

TOUCHIT

Project Plan

Somatosensory Interaction Category of the
Human Computer Interaction (HCI) track

XIAMEN UNIVERSITY MALAYSIA

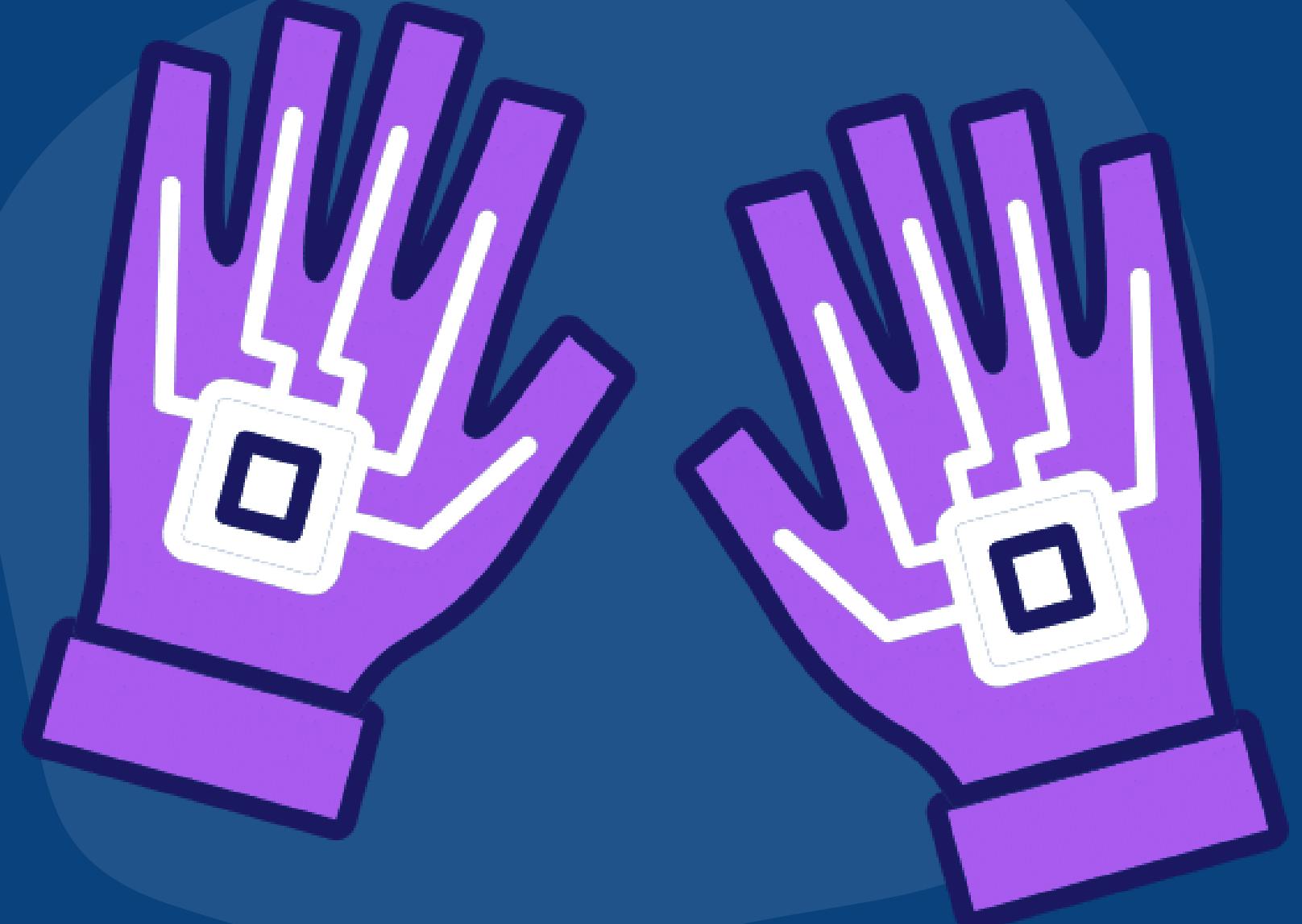


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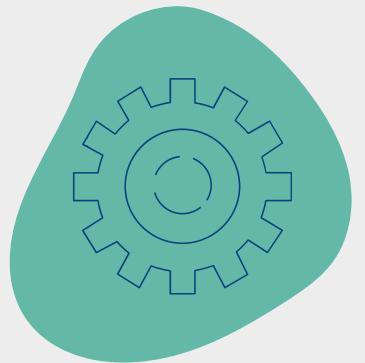
Future Prospect

PROJECT BACKGROUND



Current Industry Background

VR industries are the most concentrated industry that produces most of touch and haptic devices. However, touch feedback is limited in VR formats and consumers need to spend a high cost to purchase excessive hardware in order to enjoy this luxury experience. Moreover, the experience of current haptic hardware are not comprehensive. Most of the time, the haptic hardware are embedded to the whole VR suit which limits portability and mobility. Hence, the current product only provides inertial/pressure feedback, in which they are limited to only the motion, but not to the texture of the object.

