Organisation
https://www.iso.org/home.html

What you need to do
User-centred design
Consider the target user needs
What are the usability aspects relevant to the situation
Iterate and refine

Survey Coding

Coding Key

Lighting
Visibility and communication
Equipment
Size
Infrastructure
Education and law
Skateboard rider

Lights on the board itself won't be as effective as its down on the road and can easily be covered

Board is low. To make it visible and prominent, alerting tech needs to be attached to the rider, not the board

The fact that we want to be small and light, yet we want visibility that is achieved with size

Lack of standardisation between brands and equipment.

Finding a way to have hands free lights and some form of reflectors. It has to be on the ridders because the boards are so low to the ground it won't be seen

Also, bad roads that are new to the rider, potholes, high curbs.

Form factor of any additional items

Availability of compatible attachments

Road infrastructure for anything non-vehicular (this includes bikes and other PEVs). Cycling infrastructure in the US is extremely poor.

Separated bike lanes, bike lane signals

Just a good on board light source and maybe a horn built into the remote.

Safety is going to be an environment/ skill problem.

Any type of integrated horn or high decibel sound that can be used when necessary

Factor of size

Getting riders to wear appropriate lights. Way unsafer in countries where it's still forbidden because riders will want to stay hidden

Riding in spaces that are not made for these kind of vehicles

Survey Coding Tables

Lighting	Lights on the board itself won't be as effective as its down on the road and can easily be covered.
Visibility and communication	Cars dont care about their surroundings
Equipment	Board is low. To make it visible and prominent, alerting tech needs to be attached to the rider, not the board
Size	The fact that we want to be small and light, yet we want visibility that is achieved with size.
Equipment	Lack of standardisation between brands and equipment.
Lighting	Finding a way to have hands free lights and some form of reflectors. It has to be on the ridders because the boards are so low to the ground it won't be seen.
Infrastructure / visibility and communication	Lack of visibility gear on riders - I think every board should come with at least some visibility equipment. Also bad roads that are new to the rider, potholes, high curbs.
Equipment	Form factor of any additional items
Visibility and communication	Communicating with other vehicles and pedestrians without being too intrusive. While still being convenient for the rider.
Skateboard rider	Polyurethane wheels, lack of grip and lack of rider skill
Skateboard rider	Age and wisdom of the rider. Other than that, it's fine. It's just like a bycycle, with slower breaking so you just have to break sooner and ride more carefully due to that.
Lighting and equipment	Just a good on board light source and maybe a horn built into the remote
Infrastructure / visibility and communication	Visibility is partly a communal awareness problem. Safety is going to be an environment / skill problem.
	requiriion of power and speed of most boards, much more powerful than any legal escooter and thus more likely to cause accidents.
Equipment	Any type of integrated horn or high decibel sound that can be used when necessary
Size	Factor of size
Equipment	Availability of compatible attachments
Infrastructure	Road infrastructure for anything non-vehicular (this includes bikes and other PEVs). Cycling infrastructure in the US is extremely poor.
Education and law	Probably education on what safety gear is available
Education and law	Make it legal so others get used to seeing more E-Skaters around.
Infrastructure	Separated bike lanes, bike lane signals.
Visibility and communication	Having cars see you, especially from behind
Lighting	Getting riders to wear appropriate lights. Way unsafer in countries where it's still forbidden because riders will want to stay hidden
Infrastructure	Riding in spaces that are not made for these kind of vehicles
Skateboard rider	Having everyone understand the way e-skateboarders ride.
Skateboard rider	Other operators ruin it for everyone. A road user will have a bad experience with one rider and run all others off the road

Theme	Primary challenges identified	Rate of occurrence
Lighting	Lights on the board itself won't be as effective as its down on the road and can easily be covered.	4
	Finding a way to have hands free lights and some form of reflectors. It has to be on the ridders because the boards are so low to the ground it won't be seen.	
	Just a good onboard light source	
	Getting riders to wear appropriate lights. Way unsafer in countries where it's still forbidden because riders will want to stay hidden	
Size	The fact that we want to be small and light, yet we want visibility that is achieved with size.	2
	Factor of size	
Infrastructure	Also, bad roads that are new to the rider, potholes, high curbs.	4
	Road infrastructure for anything non-vehicular (this includes bikes and other PEVs). Cycling infrastructure in the US is extremely poor.	
	Separated bike lanes, bike lane signals.	
	Safety is going to be an environment / skill problem	
Visibility and communication	Lack of visibility gear on rider – I think every board should come with at least some visibility equipment	6
	Having cars see you, especially from behind	
	Visibility is partly a communal awareness problem.	
	Riding in spaces that are not made for these kind of vehicles	
	Communicating with other vehicles and pedestrians without being too intrusive. While still being convenient for the rider.	
	Cars don't care about their surroundings	
Equipment	Availability of compatible attachments	6
	A horn built into the remote	
	Any type of integrated horn or high decibel sound that can be used when necessary	
	Form factor of any additional items	
	Board is low. To make it visible and prominent, alerting tech needs to be attached to the rider, not the board	
	Lack of standardisation between brands and equipment.	
Education and law	Probably education on what safety gear is available	2
	Make it legal so others get used to seeing more E-Skaters around.	
Skateboard rider	Lack of rider skill	4
	Age and wisdom of rider	
	Having everyone understand the way e-skateboarders ride.	
	Other operators ruin it for everyone. A road user will have a bad experience with one rider and run all others off the road	

Interview Coding

Transcript

1 September 2025, 12:04am

Riley Dagg (Named transcription)

Riley Dagg 0:01
Sweet.
All right. So let me know when you're ready and I can start rolling the questions for you.

0:11
Yeah, go ahead.

Riley Dagg 0:13
Sweet. OK. So could you tell me about your expertise in micro mobility?

0:19
My expertise in micro mobility.
Yeah, well, that's what I do for a living. Well, the term micro mobility only became a thing. I don't know about five or six years ago, but I've been researching cycling
My entire academic career, so 15 years and but yeah with the.
I don't know when my capability officially became term five or six years ago or something like that, but yeah, I research active transport active living around people using bikes and scooters to get around cities or explore communities.
Or pursue some sort of recreational hobby that they have. And I also lead a research group at UQ called the UQ Micro Mobility Research Cluster, which has academics from all kinds of different areas of the university, from geography to planning to transport engineering.

Riley Dagg 1:03
Sorry.

1:24
I'm.
Frequently consultant to to state and local government and and work with many of the shared E scooter providers, often in the media too, around.
My from ability related topics.

Riley Dagg 1:46
Awesome.
What aspects do you think people look for in a personal mobility device that makes it a good quality device?

2:00
Good question. I think it's.
Who the person is that's looking for it. I don't. I don't know that there's a single answer to that. What?

Riley Dagg 2:06
Yep.
You have like fences.

2:13
Yeah, I I think that if you're someone that's looking for a really cheap way to get around, get around town, get to get to work or school or study or whatever, buying a $400.00 E scooter might be the cheapest way to possibly do that.

Riley Dagg 2:30
Yeah.

2:31
So.
But and I don't think they're probably necessarily really, I don't think the person that's looking for that cheap option is. This is really evaluating much more that more than that to be honest. But people that there's I think there's a big difference between people that buy.

Riley Dagg 2:45
Yeah.

2:54
An E scooter.
That's like a really like, utilitarian type of thing compared to someone that buys it. That's like kind of into it. And you know, maybe kind of associates themselves with someone that rides it EE scooter E. Scooter Rider.

Riley Dagg 3:01
And.

3:13
Compared to someone that's just kind of bind into.
Get their transport needs fulfilled in a really, really cheap and can be an easy way.
But there are lots of different features on them that make them safer, that's for sure.

Riley Dagg 3:28
Yeah.

3:31
The cheap ones still have suspension there, tyres are just solid rubber, brakes might be as good the standing deck. The Foot board is usually quite narrow.
Umm.
Where the more typically more expensive ones.
Have more power, have pneumatic tyres. Some of them have suspension. The Flipboard that you stand on, the bit wider, beefier, but fortunately actually some of those products are actually illegal in QLD.
That doesn't mean that people that don't have them but Queensland governmeent has.
Strict laws about the size of the devices.

Riley Dagg 4:20
Yeah.
With the features that you listed, how do you think they impact the way that the user uses the device?

4:32
By how they use the device?
Do you mean like for the purposes of why they're using it?

Riley Dagg 4:41
Yeah, for like their intended purpose of, I guess if they're, I guess, every person's different, but from getting from A to B or from using it for their intended purpose like it for a hobby maybe.

4:54

Interview Coding

Yeah, yeah, that's that's a good question. I've never asked this question in a research project, but just answer totally control guests. Give me my my still my opinion.

Riley Dagg 5:05
RD That's fine.

5:07
RB Yeah, if you're if you're one of these, if you're one of these folks that has a full face helmet where it's kind of like full protective gear and has one of these more robust scooters, some people call them hyper scooters.
I think is like a term for the ones that are quite powerful, but the most I think the most popular brands you see on the street are these nine bot or Segway models usually like kind of dark grey.
And they all kind of, you know, look, they look the same, but the ones that have big suspension, big tyres, those are the folks that probably I would imagine have a little more identity in themselves as a scooter rider and would be likely to be riding much faster.
Because those those models are quite powerful.

Riley Dagg 6:07
RD Yeah.

6:08
RB I don't. I don't think that the person that just rides the east scooter to work or to school. I don't know. I don't think that person really associates themselves much as being part of a group or something like someone that rides a bike.
I'm on the board for Bicycle Queensland and.
We've had to engage with these different groups a few times to variant success.
And certainly the folks that are spending a few $1000 on one and have all the gear and and go on rides and and maybe a part of like a E Scooter club that seems to be quite a different group of the person that just rides it to work.

Riley Dagg 6:50
RD OK. In terms of E skateboards, what do you think the biggest limitations with an E skateboard is when you compare them to an E bike or an E scooter?

7:02
RB That's a great question. I haven't done much research on Fast skateboards, but I would have. I would have imagined the person that owns the E Skateboard has one because it's fun and they're they've like maybe they have their own skateboard and they're like, this is now I can use this for transport.

Riley Dagg 7:16
RD And.

7:19
RB It's definitely different, definitely. It's probably a different market of consumer, someone that wants to buy an E skateboard, I would imagine.
Because E skiers are so easy to unions.
Yeah, he's good. They're so, so absolutely easy to use or an E skateboard. I think the normal person quite scared of using one of those.

Riley Dagg 7:44
RD Yeah.

7:58
RB Uh

Create a tag | See all highlights

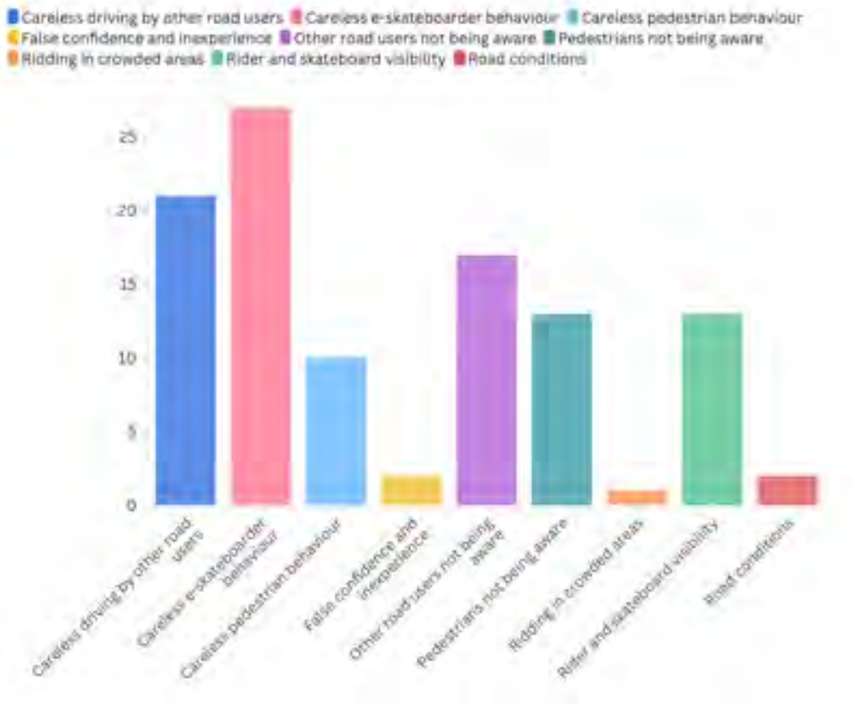
Benchmarking	15	Edit
Demographic	22	Edit
Environmental factors	4	Edit
Expenses	6	Edit
Features	24	Edit
Injuries	3	Edit
Integrated device features	25	Edit
Legal aspects	9	Edit
PPE	7	Edit
Pedestrian visibility	15	Edit
Rider factors	14	Edit
Riding intent	11	Edit
User visibility	14	Edit

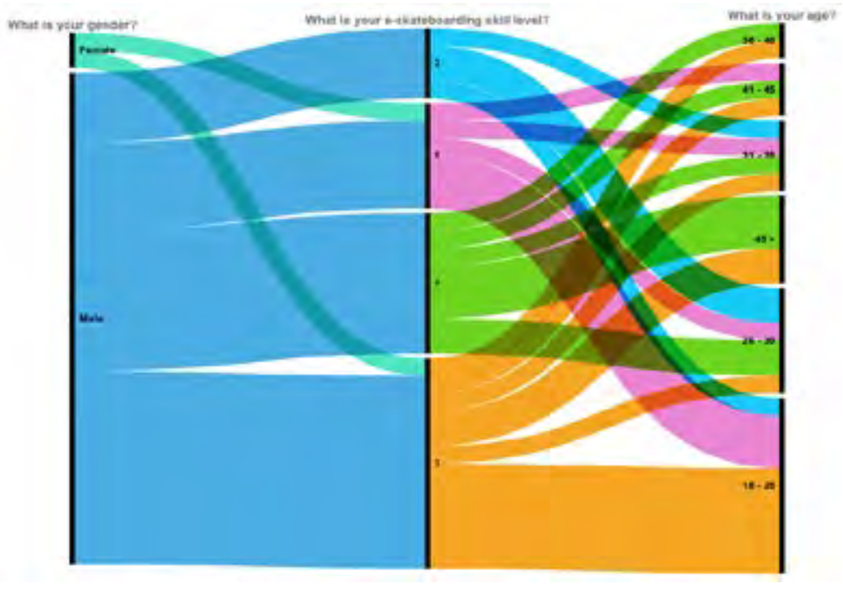
Interview Coding Table

Category	Code	Example
Experience	Demographic	**(P1)** They're so, absolutely easy to use, for an e-skateboard, I think the normal person quite scared of using one of those. **(P1)** All the people that I see wearing are riding an electric skateboard around town. Those people are like, they look like they have like, a proper helmet that they purchased. And like, they've probably bought some of the gear, like they've committed to these things like it's a hobby. **(P1)** People, pedestrians are on sidewalks. They're not looking for people moving quickly. Sidewalks are a place for people to move slowly. **(P1)** And like, if you're a skateboarder, it's like, not cool to wear a helmet these days. **(P2)** If you're on a bike way and there's a pedestrian lane and you're alerting other like users they prefer that you use a bell. I think where it could be negatively perceived is if you were riding on a footpath designated for pedestrian and you that's where it's received poorly and frowned upon.
	Legal aspects	**(P1)** You need to be wearing a helmet as a legal requirement
Safety	PPE	**(P1)** If you're one of these folks that has a full face helmet where it's kind of like full protective gear and has one of these more robust scooters, some people call them hyper scooters.
	Injuries	**(P1)** Still weighs like they don't have an athletic stance. Their knees aren't bent, and they're kind of staying quite upright, so something if they hit something then like they're not ready for it.. **(P1)** Near misses is about like pedestrians. Like almost getting hit by someone which is not a great feeling, you're a pedestrian. And like you turn around and someone's just passing you at like a high speed. That's not a good feeling. **(P2)** One of the biggest accident problems with on E scooters is that if they have a small front wheel you hit something and that does this like.
	Rider factors	**(P1)** Without that handle, be able to brace yourself. It just adds another level of skill required. **(P1)** One of the things that makes them a bit dangerous is that when people ride them, they kind of stand really stationary with like locked knees and not really like in an athletic stance. I would imagine if you're on an E skateboard and you can't really do that at all. **(P2)** With a skateboard, you're just standing there, holding nothing, really high centre of gravity. And I think, definitely the skill level and the familiarity needed to provide it is more for a skilled person.
	Environmental factors	**(P1)** On a skateboard, it'd probably be even harder to navigate defects in the pavement. Compared to a bike that has big tyres so it can soak things up.
Awareness and Visibility	User visibility	**(P2)** When I commute or ride on my bike the bells really useful. Like if you're on the bikeway pedestrians walking side by side, or you're passing someone, I think you kind of need that because you don't know what person's doing in front of you and they certainly don't have any visibility.
	Integrated device features	**(P2)** It's fairly easy to build in, things like lighting, for awareness, particularly for e-skateboards. **(P2)** I think as long as it was within the space of a familiar, for instance, if you built in like a brake light into a helmet or something like that was connected to control. A vest, things like that, I would suspect probably not. **(P2)** So like a bell to alert your presents for other people can indicate your intentions, so that could, like you're talking about like lasers or indicators or things like that can be quite useful. **(P2)** If there was going to be a haptic system, I think it would be like a computer vis system to just know and there's a something coming up behind, for instance.
Technology	Benchmarking	**(P1)** E skateboards out of all the P and DS that are on the street are like very few like 5% or something like that. **(P1)** Some of the E skateboard riders that have been wearing these helmets that have the lights built into **(P1)** I think some of those ones do have integrated lights into them. But yeah, I don't know if the one wheel. Yeah, if they would be that much. **(P1)** Yeah, absolutely. I mean, we do it with electric cars. When electric cars are like at slow speed, it's the kind of same problem. But they, you know, they usually emit some sort of like fake. Vehicle noise. **(P1)** On campus at UQ a lot of our like our plant facility staff they use like these, little like a little electric. Golf CART type of things. **(P1)** Just like a noise that they emit so you can hear them. **(P2)** A bicycle is obviously a super familiar for most people. It's a seated position with handlebars. So, it's really stable to ride, the centre of gravity is also positioned kind of differently. It's more distributive across **(P2)** I suspect that it isn't a lack of equipment, but I suspect that its niche enough that it's not in the market. **(P2)** I've seen helmet designs with lighting in them.
	Features	**(P1)** The quietness of them doesn't help, especially if they're on the sidewalk with pedestrians. **(P1)** Having some sort of light, yeah, lights, front and rear lights, and sound. **(P2)** Where I think that's quite useful is for if you're riding on a you know, on a bikeway or something like that projects down, you know, maybe it gives cues to other writers about sort of clearances. I suppose there's also opportunities to present information, like indicating which directions. **(P2)** Yeah, I mean, bells are lame, I guess. But also, really useful, and effective. **(P2)** It probably has to be given in the hand. I don't think it's safe to have a foot operated bell, but it would have to be integrated into the remote. **(P2)** I don't know that I've seen one that has, like, turn signals up high. I think the signal light is still down low in the back. **(P2)** I guess like as a low profile vehicle, where everything is sitting, you know probably within 200 mill of the ground or less, you know, the full visibility almost relies on the rider itself.
	Expenses	**(P1)** Get their transport needs fulfilled in a really, really cheap and can be an easy way. **(P2)** There's sort of entry level and reliable options, and probably when people are kind of looking at it is so cost and quality trade-offs. **(P2)** I think some of the challenges are already that helmets can be quite expensive.
	Future thinking	**(P2)** If there is someone coming up behind you or looking to pass you, like a haptic system that alerts to potential dangers. **(P2)** Less about new technology and it's more just around the safe design, like how you make them more stable or more like depending on the use case for them, yeah, like how they can tolerate different types of surfaces.

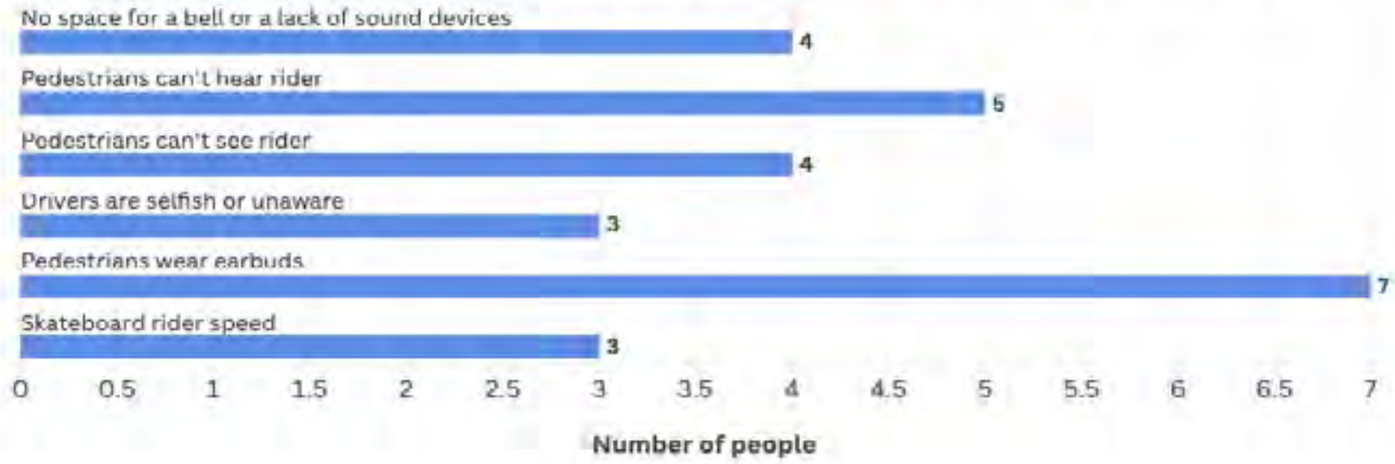
Research Report Graphs

What factors contribute the most to e-skateboarding accidents



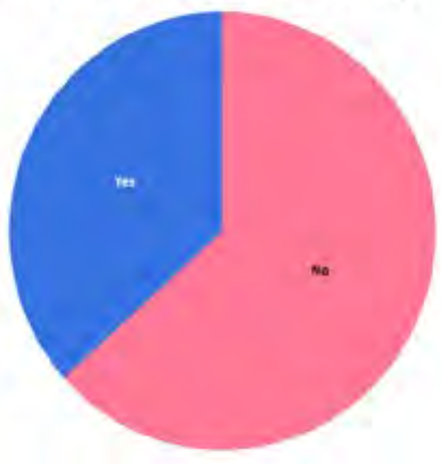


Challenges with alerting pedestrians and road users



Types of PPE Used

Are pedestrians and other road users easy to alert?



Discussion

Data analysed from both the survey and interview responses highlight the need for increased measures that improve visibility and awareness around e-skateboard riders and the pedestrians in the surrounding shared spaces. This is evident through the identified issues relating to skateboarding accidents, primarily seeing the incidents caused by a lack of road user awareness, minimal rider visibility, and improper use of active transport infrastructure.

Insights also revealed the limitation around accessible skateboard technology and devices that provide visibility and safety benefits to the riders. Benchmarking data highlighted this gap in the market and compared the findings to current products that are designed and readily available for e-bikes and scooters. These products have shown to positively benefit bike and scooter riders through their range of visibility, connectivity, and awareness based features allowing them to seamlessly integrate into active transport areas. But the limitation for e-skateboards remains present and the lack of accessible products is contributing to the unsafe environments these users are riding in.

Additionally, insights from e-skateboard riders suggests that incidents are more likely to occur due to factors relating to experience, safety, technology, awareness, and visibility. This aligns with the identified benchmarking, and accident data as predominantly skateboard riders are more likely to experience an accident from a lack of visibility devices, poor quality infrastructure, a lack of accessible equipment, and minimal communicative devices.

The significance and recurring theme of visibility, connectivity, and awareness also highlights the role each element plays in the long term benefits of safe device integration. Ultimately, implementing these features is essential in creating a safer and more accessible environment for all active transport users.

Through this understanding of the limiting factors found within the data, unsafe skateboarding environments will continue to remain present without careful consideration of future devices and technology. Industry experts emphasise that in this current position existing and developing technologies need to be implemented into e-skateboarding setups to have positive impact on the safe integration of every ridable device.

Design Implications

The project extends its focus on the accidents involving e-skateboarders and surrounding road users or pedestrians specifically relating to the limiting factors of visibility, awareness, and connectivity. The prominence of these elements were highlighted throughout product benchmarking data, the survey targeted at e-skateboard riders, and the interviews with industry experts. Given the powerful and unpredictable nature of e-skateboards the need for practical, easy to use solutions that maximise safety and injury prevention is greater than ever.

While PPE contributes to the protection and prevention of e-skateboarding injuries it finds itself being challenged by adaptability to different environments and usability by the riders. There is significant limitation in regard to current PPE's ability to provide additional measures of safety like visibility and the ability to allow the users to stand out. However, to combat this, the design solution may integrate features like lighting, devices that produce sound, aesthetics, or reflective elements to increase the usability and appeal of the equipment. The solution would need to prioritise device attach-ability to existing equipment and ensure it does not further increase restrictiveness and the unappealing nature of PPE.

The condition and state of the rider must also be considered when providing a design solution as altering the way riders position themselves, the weight or composition of the board, or even how the rider operates additional features could have significant impacts on user safety. Due to this there is opportunity for a device to be implemented into existing e-skateboarding setups, on the user themselves or similarly to what was previously stated, the equipment the user is wearing. The solution would need to be easy to use to minimise the elements the rider has to consider, unobtrusive so the user does not become restricted, positioned accordingly to maintain the weight of the board, and able to provide elements of visibility in an ergonomic manner. This considers the placement of the solution so that it always remains visible to surrounding people and contributes to the riders safety and usability of the device.

With the lack of existing technology currently on the market for e-skateboards there is also opportunity to implement a solution that supports the rider in differing environments. Devices which contribute to standing out visually, keeping pedestrians aware with sound, and connecting the rider to surrounding pedestrians and road users throughcommunicative tools would significantly increase the safe integration of e-skateboards.

Finally, any design solution created in this space should adhere to the principles and guidelines associated with the surrounding infrastructure. Ensuring the implementation of a device that is unobtrusive, and respects the environment will contribute to maintaining a design aligned with the areas specific regulations. This would include a device that prioritises safe visibility and sound technology which isn't a disturbance to the public but can also achieve it's intended function of alerting people. The use of lasers, projection based products, or frustrating sound systems should be avoided in this space.

The design implications stated in this research report emphasises the need for a solution that seamlessly integrated into current e-skateboarding and shared space environments. Ultimately, the device must consider the gaps in current technology and how it can adapt to existing equipment while making it more effective to accident prevention. Overall, the design should maintain its position within regulations to ensure safe use in all environments and forms of skating infrastructure. In doing so, e-skateboard riders will become more visible, and connected while other road users and pedestrians will be more aware in shared environments.

Week 8

Week 8 Lecture Notes

B101 room for A1 Part 2 presentations on Friday

Week 9
- Concept
- Features
- Technical

Week 10
- Prototyping
- Testing

User Experience
Aims to create appropriate positive experiences, before, during, and after user-product-context interaction.

Experiences focused (user expectations)
Time (longitudinal)
Context (relevance)

- Fun and enjoyment
- Familiarity
- Challenge
- Novelty
- Surprise
- Sentimental

Understand and conceptualise user product interaction in context. Also consider how this is evolved over time.

5 Principles of interaction for product design
- **Affordances** - Relationship between the properties of a product and the capabilities of the agent (user) using the product.
- **Signifiers** - Communicates where action should take place, what is happening, and what other possible options exist. Texture suggests “touch the product here.” Lights and curvature can signify different components.
- **Mappings** - Association / reltationship between action and an event. Turn the wheel left in the car and the car goes left is a natural mapping. Pedals which are pushed down to go forward or back are unatural. Affordances help remember mappings.
- **Feedback** - Means of communicating the result of an action. A remote will vibrate when you turn it on. Turning a switch might activate a light to provide feedback that the device is turned on.
- **Conceptual model** - Conceptual models are mental models that people create in their minds of how certain things can be done with a product.

Interaction design guidelines
- Expectation
- Consistent design
- Functionality
- Cognition
- Engagement
- User control
- Perceivability
- Learnability
- Error handling
- Affordability

What should you do
- Consider the experience design aspects as you develop your design
- Fit your design within the experience design framework
- Apply interaction design principals

Week 8 Lecture Notes (Continued)

Manufacturing
Things to consider and complete
- Bill of Matierals
- Standard Parts
- Custom Parts
- Drawings
- Quality Assurances

Standard Parts - Standard or off the shelf parts are items produced to a standard or of such a high quanity making them readily available. Standard parts can include:

- Fasteners
- Bearings
- Castors/wheels
- Hard Drives
- USB's
- PCB's (Circuit Boards)
- Motors
- Extrusions

Links to standard parts
- RS Components
- IBS
- Schroff
- Clark Rubber
- Bolts and Industrial Supplies

Custom Parts - Items that you sketch, CAD, tool and manufacture. Also includes artwork, packaging, graphics. Custom parts can include:

- Sheet metal enclosures
- Injection mouldings
- Specific mechanisms
- Die castings
- Brackets
- Gaskets
- Artwork
- Machined parts

Drawing Specifications
AS 1100 is the standard for drawings

What you should do

- Think about the components / parts of your design. What are standard (off-the-shelf) and what are custom parts?

- Develop a BOM for your design

- Have a PDF with all manufacturing elements.

Week 8 Studio 1

Conversation with Raf

Helmet - augmented reality, sound lights to project in environment

A glove that controls steering, maybe with gestures

A glove that uses gestures to signal different elements - getting peoples attention, signalling what way you are going, and saying thank you when people move out the way. This could all be achieved through guestering as you normally would with your hands.

Informing the rider of their environment

Concepts to communicate to the public

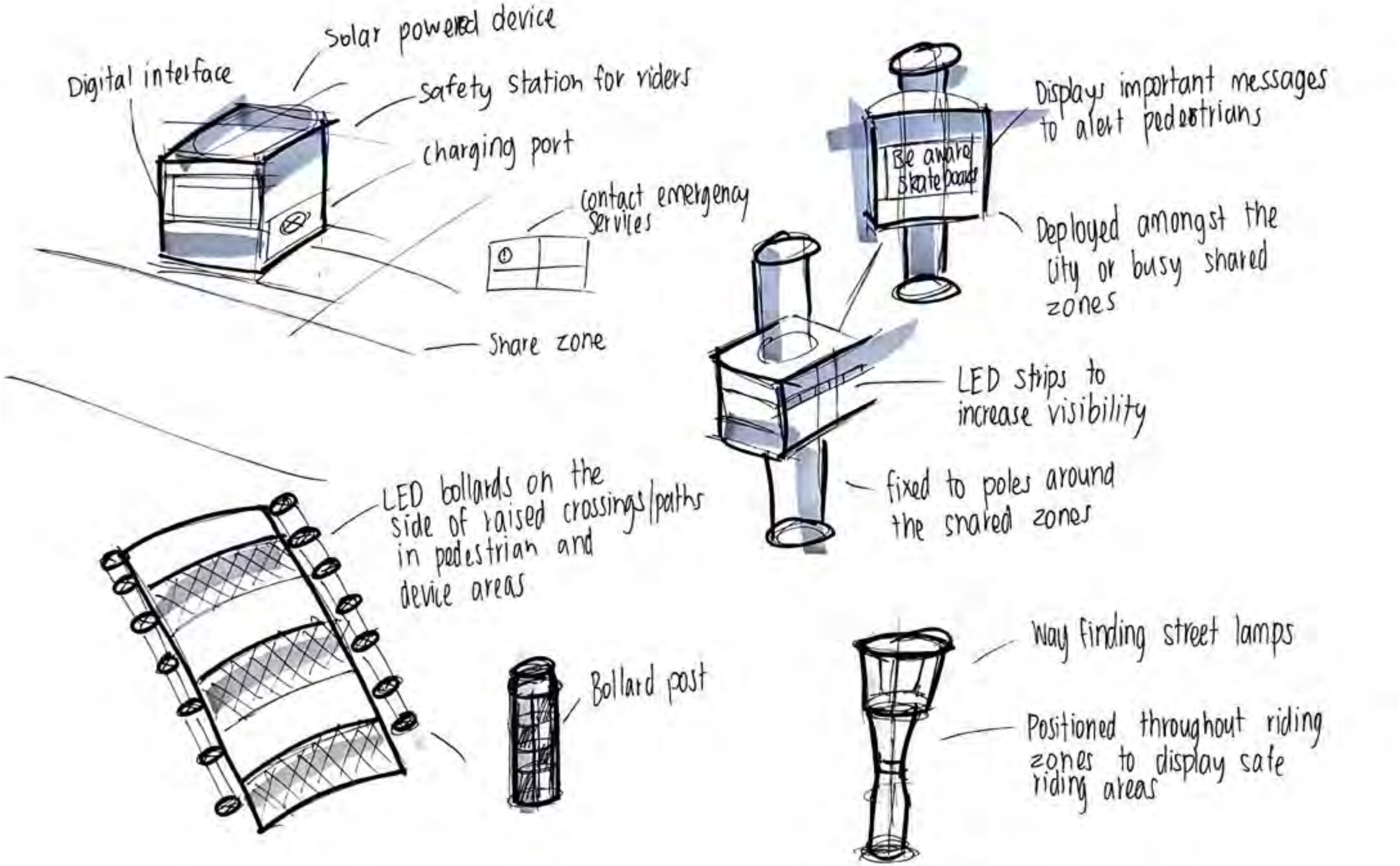
Infrastructure changes - adding informational technology around high accident areas, lighting, signals etc.