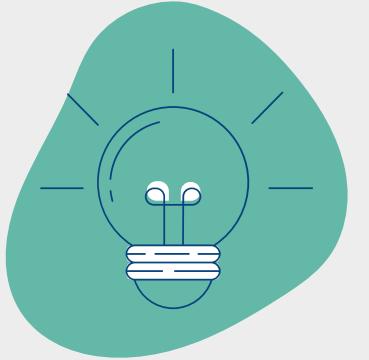


Project Background

With that being the case, TouchIT, the next generation gloves, provides both fully-immersive and semi-immersive haptic interaction with 3D objects on any electronic devices. To be fully immersed in the virtual world, TouchIT is paired with VR headset to enhance the virtual experience. Conversely, on the cheaper end, TouchIT provides a semi-immersive environment that allows physical interaction with objects in the virtual world on any device.

PROJECT BACKGROUND

Reasons for Choosing This Project



In the world of Human Computer Interaction (HCI), we focus on how computer can interact with human's natural instincts. Humans have 5 basic senses which are sight, hearing, smell, taste and touch. Technology nowadays only focuses on how to digitalize audios and visuals that only comply to the human's sight and hearing senses. Lesser research and studies are focusing on digitalizing the human sense of touch. For instance, digitalizing matrices of rough surface into 0s and 1s.

Especially in this era, humans are more vulnerable to many external issues such as health and natural disasters, in which the remote trend has been surging high. With the existence of the 5G era that is soon to come, the problem of optimising the benefits of 5G especially in remote environment rises. Hence, the reason of choosing this project is to virtualise the human sense of touch that

- Allows users to explore new places, both real and fictional, from the comfort of their homes such as experiencing: real life events (seasons, petting a zoo animal), new product release and ancient objects like historical buildings, artefacts or paintings.
- Encourages social interaction without risking infection with the existence of the recent coronavirus and to enable large groups of people to gather and learn without physically being present.
- Assists the learning process in the field of education that increases the realism of simulations by providing force or tactile feedback to students.

PROJECT INNOVATION

Higher Affordability

TouchIT GLOVE: <RM433.26 (<\$100)

Hi5 VR GLOVE Noitom: RM4,328.27 (\$999)

TESLASUIT GLOVE: RM2,166.30 (\$500)

OCAPTO GLOVE: RM2,122.97 (\$490)

Higher Portability and Connectivity

Using Mobile Platform

Higher Interactivity

Provide a “physical interaction” with objects that intensifies the immersive environment

Novelty of TouchIT

This project aims to cope with the rapidly changing technology by providing users a cheaper alternative to experience an immersive haptic interaction.

FEASIBILITY ANALYSIS

Higher Affordability

This project aims to approach a variety range of customers and allow them to experience technology at a low cost.

Aim

We intend to populate the use of virtualize technology in a normal consumer level.

FEASIBILITY ANALYSIS

Higher Portability and Connectivity

TouchIT has higher mobility such that the gloves can be used anywhere and anytime

Light and portable, minimalist design

Compatible with any platform that support wireless connection, eg: mobile devices, smart TV, PC, etc

User do not need to purchase any extra devices other than the gloves

FEASIBILITY ANALYSIS

Higher Interactivity

TouchIT combines several different technologies to simultaneously create the impression of

- touching and holding objects
- capturing the motion of user's hands, and
- recording pulse and other biometric information.

FEASIBILITY ANALYSIS

Target Audience

Our product aims to reach a wide range of target audience
(Individual age ranging from 15 to 40)

Scenario 1: Clinical

- Provide rehabilitation therapy for skin epidermis damaged patient
- Incorporate with 5G in remote surgery purposes (allows surgical doctor to have a more precise and realistic feedback)

Scenario 2: Education Institution Training

- Do experiments with added sensation
- Allow medical students to touch a virtual heart but have a realistic feeling(training)
- Allow students to touch and feel virtual things which are dangerous or even non-existing in real life

Scenario 3: Gaming / Online Shopping / Zoo (entertainment purposes)

- Feel the texture of clothes, furniture etc...
- Pet wild animals at ease

PROJECT RESEARCH PROGRAM

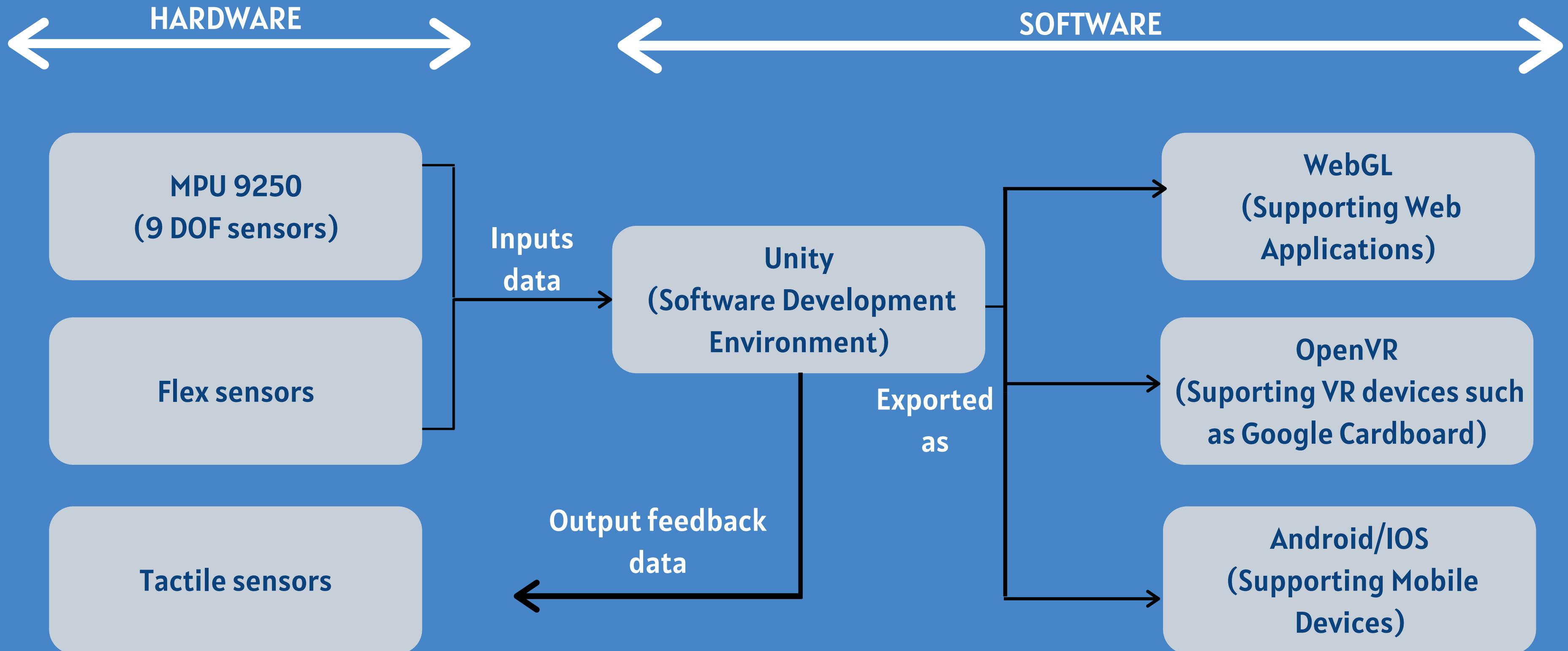
System Development
Methodology &
User Application
Methodology