Concept Direction Ideas

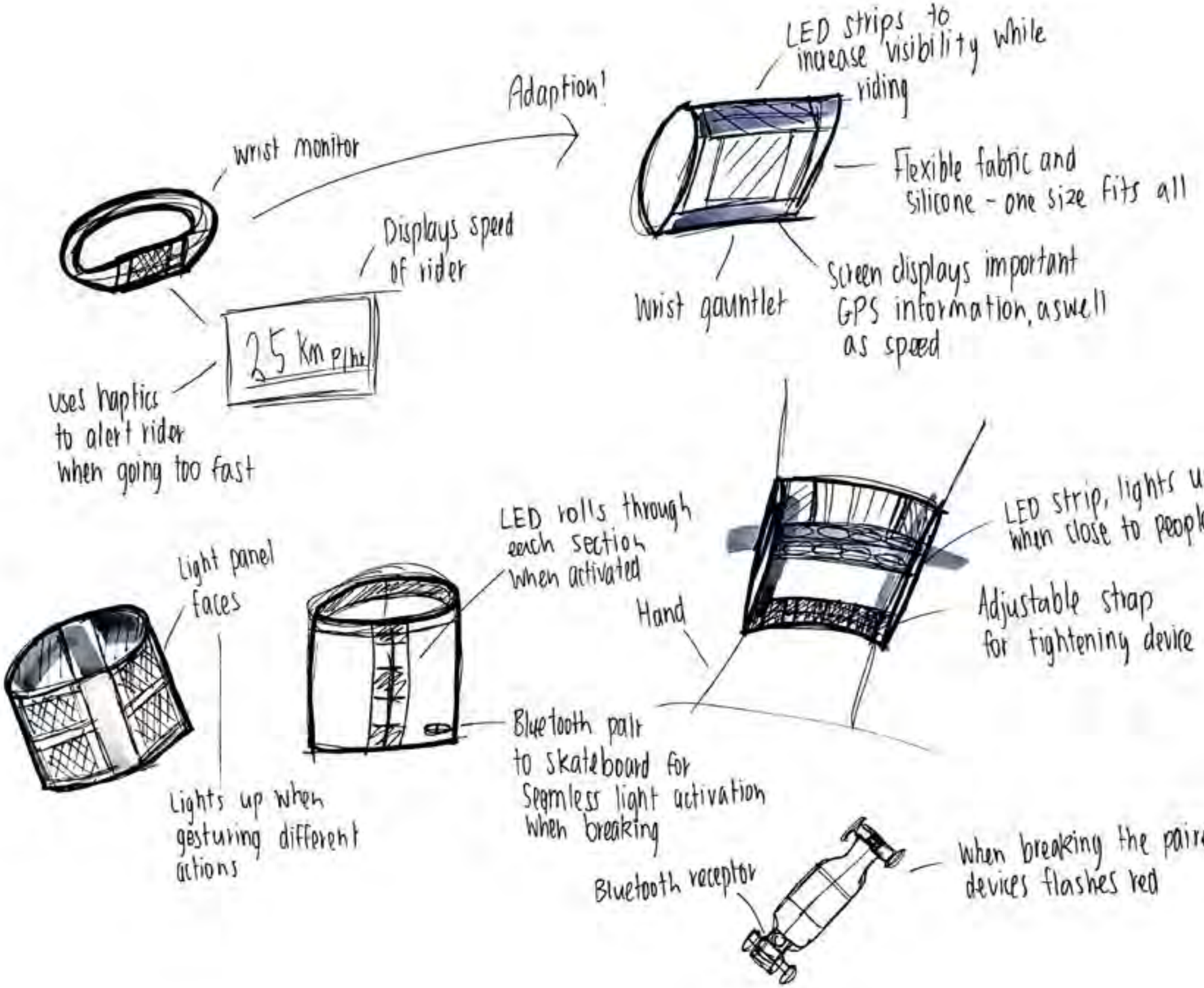
Notes on possible concept directions

- Gesture wrist bands
- Informational signage - Rider has a device which connects to nearby signage device which will then read out a short messsage saying skateboarder in area be aware and give room etc.
- Communicative gloves using gesturing
- Gloves used for operating skateboard
- Attachable and modular lighting and speaker for equipment - bluetooth connection to skateboard allowing breaking system to work between the board and the led output in the device.
- Portable lane divider
- Emergency post
- Emebeded rider guidance system
- An arm monitor which tracks speed and signals through vibration and noise when the rider is close to other people
- Connectivity through an app - rider wears a monitor and picks up surrounding phone cells, this will be alerted through the monitor signalling to the rider that they can use the device. When receiving this signal the rider can send out their own signal to the surrounding people which will vibrate their phone. The app pedestrians install is simple and has the in built vibration when receiving the signal from the rider. The device also sends out noise and flash unobtrusive lights when in close contact to people.
- A helmet attachment which has small speakers and lights.
- Wrist device which emits light. Both stay on when arms are close together but one will turn off when the other arm is extended out to the side. This can be used as a signalling mechanism
- A reconfigured control remote with an integrated button for a sound system
- A vest with speakers and lights
- Attachment on phone
- Clip mechanism both sides of shirt - integrate light or something into that

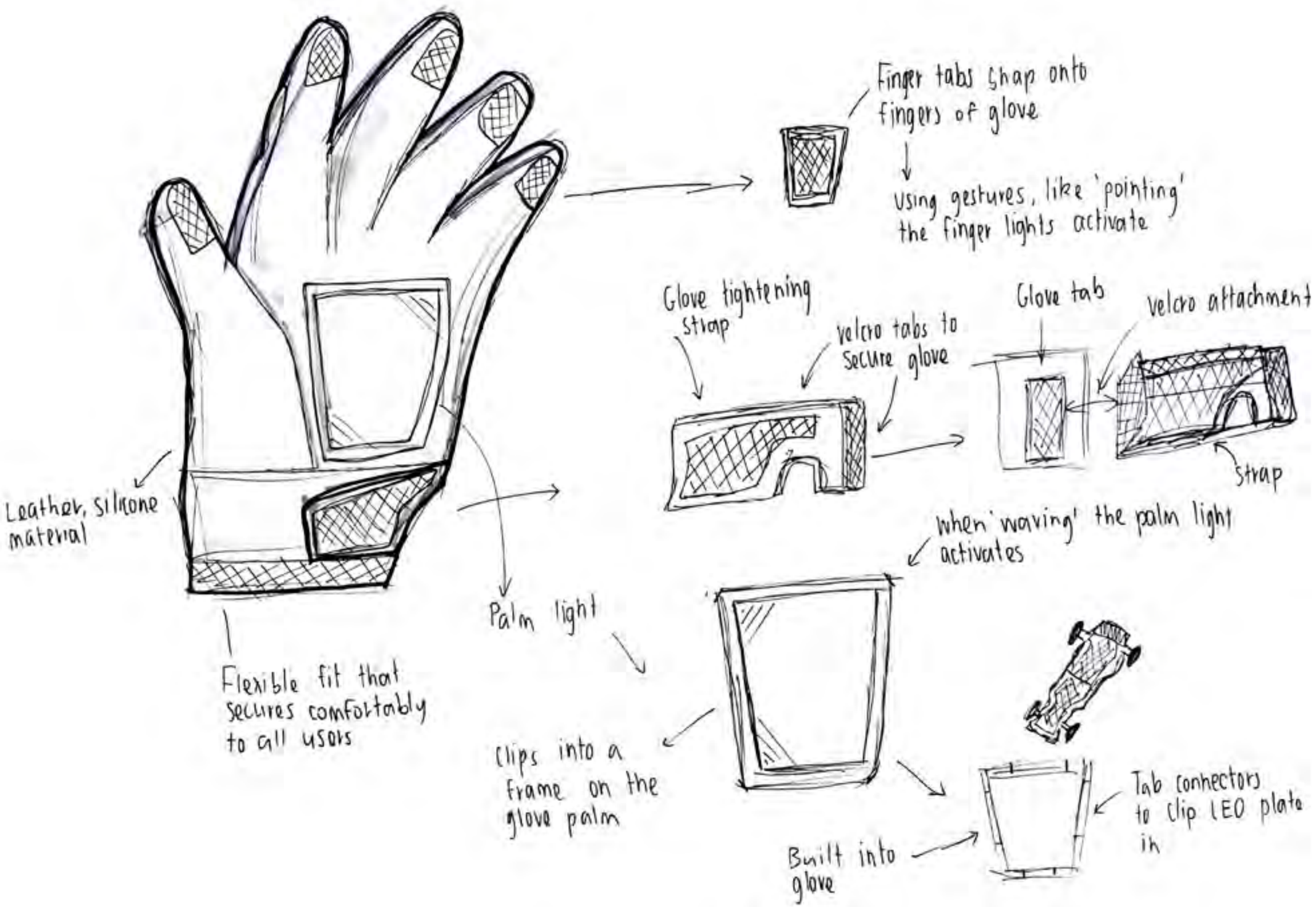
Concept Development Sketches



Concept Development Sketches



Concept Development Sketches



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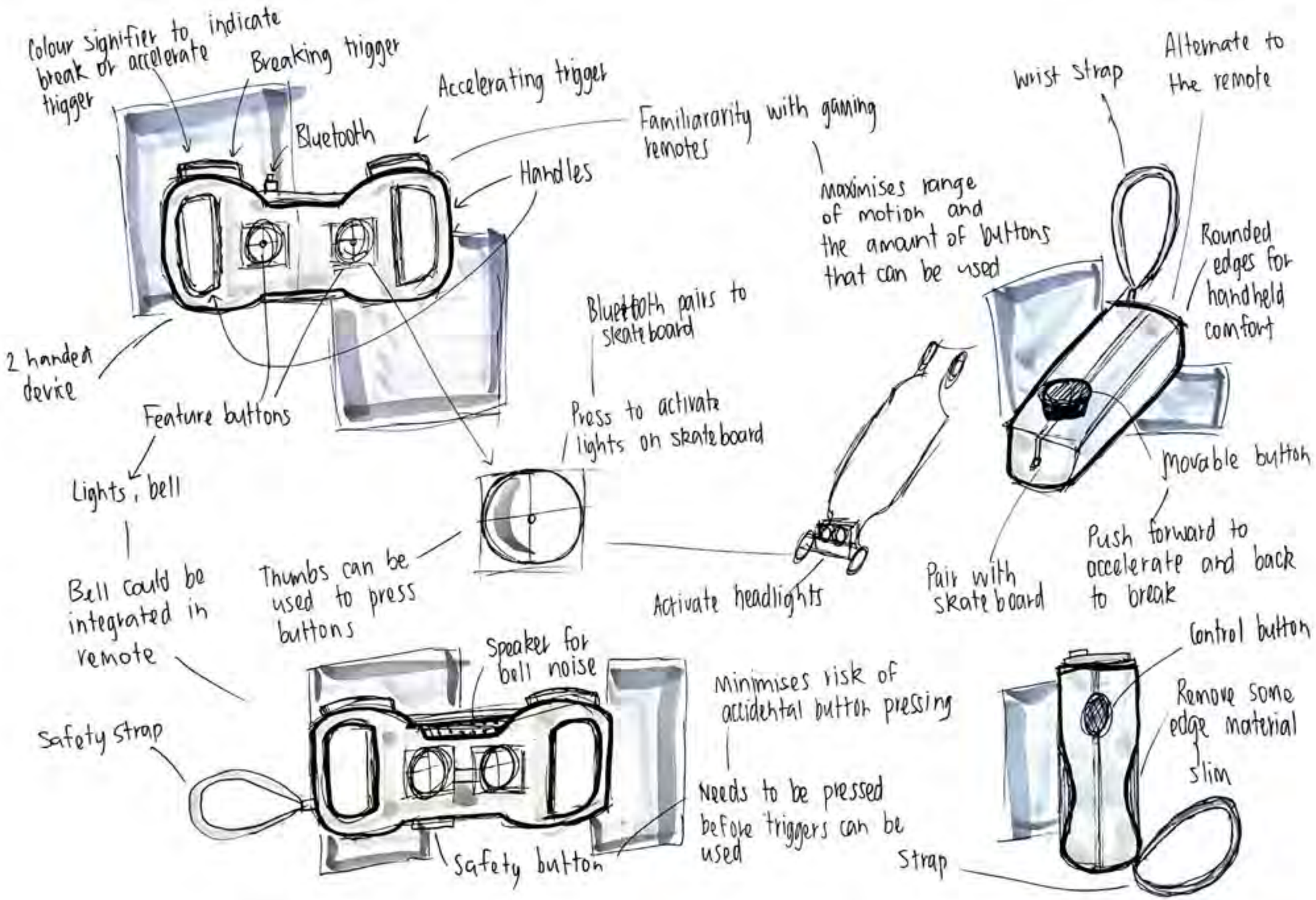

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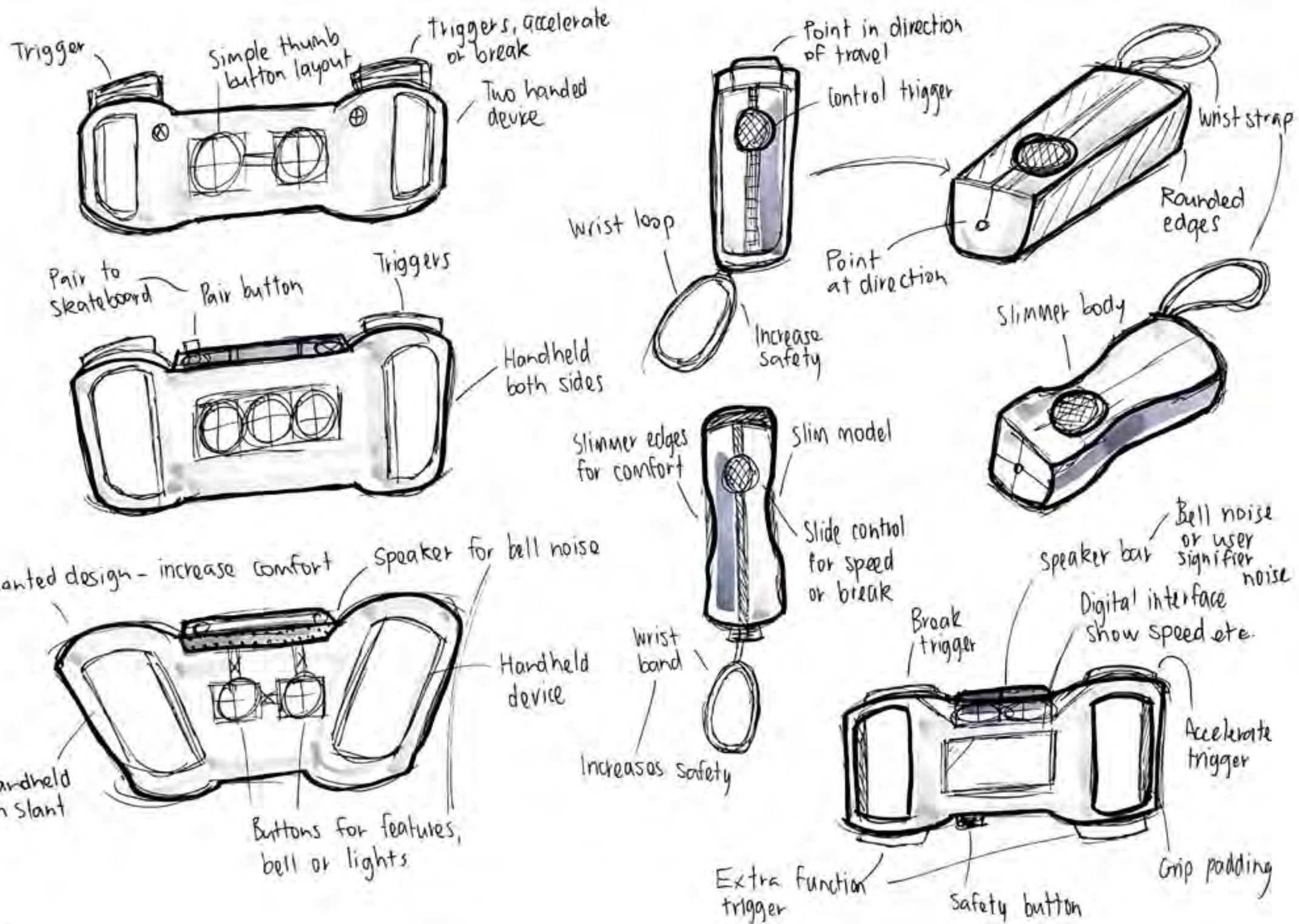

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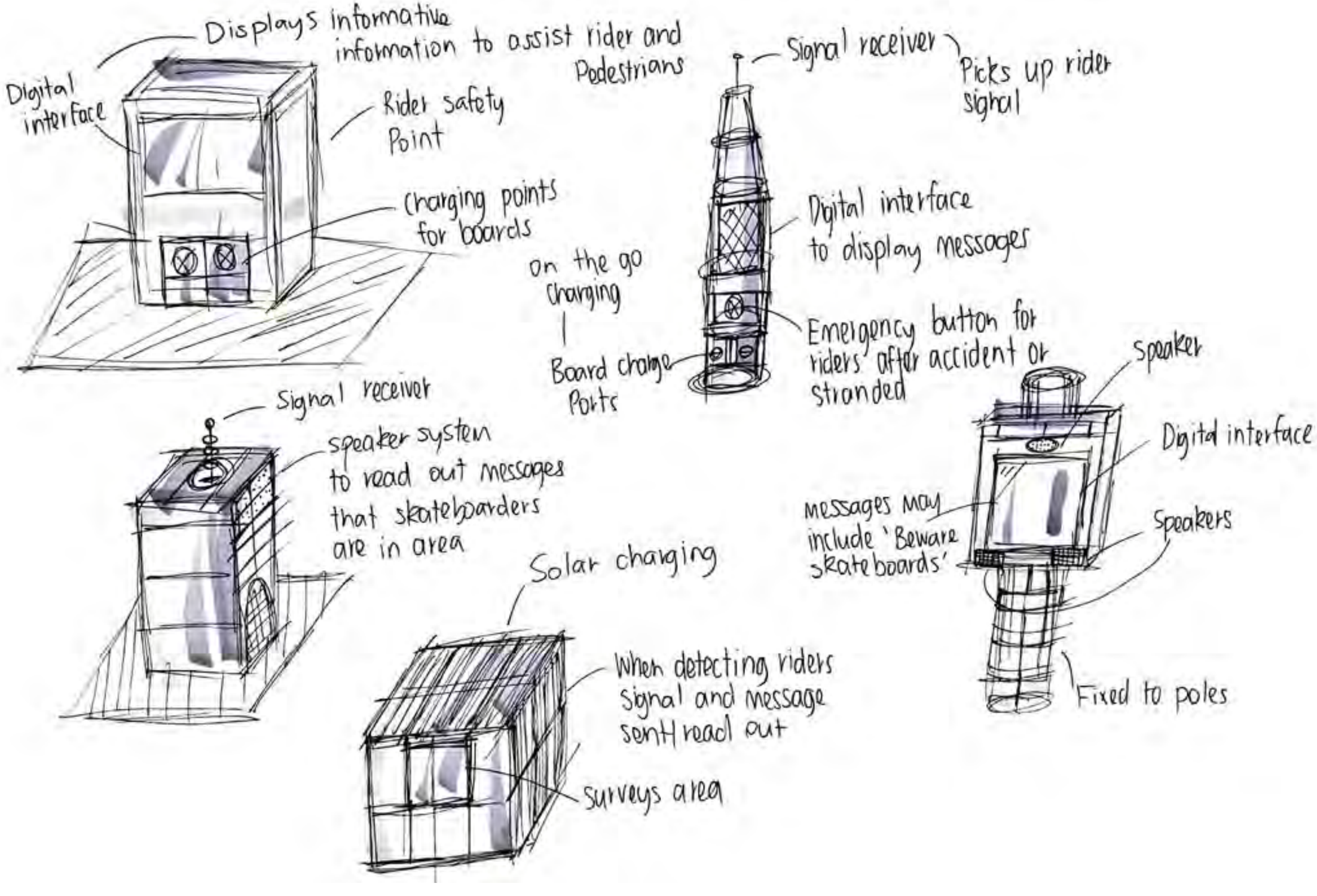


Concept Presentation

Concept Presentation

Authenticity Statement

I declare that this concept presentation is my own original work and has been prepared in accordance to QUT's academic integrity guidelines. All sources of information, data, and images have also been professionally cited and referenced.

AI Use Statement

I acknowledge that AI was utilised in the project only for assisting in generating concept direction material using originally created ideas. Any generated material was then taken as inspiration only.

Riley Dagg
n11608188
12/09/2025

Concept Presentation

BACKGROUND & BENCHMARKING

Riley Dagg | N11608188 | 12/09/2025

BACKGROUND

E-Skateboarding is a **developing form of active transport** within Australia yet it is contributing to a large amount of **micromobility related road incidents.**

People aged between **18 to 25**, and **26 to 30** are the most regular e-skateboarding users, most saying there riding **skill level** is around a **3 or 4 out of 5**.

Unaware road users or pedestrians, and a **lack of visibility around riders** are leading causes for both minor and serious injuries. Sometimes accidents have even resulted in fatality.

61.5% of riders say that these factors **contributed the most** to to accidents they had experienced while riding their e-skateboard.

BENCHMARKING

Currently for e-skateboard users PPE is worn by riders to **increase their safety** and the **protection against accidents.**

But PPE is **not designed** to increase **visibility**, **awareness**, or **connectivity** in a skateboarding context.

PPE **is limited** in that it does not provide adequate measures to increase injury or accident prevention. PPE is only **affective** against **minor accidents** and **does not** take into account the **severity of some incidents.**

Current skateboarding **technology** and **attachable devices** are also limited for purposes of increasing visibility and awareness.

When comparing current technology in the e-bike and scooter market there are **significant gaps** for e-skateboard access and usability of such great devices.

Concept Presentation

RESEARCH & PRIMARY DIRECTIONS

Riley Dagg | N11608188 | 12/09/2025

Data from survey and semi structured interviews found...

Informing and Assisting the Rider

- E-Skateboard riders **lack technology** and **devices** that assist in **increasing** their **visibility**, and **ability to communicate** to others.
- There is also **limitation** around devices that assist the rider with being **well informed** about safe measures when using shared spaces

Communicating to the Public

- Pedestrians **lack awareness** around e-skateboard riders and thus contribute to **unsafe environments**.
- There are **limited devices** or **technology** that assist in provide **communicative beneifts** in shared space environments.

Infrastructure Changes

- Infrastructure **poorly accommodates** for **shared use** within busy city contexts. Riders are restricted in congested areas and face **challenges communicating** to the public.
- Current environments **lack informational** or **awareness** related technology to assist in directing pedestrians to be more **spatially aware**.

Concept Presentation

CONCEPT 1 - GESTURE WRISTBANDS

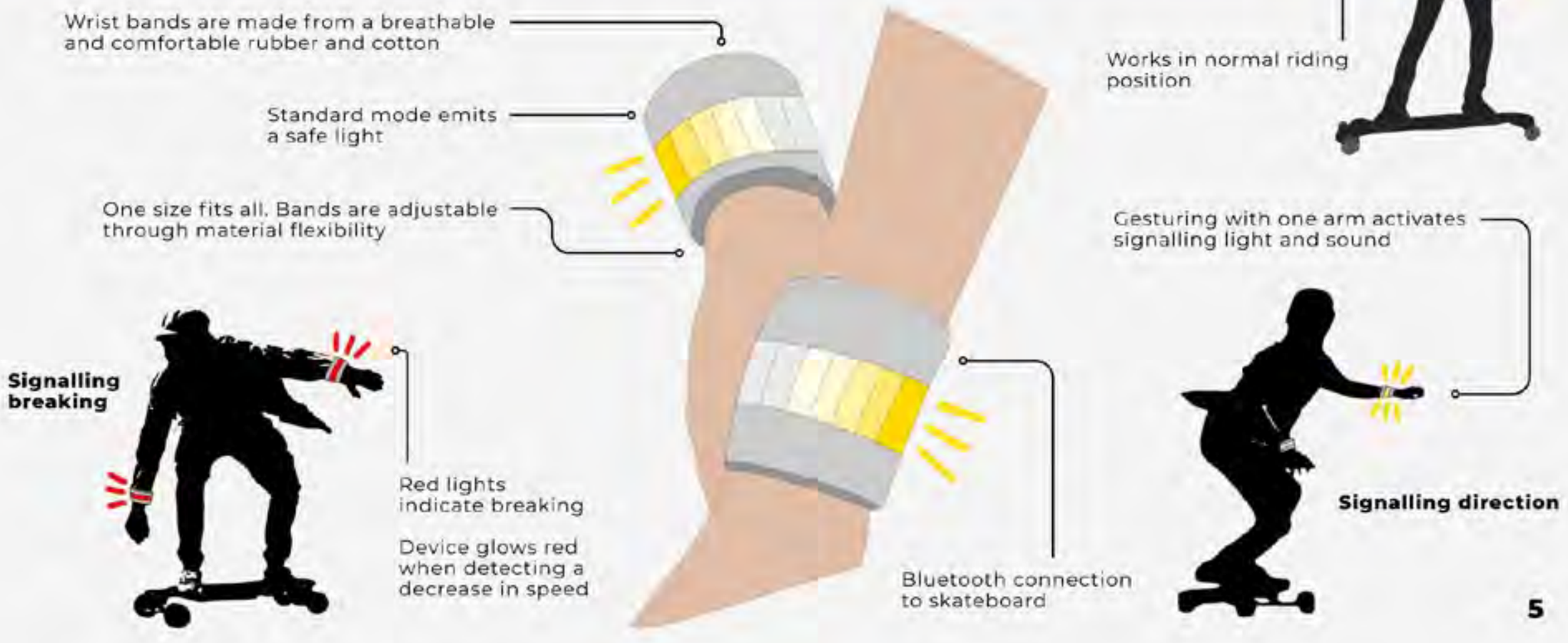
E-Skateboard Awareness & Safe Integration into the Transport Network

Riley Dagg | N11608188 | 12/09/2025

This concept targets:
- Communicating to the public/pedestrians
- Informing and assisting the rider

Link to research:
- Skateboarders have limited devices that allow them to communicate their intentions or to remain visible around pedestrians.

How it solves the issue:
- Offers an intuitive way of communicating rider intentions through gesturing. This removes the need to press buttons or hold a new device.
- Gesturing actions can simulate familiarity around what is being communicated for pedestrians and the operator



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Concept Presentation

CONCEPT 2 - COMMUNICATIVE GLOVES

E-Skateboard Awareness & Safe Integration Into the Transport Network

Riley Dagg | N11608188 | 12/09/2025

This concept targets:
- Communicating to the public/pedestrians
- Informing and assisting the rider

Link to research:
- E-Skateboarding lacks adaptable and easy to use equipment that increases visibility and communication between the rider and pedestrians.

How it solves the issue:
- Device offers ease of use through the familiarity of delivering hand gestures like waving, pointing, or positioning hand in a certain way.
- It allows skateboard riders to easily convey their intentions when using shared spaces.

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Concept Presentation

CONCEPT 3 - ENVIRONMENT SIGNAGE

E-Skateboard Awareness & Safe Integration into the Transport Network

Riley Dagg | N11608188 | 12/09/2025

This concept targets:
- Communicating to the public
- Infrastructure changes

Link to research:
- Current infrastructure around busy shared spaces lacks adequate technology or tools that assist in communicating to pedestrians and informing them of ways to be more aware of skateboarding activity.

How it solves the issue:
- The informative signage can be integrated in a range of busy areas allowing easy communication to all pedestrians.
- The use of the paired skateboarder tab allows all signs to operate quickly and deploy the messages seamlessly. Pedestrians can stay well informed before they are creating an unsafe environment for the skateboarder.

Riders wear a pairable device, when the signage detects its signal within a 1km radius the message will be deployed so that pedestrians become more aware

Signs are fixed to poles around the area

Displays green light when a rider signal is picked up

Light strips activate when message is on the screen

Displays an informative message for pedestrians to view and become more aware

The message is displayed once an e-skateboarder is detected in the area

The message is generated using digital LED light text

Small speakers to read out the information "Siri type voice"

These informative signs are integrated in many CBD areas

Implemented along busy streets in the CBD

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Concept Presentation

CONCEPT 4 - GLOVE CONTROLLER

E-Skateboard Awareness & Safe Integration Into the Transport Network

Riley Dagg | N11608188 | 12/09/2025

This concept targets:
- Informing and assisting the rider

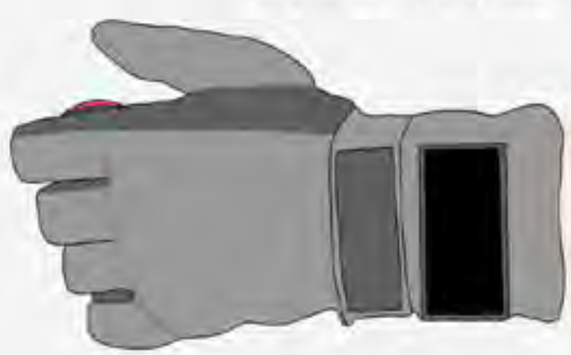
Link to research:
- E-Skateboarding involves a range of elements to consider while riding, particularly observing surroundings, controlling the board, and maintaining balance. A combination of factors piled together can contribute to unsafe riding.

How it solves the issue:
- Provides a comfortable, familiar feeling device that considers ease of use in high paced environments requiring many elements to be recognised. Users can operate their skateboard with their hands and the familiarity of gloves.
- Gloves are one of the most commonly worn pieces of skateboarding equipment making the adjustment seamless in user setups. Operating the skateboard is comfortable and minimises user error with the safe operating controls.

Buttons on either the left or right glove need to be pressed down to accelerate or break

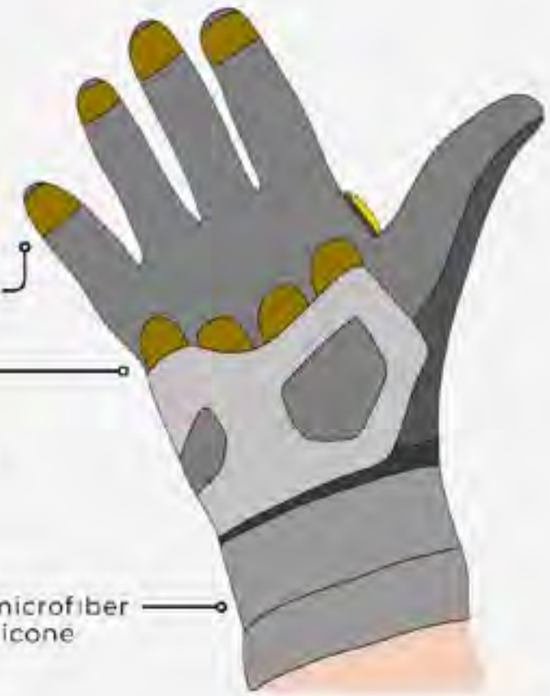
Yellow button indicates accelerating on the right hand

Digital panel displays rider speed



Device connects to the skateboard using bluetooth

Red light on left hand indicates the break button



Finger tabs need to be place on the palm tabs for the acceleration and breaking buttons to work

Hand should be positioned in a clenched fist to link tabs and allow the functions to work

Comfortable microfiber leather and silicone materials

8

Concept Presentation

CONCEPT 5 - SOLAR SAFETY STATION

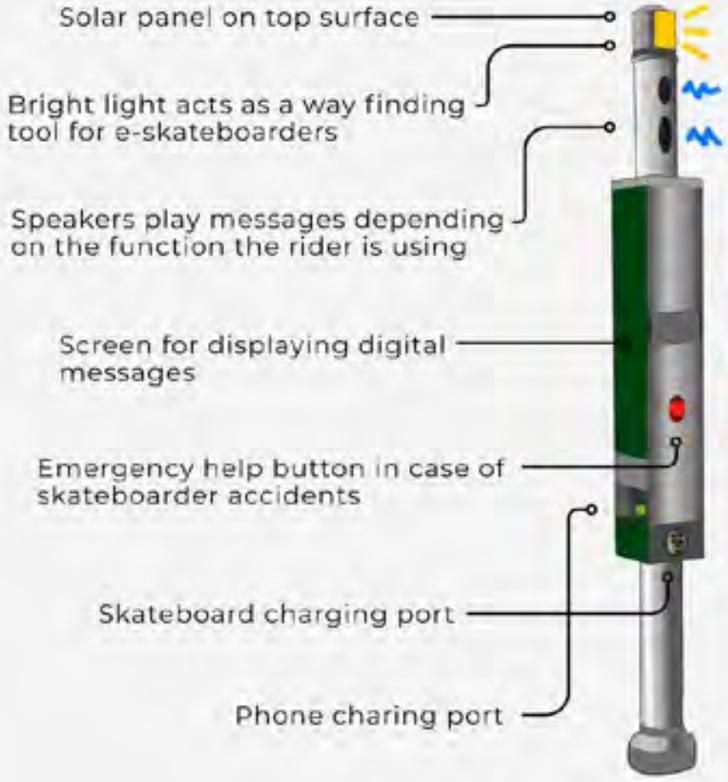
E-Skateboard Awareness & Safe Integration Into the Transport Network

Riley Dagg | N11608188 | 12/09/2025

This concept targets:
- Informing and assisting the rider
- Infrastructure changes

Link to research:
- E-Skateboard related accidents are rapidly increasing in Australia and there are limited infrastructure based solutions that assist the riders during times of need or emergency.

How it solves the issue:
- The solution provides a point of contact for all e-skateboard riders needing a place to rest, recharge, or for in times of emergency after an accident. Riders can easily contact emergency services through the device.
- The post is also a symbol for safety providing light in the dark and a way for riders to know where safe zones are.



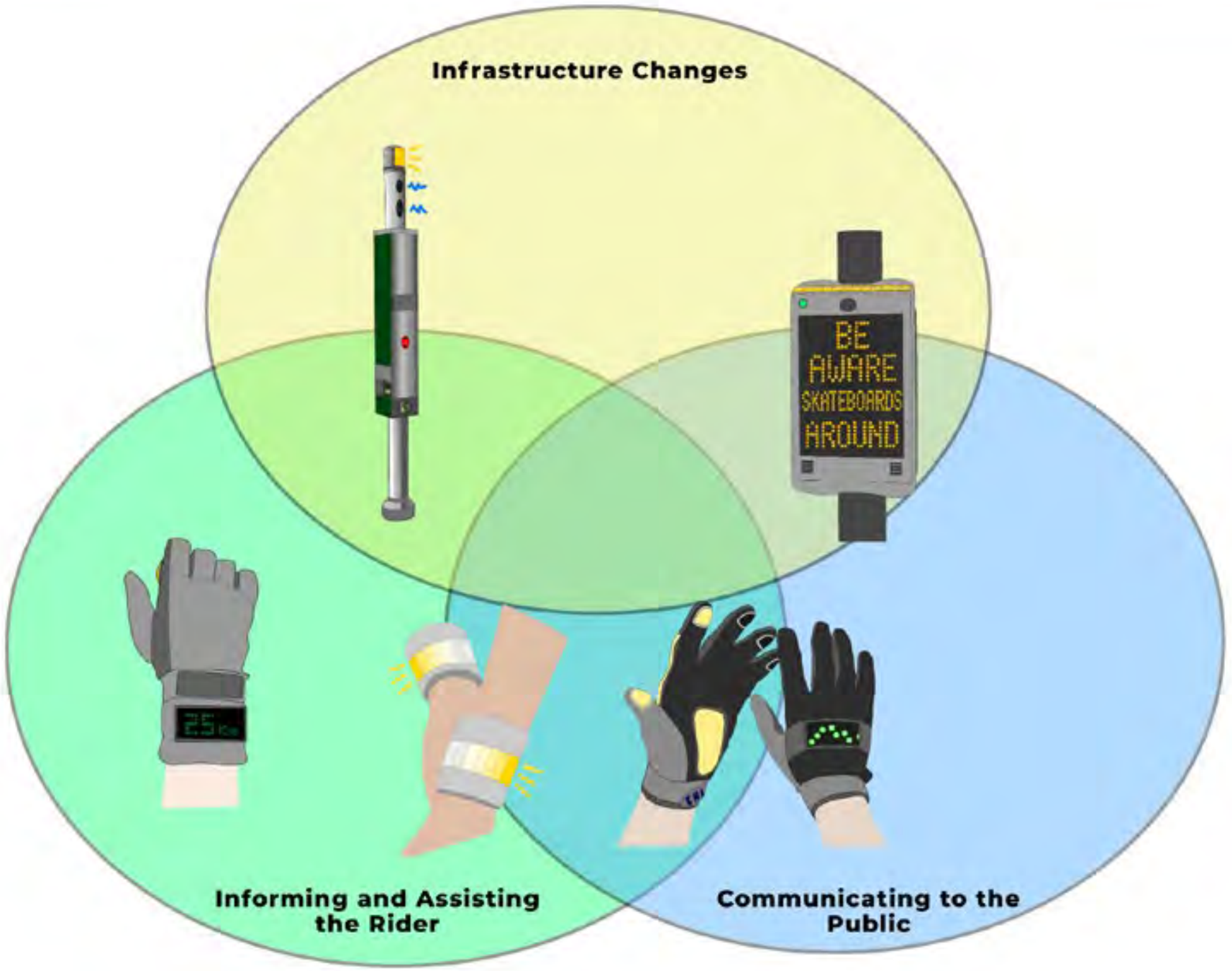
9

Concept Presentation

SUMMARY

E-Skateboard Awareness & Safe Integration Into the Transport Network

Riley Dagg | N11608188 | 12/09/2025



Concept Presentation Feedback

Concept presentation feedback

- How do people know the device is working - integrate vibration or audio which will alert the user that it is working. Feedback loops when the device is working or lights come on
- Could some features/concepts be integrated together
- Can the concepts be used by other modes of transport?
- Triggers for the glove remote?
- Colour signifiers for the gloves - breaking and accelerating - potentially change the colour of the finger tabs to the colour of red or green/yellow to signify which glove is the break and the accelerator
- Concept 1 and 2, how do you know when the lights are activated (is there any feedback to the user from the product)
- Concept 3, is there a way to integrate the wearable with the skateboard, what if a user forgets to attach the wearable with them
- Concept 4, how safe is this for when the user falls off? I like the idea of it displaying the users speed, good consideration of how the user carries items during skateboard use
- Concept 5, how prevalent will this device be in the city? how is it integrated within rural / suburban environments?

Chosen Concept: Communicative Gloves

Week 9

Week 9 Lecture Notes

Prototyping
- Use photos as underlays and annotate, draw over the images - repeat process for a lot of ideations
- Lots of material testing and model prototyping with annotations
- Physically test prototypes with a range of people
- Stickers or prints with information (electrical, danger, advising the user).
- Make, build, learn and repeat

Considerations
- What does this device do, what are the features, technical elements - screen, batteries, wiring etc.

Aesthetics
Psychological properties
- Colour: Red connotes energy, orange connotes happiness, blue connotes stillness/stability.
- Shape and form: Square = stability, round form - softness, wedges - direction.

Organisational properties
Look for patterns that allow us to see relationships or create order.
- Unifying properties - Balance, good proportions (context dependent).
- Complexity and variety - Diverse thinking and exploration, visual patterns are important.
- Unity in variety - Maximum pleasure in balance between unity and variety, conjunctive ambiguity, maximum effect for minimum means.

Meaning properties
- Familiarity - Things that are familiar and recognisable are liked or more prefered then things that are not.
- Originality, novelty and innovativeness - We are drawn to exciting and new things which are novel and innovative. Yet it may take time to have this affect.
- Most advanced yet acceptable - Balance between novelty, and innovation.
- Product expressions and association - Products are given different meaning based off their aesthetic. While aesthetic expression can reveal the intent of the product there needs to be deeper meaning.

Aesthetic principles
- Balance: Visual weight of elements
- Contrast: Difference between elements
- Emphasis: Areas that are visually dominant, and commands attention
- Movement: Result of using elements which move users attention around
- Pattern: Uniform repetition of elements
- Rhythm: Created by movement
- Unity/Variety: Both elements are needed to create balance

Material selection is pivotal to the final aesthetic outcome of the design
When making material choices you cannot just say it is a certain material - there needs to be a justification and explanation of what type of material it is. Glossy, soft, rough, textured etc.

- Form: What is the form and shape of the product?
- Proportions: How does the form feel, and how do the forms come together?
- Materials: What materials and types of materials are there?
- Surface finish: Material finishes, shiny, matte etc.
- Colour: Colour selection should relate to the context of the design
- Edges/transitions: Sharp, soft, inbetween edge types? How do edges transition?
- Aesthetic principles: How are they applied in the design?

Week 9 Studio 1

Do I lay my CAD components out as attachments for e-skateboarders

Perhaps the solution is a range of features the user can purchase to add to their modular glove - palm LED, finger LED's, speakers, side hand LED's etc.

CAD all components and connect them using wires so it looks like a skeleton of the hand.

Grab CAD

3D scan hand (increase thickness so it looks like a glove)

Purchase an existing skateboarding/riding glove

In CAD create a skeleton of the technology on the underside of the hand and from the palm area create a loop which would resemble the back of the hand interface.

Iteration and prototyping will involve:

- What technology should be included
- How the technology, buttons, features, speakers, lights should look, and feel
- How does the technology signify to the user that it works
- Testing the best ways to layout the desired technology

Things to consider:

Haptic tech

Gesture tech

Scratch proof aspects

Speakers to signal light actions

How will the LED's/lights fit and work

Best ways to layout lights and other tech

Does the concept involve both gloves or just one to accomodate for the skate control?

How will the technology connect together? - technology skeleton

What concepts/ideas already do this?

Don't forget about the context

Week 9 Studio 2

Conversation with Raf
Consider exactly what technology is needed (LED's, batteries, charging etc.)

Option 1: Removable skeleton, everything is joint together using flexible bands and wires. Can be easily removed for cleaning and packing away.

Option 2: Have individual pieces which can clip in to the glove and be stored within a case.

Do the gloves have a protective case - does it charge the gloves? How does it charge them?

Consider how users know when the tech skeleton is in the right place after putting it over their glove - do the finger tabs have a click, sound magnet which locks it in place, haptics to signal connection etc.

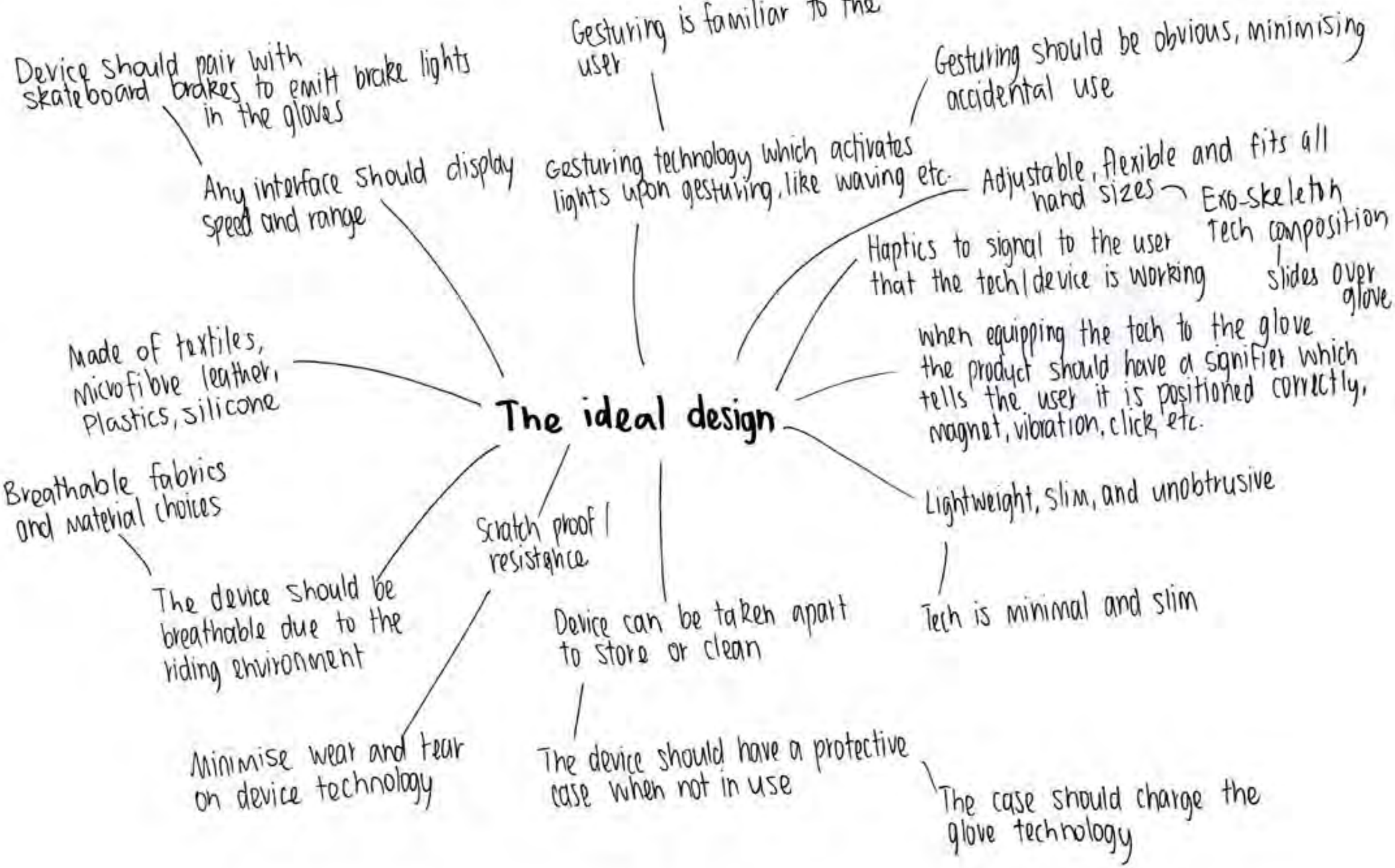
Consider breathable materials within the glove - Consider the context, where people are riding, the climate, activities etc.

Conversation with AJ
Consider moving the main LED's to the back of the hand rather then the palm and under side of fingers - minimses scratching and can easily single with the back of the hand to people in front and behind by twisting hand.

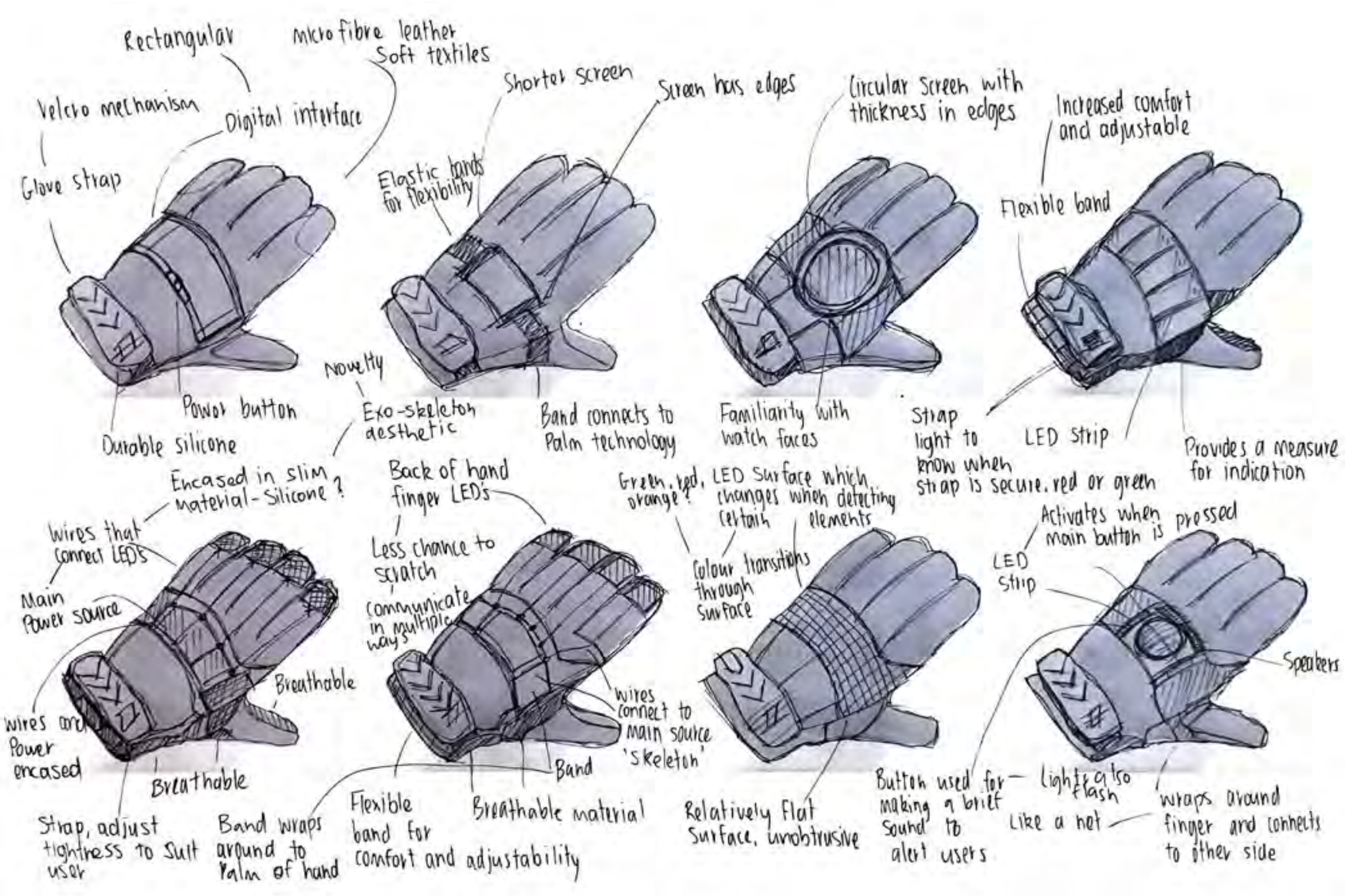
Primary things to show on the interface would be speed and range

Notes:
Watch youtube video

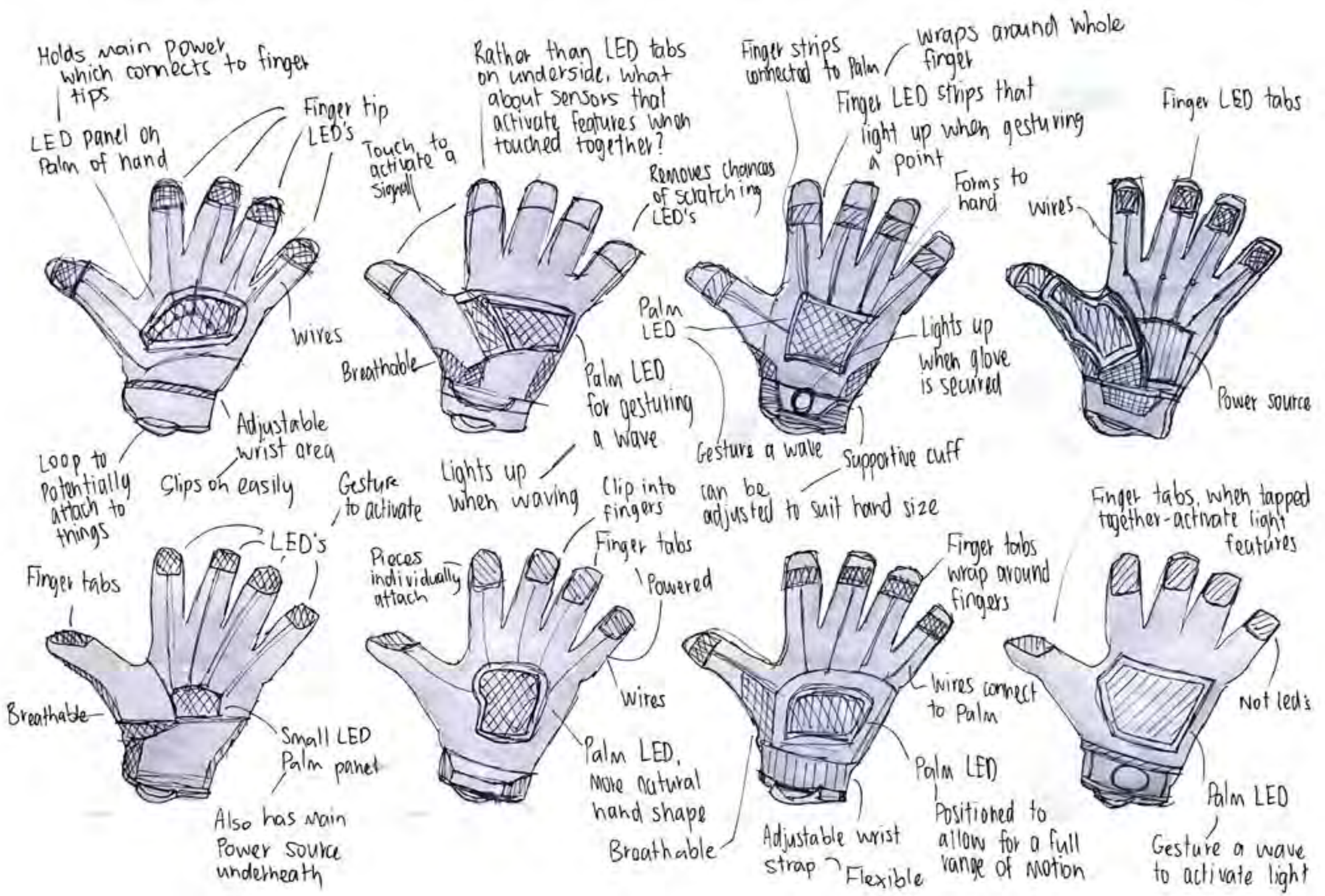
Ideal Design Brainstorm



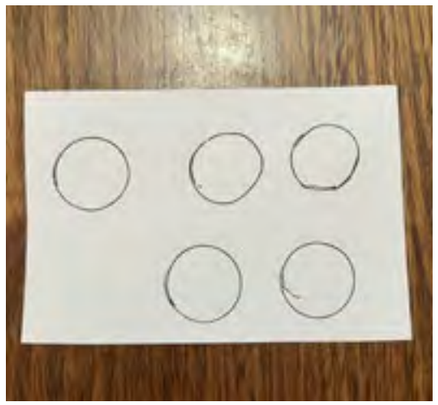
Sketch Iterations



Sketch Iterations



Prototyping



Circles were drawn out on paper resembeling the finger LED components.

To get a more natural look the finger LED components were cut out with more of an oval shape rather then a circle. This would make it fit into the finger sections of the glove.

The intended design would have the finger LED's clip or magnitise to the glove fingers. This was prototypes by taping the sections onto the fingers.

A circle was cut out fitting the palm of the glove and users hand. Similarly this was tested using tape to hold it down. The intended design would have this clip into the palm.

After testing to get a more natural and comfortable fit allowing the user to have a ful range of motion, the palm LED was cut with a slanted edge to wrap around the thumb.

To join the LED components together string was used to resemble wire and tap was applied to give the appeal that the wires are solded or attached to the components.

When applying the joint device the wires give the appeal of an exo-skeleton. This helps guide the user of where each piece should go as the wires resemble each finger.

Testing the glove attachments felt natural and wasn't an obstruction when wanting to perform gestures like waving or pointing. This was due to the slim line form of the parts

It is also important to consider how the battery integrates into the setup. Currently the prototype only includes the palm LED which would have the battery underneath.

Finger motion was tested to see how comfortable the current prototype was. It would be important to stick the wires to the flat parts of the fingers avoiding the bends.

Prototyping

Paper was used to resemble the devices flexible strap which extends around the users hand onto the back side. This is designed to be the surface where the interface sits.

The paper was trimmed to accomodate for an average hand and glove size. Testing indicated a band that was smaller would be less obtrusive and easier to slip on the glove.

When extending around to the back of the hand the piece fits naturally around the hand. This created a flat surface wher an eventual digital interface could be placed.

The layout of the wires and LED tabs give off an aesthetic of an exo-skeleton. This approach is to make it appealing to the itense nature of e-skateboard riders.

The current arrangement allows for a full range of motion throughout the hand making it easy to convey signals with gestures like waving, pointing or dropping hand to the side.

The current screen sits directly in the middle of the users hand so it is easy to view and avoids contact with the fingers.

The glove attachment uses a flexbile band that forms around the side of the glove fitting to the users hand size. This can be adaptaed due to the bands flexibility.

While the attachment is positioned over the glove it is designed to be placed appropriately where movement is not impacted and the tech doesn't contact other elements.

Comments:

This current prototype does not include the digital interface but provides the foundation for where it would eventually be placed.

The protoype is directed at using the space on the under side of the hand, including the palm and finger tips. There is notable risk of damaging these parts if the rider was to fall and use their hands to brace themselves upon impact.

Each element would be raised slightly in further prototyping to accomodate for the technology that needs to be included.

Break

Week 10

Week 10 Studio 1

Conversation with Raf

What is the value of the product: Think context and story behind why the product is being developed

Have the palm LED on the wrist with the adjustable wrist band as well on the other side the interface with the speed and range etc.

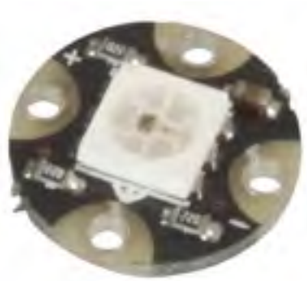
Other notes

Areas to prototype and solve:

- How do the LED’s attach to the fingers?
- How does the system charge?
- Does it have a battery or is it charged by another source?
- What does the interface look like?
- Does the interface have extra attachments like the charging system?
- How does the whole system attach together?
- Does the equipment have a case?
- Does the equipment have a portable and detachable charging device?

- Look at adjustable mouse cables
- Look at extendable waist band clips

Finalising Solution Details



Black Light Duty Hook Up Wire
https://www.jaycar.com.au/black-light-duty-hook-up-wire-25m-roll/p/WH3001

x 3
- Each LED sits at the tip of a finger tip, the middle, pointer, and ring finger.

Leonardo Tiny Atmega32U4 Main Board
https://www.jaycar.com.au/leonardo-tiny-atmega32u4-main-board/p/XC4431

x2
- Used for the main interface unit, and the larger LED panel located on the under side of the hand.

Duinotech Arduino Compatible Hand Gesture Sensor
https://www.jaycar.com.au/duinotech-arduino-compatible-hand-gesture-sensor/p/XC3742?srsltid=AfmBOoq0pDAYdijOzcmS-KkNkts3XGj8xLAX9u1xWAp0vE0RfWuHNgV7

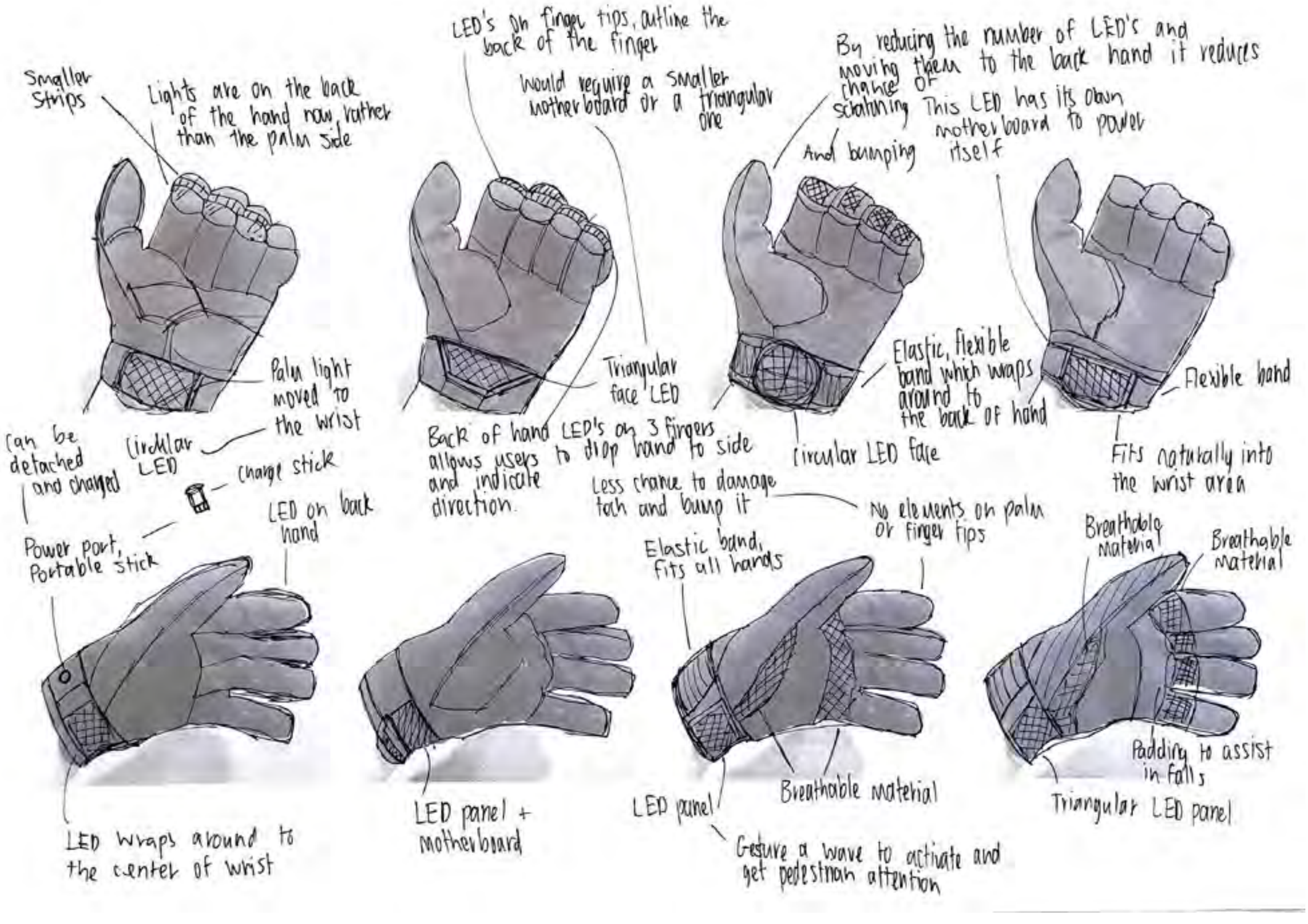
x 1
- Located in the compartment under the interface unity

Duinotech Arduino Compatible Hand Gesture Sensor
https://www.jaycar.com.au/black-light-duty-hook-up-wire-25m-roll/p/WH3001

x 1 roll
- Used to cut custom lengths of wire to join LED's to main boards and sensors.

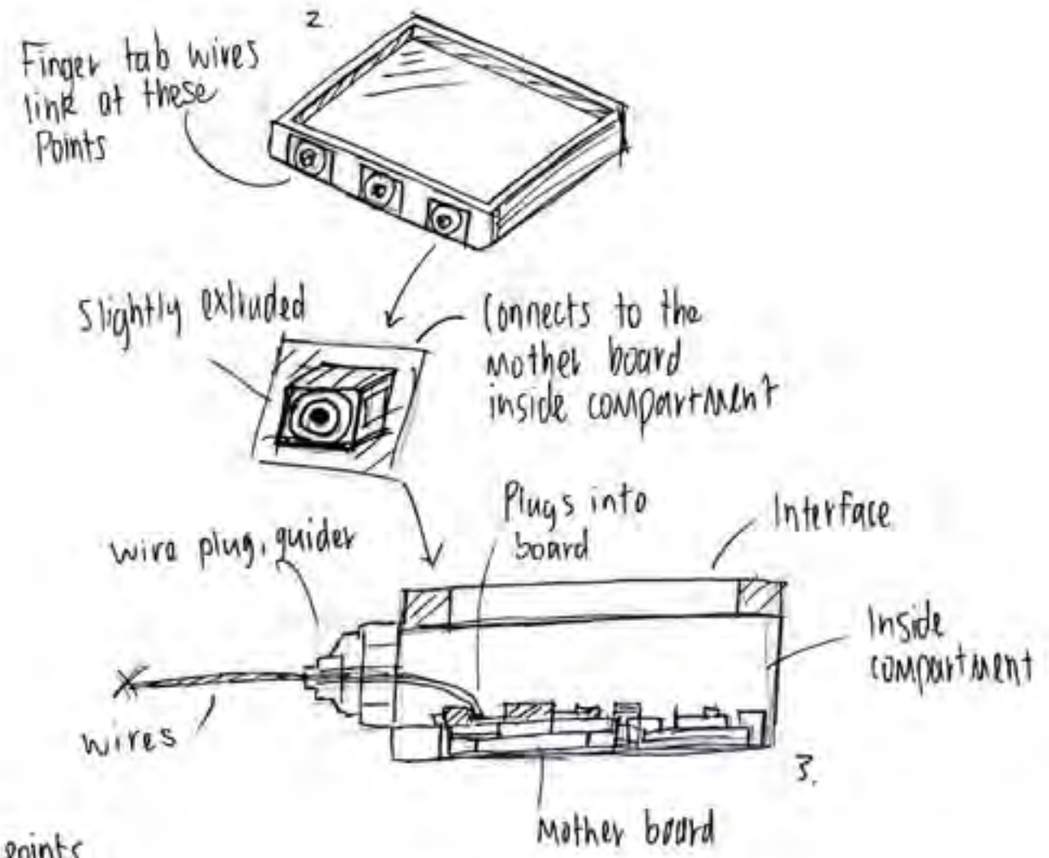
Key functions and features of the solution
- Small back of hand digitial interface which displays riding range, skateboard speed, and the percentage left in the devices battery
- Wave gesturing
- Point gesturing
- Light activation when gesturing
- Sound output when gesturing and lights are activated
- Adjustable tightening with elastic bands and tightening tab

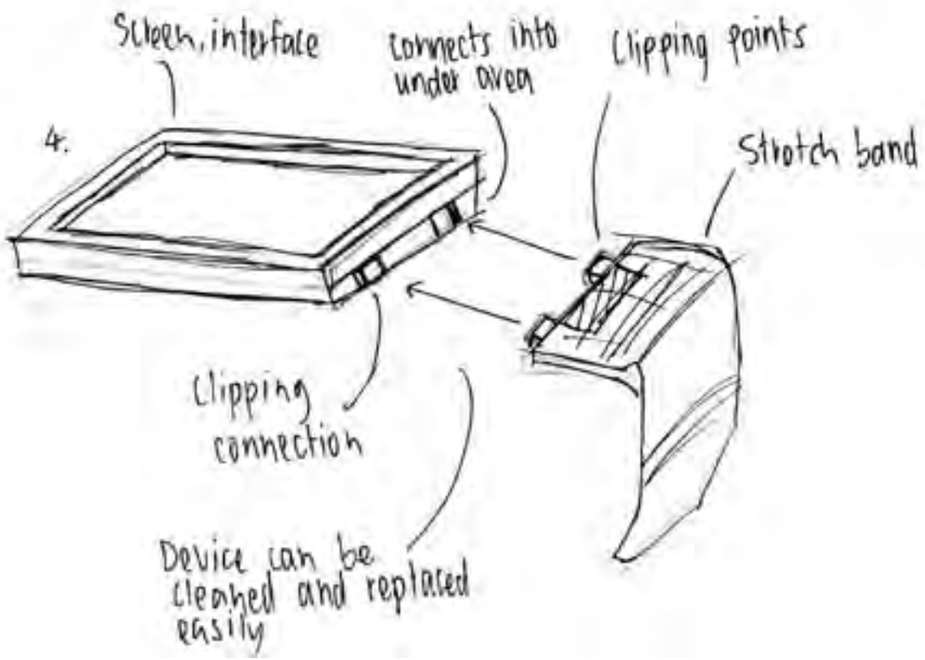
Sketch Iterations

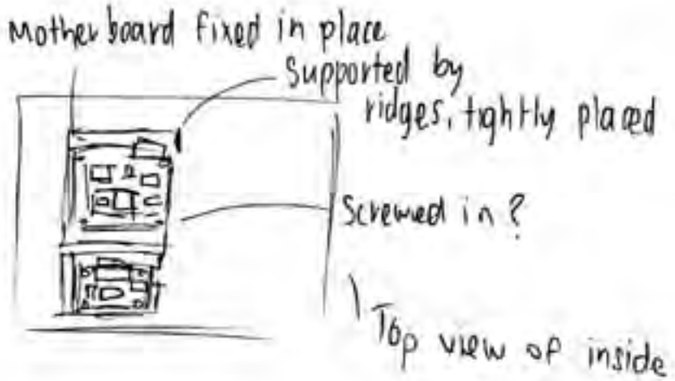


Sketch Iterations

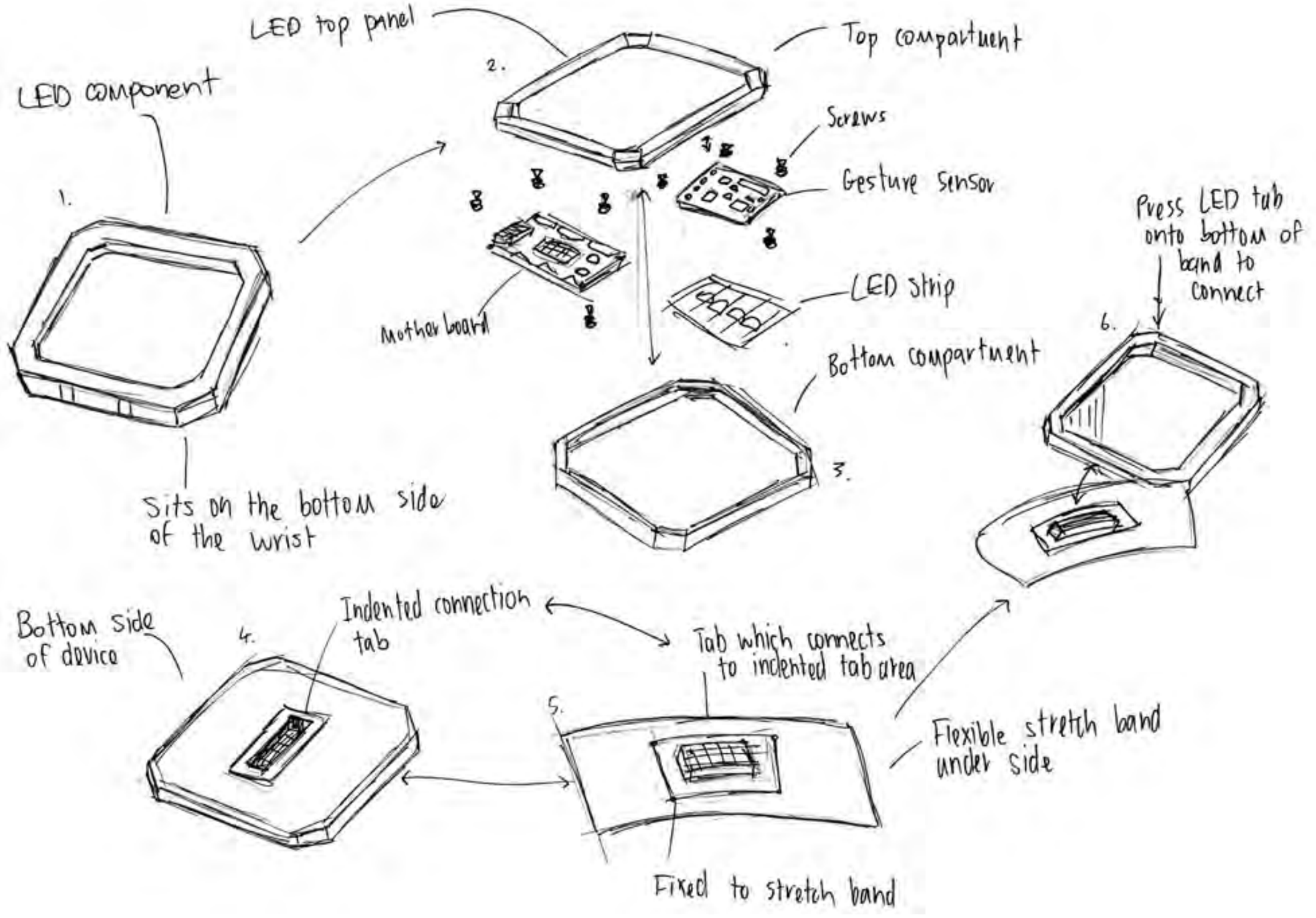
Sketch Iteration Details







Sketch Iteration Details



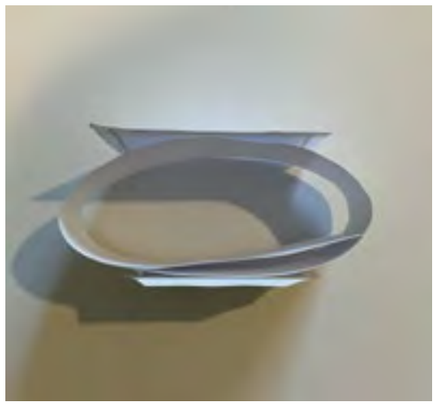
Prototyping

Revised prototype using a flexible wrist band that is placed around the users wrist comfortably and firmly. This is the base for the eventual tech to sit in place on.