Project Progress
& Expected
Results

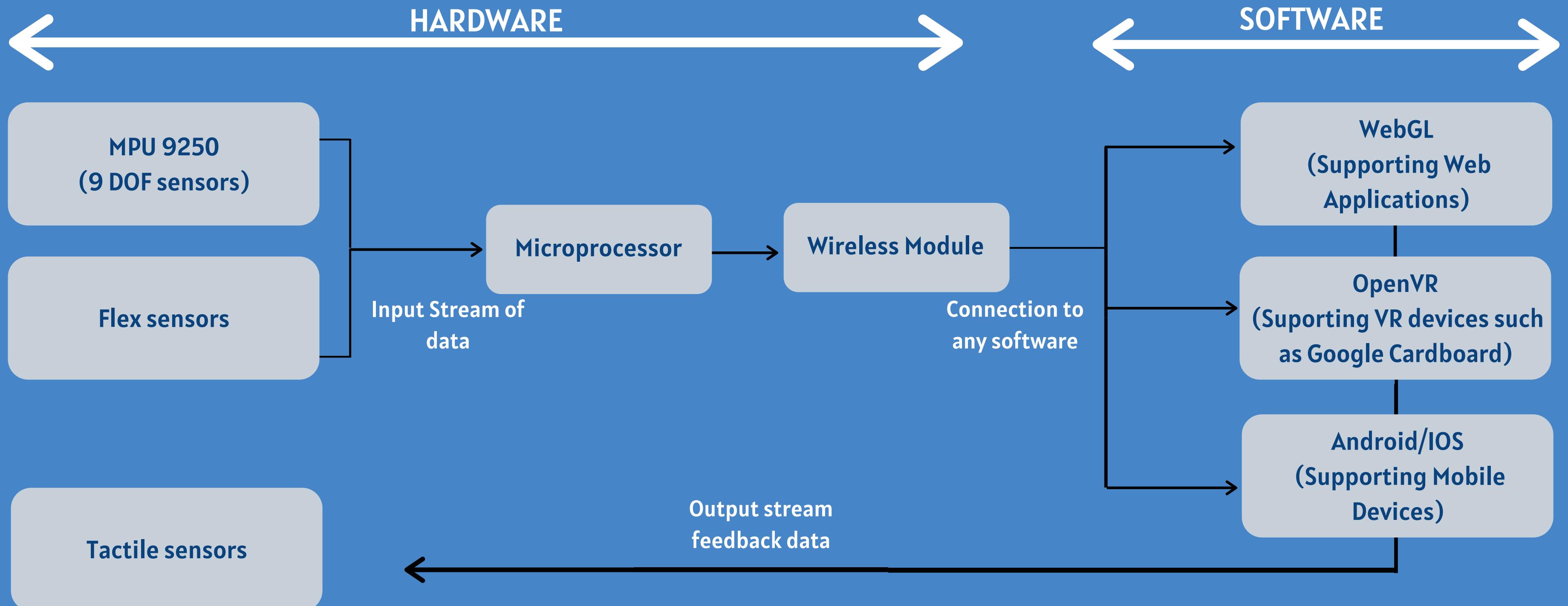
Improvement of
Current Situation

Business Plan
Analysis

SYSTEM DEVELOPMENT METHODOLOGY



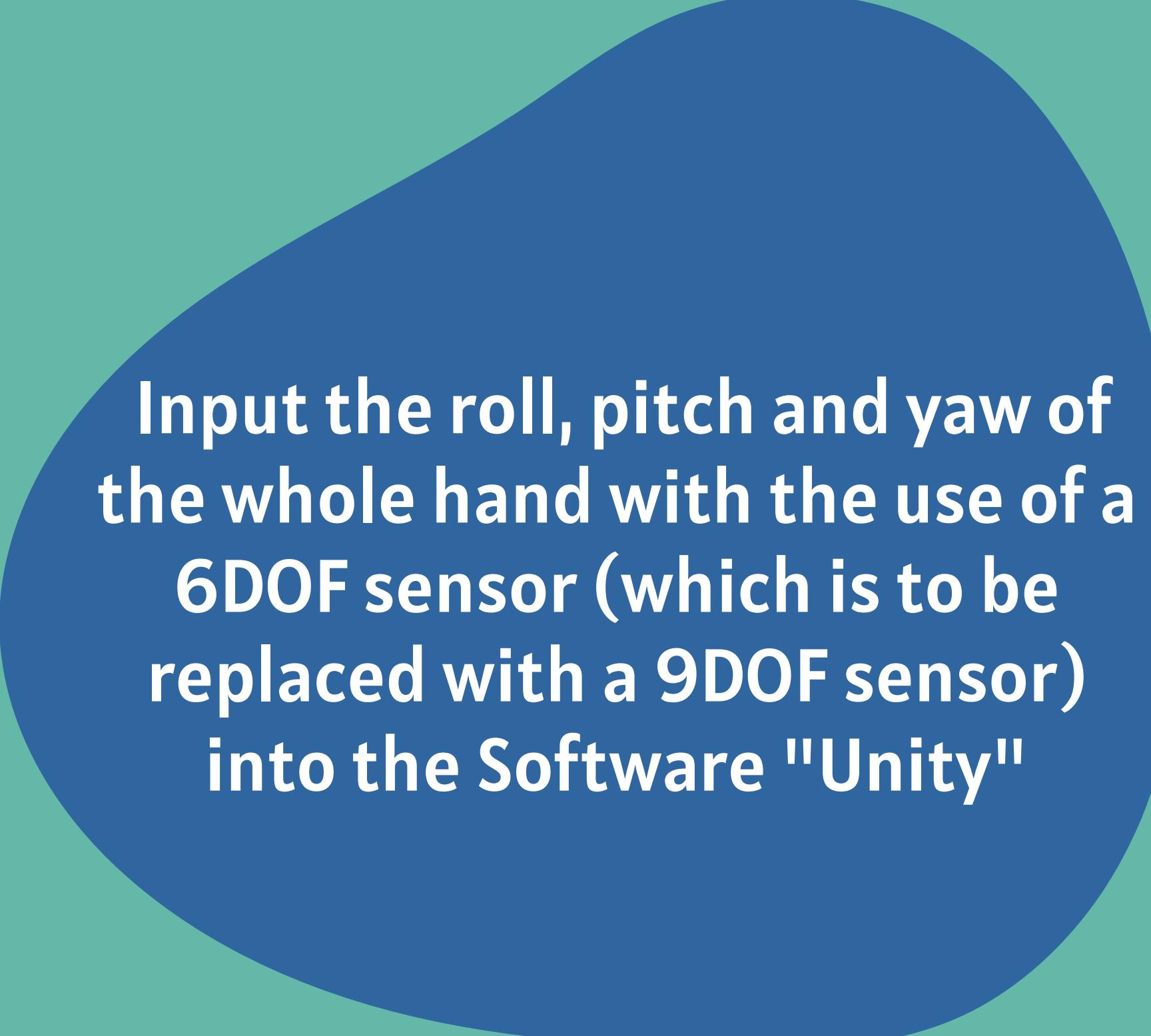
USER APPLICATION METHODOLOGY



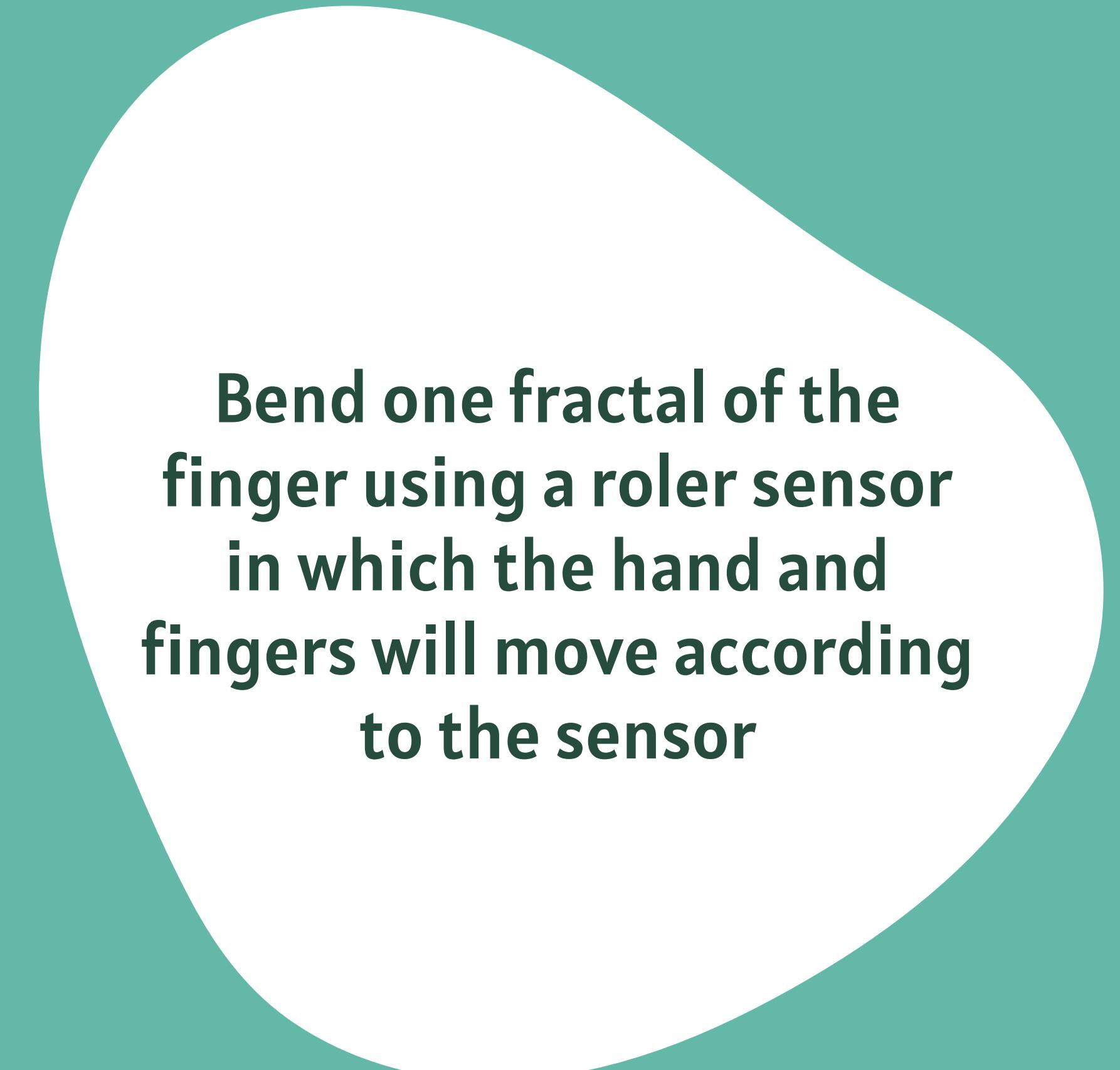
IMPROVEMENT OF CURRENT SITUATION

Feature	Existing Product	TouchIT
Price	> RM2,122.97 (>\$490)	<RM433 (<\$100)
Design	Heavy and Complicated Design	Lighter and Adopts a Minimalist Design
Portability / Flexibility	Low	High
Technology	Use camera to capture hand motion (incur loss of sight problem)	Use tangible sensors to track hand motion without worrying about the loss of sight
Feedback	Only provide inertial/pressure feedback (limited to motion but not tactile of the object)	Aim to produce an artificial skin epidermis (simulating heat, pressure, pain and touch receptors), allowing user to feel the tactile