Planning for where the screen is going to be placed. Similar to a smart watch the interface can be viewed with ease while riding an e-skateboard.

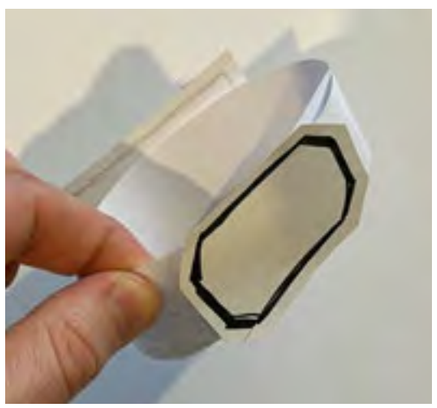
Further detail added to the screen base for purposes of understanding the visual intent and how other features will work in addition to this.

Under side of the glove, LED panel was prototyped using a similar design to the main interface. This design was unique though so users can distinguish it is the LED.



When looking at these parts seperately to the glove it gives off the appeal of a smart watch. This is familiar to users and can be easily integrated into a skateboarding setup.

The prototype band is no bigger then a normal smart watch, but it ensures the information displayed is easy to read. This is Important because original remote failed to do this.



Components sit vertical to each other so the user can rotate 180 degrees to observe the opposite side easily. Choosing the wrist avoids contact to the under side of the hand.

Comments:

Currently this is a removable set of parts that the user is easily able to dettach from the glove. This is for purposes of cleaning and maintenance.

While this is apparent there is still the idea of having it nearly fully fixed to the glove with the exception of slight movement to be able to clean under the parts. Something that would help achieve a semi fixed finish is velcro or hooks. This would mean users can lift up the part off the velcro or hooks and clean underneath while easily being able to fix it back to place.

Week 10 Studio 2

Detail images of key functions: having a blurred out user showing the actions

Stitch wires into glove using material over the top - maybe semi transparent so that the wires can be seen when they light up

LED wires that light up when activated then further activate the finger tip LED’s

Velcro attachment for the wrist band?

Or just stitch in the wrist band?

Charging case - Bose headphones case style. Look at branding, and the charging system like AirPods. Portability, charge case then unplug and charge gloves on the go.

The wrist interface is there because the controller visuals are too small to read

Look at easy to clean materials so that the attachments don’t have to be removed when cleaning. Safe fabrics, plastics, metal, silicone etc.

Wherever plugs or tech may be exposed like the charging port, wires or the screen etc use materials that are safe to be cleaned and not damaged or have in built covers over exposed items.

Look at Tron and how their props are made

Branding on glove

The product is now basically one. Not a whole seperate removable part… stitch material over wires and attach the writ band with Velcro or stitching

Flat cabelling

Product information: Safety details, how to use

Product Features & Detail (Waving)

Wave your way through busy environments when traversing on your e-skateboard.

Gesturing the familiar actions of a wave activates an LED panel located on the wrist to convey to pedestrians that the rider is there.

Unaware riders can still be reached as the gesture also emits a short, sharp beep to get all surrounding peoples attention.

The device will work with the raise of an arm, and the action of a wave.

Integrates a sound system that emits a short, sharp sound burst (beep) to alert unaware pedestrians.

Activates when lights are on.

LED’s are an integral feature used in the communicative glove design as they allow riders to communicate their actions with ease.

Product Features & Detail (Side Signalling)

Drop you hand down and give pedestrians or road users a clear indication of where you are intending to go.

The device incorporates LED wires and finger tip LED’s that activate upon dropping the arm to the side and pointing with the three fingers.

This gesture results in the glove lighting up simulating an effect similar to how motor vehicle drivers indicate on the back and front of their vehicles.

The familiarity of the action (as bike riders already do this) makes it easy.

Product Features & Detail (Pointing)

Point and make your intentions known with ease.

The Cruise skateboarding gloves allow users to gesture a pointing motion triggering the finger and respective LED’s to light the way.

The addition of a short and small beep also allows unaware users to hear you coming before it is too late and an accident happens.

Pointing is one of many ways a rider can increase their safety and the pedestrians around them.

Product Features & Detail (Digital Interface)

Digital interface is interactive with option to customise colours, font, and text sizes

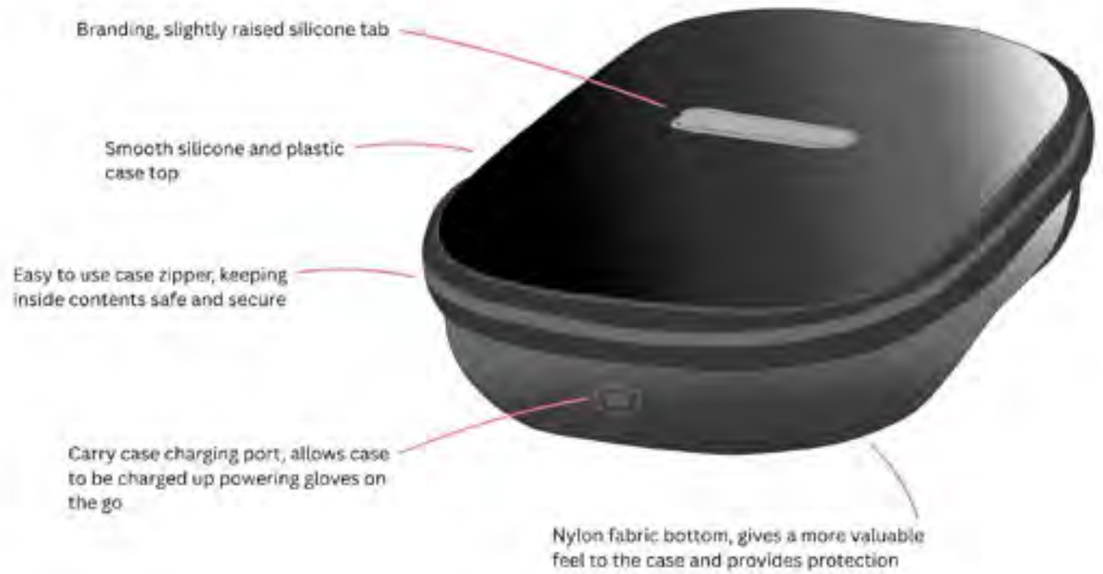
Wire connector, guides finger LED wires into the under compartment where the power source is

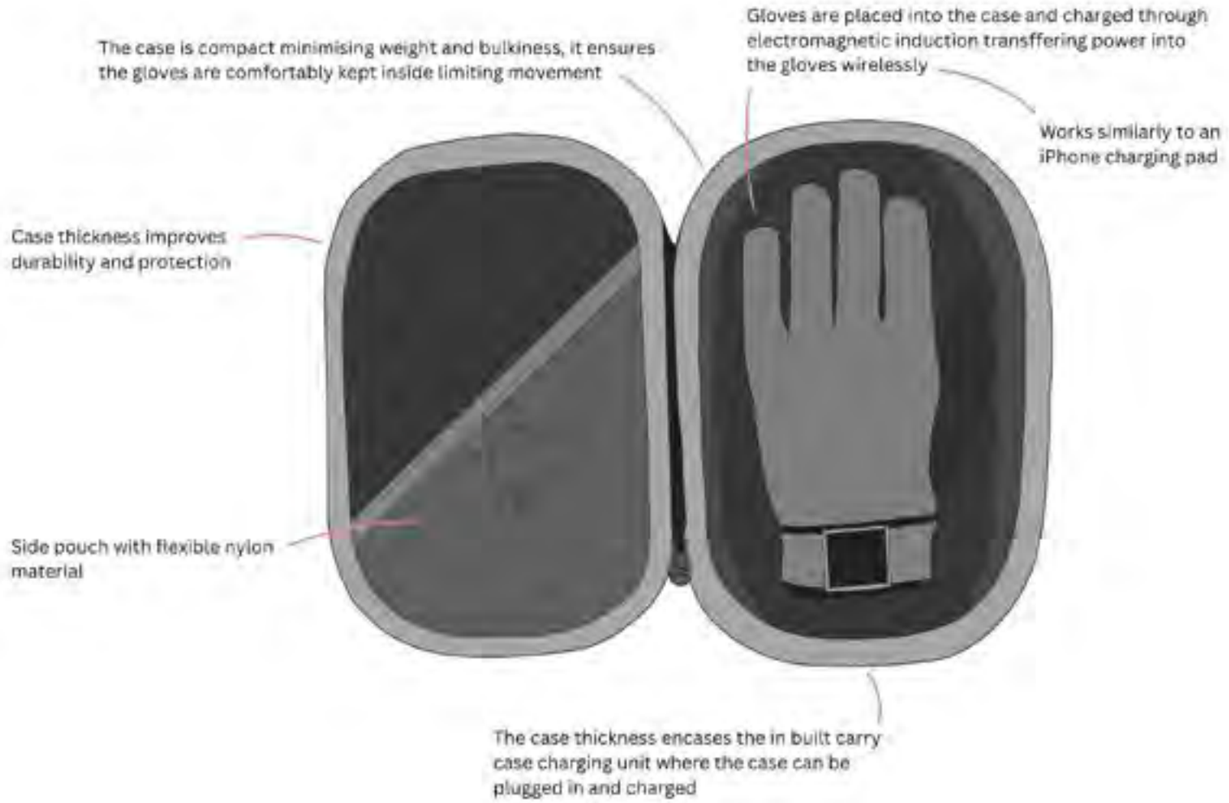
Digital interface, displays speed, battery life, and bluetooth connection to skateboard

Brake lights, device pairs with e-skateboard

Product Features & Detail (Carry Case)

Carry Case and Charging Mood Board





Week 11

Week 11 Lecture Notes

DNB311 Final Submission Review

Assessment 2 submission requirements
Wednesday 29th October
9am to 2pm presentation session

Key assessment areas

- Final presentation
- Website
- Exhibition

CRA

- Design leadership and project management
- Design development
- Integration of research into design - The research you did to create the products story
- Final design resolution - How well does it look aesthetically and how well thought out is the design as a whole. Product context is important here.
- Presentation - Verbally, visually, and well written

Submission requirements
- Final report - remove appendix upon final submission
- Design development record
- Physical model/prototype (process)
- Computer generated images
- Technical documentation - Exploded view with notes, part names, manufacturing process. Bill of materials. Part drawings.
- Video presentation of final design - 1 to 3 minutes, key features, context, process of use, scenario. Comparison with existing designs. Real actors and prototype embedded, or stills with smooth animations and text. Voice over highlighting features.

Hard copy submission
- Final design report
- Design development record
- Physical final design model

Digital (USB) submission
- Final design report
- Photographs of rough models, prototypes and final design model
- Renders of computer generated images
- Technical documentation and details
- Final presentations slides
- Video presentation

USB submissions file coding
Parent folder: DNB311 2025 Submission_Your Name
Sub folders: Report / DDR / etc...
Files names: Name of files_Your Name

8 minute presentation, 2 minutes of feedback (10 minutes total)

Week 11 Studio 1

Speak to Ikaro about how to design a glove in a way that is simple and makes it as close to a functional glove as possible.

For the final model I could use a battery to power one of the finger LED's.

Look at digital interfaces with touch screens and use it on the side for final presentation

Work to do

Keep doing sketches to get the idea across for the CAD modelling

Function sketches

Plan out a glove net, the ideal materials it uses and the form of the glove

CAD model and iterate parts I can already do - strap, LED panel, LED finger tip panels and interface

Steps:

- Material research for gloves and components
- Finalising component details (measurements, fitting)
- CAD components
  - PCB boards
  - Gesture sensor
  - LED tabs and wire connectors
  - LED panel
  - Interface
  - Strap
- Make pair of gloves

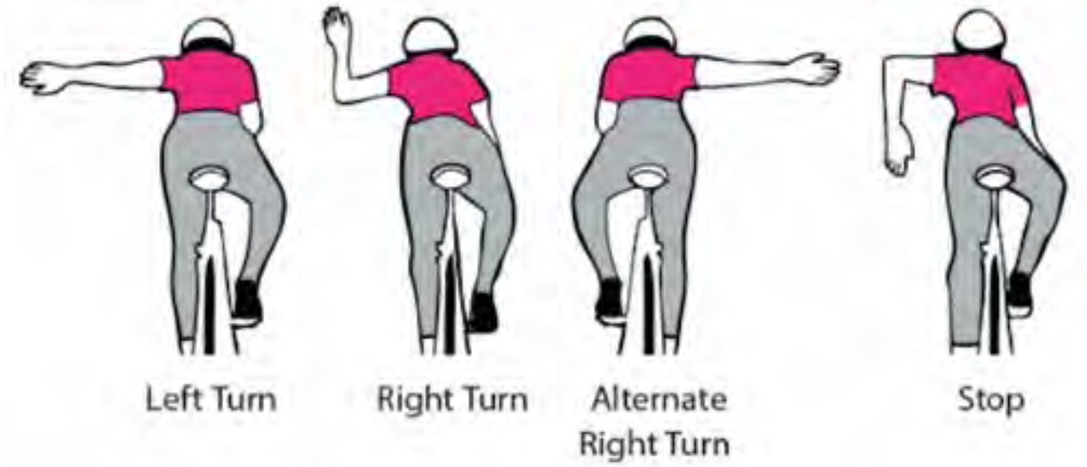
IDEA

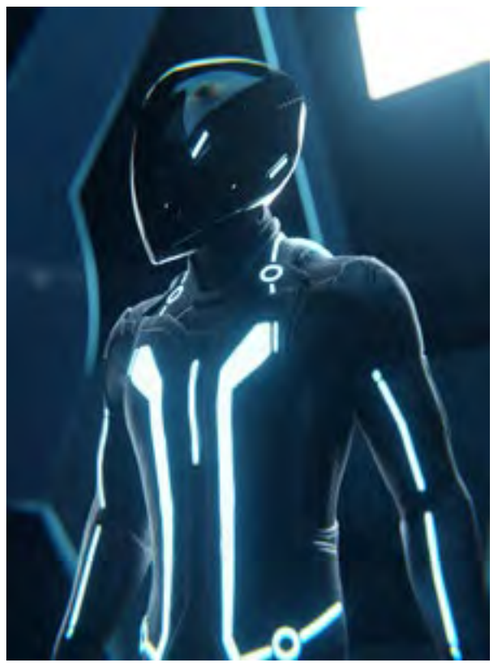
Have a display of materials I would ideally use for the glove design, like breathable material, grip material, and protective material.

Sketches could show how the glove would look instead of the model.

I could use a battery inserted into the finger of the glove to power one of the LED's as an example of its use.

Product Inspiration





Checklist

CAD / Renders / Tech Drawings

Interface Screen
Interface Compartment
Finger Tip LED Tabs
Wires
LED Panel Compartment and LED Panel
Strap / Band

CAD renders will be entirely just about these components.
Technical drawings will be entirely focused on these components.

Model Approach #1

Use existing / purchased glove
Apply desired features onto glove
Apply desired materials over glove

On the side display the digital interface purchased online. This would highlight how the screen actually works while the model shows the intended aesthetic.

Model Approach #2

Make gloves using stretch fabric (very basic but would be ideal).
Apply desired features onto the glove (3D printed parts etc.)

On the side display the digital interface purchased online. This would highlight how the screen actually works while the model shows the intended aesthetic

Additional Model Approach #2 options

Using a seperate A3/A2 sheet of material, lay out sections of desired materials the gloves would ideally use. Sketches could support this feature showing where each material type would fit into the glove.

OR

Just use sketches to display the desired glove aesthetic to support the hand made glove model and manufactured parts/technology.

CAD Part Breakdown

Interface Screen
- Arcylic Screen Cover

Interface Compartment
- Motherboard
- Gesture Sensor

Finger Tip LED Tabs
- LED Tabs

Wires (x3)

LED Panel Compartment
- Motherboard
- LED Strip

Week 11 Studio 2

Class Notes

CAD RENDERING
Overview shot
Detail shots (close ups)

VIDEO
In context use
CAD animation when needing to show details of technology

Other notes
Product informtion stickers to show further product detail

Creating Glove Pattern Layout

Glove making video

Images of previous student glove examples

Relate to ergonomics

My hand size could resemble a medium or large, based off that I can scale up or down to figure out other glove sizes.

Notes**

After prototyping with the glove cut out it was decided that this option of making my own glove should be discarded and instead used as prototype and ideation material.

Instead, existing gloves with a similar style to what was trying to be made will be purchased and this page will inform how they would be made in future.

Left and right hands traced

Paper trace cut out

Trace pinned to material

Material cut out following trace

Double sided material layed out

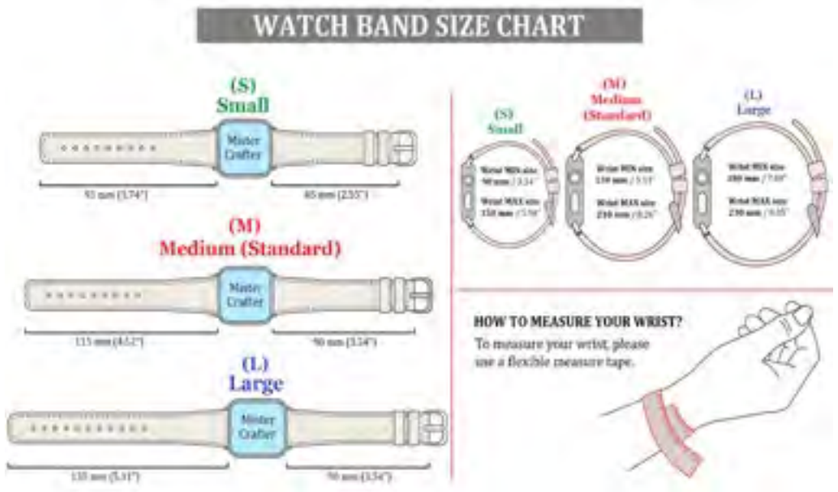
Material pinned together

Comparing cutout to trace

Left and right hand cutouts

Ergonomics

Apple Watch interfaces are a direct example of good interfaces as they vary in size, accommodating for different wrist size. These devices have evolved from 38mm by 42mm to 41mm by 45mm and also 49mm. These sizing units relate to the approximate height of the watch, influencing the display resolution, and area. Larger watches will accommodate for more screen real estate while smaller watches provide sleakness, (Apple, 2025).



To ensure the product accommodates for a broad range of users a small, medium, and large scale will be used to support the differences in hand and wrist sizes. (Similarly this will be done with glove sizing as well). Derived from the provided image, a small strap ranges from 95mm and 65mm, while a large is around 135mm to 90mm in length.

As this product is meant to be durable and require very minimal maintenance the strap sizing and glove sizing can be personalised upon purchase.

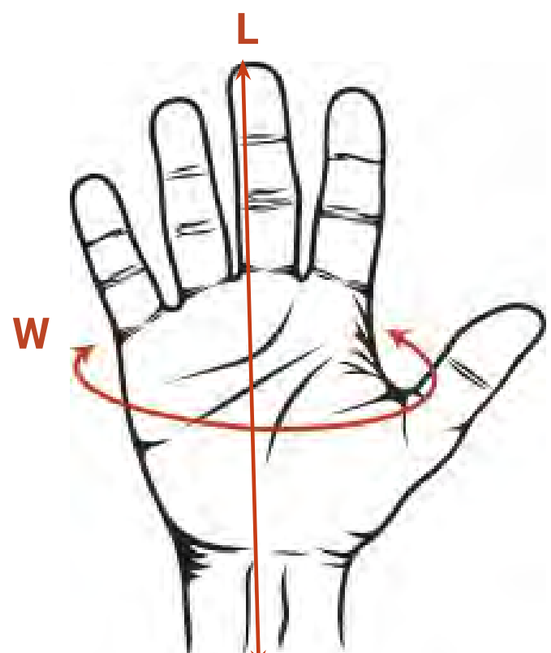
The band should be designed using materials appropriate to the context of e-skateboarding or physical activity. Bands that are breathable, minimal, and easy to use / function / or operate with are ideal in this area. Colour is also important to suit the riding aesthetic but ideally dark colours would be prefferable.

Glove Ergonomics

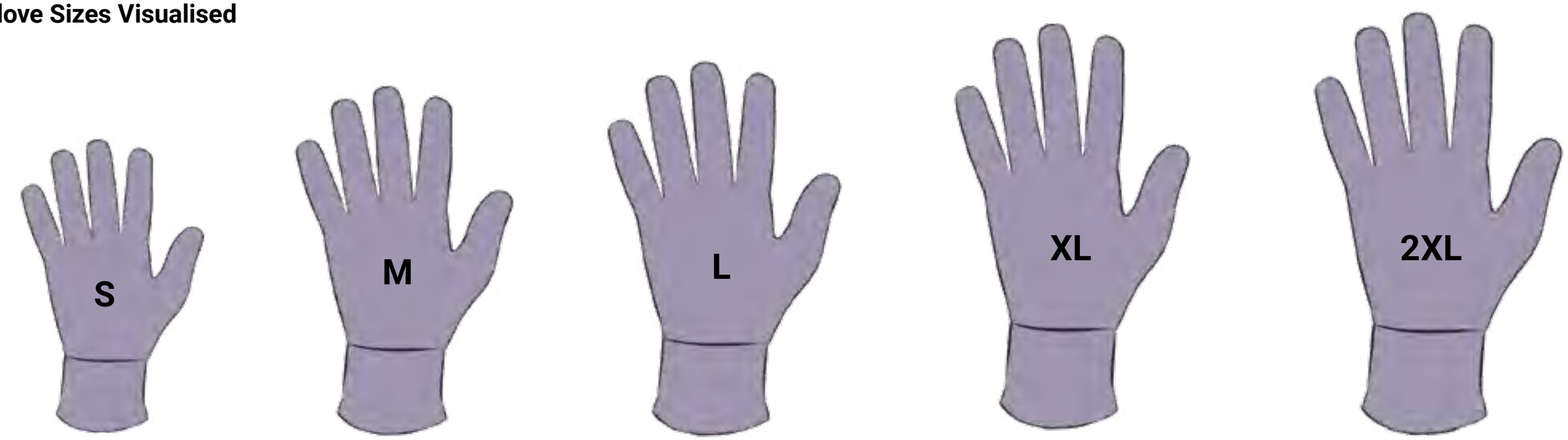
Glove Sizing For Men and Women

Note**
Model glove is a medium (M) sized glove

	Size	Length	Width
Women	S	16.7 – 17.2	17.0 – 17.7
	M	17.2 – 17.8	17.7 – 18.3
	L	17.8 – 18.5	18.3 – 19.0
Men	S	19.0 – 19.6	19.3 – 20.1
	M	19.6 – 20.3	20.1 – 20.9
	L	21.0 – 21.8	21.8 – 22.4
	XL	21.8 – 22.5	22.4 – 23.0
	2XL	22.5 – 23.0	23.0 – 23.7



Glove Sizes Visualised



Materials & Manufacturing

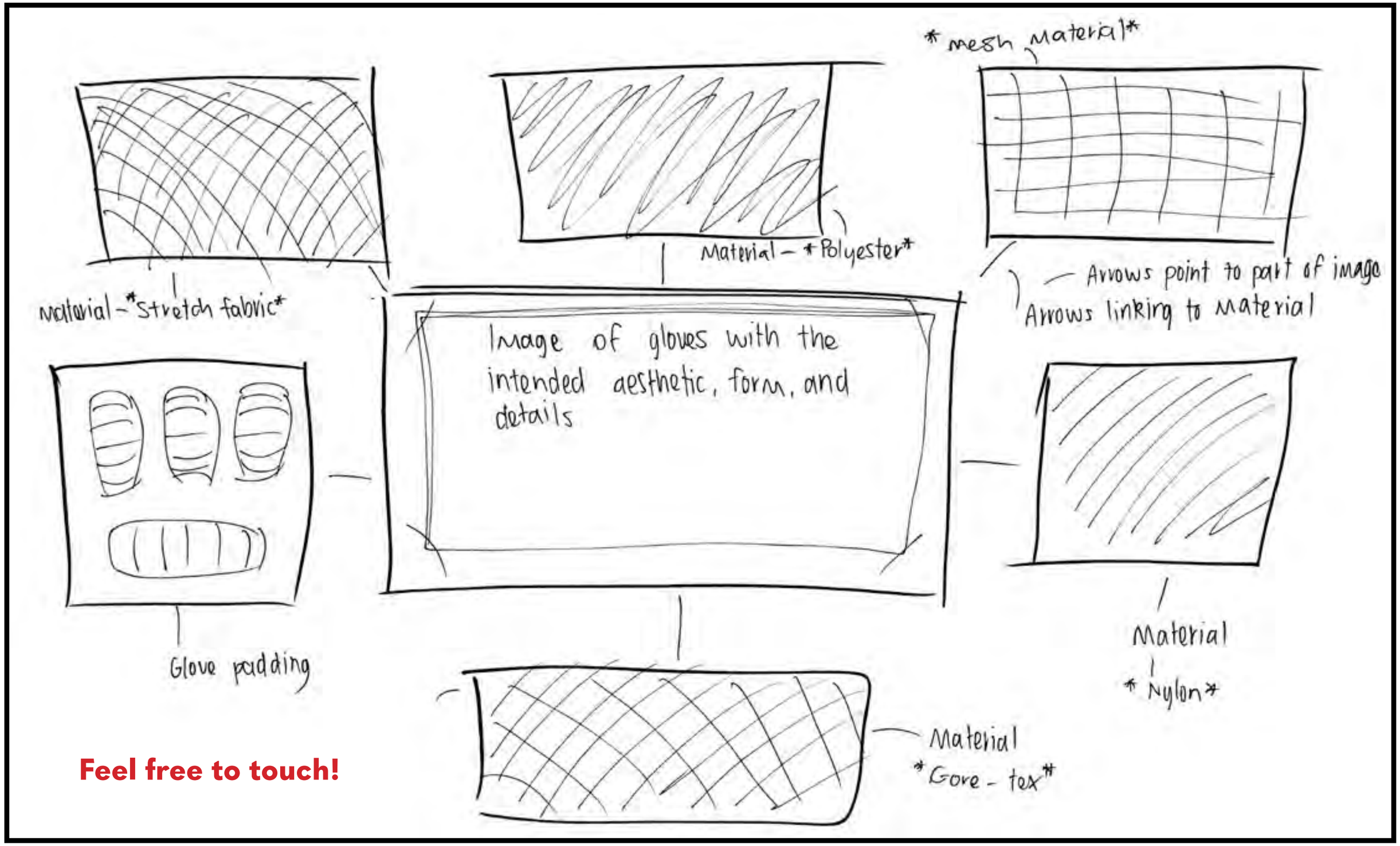
Table 1: Glove Technology Materials and Manufacturing

	Part Type	Colour	Material	Finish	Manufacturing Process
1	Interface Compartment	Grey	Aluminium	Matte	CNC Machining and Casting
2	Interface Screen	N/A	Off The Shelf Part	N/A	N/A
3	Interface Screen Glass	Clear	Clear Acrylic	Standard Gloss	Extrusion and Casting
4	LED Panel Board	N/A	Off The Shelf Part	N/A	N/A
5	LED Panel	Grey	Aluminium	Matte	CNC Machining, and Casting
6	LED Panel Cover	Clear	Clear Acrylic	Standard Gloss	Extrusion and Casting
7	Finger Tabs	Grey	ABS Plastic	Low Gloss	Injection Moulding
8	Strap	Grey	Nylon	Matte	Weaving and Stitching
9	PCB	N/A	Off The Shelf Part	N/A	N/A
10	Gesture Sensor	N/A	Off The Shelf Part	N/A	N/A
11	LED Tabs	N/A	Off The Shelf Part	N/A	N/A

Table 2: Glove Materials and Manufacturing

	Part Type	Material	Finish	Manufacturing Process
12	Inner Glove Layer	Nylon	Microporous Coating	Stitching
13	Outer Glove Layer	Polyester	Textured and perforated	Stitching
14	Breathable Glove Patches	Synthetic Mesh	Microporous Coating	Layering and Stitching
15	Glove Grip	Polyurethane (PU)	Silicone Based Coating, Tactile	Layering and Stitching
16	Glove Padding	High Density and PVC Foam	Layered, Tactile	Layering and Stitching

Material Board Ideating



Material Board Ideating

Week 12

Week 12 Studio 1

Class Notes / and Conversation with Raf

MATERIAL BOARD
Layout swatches of materials rather then the glove cutouts (Cut glove fingers off)
Detailed sketch to show where materials apply

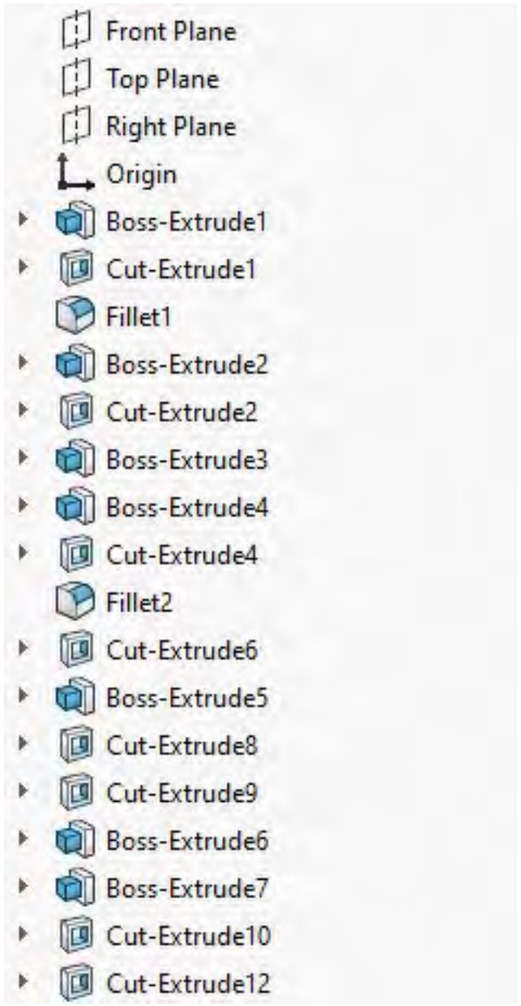
WORKING TECH BOARD
Buy LED strip wire
Digital interface board

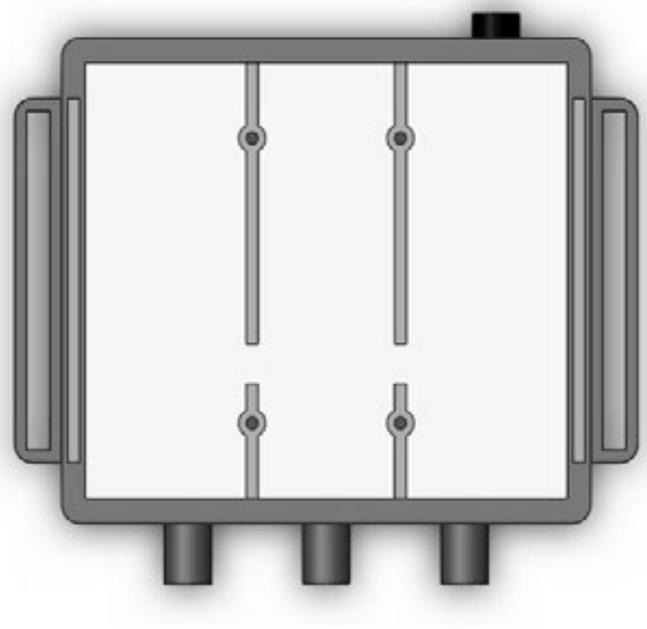
ROUGH MODEL
Just get it done as best as possible (Not working is ok)

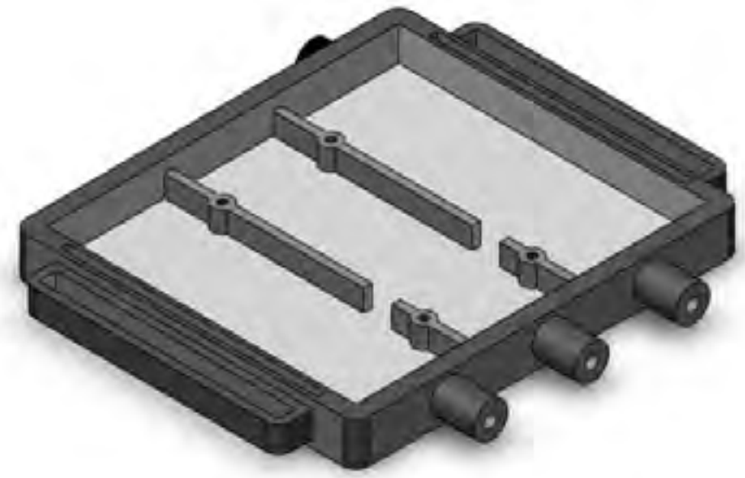
HIGH QUALITY SKETCHES
Showing all key details
These should be implemented all throughout the project - Materials board, video, tech board, presentation

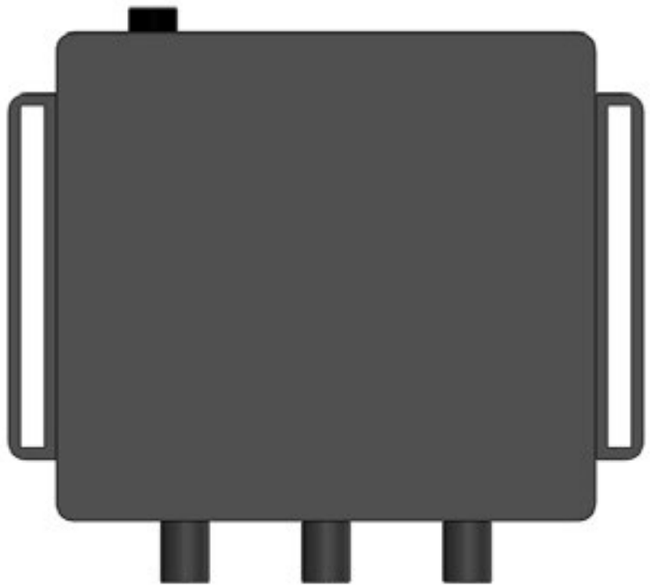
MOVING FORWARD
- Complete CAD model and produce renders - Document CAD progress and images
- Complete physical model - Photograph and layout for presentation
- Create sketches of final model - Display key funtions, features, and aesthetic
- Produce video presentation - Introduce problem, key features, functions, technical view (CAD video)
- Prepare material for submission - USB related material, refer to previous lecture for contents

CAD Progress Interface Compartment

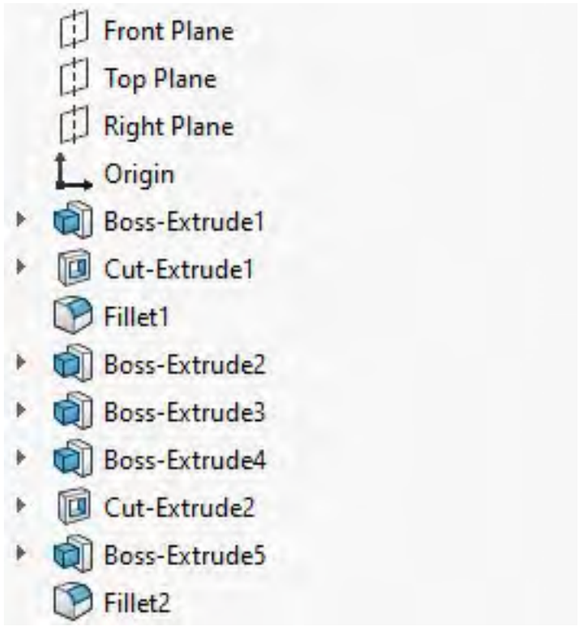


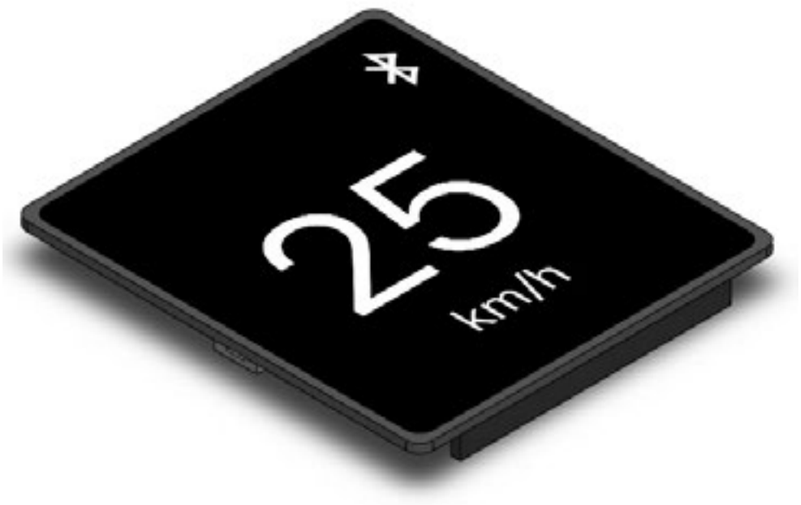


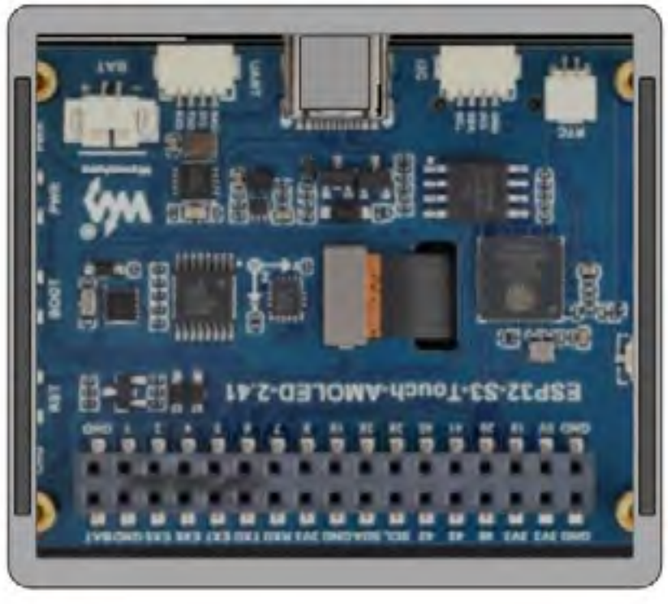




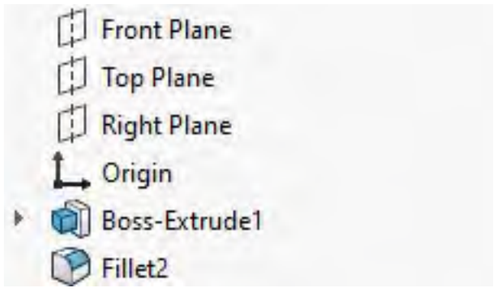
CAD Progress Interface Screen

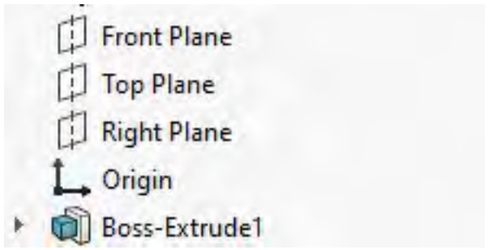


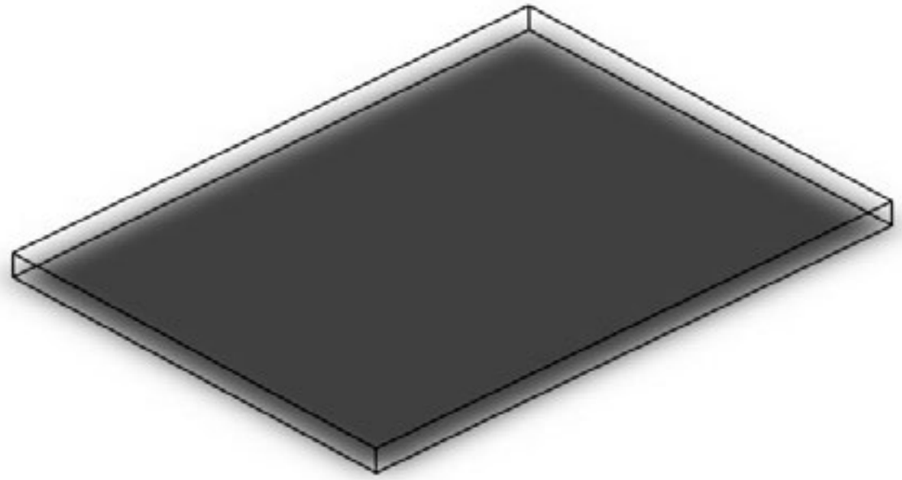




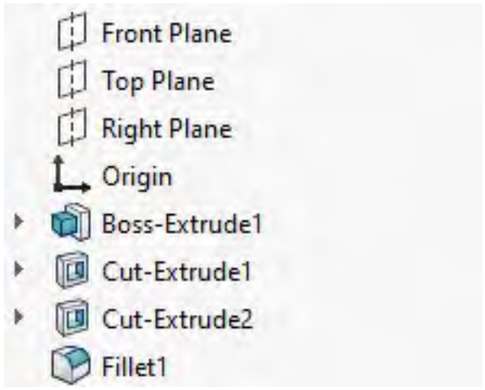
CAD Progress Interface Screen Cover and LED Panel Cover

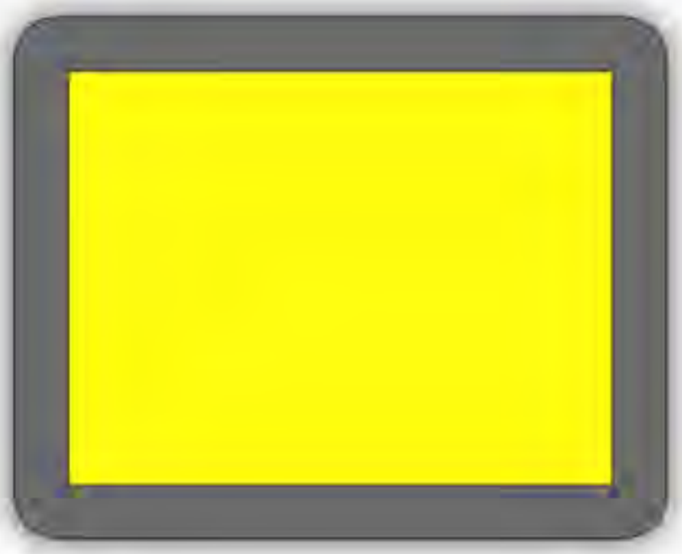


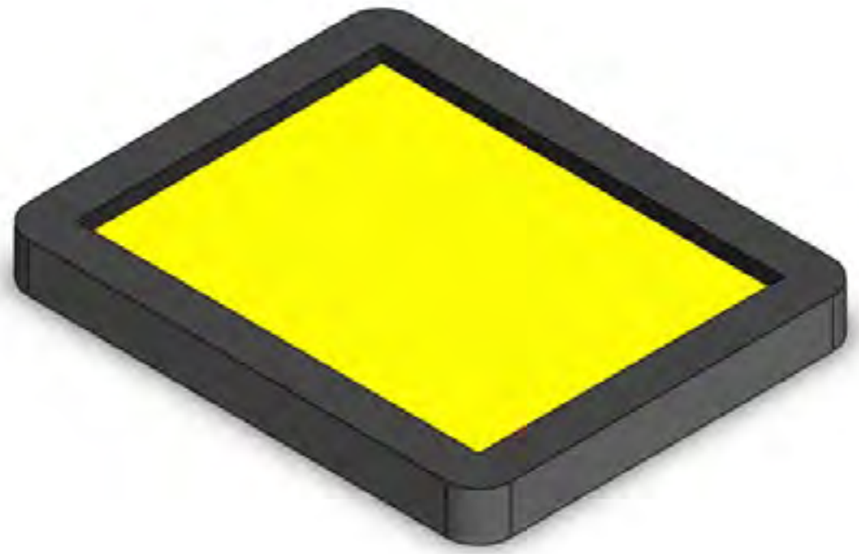


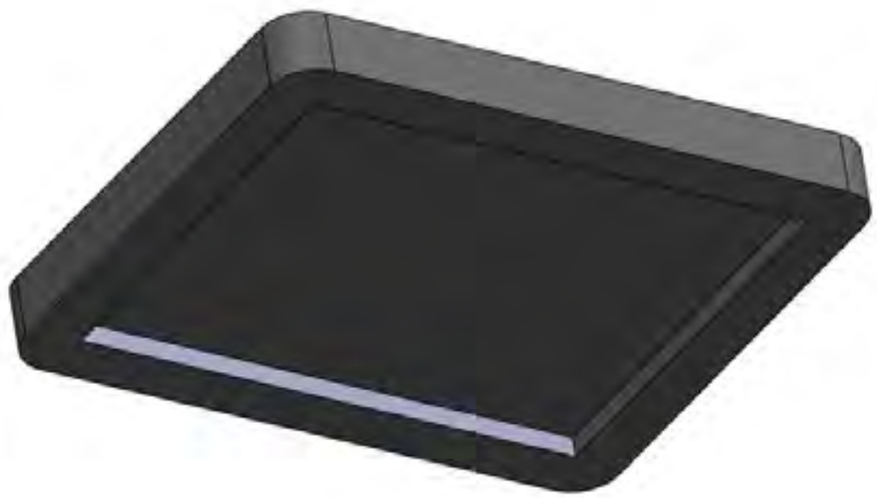


CAD Progress LED Panel Board

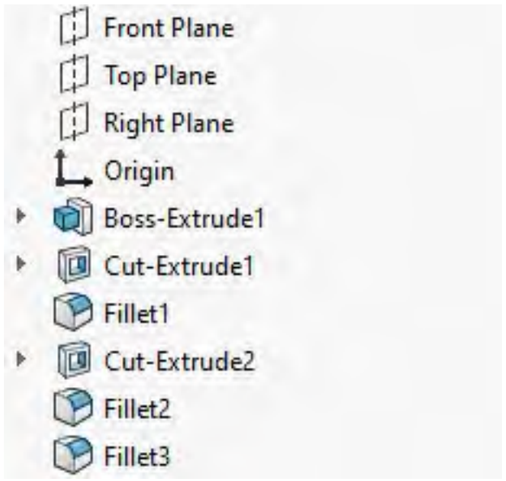


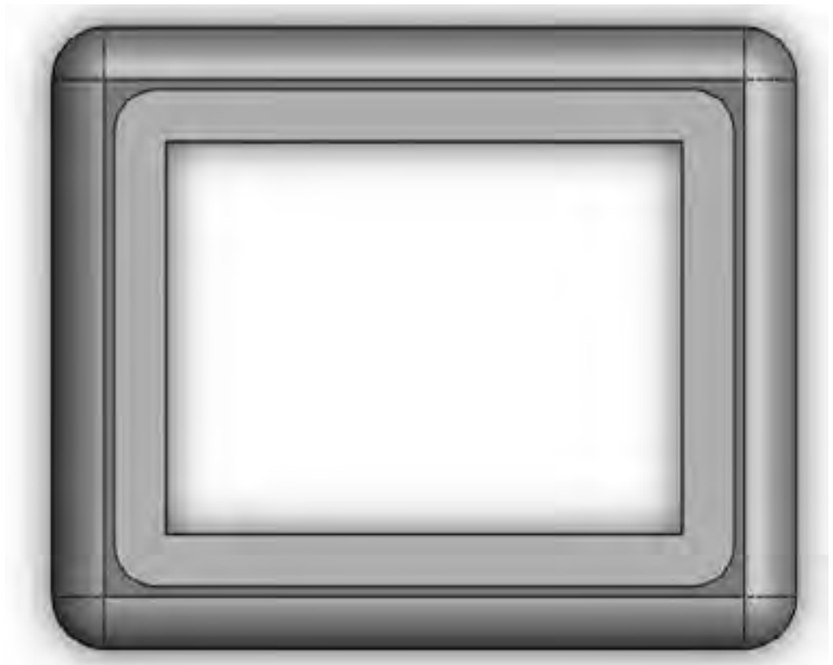


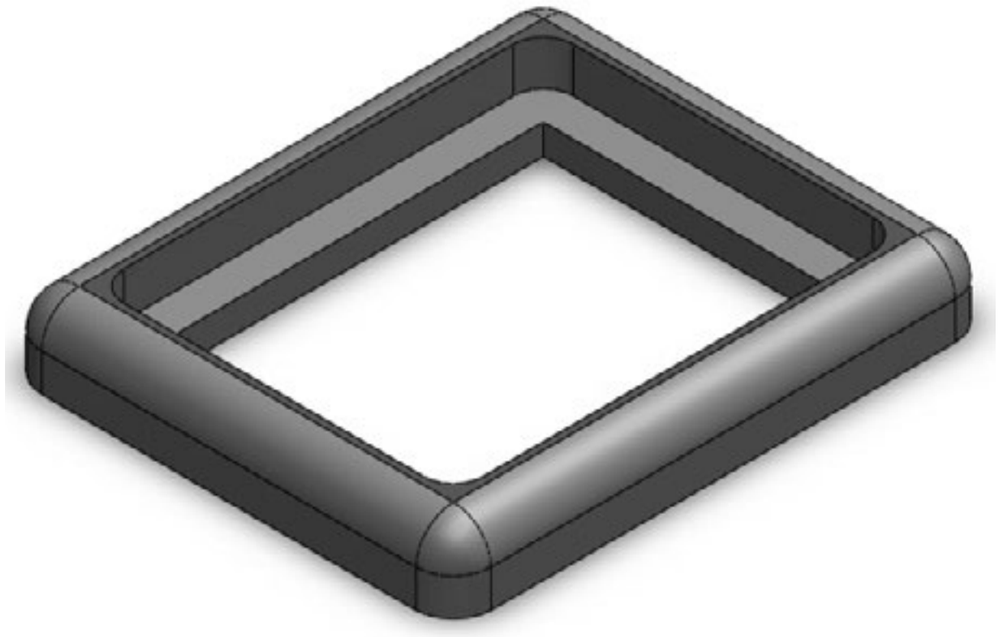




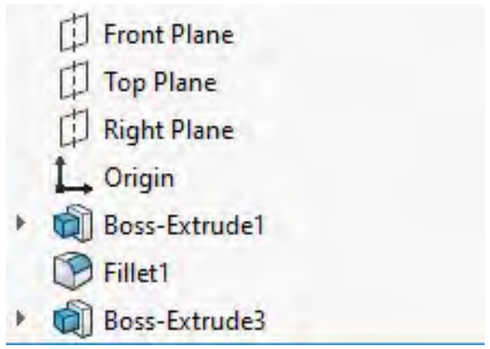
CAD Progress LED Panel



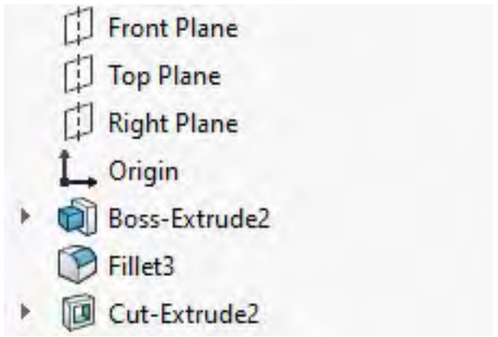


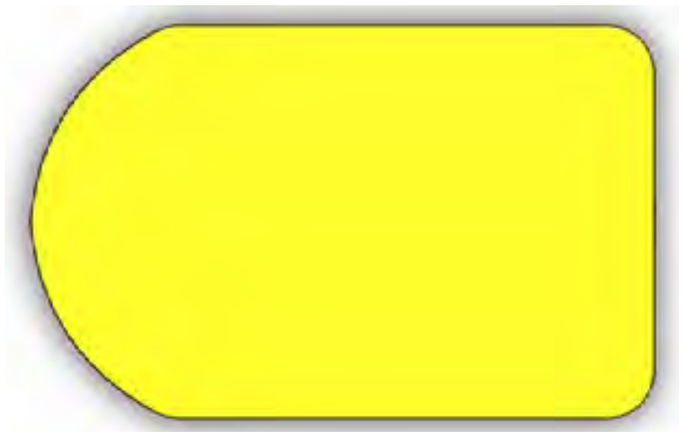


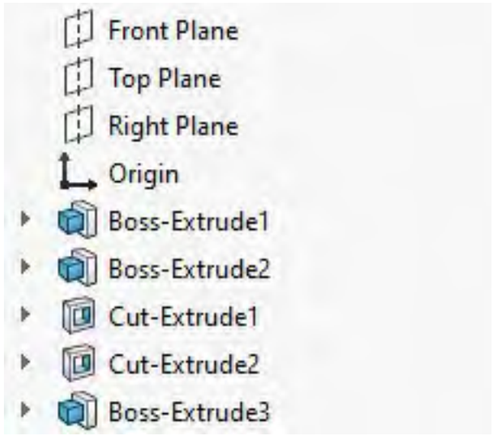
CAD Progress Strap

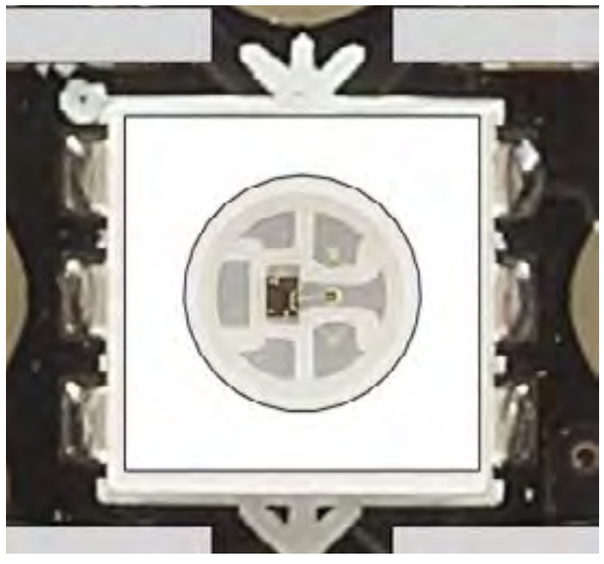


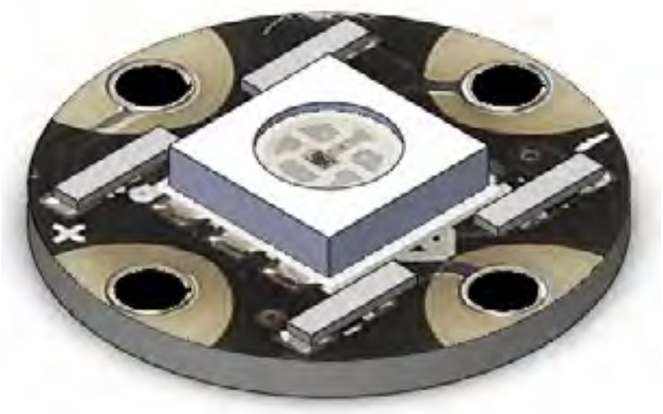
CAD Progress Finger Tabs and LED Tabs



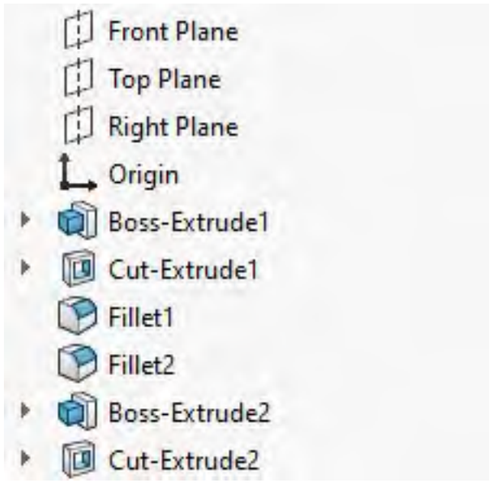


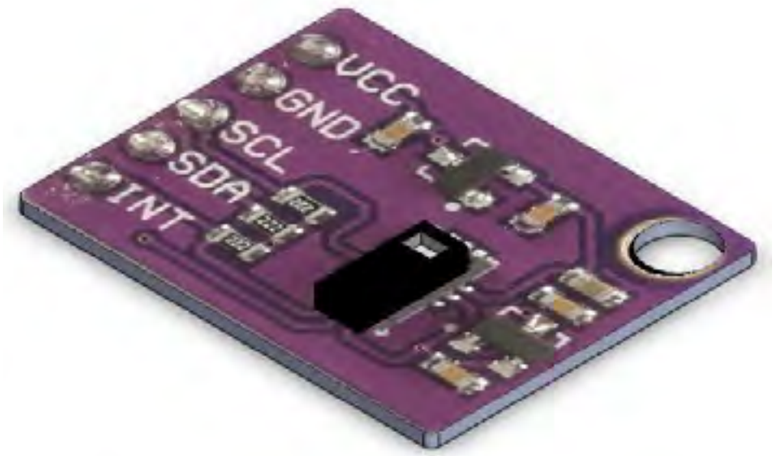


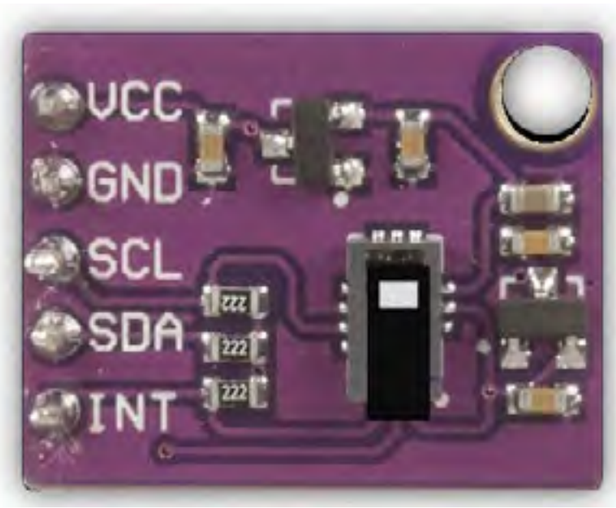


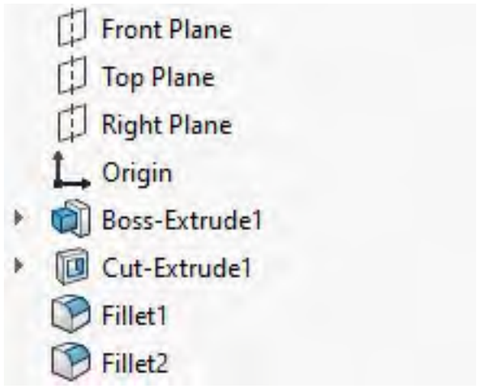


CAD Progress Gesture Sensor and PCB



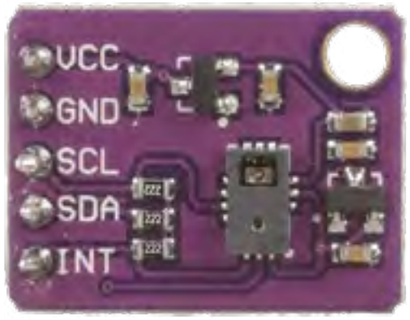






CAD Decals

Gesture Sensor



Digital Screen Board

Finger Tab LED's

Finger Tab LED Center

Digital Interface Screens

Speed Interface

Range/Battery Interface

PCB / Motherboards

BOM Final

	Part Name	Quantity	Weight	Manufacturing Process	Finish	Material	Colour	Production Volume	Cost Per Part	Unit Cost
1	Interface Compartment	1	15g	CNC Machining and Casting	Matte	Aluminium	Grey	5,000	$9.30	$9.30
2	Interface Screen	1	5g	N/A	N/A	Off The Shelf Part	N/A	5,000	$12.40	$12.40
3	Interface Screen Glass	1	2g	Extrusion and Casting	Standard Gloss	Clear Acrylic	Clear	5,000	$0.78	$0.78
4	LED Panel Board	2	5g	N/A	N/A	Off The Shelf Part	N/A	5,000	$7.75	$15.50
5	LED Panel	2	10g	CNC Machining, and Casting	Matte	Aluminium	Grey	5,000	$3.10	$6.20
6	LED Panel Cover	2	2g	Extrusion and Casting	Standard Gloss	Clear Acrylic	Clear	5,000	$0.62	$1.24
7	Finger Tabs	6	5g	Injection Moulding	Low Gloss	ABS Plastic	Grey	5,000	$0.23	$1.40
8	Strap	2	110g	Weaving and Stitching	Matte	Nylon	Grey	5,000	$6.20	$12.40
9	PCB	2	2g	N/A	N/A	Off The Shelf Part	N/A	5,000	$9.30	$18.60
10	Gesture Sensor	2	2g	N/A	N/A	Off The Shelf Part	N/A	5,000	$12.40	$24.80
11	LED Tabs	6	1g	N/A	N/A	Off The Shelf Part	N/A	5,000	$0.31	$1.86

Total Manufacture Cost
$110.48

BOM NOTES:

Cost Per Part: Estimated unit price to procure or manufacture each of the parts respectively.

Unit Cost: Cost contribution of that part to one assembled device

Total Cost Estimate: $110.48, this does not include additional services like…

- Assembly labour
- Test and calibration
- Tooling amortisation (especially for injection moulding or CNC fixturing)
- Quality inspection
- Enclosure finishing or surface treatments beyond raw part cost
- Packaging, shipping, tariffs, overhead or profit margin

Based off of the listed observations, the total manufacturing cost would be estimated around: $135 to $170 in total to produce the device.

Market/Production Scenario
Small pilot run: 500 – 5,000 units (Initial customer sales, small batch crowdfunding fulfilment)

Practical Recommendation
It is recommended for a glove-attached-wearable device in the sport/skating industry a first production target of between 5,000 to 50,000 is ideal. Due to how niche e-skateboarding is and the market for high-tech devices a production run of 5,000 units is a reasonable amount to begin with.

How reasonable is the cost and production estimate?
When comparing the cost estimate to products like the Apple Watch, or other notable smart watch brands it can be assumed that the device is within a reasonable range.

Apple Watches are estimated to cost $129.42 to $277 to manufacture. These figures differ depending on the model of watch. With this in mind, the final cost estimate of $135 to $170 for the Integrated Glove Technology falls directly in between existing watch manfacturing costs.

Week 12 Studio 2

Perspective of glove
Identifying features
Images of gloves

Stills of scenariors
Keeping people safe
Guide viewer through
A few key frames
etc...