THE PROJECT PROGRESS

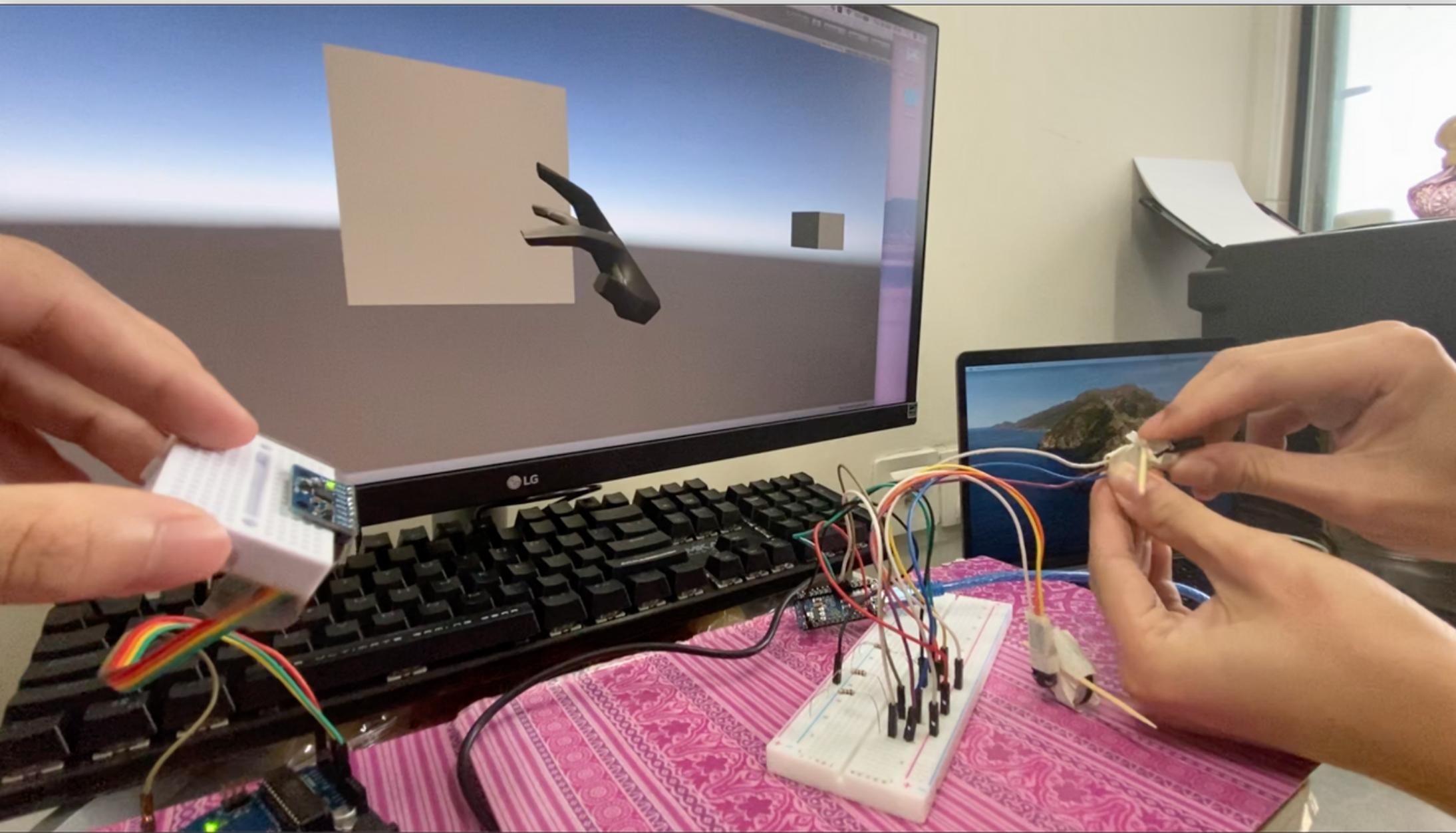


Input the roll, pitch and yaw of the whole hand with the use of a 6DOF sensor (which is to be replaced with a 9DOF sensor) into the Software "Unity"



Bend one fractal of the finger using a roller sensor in which the hand and fingers will move according to the sensor