Annotations

Have text slide through

Week 13

Week 13 Studio 1

NOTES

LED Strip for board
Materials board

Supporting feature guide

Model will be as good as I can get it

STEPS TO FINISH
Finish model
Finish material board and working LED display
Make video
Finish features and functions guide booklet
Make presentation slides
Create presentation script
Finish DDR
Combine material into folders required for digital USB submission

Model Making

1

Components prepared by taping holes and areas not wanting to be painted

2

Interface screen and interface compartment joined together

3

Full coated and glued interface compartment and screen ready for assembly

7

Spray painting parts in context using water based spray paint and cardboard plates

8

All parts required multiple coats to achieve a desirable finish

4

LED panel prepared and spray painted to match intended finish as best as possible

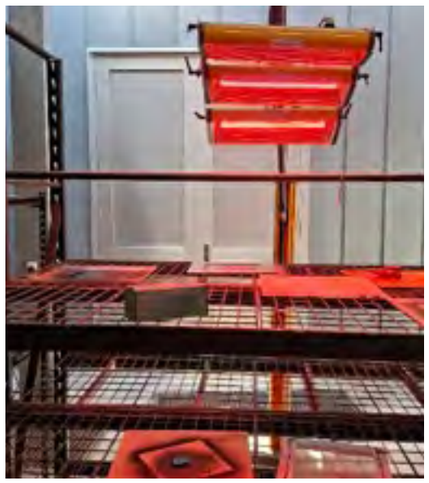
5

LED panel screen prepared by covering areas with tape and spray painting edges

6

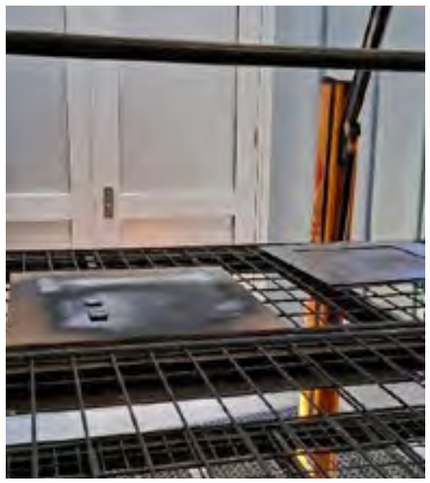
Finger tabs spray painted and positioned accordingly for assembly

9



The drying racks were utilised for drying parts in between coats

10



Due to the size of the parts they were placed to the sides recieving minimal heat

Model Making

11

The band connecting the interface and LED panel was cutout using a stretch fabric

12

The material was wrapped around the glove and threaded through the strap clasps

13

By pulling the ends of the fabric the interface was tightended to the glove

14

At each end of the strap it was cut to a desired length and stitched down to the glove

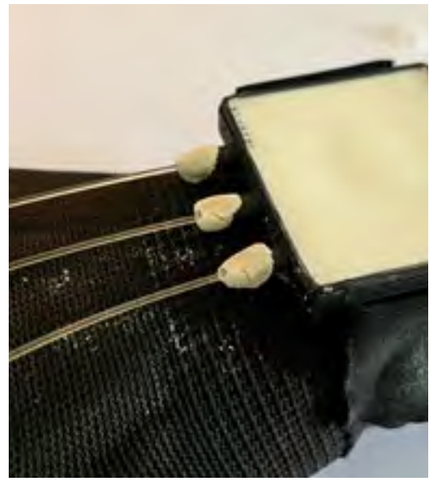
15

LED finger tabs attached to the finger tips of the glove resembling where the lights are

16

A translucent wire was chosen in the assembly as it best resembles the intended design

17



The wire was attached to the interface jacks showing how each wire connects inside

18

The wires were also attached to the finger tabs connecting the power to the output

19

At the glove knuckles the LED wires were attached onto the glove to ensure they remained in place

20

Translucent wires have a similar effect to what the actual LED's will look like

Final Physical Model

Model Making Breakdown:

Materials

PLA 3D prints - Technology components

Stretch fabric - Wrist strap

Modelling clay - Wire joins

Translucent plastic wire - LED strips

Existing glove

Assembly Methods

Glueing - For model purposes only

Physical part joining

Stitching

Painting

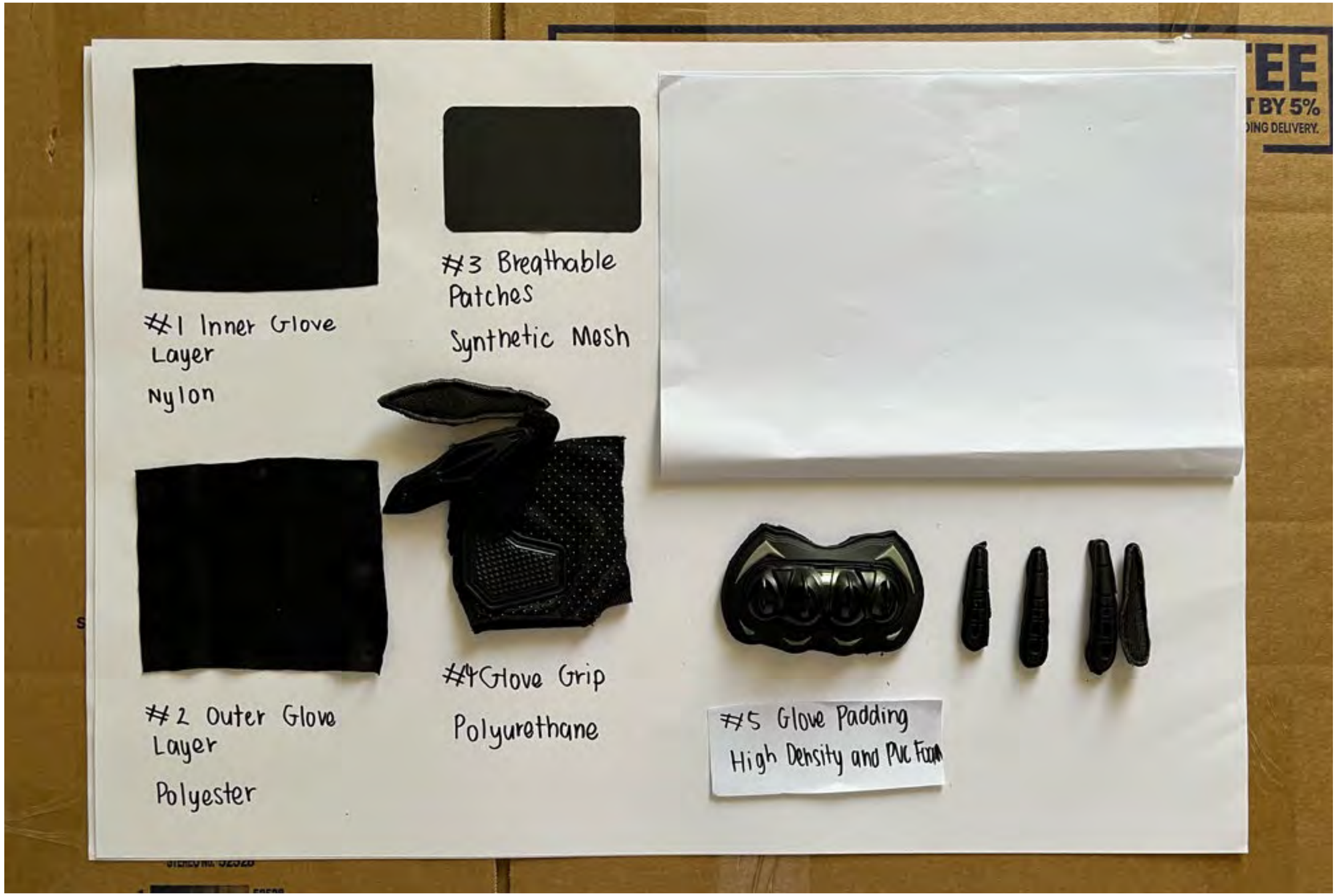
Component Manufacture Methods

3D Printing - PLA Material

Cutting - Fabric Materials

Stitching - Fabric Materials (Not the glove)

Material Board



Product Branding

PRIMARY BRAND LOGO & NAME

CRUISE

CRUISE EBOARDS

CRUISE

BRAND CALLING CARD

CRUISE EBOARDS

CRUISE

COMMUNICATIVE GESTURE GLOVES

COLOUR ALTERNATIVES

CRUISE

CRUISE

CRUISE

CRUISE EBOARDS

CRUISE

BRANDING DETAILS

Name Meaning

Cruise describes the enjoyment of travelling smoothly in relation to the mode of transport being used. The Cruise Gesture Gloves allow riders to communicate their intentions making their ride more enjoyable.

Colour Choice

Dark blue and off white were chosen as the primary logo and font colours as they resemble discipline and balance, key elements in someones ability to ride an electric skateboard.

Slogan & Expressions

Light your way!
This expression relates to the ease of use and ability to make your intentions clear when on the road or within shared active mobility spaces. The Cruise Gloves allow riders to light their way by gesturing actions in certain environments.

Branding Deployment

The branding features on a tag inside of the gloves itself, as well as the carry and charging case included upon purchase of the devices.

Week 13 Studio 2

VISUAL LAYOUT OF PRESENTATION

Make it fun and context centred, Raf likes the Hero render drawings so make the aesthetic around those or skateboarding context.

Potentially replace the banners of the presentation to an image block

Keep title text in one line

DRAWINGS
Hero image of the charging case open

Show the light of the charger

Video Making

Video Planning

Title Screen - 5 Seconds

Context - 15 seconds

Primary risks/dangers identified - 24 seconds (multiple transitions)

Introduce the product - 20 seconds (multiple transitions)

Slide 1: Activation - 10 seconds (video demonstration)

Slide 2: Side direction signalling - 8 seconds (video demonstration)

Slide 3: Wave gesturing - 9 seconds (video demonstration

End hero shot & branding - 5 seconds

Total time: 1 minute, 35 seconds

Key Video Elements

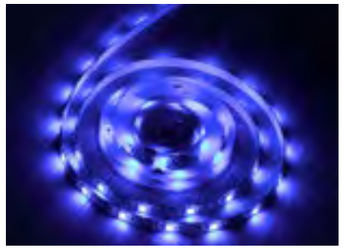
Video Editing Snapshot

Working LED Component

Design Process

Materials Used

LED Strip Lights

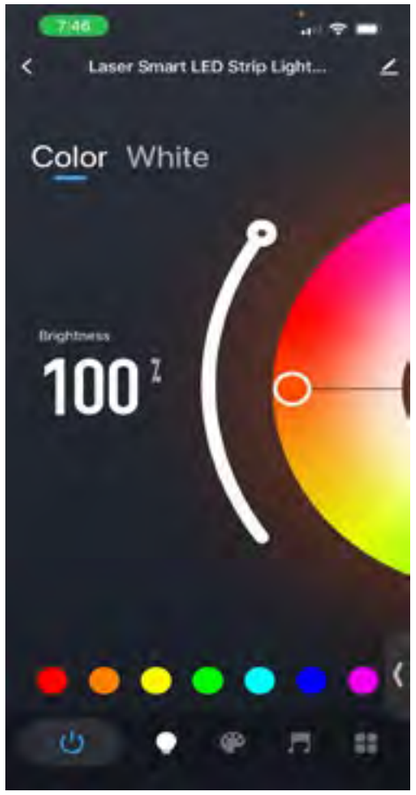


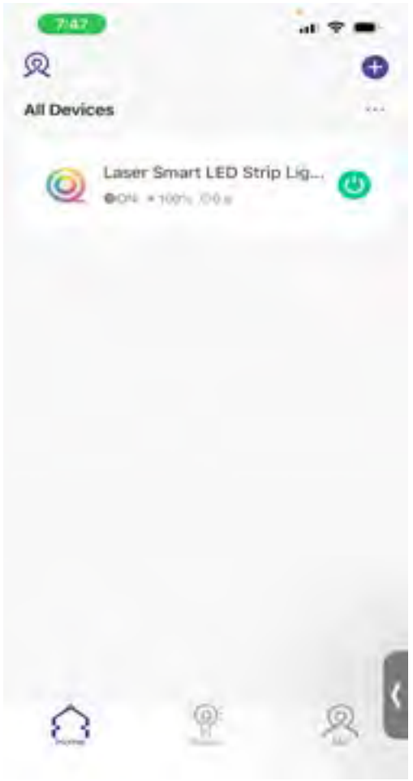
Cardboard Box

Grey Spray Paint

LED Setup

App Screens





Supporting LED app allows you to customise light colour, brightness, and time limits through your phone. This is ideal for presenting this component in the exhibition as I can place the portable charger inside the box with the USB-C cable already plugged in.

With the click of a few buttons the lights can turn on to represent the gesture glove LED strips.

Final Design Outcome

Purpose

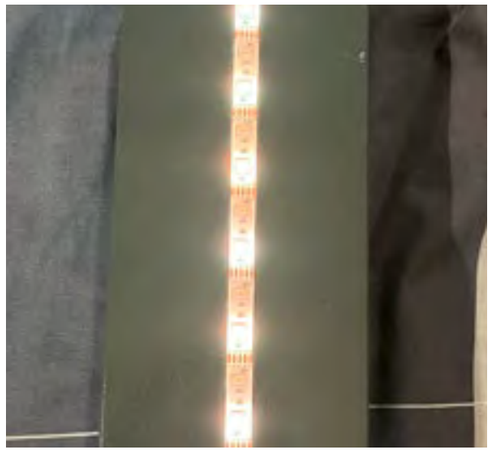
Simulates the working LED strips within the gloves lcoated around the fingers and finger tips.

The model will be used as a proof of concept rather then stitching the LED's into an actual glove

Manufacture Process

Methods used:
Spray painting (box)
Sticking and cutting (LED's and box)

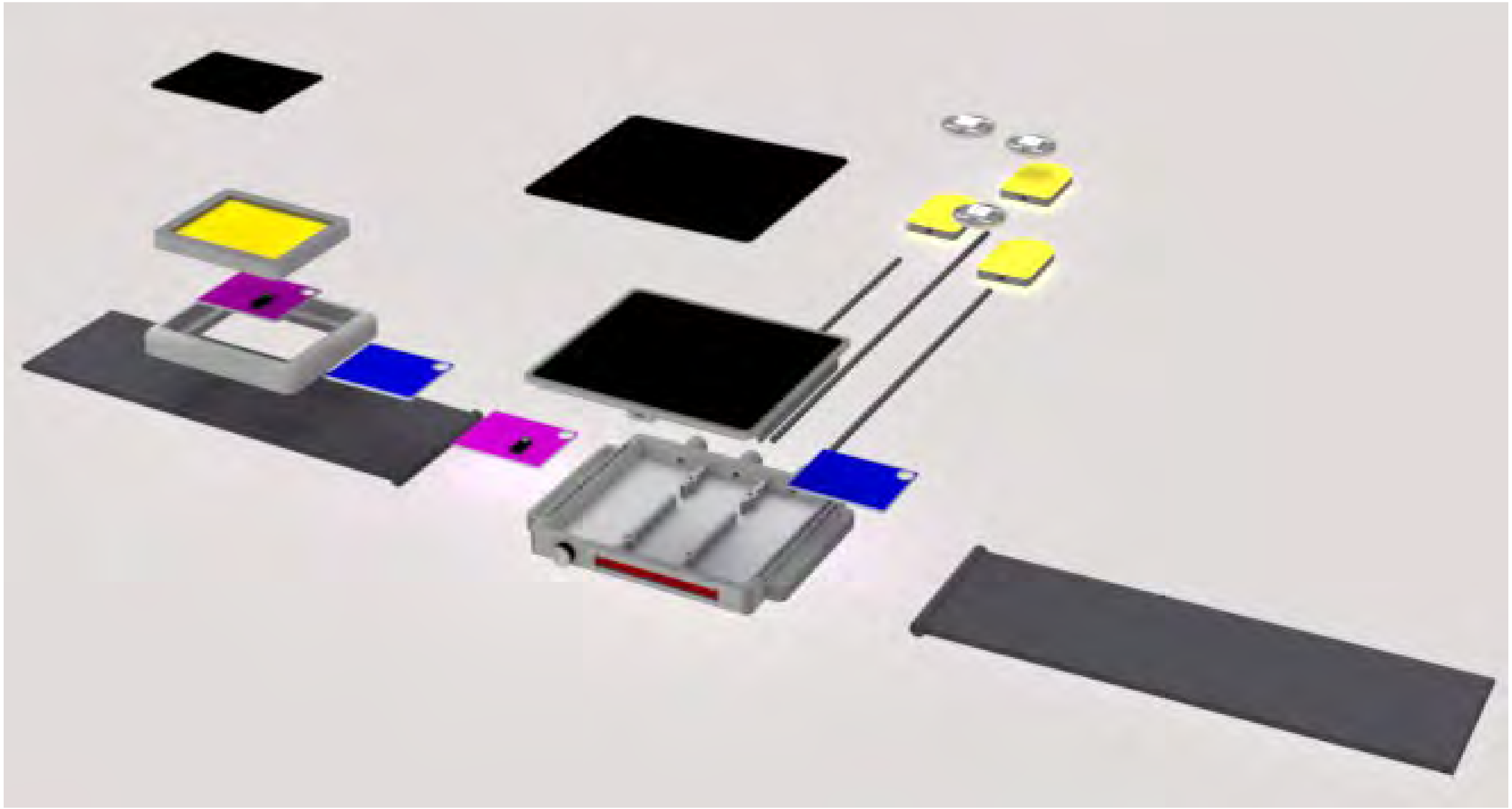
Materials used:
Cardboard box (base)
LED strip lighting (visual representation)
Power bank (power source)



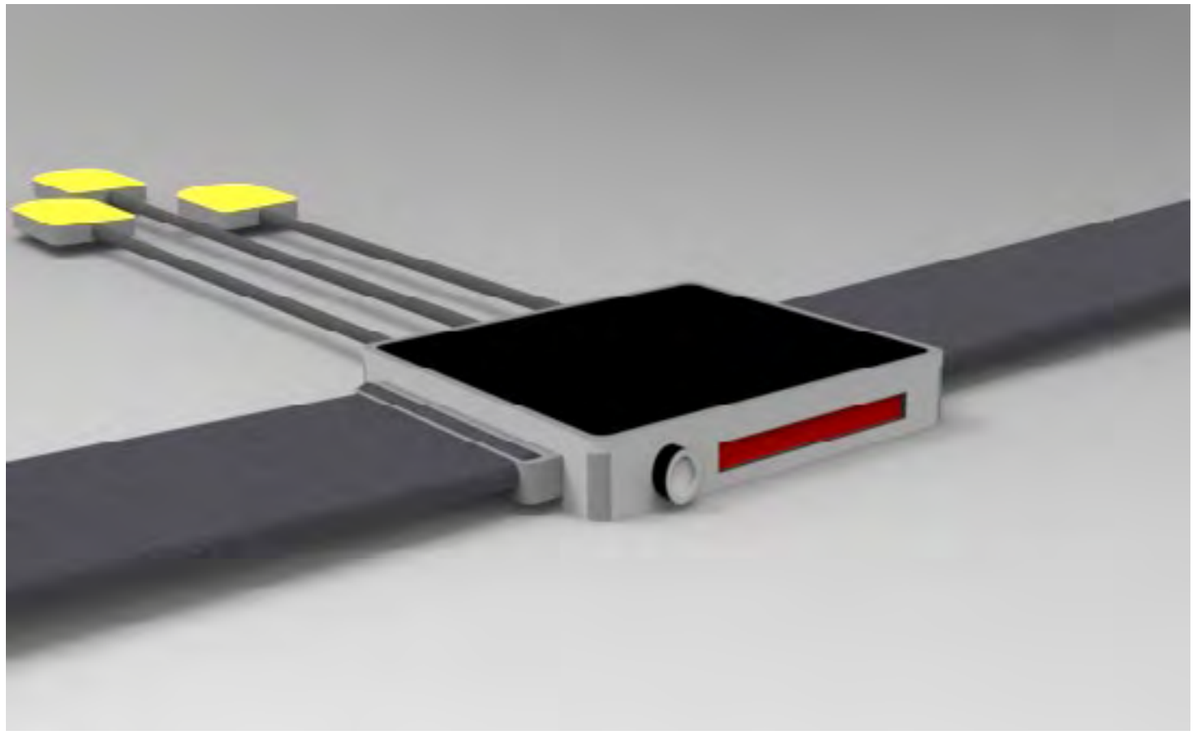
Week 14

Final CAD Renders

Final CAD Renders



Final CAD Renders



Final Model Images

Final Model Images

Final Model Images



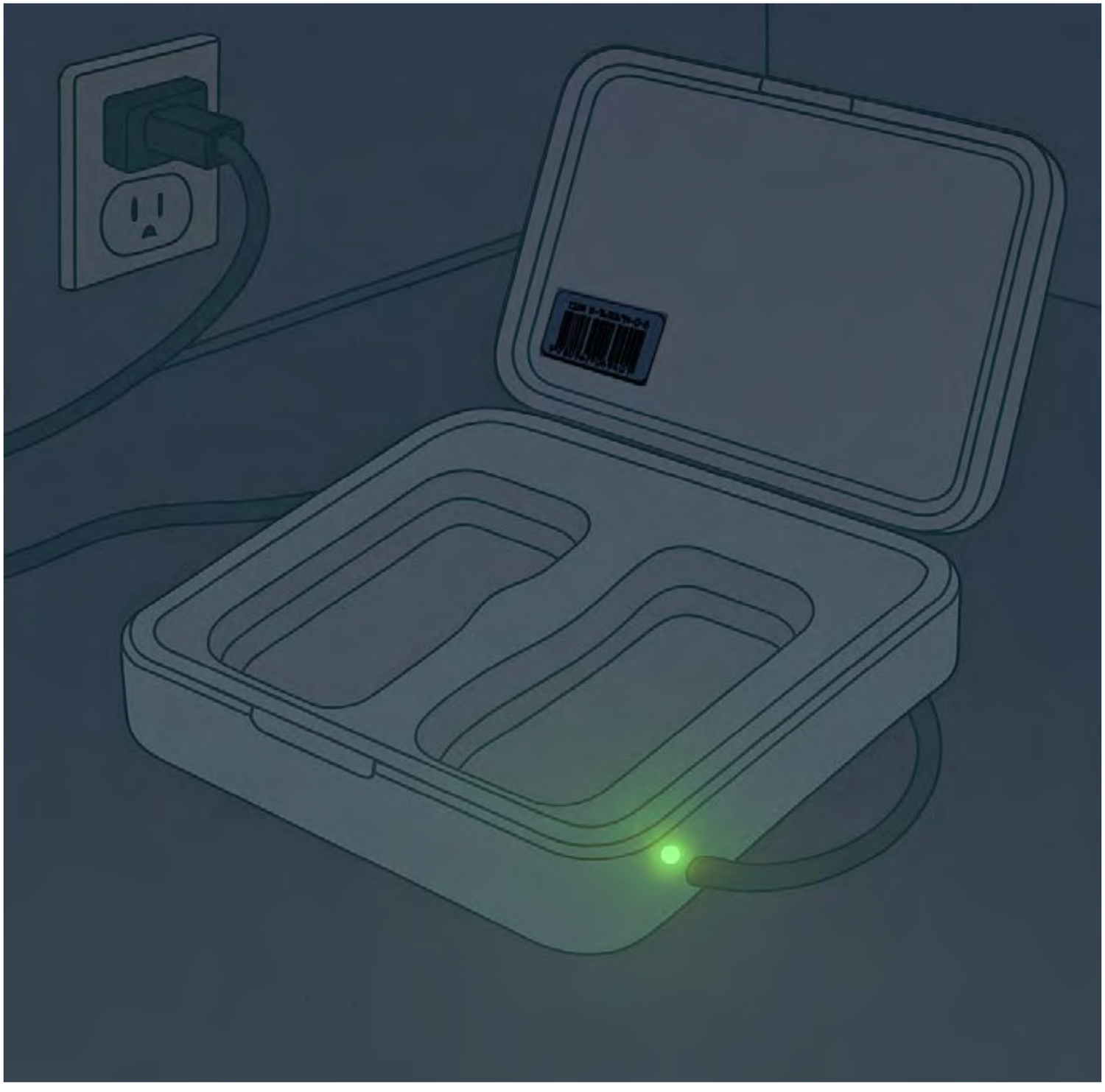




Final Model Drawings

Final Model Drawings

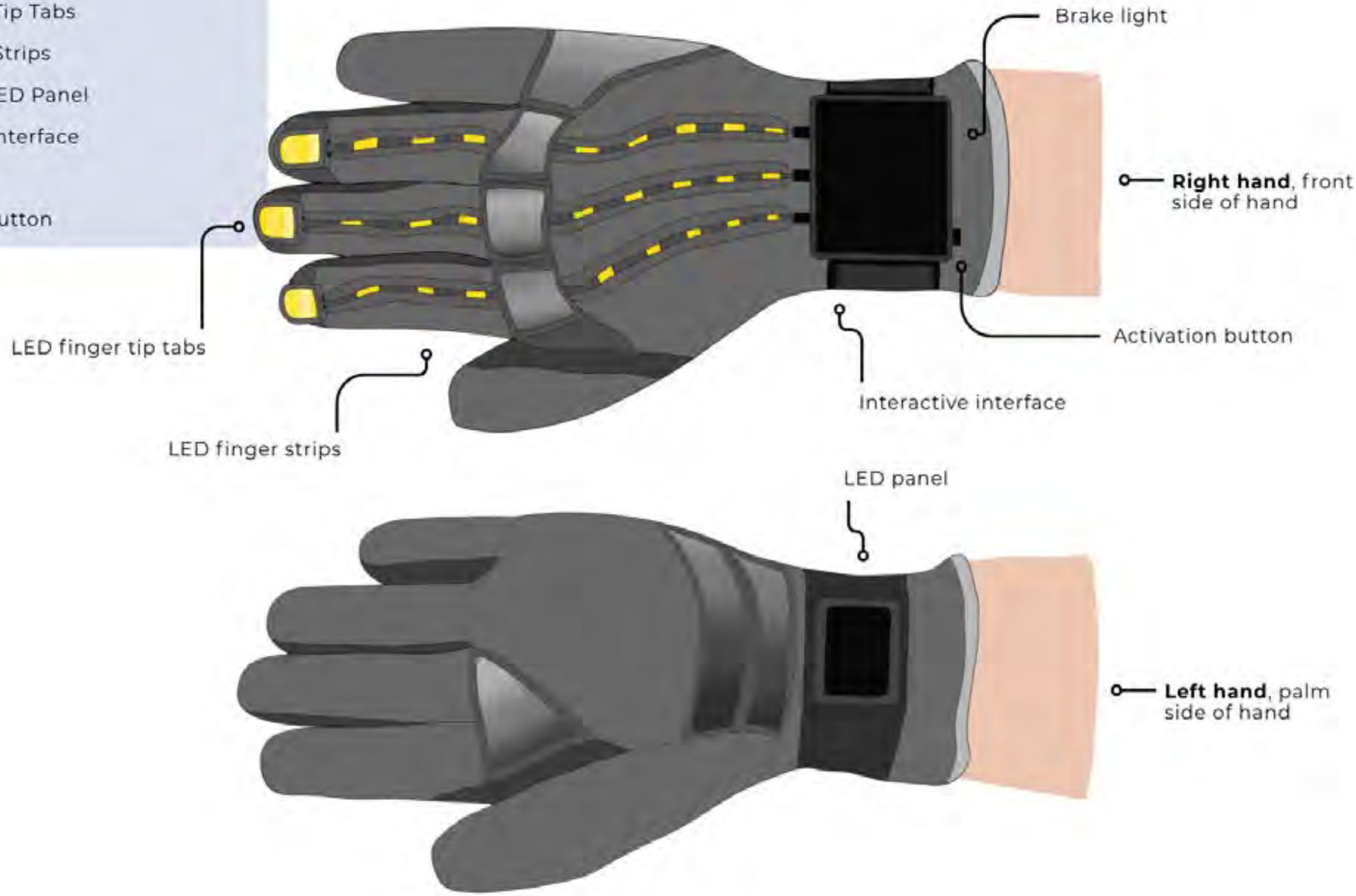
Final Model Drawings



Final Model Drawings

Key Feature Overview

- LED Finger Tip Tabs
- LED Finger Strips
- Underside LED Panel
- Interactive Interface
- Brake Light
- Activation Button



Riley Dagg

Final Model Drawings (Glove Materials & Manufacture)

Glove Components

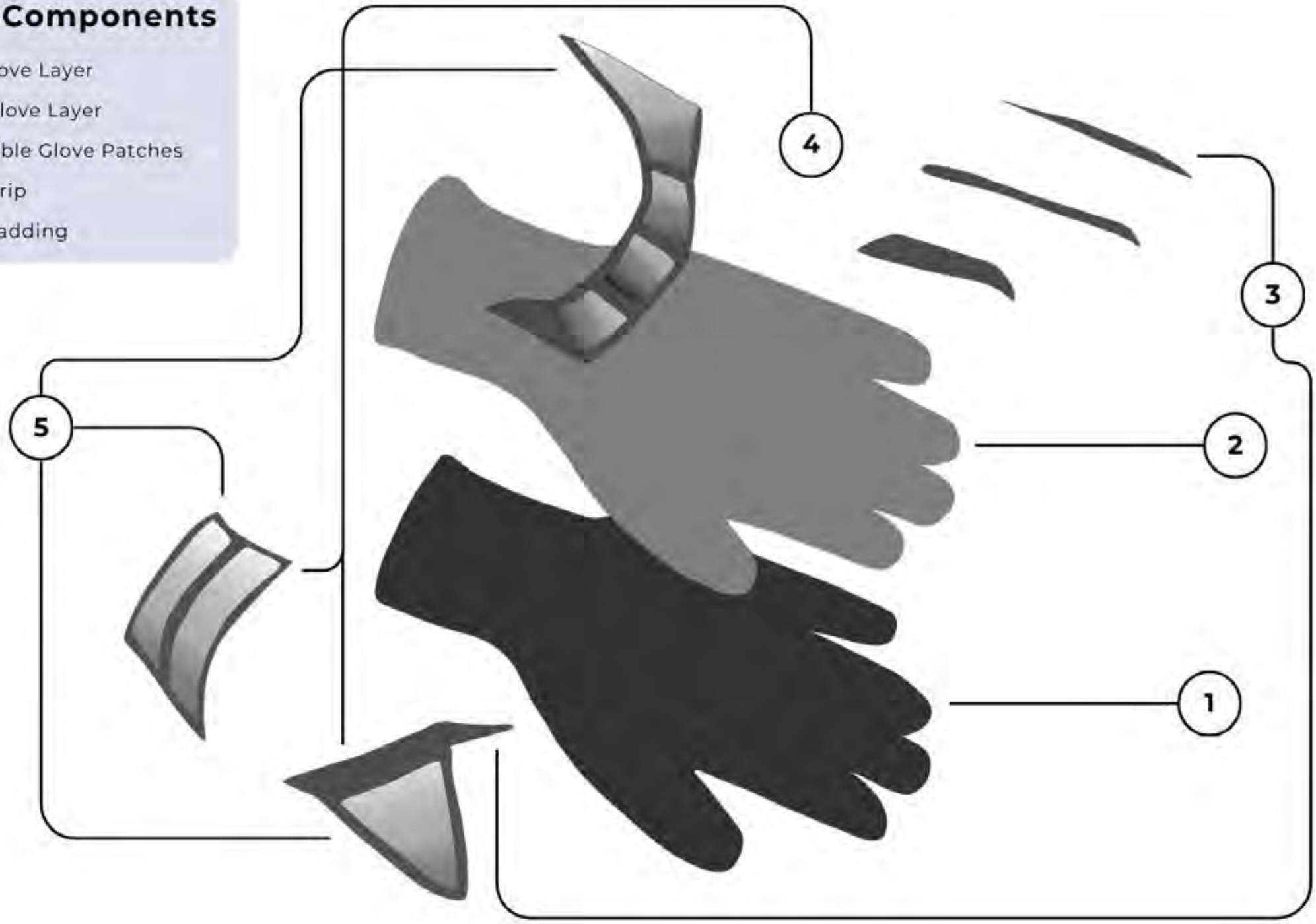
1: Inner Glove Layer

2: Outer Glove Layer

3: Breathable Glove Patches

4: Glove Grip

5: Glove Padding



Final Model Drawings (Power On/Off & Bluetooth)

ON/OFF ACTIVATION

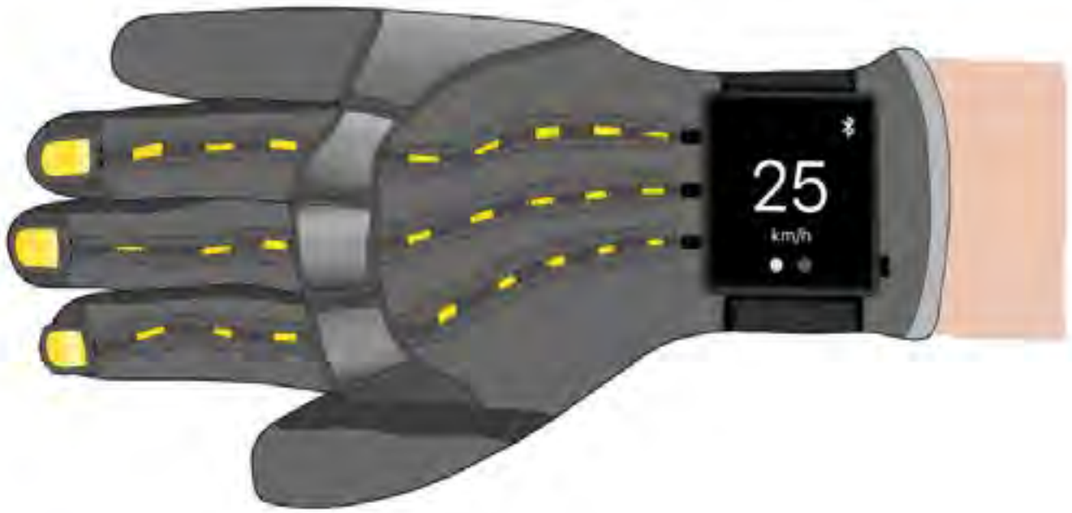
Press activation button to turn the device on or off

BLUETOOTH ACTIVATION

Press and hold activation button to connect the device to the e-skateboard

Final Model Drawings (Interface Interaction)

INTERFACE 1: SPEED MONITOR

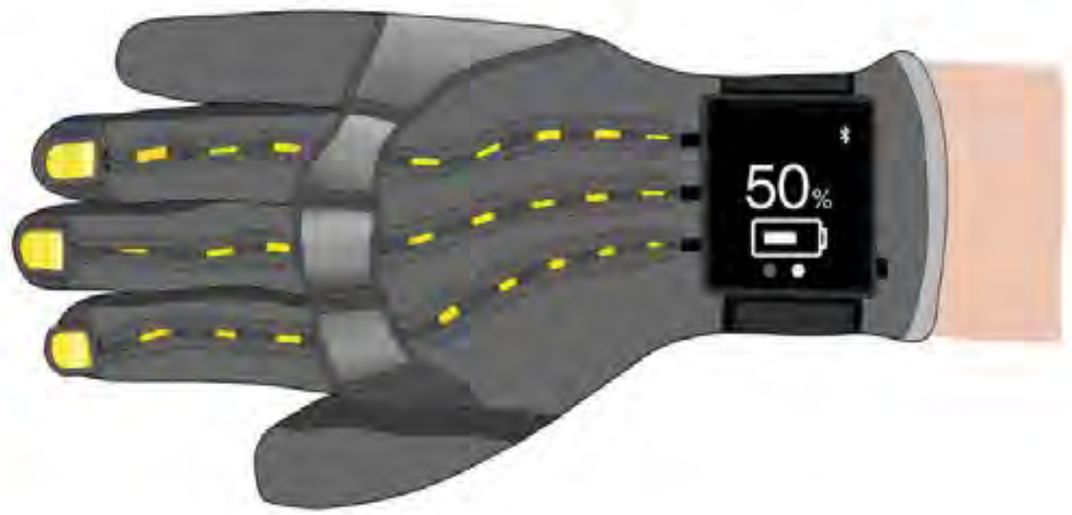


Interface Screen 1

Bluetooth connection symbol displays pairing to skateboard

Grey dots indicate the screen the interface is showing

INTERFACE 2: GLOVE CHARGE LIFE



Interface Screen 2

Swipe screen gently to view alternate interface

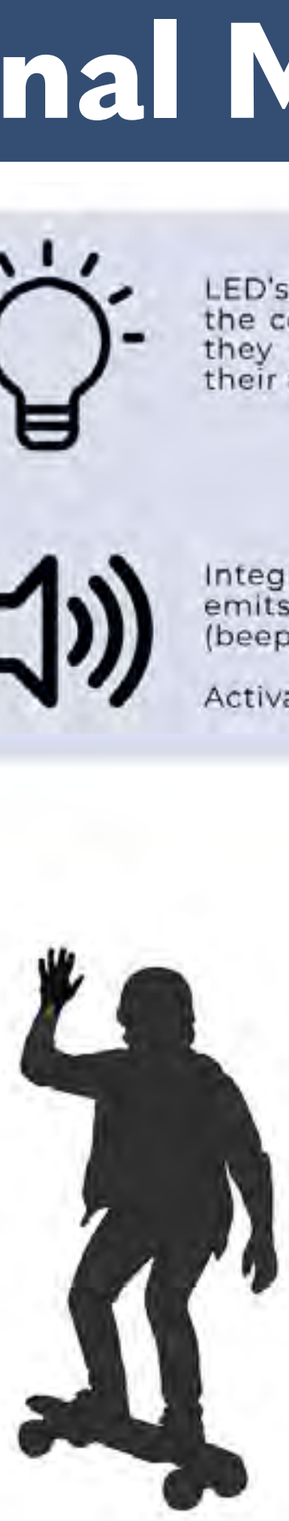
Glove touch friendly

Final Model Drawings (Wave Gesturing)

LED's are an integral feature used in the communicative glove design as they allow riders to communicate their actions with ease.

Integrates a sound system that emits a short, sharp sound burst (beep) to alert unaware pedestrians.

Activates when lights are on.



Riley Dagg
n11608188@qut.edu.au

Final Model Drawings (Point Gesturing)

Key functions

Extend the pointer finger to the intended area and hold arm out in front of the body to activate finger LED's

Pointing can be used to communicate intentions or for a fun way to greet or interact with passing people.

The LED's activate along the pointer finger and the strips along the hand

GESTURE CAPABILITIES

Pointing activates the pointed finger tip and the LED strips along the hand

Pointing is a fun way to interact with people on the go

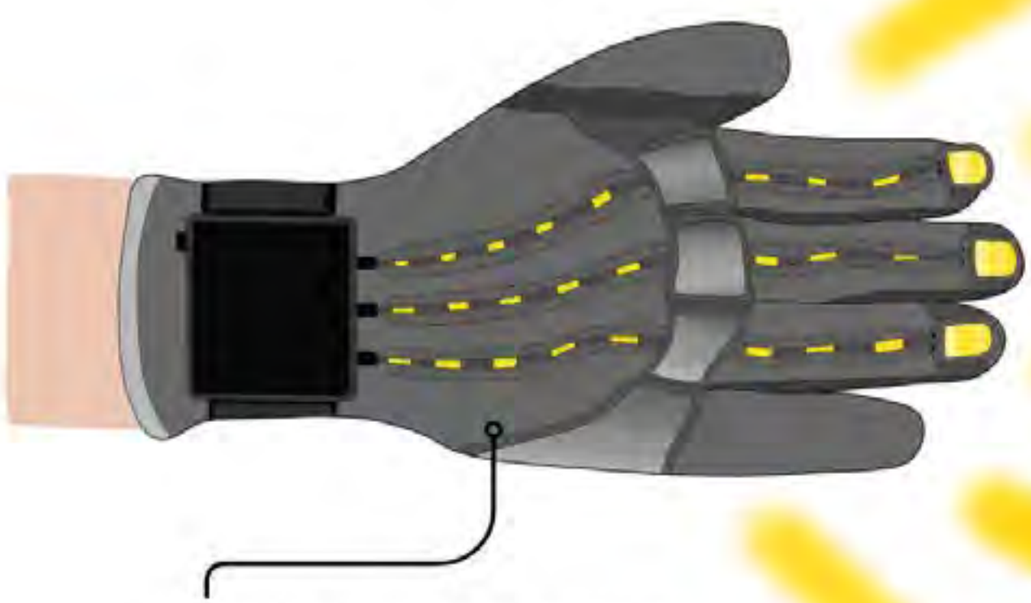
Final Model Drawings (Directional Gesturing)

Key functions

Drop the arm to desired height pointing all three fingers in the intended riding direction.

The LED's laced along the fingers and on the finger tips will light up giving people indication of where the rider is going.

Uses the familiarity of standard cycling indicating

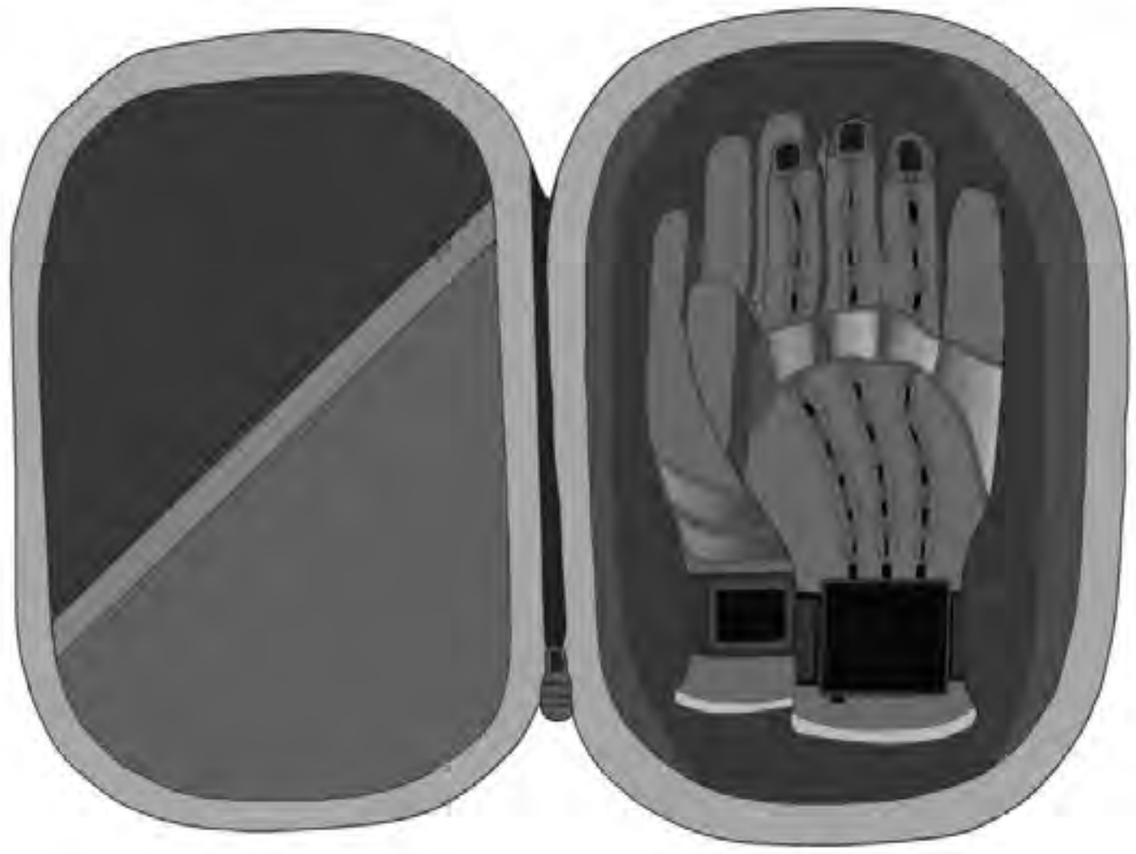


The LED activation affects the finger strips and the ends of the fingers

LED's light up upon gesturing a direction to the side of the body

Final Model Drawings (Storage & Charging)

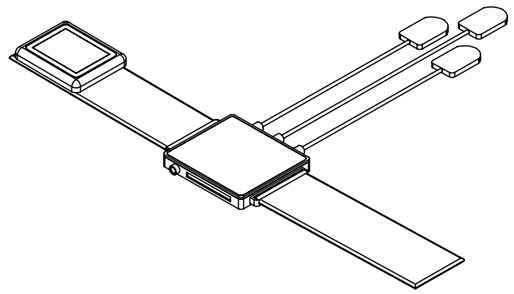
PORTABLE CHARGING CARRY CASE

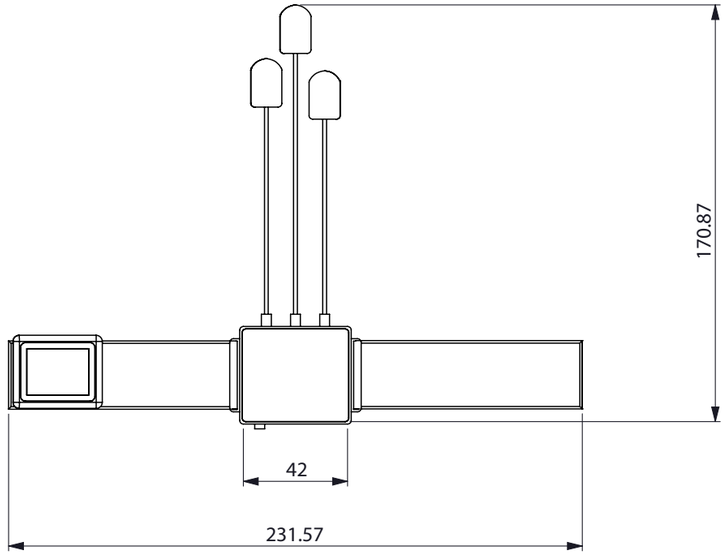


When the gloves are placed inside the case, it uses electromagnetic induction transferring power into the gloves wirelessly

Carry case can be charged up before use allowing the glove equipment to be charged on the go

Technical Drawings





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Interface Compartment	Aluminium	1
2	Interface Screen	Off The Shelf Part	1
3	Interface Screen Glass	Clear Acrylic	1
4	LED Panel Board	Off The Shelf Part	2
5	LED Panel	Aluminium	2
6	LED Panel Cover	Clear Acrylic	2
7	Finger Tabs	ABS Plastic	6
8	Strap	Nylon	2
9	PCB	Off The Shelf Part	2
10	Gesture Sensor	Off The Shelf Part	2
11	LED Tabs	Off The Shelf Part	6

QUT

TITLE
Cruise Glove Tech Assembly

PART/ASSY. NUMBER: Assembly 01
REV. 1
SHEET 1 OF 13

MATERIAL
- Refer to BOM

COLOUR
- Grey, Black, Yellow, Red

FINISH
- N/A

DRAWN BY
RD

DATE
29.10.2025

DRAWING NO.
01

GENERAL TOLERANCES

0.000	±0.05
0.00	±0.1
0.0	±0.2
0	±0.5
ANGLE	±0.5 °

1:2

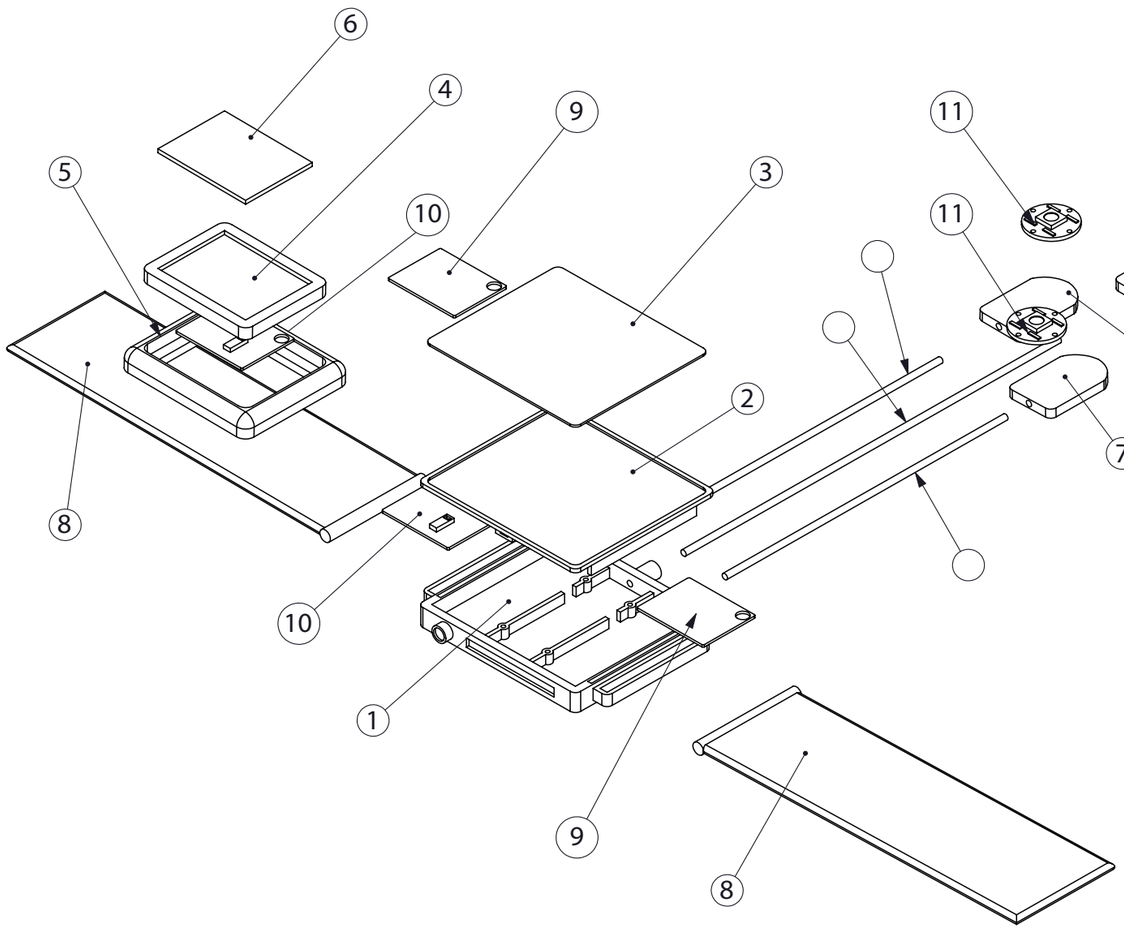
A3

ALL DIMS. IN MM

DO NOT SCALE DRAWING

https://www.behance.net/rileydagg27

Technical Drawings



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Interface Compartment	Aluminium	1
2	Interface Screen	Off The Shelf Part	1
3	Interface Screen Glass	Clear Acrylic	1
4	LED Panel Board	Off The Shelf Part	2
5	LED Panel	Aluminium	2
6	LED Panel Cover	Clear Acrylic	2
7	Finger Tabs	ABS Plastic	6
8	Strap	Nylon	2
9	PCB	Off The Shelf Part	2
10	Gesture Sensor	Off The Shelf Part	2
11	LED Tabs	Off The Shelf Part	6

QUT

TITLE
Cruise Glove Tech Exploded View

PART/ASSY. NUMBER Assembly 02 | REV. 1 | SHEET 2 OF 13

MATERIAL
- Refer to BOM

COLOUR
- Grey, Black, Yellow, Red

FINISH
- N/A

DRAWN BY
RD

DATE
29.10.2025

DRAWING NO.
02

GENERAL TOLERANCES

0.000	±0.05
0.00	±0.1
0.0	±0.2
0	±0.5
ANGLE	±0.5 °

1:2

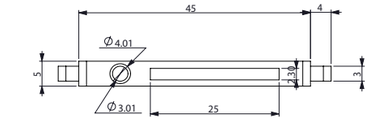
A3

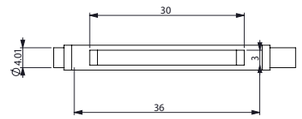
ALL DIMS. IN MM

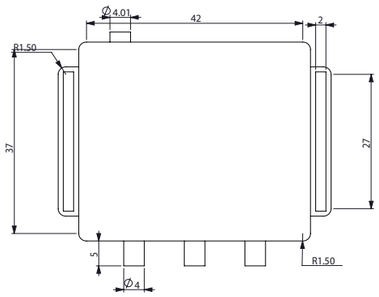
DO NOT SCALE DRAWING

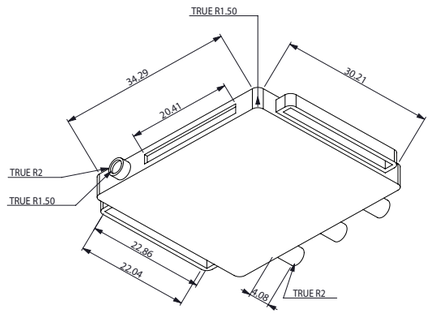
https://www.behance.net/rileydagg27

Technical Drawings



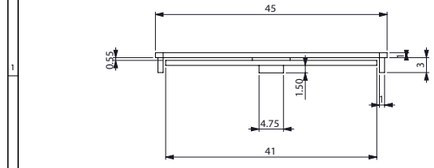


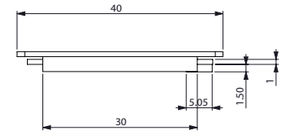


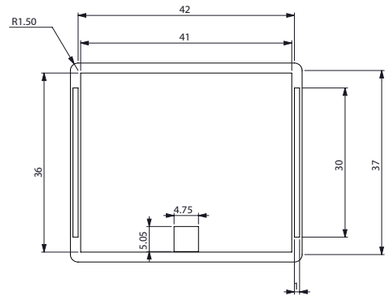


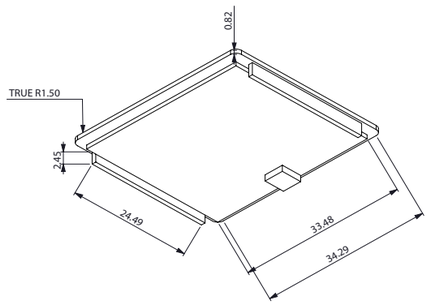
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
01	Interface Compartment	Matte Aluminium	1

QUT	TITLE: Interface Compartment	MATERIAL: - Aluminium	DRAWN BY: R D	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°	2:1	A3	DO NOT SCALE DRAWING	© RILEY DAGG 2025
	PART/ASSY. NUMBER: Part 01	REV. 1	SHEET 3 OF 13	COLOUR: - Grey	DATE: 29.10.2025		ALL DIMS. IN MM	https://www.behance.net/rileydagg27
				FINISH: - Matte	DRAWING NO.: 03			



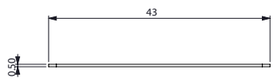


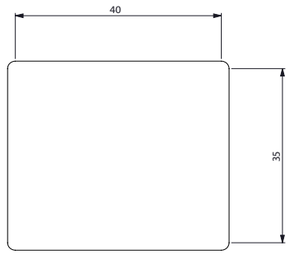


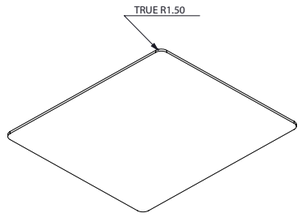


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
02	Interface Screen	Off The Shelf Part	1

QUT	TITLE: Interface Screen	MATERIAL: - Off The Shelf Part	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°	2:1	A3	DO NOT SCALE DRAWING	© Riley Dagg 2025
	PART/ASSY. NUMBER: Part 02	REV. 1	SHEET 4 OF 13	COLOUR: - N/A	DATE: 29.10.2025		ALL DIMS. IN MM	https://www.behance.net/rileydagg27
				FINISH: - N/A	DRAWING NO.: 04			

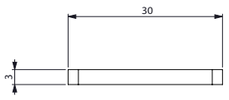


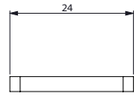


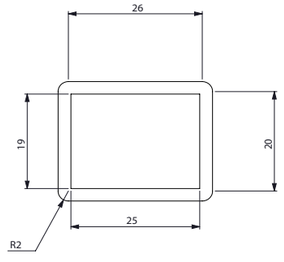


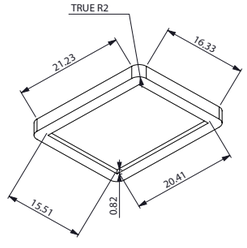
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
03	Interface Screen Glass	Clear Acrylic	1

QUT	TITLE: Interface Screen Glass	MATERIAL: - Acrylic	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°	2:1	A3	DO NOT SCALE DRAWING	© RILEY DAGG 2025
	PART/ASSY. NUMBER: Part 03	REV. 1	SHEET 5 OF 13	COLOUR: - Clear	DATE: 29.10.2025		ALL DIMS. IN MM	https://www.behance.net/rileydagg27
				FINISH: - Standard Gloss	DRAWING NO.: 05			





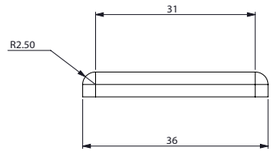


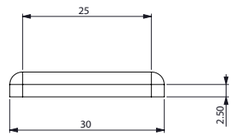


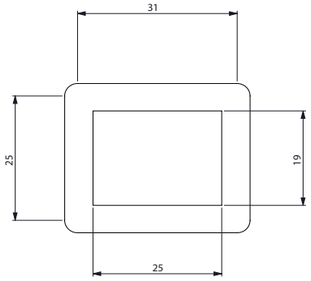
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
04	LED Panel Board	Matte Aluminium	2

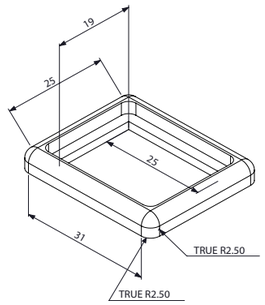
QUT	TITLE: LED Panel Board	MATERIAL: - Aluminium	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°	2:1	A3	DO NOT SCALE DRAWING	© RILEY DAGG 2025
	PART/ASSY. NUMBER: Part 04	REV. 1	SHEET 6 OF 13	COLOUR: - Grey	DATE: 29.10.2025		ALL DIMS. IN MM	https://www.behance.net/rileydagg27
				FINISH: - Matte	DRAWING NO.: 06			

Technical Drawings



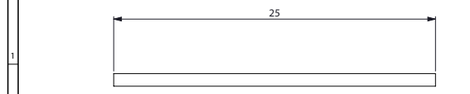


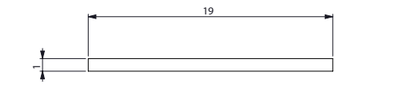


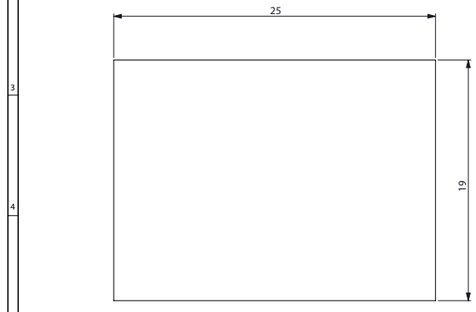


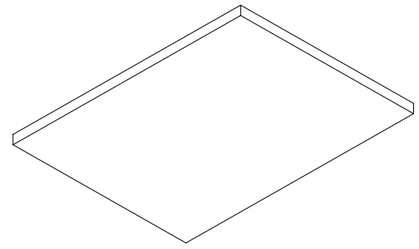
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
05	LED Panel	Matte Aluminium	2

QUT	TITLE: LED Panel	MATERIAL: - Aluminium, Rubber	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05, 0.00 ±0.1, 0.0 ±0.2, 0 ±0.5, ANGLE ±0.5 °	2:1	A3	DO NOT SCALE DRAWING	© RILEY DAGG 2025
	PART/ASSY. NUMBER: Part 05	COLOUR: - Grey	DATE: 29.10.2025			ALL DIMS. IN MM		https://www.behance.net/rileydagg27
	REV. 1	FINISH: - Matte	DRAWING NO.: 07					
	SHEET 7 OF 13							



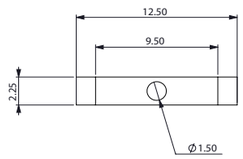


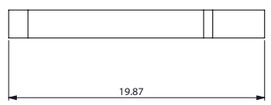


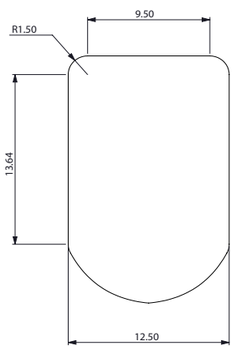


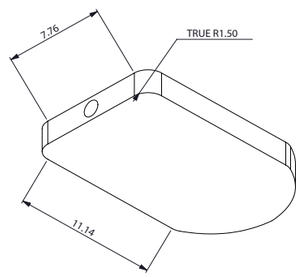
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
06	LED Panel Cover	Clear Acrylic	2

QUT	TITLE: LED Panel Cover	MATERIAL: - Acrylic	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05, 0.00 ±0.1, 0.0 ±0.2, 0 ±0.5, ANGLE ±0.5 °	5:1	A3	DO NOT SCALE DRAWING	© RILEY DAGG 2025
	PART/ASSY. NUMBER: Part 06	COLOUR: - Clear	DATE: 29.10.2025			ALL DIMS. IN MM		https://www.behance.net/rileydagg27
	REV. 1	FINISH: - Standard Gloss	DRAWING NO.: 08					
	SHEET 8 OF 13							



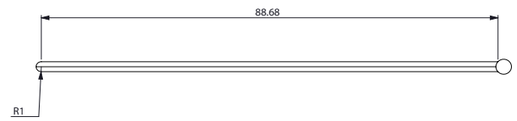


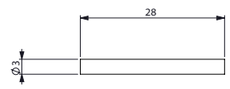


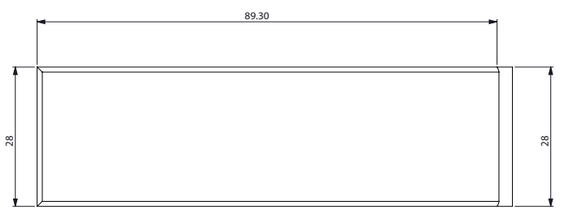


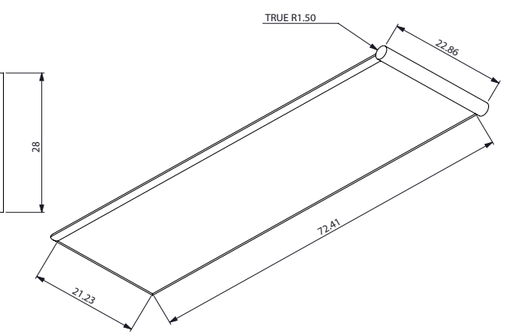
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
07	Finger Tabs	ABS Plastic	6

QUT	TITLE: Finger Tabs	MATERIAL: - ABS Plastic	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05, 0.00 ±0.1, 0.0 ±0.2, 0 ±0.5, ANGLE ±0.5 °	5:1	A3	DO NOT SCALE DRAWING	© RILEY DAGG 2025
	PART/ASSY. NUMBER: Part 07	COLOUR: - Grey	DATE: 29.10.2025			ALL DIMS. IN MM		https://www.behance.net/rileydagg27
	REV. 1	FINISH: - Low Gloss	DRAWING NO.: 09					
	SHEET 9 OF 13							





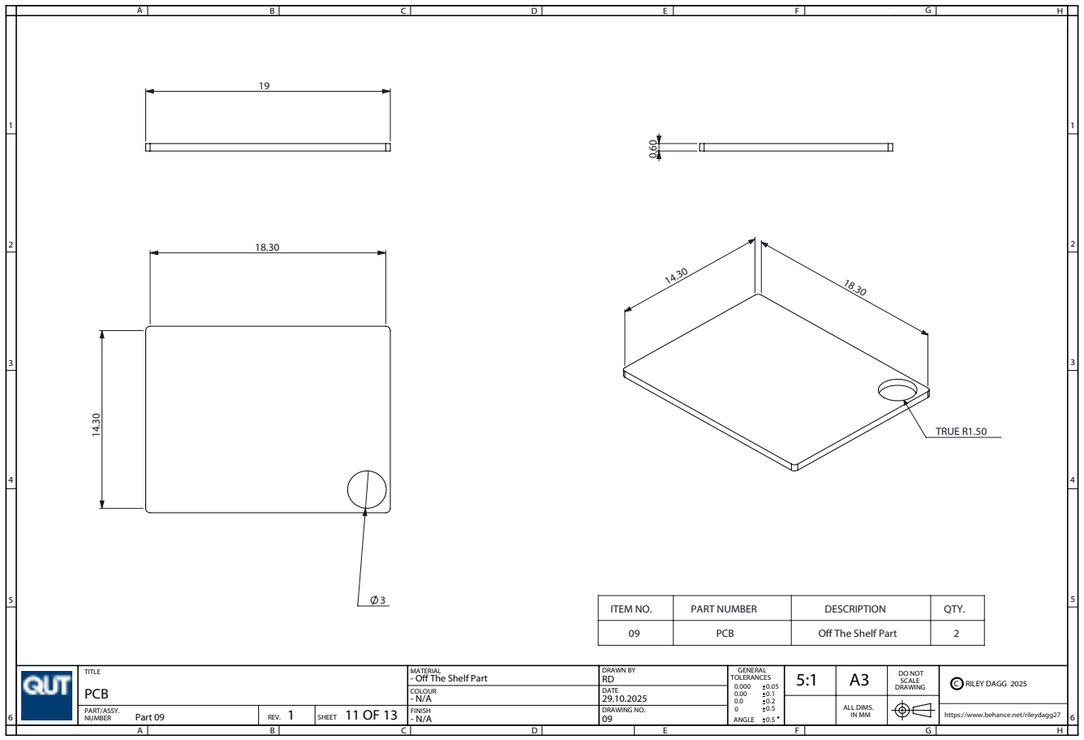




ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
8	Strap	Grey Nylon	2

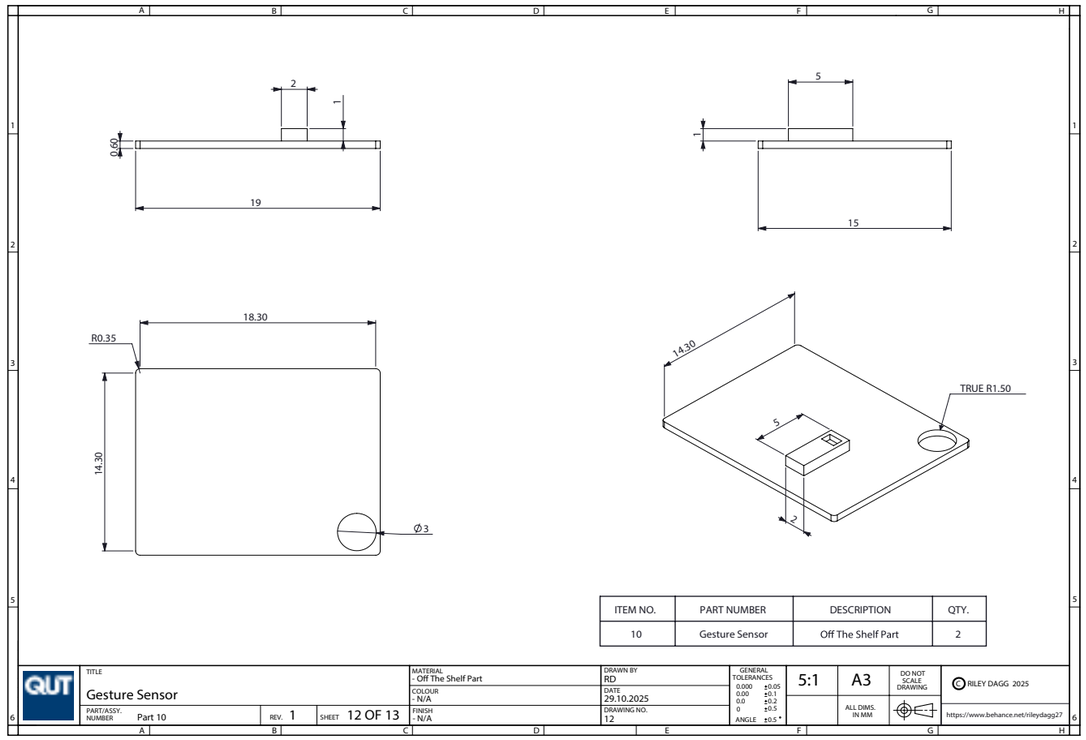
QUT	TITLE: Strap	MATERIAL: - Nylon	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05, 0.00 ±0.1, 0.0 ±0.2, 0 ±0.5, ANGLE ±0.5 °	2:1	A3	DO NOT SCALE DRAWING	© YOUR NAME 2023
	PART/ASSY. NUMBER: Part 8	COLOUR: - Grey	DATE: 29.10.2025			ALL DIMS. IN MM		https://www.behance.net/rileydagg27
	REV. 1	FINISH: - Stitched, Matte	DRAWING NO.: 10					
	SHEET 10 OF 13							

Technical Drawings



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
09	PCB	Off The Shelf Part	2

TITLE: PCB	MATERIAL: - Off The Shelf Part	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05, 0.00 ±0.1, 0.0 ±0.2, 0 ±0.5, ANGLE ±0.5°	5:1	A3	DO NOT SCALE DRAWING	© RILEY DAGG 2025
PART/ASSY. NUMBER: Part 09	COLOUR: - N/A	DATE: 29.10.2025				ALL DIMS. IN MM	https://www.behance.net/rileydagg27
REV. 1	FINISH: - N/A	DRAWING NO.: 09					
SHEET 11 OF 13							



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
10	Gesture Sensor	Off The Shelf Part	2

TITLE: Gesture Sensor	MATERIAL: - Off The Shelf Part	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05, 0.00 ±0.1, 0.0 ±0.2, 0 ±0.5, ANGLE ±0.5°	5:1	A3	DO NOT SCALE DRAWING	© RILEY DAGG 2025
PART/ASSY. NUMBER: Part 10	COLOUR: - N/A	DATE: 29.10.2025				ALL DIMS. IN MM	https://www.behance.net/rileydagg27
REV. 1	FINISH: - N/A	DRAWING NO.: 12					
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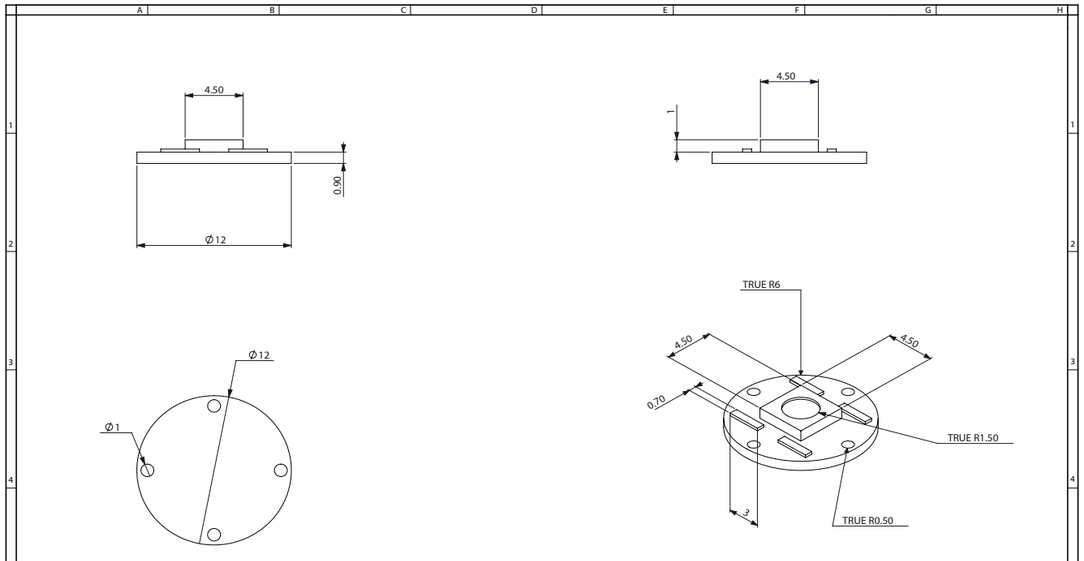
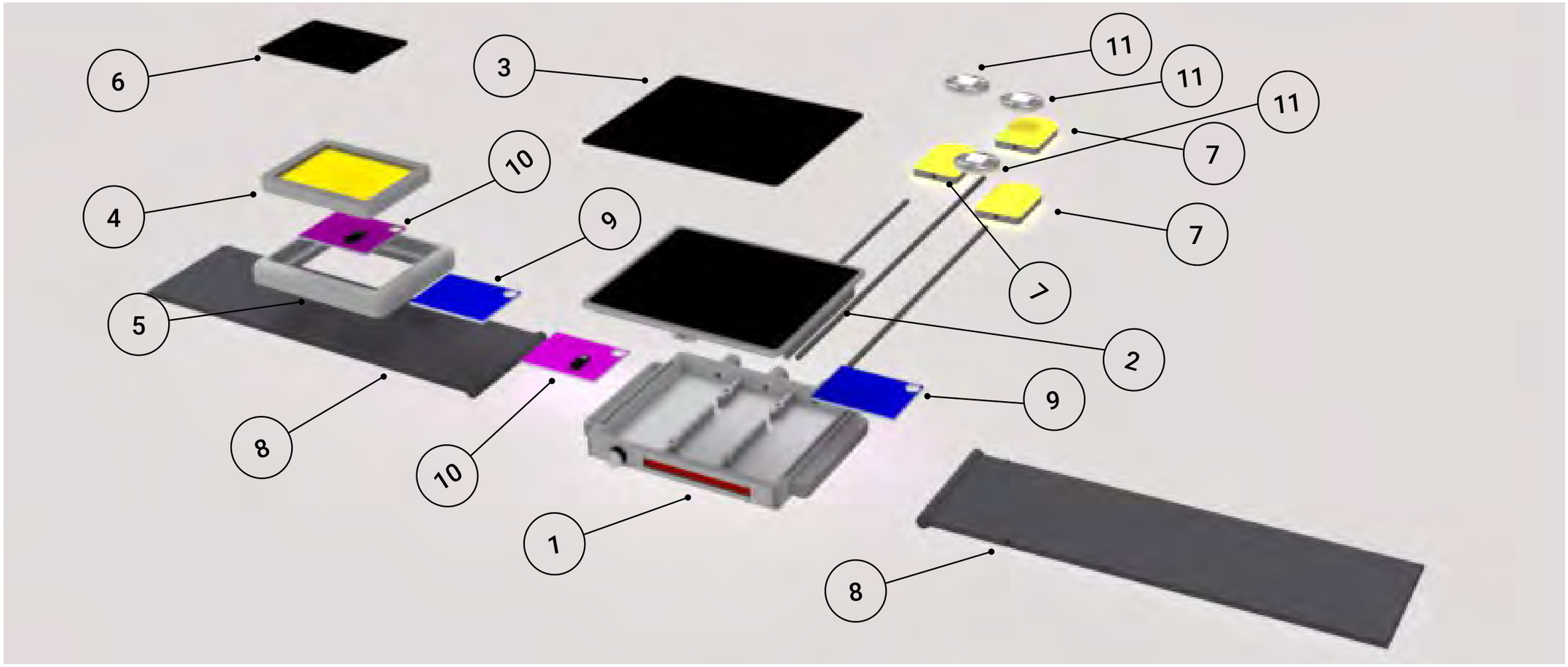


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
11	LED Tabs	Off The Shelf Part	6

TITLE: LED Tabs	MATERIAL: - Off The Shelf Part	DRAWN BY: RD	GENERAL TOLERANCES: 0.000 ±0.05, 0.00 ±0.1, 0.0 ±0.2, 0 ±0.5, ANGLE ±0.5°	5:1	A3	DO NOT SCALE DRAWING	© RILEY DAGG 2025
PART/ASSY. NUMBER: Part 11	COLOUR: - N/A	DATE: 29.10.2025				ALL DIMS. IN MM	https://www.behance.net/rileydagg27
REV. 1	FINISH: - N/A	DRAWING NO.: 13					
SHEET 13 OF 13							

Exploded View & BOM



	Part Name	Quantity	Weight	Manufacturing Process	Finish	Material	Colour	Production Volume	Cost Per Part	Unit Cost
1	Interface Compartment	1	15g	CNC Machining and Casting	Matte	Aluminium	Grey	5,000	$9.30	$9.30
2	Interface Screen	1	5g	N/A	N/A	Off The Shelf Part	N/A	5,000	$12.40	$12.40
3	Interface Screen Glass	1	2g	Extrusion and Casting	Standard Gloss	Clear Acrylic	Clear	5,000	$0.78	$0.78
4	LED Panel Board	2	5g	N/A	N/A	Off The Shelf Part	N/A	5,000	$7.75	$15.50
5	LED Panel	2	10g	CNC Machining, and Casting	Matte	Aluminium	Grey	5,000	$3.10	$6.20
6	LED Panel Cover	2	2g	Extrusion and Casting	Standard Gloss	Clear Acrylic	Clear	5,000	$0.62	$1.24
7	Finger Tabs	6	5g	Injection Moulding	Low Gloss	ABS Plastic	Grey	5,000	$0.23	$1.40
8	Strap	2	110g	Weaving and Stitching	Matte	Nylon	Grey	5,000	$6.20	$12.40
9	PCB	2	2g	N/A	N/A	Off The Shelf Part	N/A	5,000	$9.30	$18.60
10	Gesture Sensor	2	2g	N/A	N/A	Off The Shelf Part	N/A	5,000	$12.40	$24.80
11	LED Tabs	6	1g	N/A	N/A	Off The Shelf Part	N/A	5,000	$0.31	$1.86
									Total Manufacture Cost	
									$110.48	

Presentation Script

Slide 3: The Problem
With the rapid growth of micromobility in Australia, and the deployment of devices such as the electric skateboard it is becoming more common to see both non-fatal and fatal accidents. There has been an approximate 150,000 emergency room visits worldwide due to these battery powered devices.

Hi everyone, I'm Riley, and my project investigates the elements contributing to electric skateboarding accidents with the aim being to create a more aware environment that integrates this form of micromobility more safely into the transport network.

Change Slide.....

Slide 4: Research Overview
Initially through benchmarking it was revealed that between other forms of micromobility and electric skateboarding there was a gap in the market for effective solutions. For e-bikes in particular there are a range of products which positively influence riding behaviour and allow riding to become safer for all individuals. A prominent example was Lumos who specialise in LED equipped products.

Additionally, research also included a survey and two interviews both concluding that accidents most commonly occur due to unaware road users and pedestrians, rider fault, or a lack of visibility around the rider.

Change Slide.....

Slide 5: Ideation
Informed by this research I narrowed down the ideation scope to infrastructure changes, informing and assisting the rider, and communicating to the public. Based off this I developed the solar safety station, environment signage, the glove controller, gesture wrist bands, and also the communicative gloves.

My final design incorporated aspects from both the wrist bands and communicative gloves, ultimately allowing for a design that speaks directly to the issue of awareness and visibility. I am now excited to present the final design:

Change Slide.....

Slide 6: Hero Image
The Cruise Gesture Gloves
The Cruise Gesture Gloves seamlessly integrate into existing skateboarding setups prioritising familiarity and purpose while riding. The product is designed to maximise safety for the wearer and ultimately contribute to the broader safety of riding infrastructure and other shared spaces.

Change Slide.....

Slide 7: Hero Image
Device operators can use familiar actions like waving, pointing, or directional signalling to make their intentions clear while simultaneously lighting their way with the in-built LED lights.

Change Slide.....

Slide 8: Storage & Charging

Accompanying the gloves is a portable charging and carry case that can be plugged into a main power source before use. With the addition of electromagnetic charging the gloves can be powered on the go making use seamless and time efficient. Placing the gloves into the respective case grooves will ensure sufficient battery life for multiple uses.

Change Slide.....

Slide 9: Activation Features

By pressing the activation button on the side of the interface the device will activate. After pressing and holding the button the device will wirelessly connect to the electric skateboard. Doing this will allow all users to have a visual read when braking, this is highlighted by the red braking light on the interface.

Change Slide.....

Slide 10: Interface interact
Upon connecting the gloves, users will also have access to digital interface features. Skateboard speed, as well as the glove and skateboard battery life. This can be interacted with using a gentle glove friendly swipe across the screen. The transition between pages can be visualised by the dots on the screen.

Change Slide.....

Slide 11: Wave & Point Gesturing
The first two initial actions a skateboard rider can gesture is through waving and pointing. By raising the hand and gesturing a wave the gesture sensors will trigger the LED panel signalling to surrounding people that the rider is there. Additionally, gesturing a pointing action also triggers the LED strips along the fingers allowing riders to communicate precisely.

Change Slide.....

Slide 12: Directional Gesturing
The other primary gesture is directional signalling. This can be done in a number of ways but most commonly this would be used to signal the direction the rider wishes to ride to. Dropping the arm to waist height or above the head and straightening the hand in the intended direction will trigger all LED's to activate and formulate a directional LED signalling pattern.

Change Slide.....

Slide 13: Video Presentation

Change Slide.....

Slide 14: Technology Details
In terms of technology the device is designed with an array of features contributing to different aspects of the riders safety and enjoyment. The addition of the interactive interface aligns with enjoyment and self-awareness, while the braking light and LED features contribute to the broader safety of pedestrians, road users, and the riders themselves.

Change Slide.....

Slide 15: Exploded View & BOM
The Cruise model exploded view further showcases these technological features by highlighting all 11 of its parts. Off the shelf parts consist of 2 gesture sensors, 2 PCB's, and 6 LED tabs, while the hard parts are made up of the interface compartment, and screen, LED Panel, and cover, as well as the LED finger tabs.

Additionally, the model also uses a flexible stretch band to secure the technology to the glove. This contributes to Cruise's adjustability options in relation to glove sizing.

Change Slide.....

Slide 16: Glove Technical Details
As shown within the glove sizing table, users are able to customise their glove size upon purchase. To ensure the lowest and highest percentile users are catered for a range of small to 2XL has been included for the men, while women have the option to choose between small to large.

In terms of glove manufacture, the design is made up of 5 key materials. An inner glove layer made of nylon, a polyester outer glove layer, breathable synthetic mesh patches, glove grip, and glove padding.

Change Slide.....

Slide 17: Value Proposition
The Cruise Gesture Gloves are once again a response to the emergence of electric skateboarding accidents across the globe. They are designed to advance communication on the roads and create a safer environment for all people involved.

Utilising familiarity through gesturing, riders are able to comfortably communicate their intentions with purpose and an ease of use. Features of user friendliness, and interaction also contribute to the enjoyment and idea of awareness around the device.

Customisation and flexibility also offers coverage to a broad range of users allowing the lowest and highest percentile individuals to experience safety in the same way.

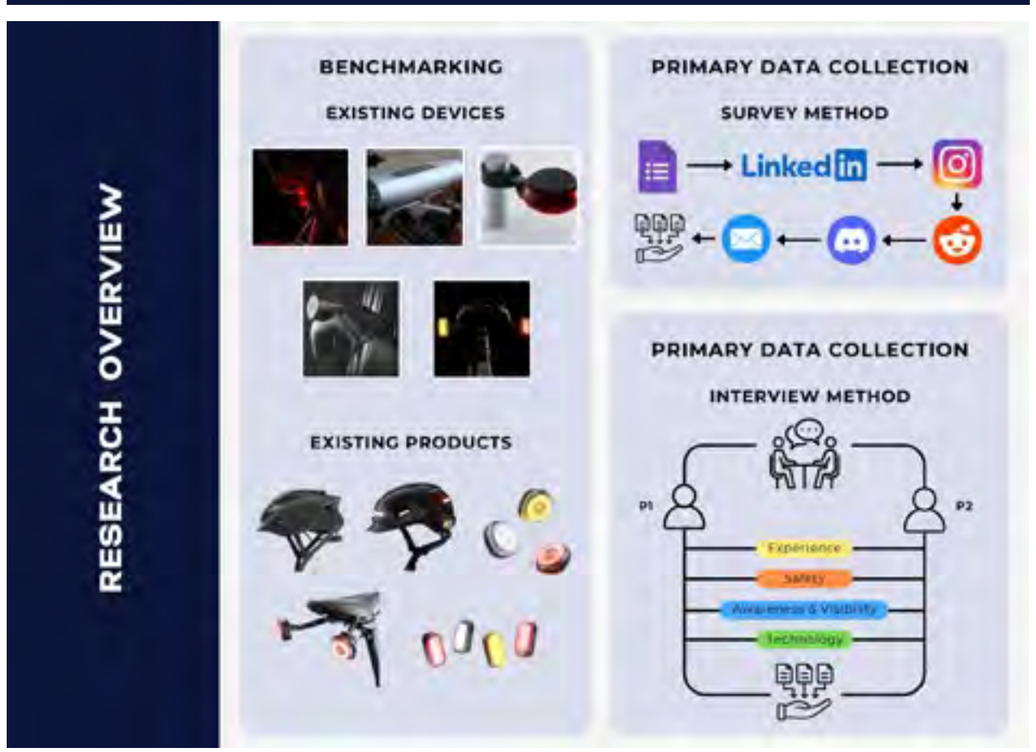
Ultimately, this ensures that safety is prioritised throughout all shared spaces and active transport environments.

Change Slide.....

Slide 18: Summary
The Cruise Gesture Gloves empowers riders to seek enjoyment in electric skateboarding while simultaneously lighting their way through familiar, purposeful, and safe design features. With the implementation of Cruise, awareness around electric skateboarding will become more solidified, and streets will see a reduction in risky behaviour and unexpected accidents between pedestrians, road users, and the riders themselves.

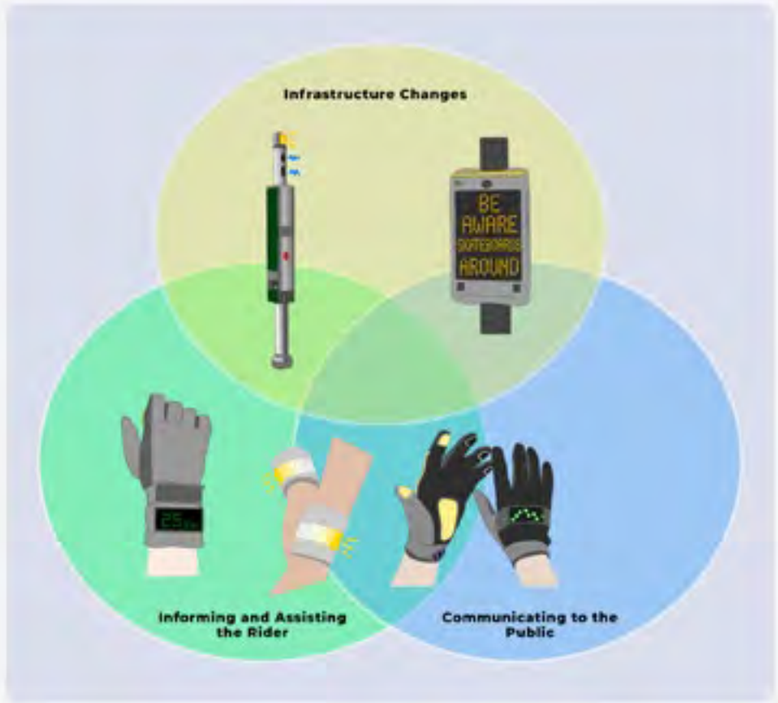
Thank you for listening.

Presentation Slides

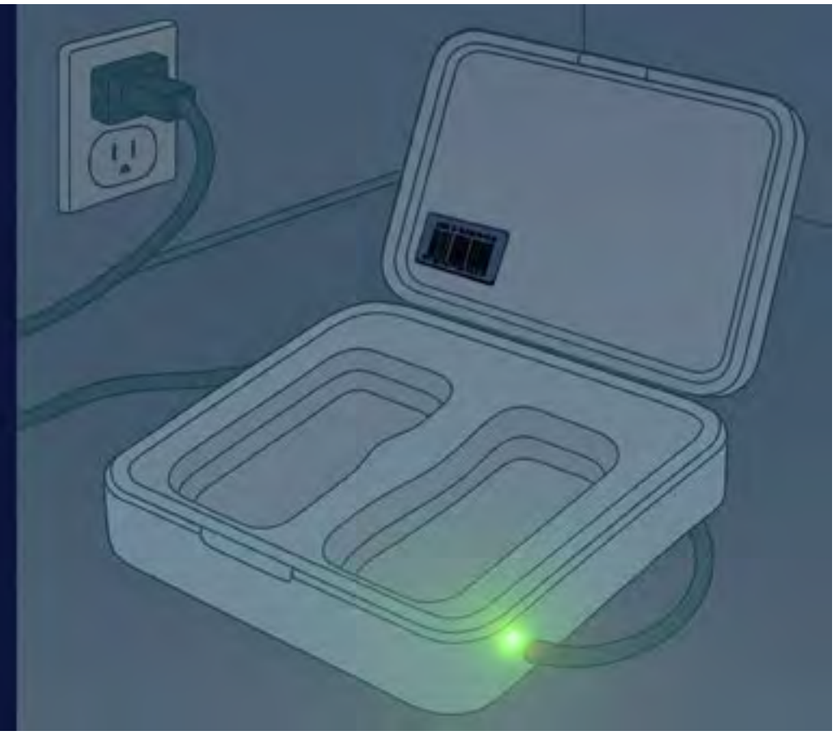


Presentation Slides

IDEATION

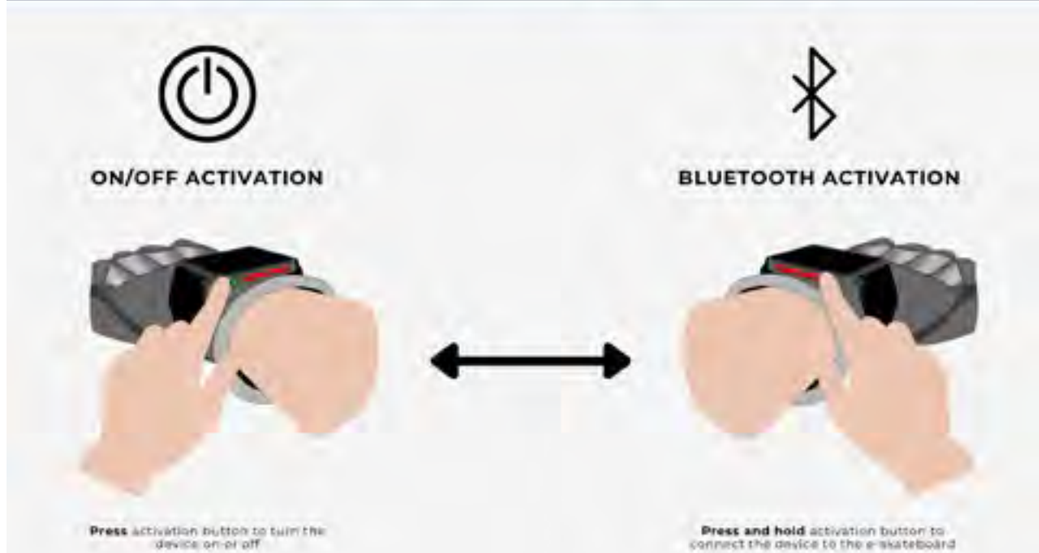


STORAG & CHARGING



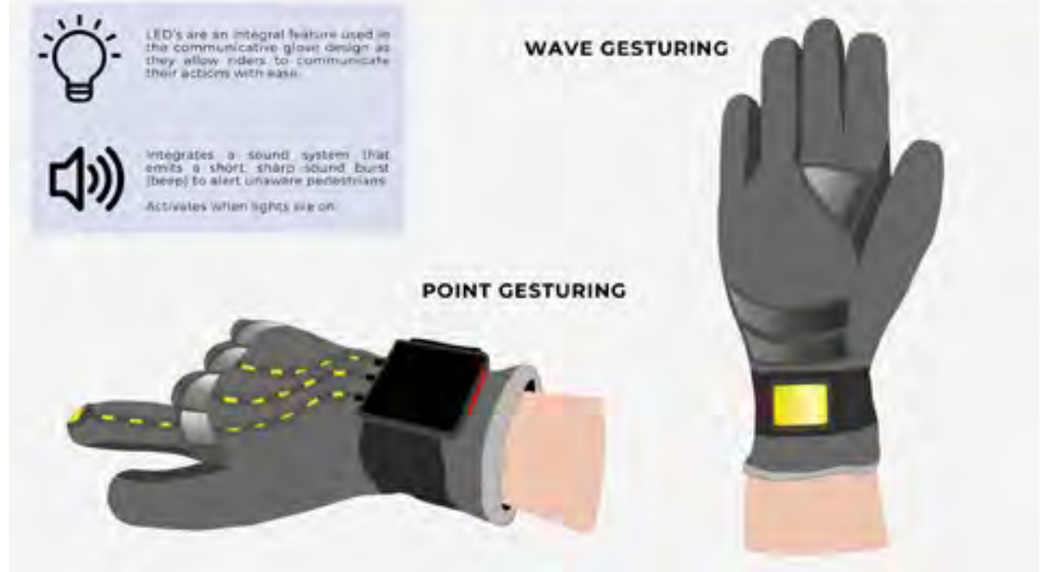
Presentation Slides

ACTIVATION FEATURES

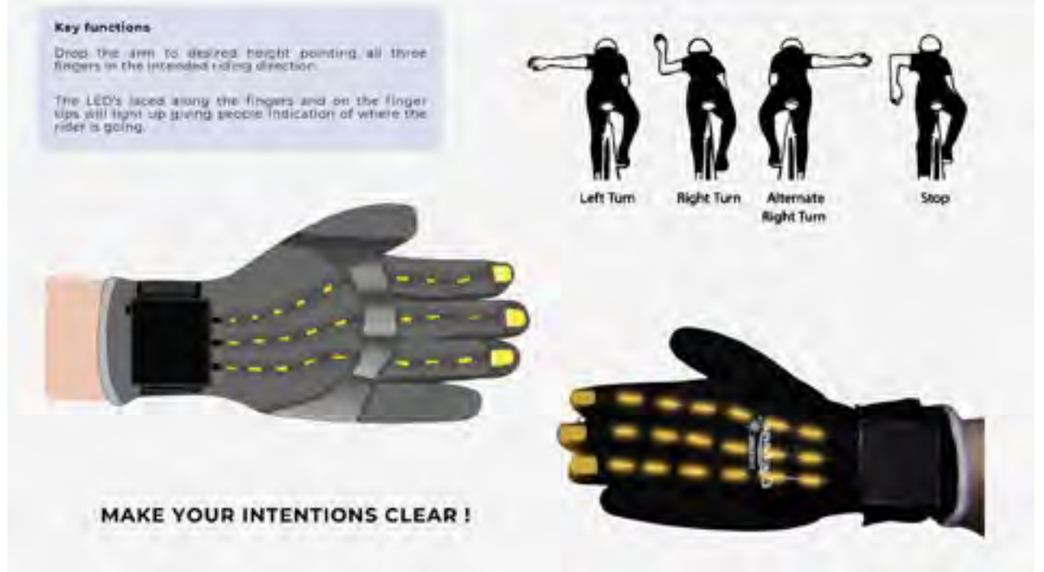


INTERFACE INTERACTON

WAVE AND POINT GESTURING



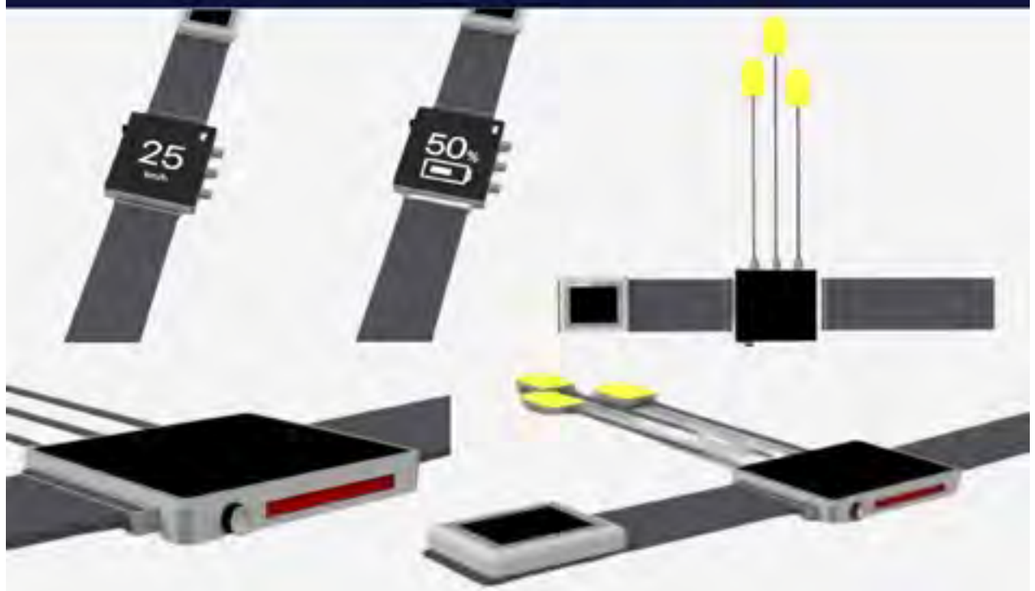
DIRECTIONAL GESTURING



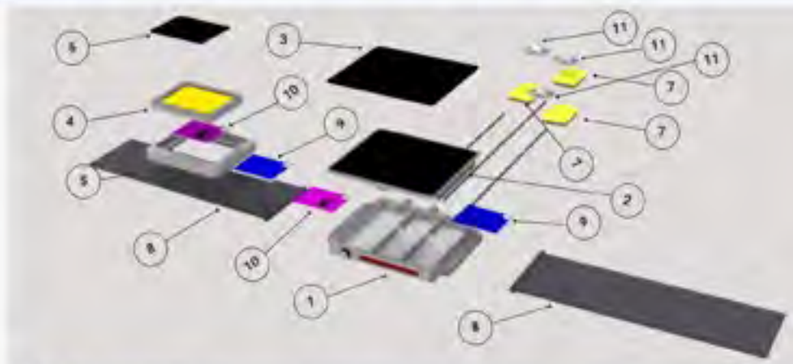
Presentation Slides

E-Skateboard Awareness & Safe Integration Into the Transport Network

TECHNOLOGY DETAILS



TECHNOLOGY EXPLODED VIEW & BOM



	Part Name	Quantity	Weight	Manufacturing Process	Finish	Material	Colour	Production Volume	Cost Per Part	Line Cost
1	Interface Compartment	1	57g	CNC Machining and Casting	Matte	Aluminium	Grey	5,000	$9.97	$9.95
2	Interface Screen	1	5g	N/A	N/A	Off The Shelf Part	N/A	5,000	$12.40	$12.40
3	Interface Screen Glass	1	2g	Extrusion and Casting	Standard Gloss	Clear Acrylic	Clear	5,000	$0.79	$0.78
4	LED Panel Board	2	8g	N/A	N/A	Off The Shelf Part	N/A	5,000	$7.77	$15.53
5	LED Panel	2	10g	CNC Machining, and Casting	Matte	Aluminium	Grey	5,000	$3.53	$6.20
6	LED Panel Cover	2	2g	Extrusion and Casting	Standard Gloss	Clear Acrylic	Clear	5,000	$0.62	$1.24
7	Finger Tube	4	3g	Injection Moulding	Low Gloss	ABS Plastic	Grey	5,000	$0.21	$1.40
8	Strap	2	140g	Weaving and Stitching	Matte	Nylon	Grey	5,000	$6.20	$12.40
9	PCB	1	30g	N/A	N/A	Off The Shelf Part	N/A	5,000	$9.95	$28.60
10	Gesture Sensor	1	2g	N/A	N/A	Off The Shelf Part	N/A	5,000	$13.40	$34.40
11	LED Tube	9	4g	N/A	N/A	Off The Shelf Part	N/A	5,000	$0.51	$1.88
									Total Manufacture Cost	
									$110.49	

GLOVE TECHNICAL DETAILS

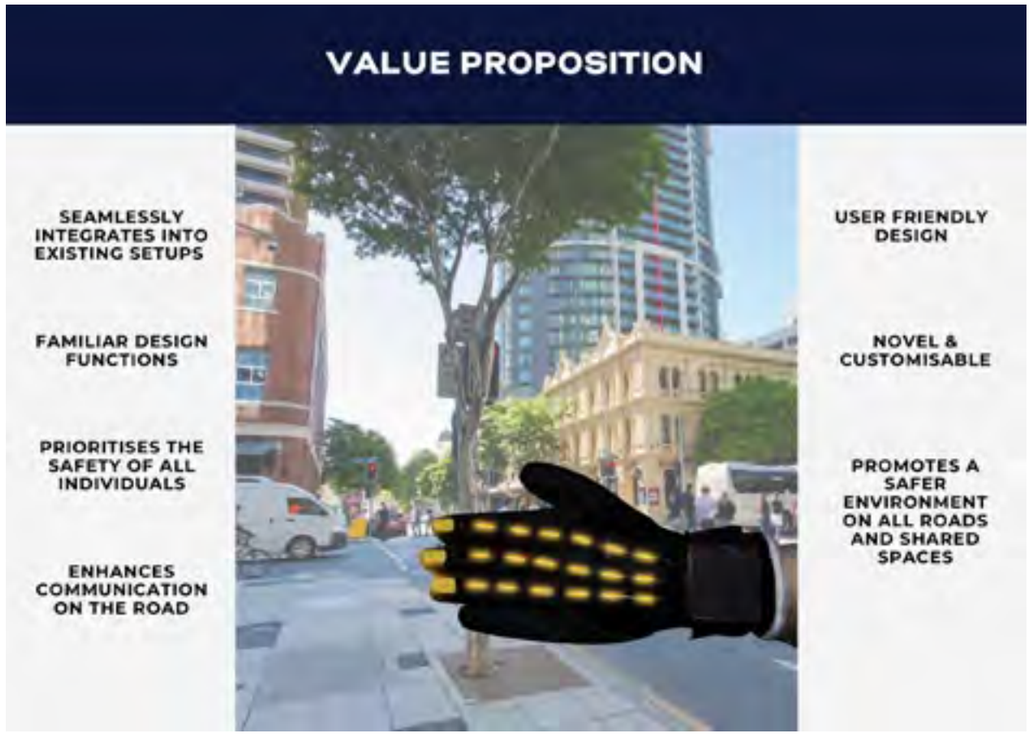
Glove Materials and Manufacturing

	Part Type	Material	Finish	Manufacturing Process
1	Inner Glove Layer	Nylon	Microporous Coating	Stitching
2	Outer Glove Layer	Polyester	Textured and perforated	Stitching
3	Breathable Glove Patches	Synthetic Mesh	Microporous Coating	Layering and Stitching
4	Glove Grip	Polyurethane (PU)	Silicone Based Coating, Tactile	Layering and Stitching
5	Glove Padding	High Density and PVC Foam	Layered, Tactile	Layering and Stitching

Glove Sizing

	Size	Length	Width
Women	S	16.7 – 17.2	17.0 – 17.7
	M	17.2 – 17.8	17.7 – 18.3
	L	17.8 – 18.5	18.3 – 19.0
Men	S	19.0 – 19.6	19.3 – 20.1
	M	19.6 – 20.3	20.1 – 20.9
	L	21.0 – 21.8	21.8 – 22.4
	XL	21.8 – 22.5	22.4 – 23.0
	2XL	22.5 – 23.0	23.0 – 23.7

Presentation Slides



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Model Making

1

Components prepared by taping holes and areas not wanting to be painted

2

Interface screen and interface compartment joined together

3

Full coated and glued interface compartment and screen ready for assembly

4

LED panel prepared and spray painted to match intended finish as best as possible

5

LED panel screen prepared by covering areas with tape and spray painting edges

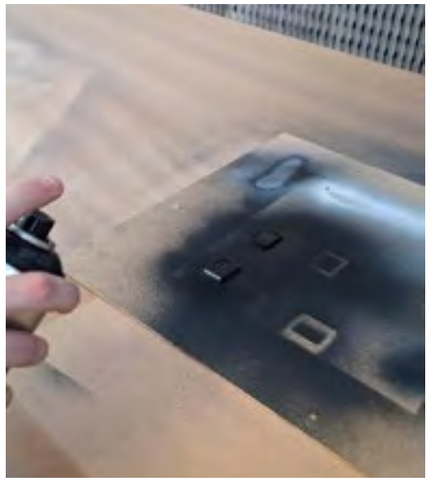
6

Finger tabs spray painted and positioned accordingly for assembly

7

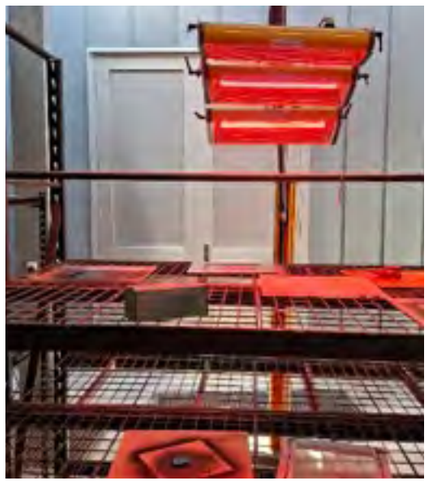
Spray painting parts in context using water based spray paint and cardboard plates

8



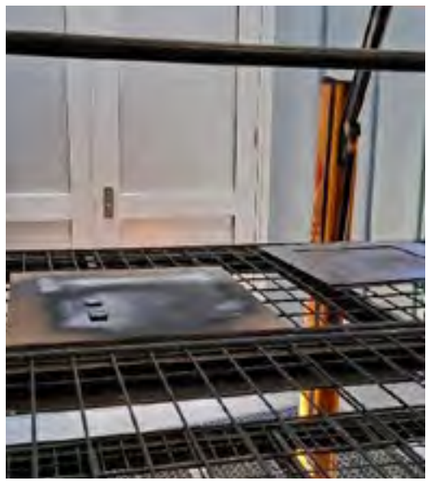
All parts required multiple coats to achieve a desirable finish

9



The drying racks were utilised for drying parts in between coats

10



Due to the size of the parts they were placed to the sides recieving minimal heat

Model Making

11

The band connecting the interface and LED panel was cutout using a stretch fabric

12

The material was wrapped around the glove and threaded through the strap clasps

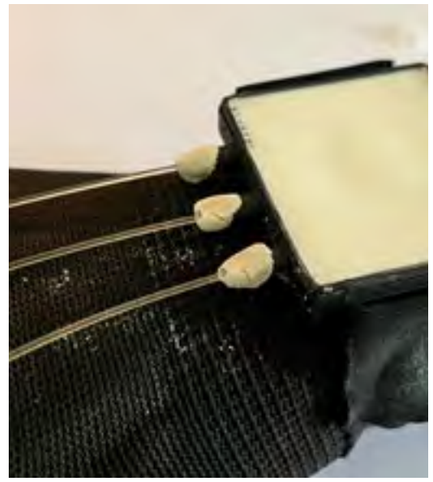
15

LED finger tabs attached to the finger tips of the glove resembling where the lights are

16

A translucent wire was chosen in the assembly as it best resembles the intended design

17



The wire was attached to the interface jacks showing how each wire connects inside

13

By pulling the ends of the fabric the interface was tightended to the glove

14

At each end of the strap it was cut to a desired length and stitched down to the glove

18

The wires were also attached to the finger tabs connecting the power to the output

19

At the glove knuckles the LED wires were attached onto the glove to ensure they remained in place

20

Translucent wires have a similar effect to what the actual LED's will look like

Final Physical Model

Model Making Breakdown:

Materials

PLA 3D prints - Technology components

Stretch fabric - Wrist strap

Modelling clay - Wire joins

Translucent plastic wire - LED strips

Existing glove

Assembly Methods

Glueing - For model purposes only

Physical part joining

Stitching

Painting

Component Manufacture Methods

3D Printing - PLA Material

Cutting - Fabric Materials

Stitching - Fabric Materials (Not the glove)