CURRENT HARDWARE PROGRESS

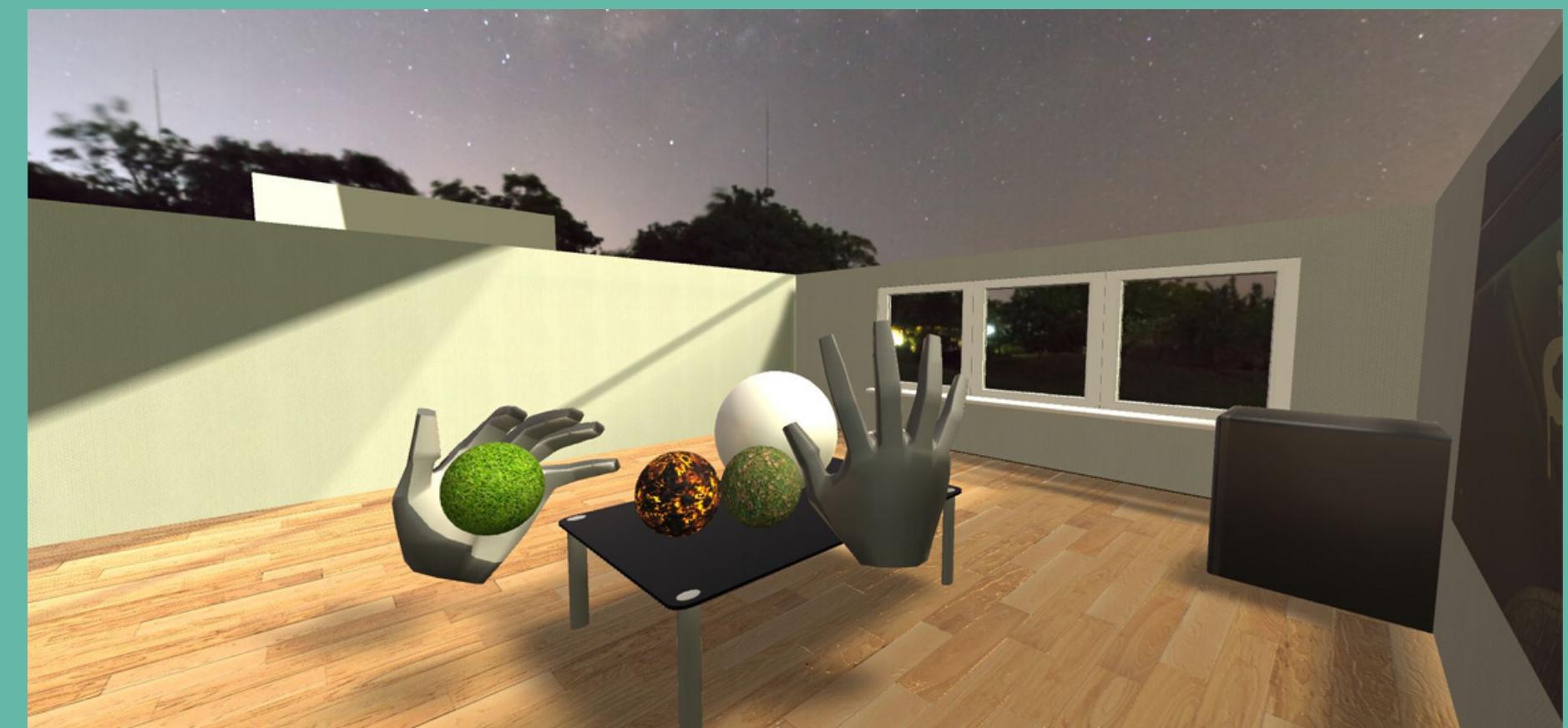
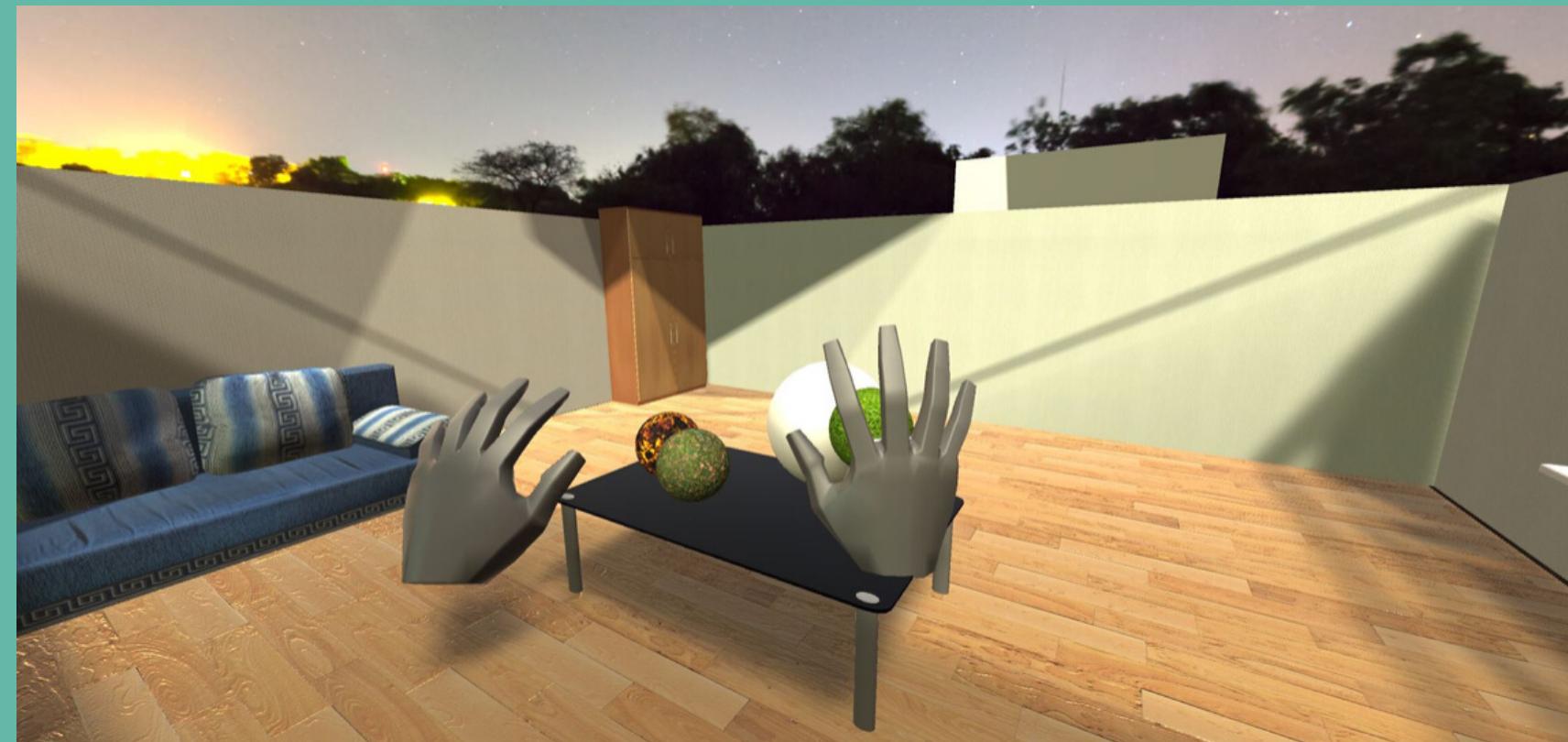


Link to video demo:

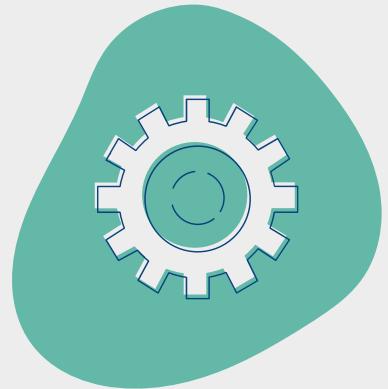
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CURRENT SOFTWARE PROGRESS

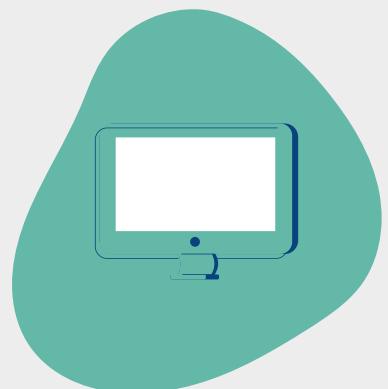


EXPECTED RESULTS



HARDWARE

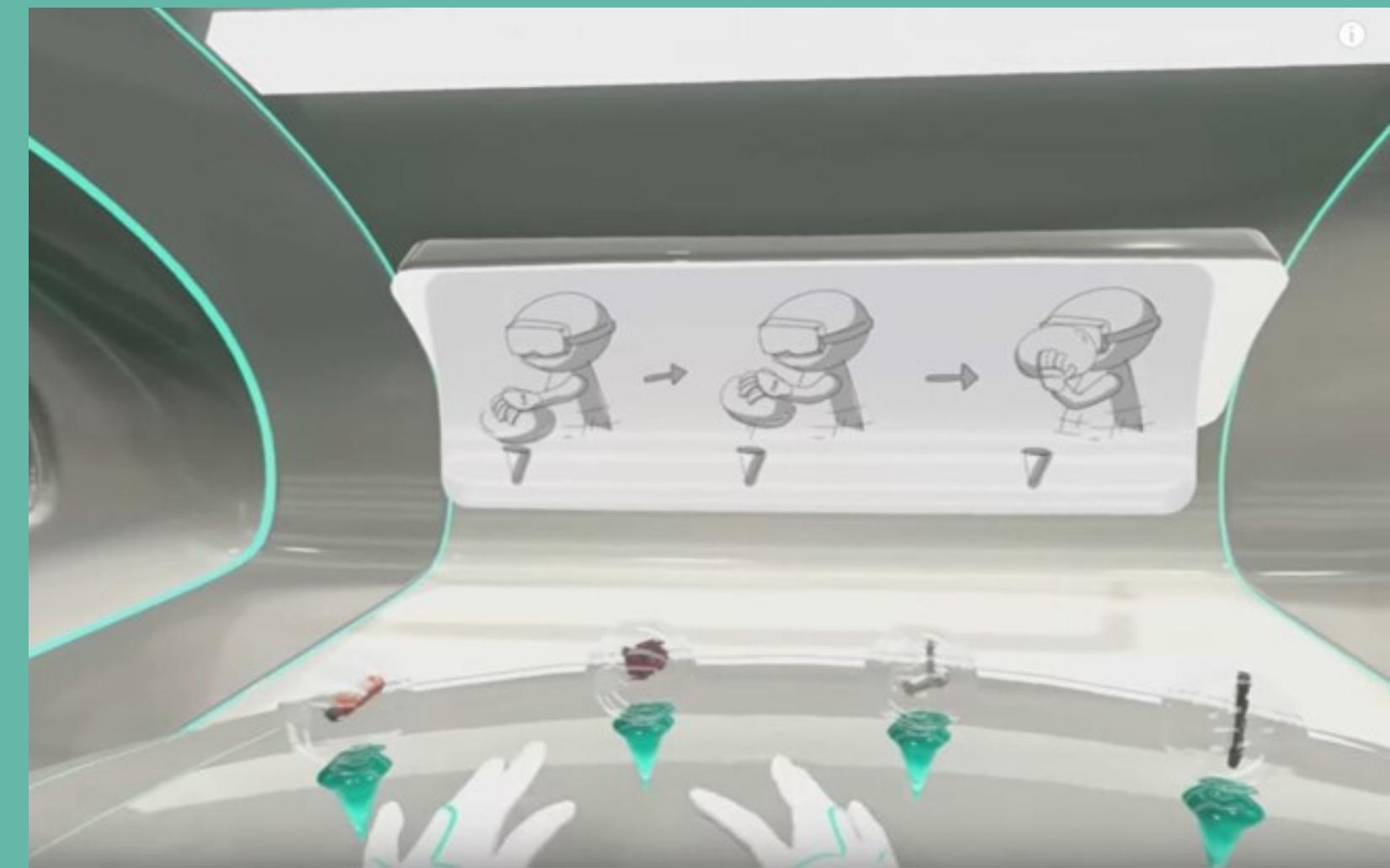
A haptic interaction glove that is more affordable and portable in which it is highly sensible to hand and finger movement that enables tactile sensation feedback to the fingers and palms, providing a real-time immersive interaction in the virtual world by giving the feeling of squeezing or grasping on an object.



SOFTWARE

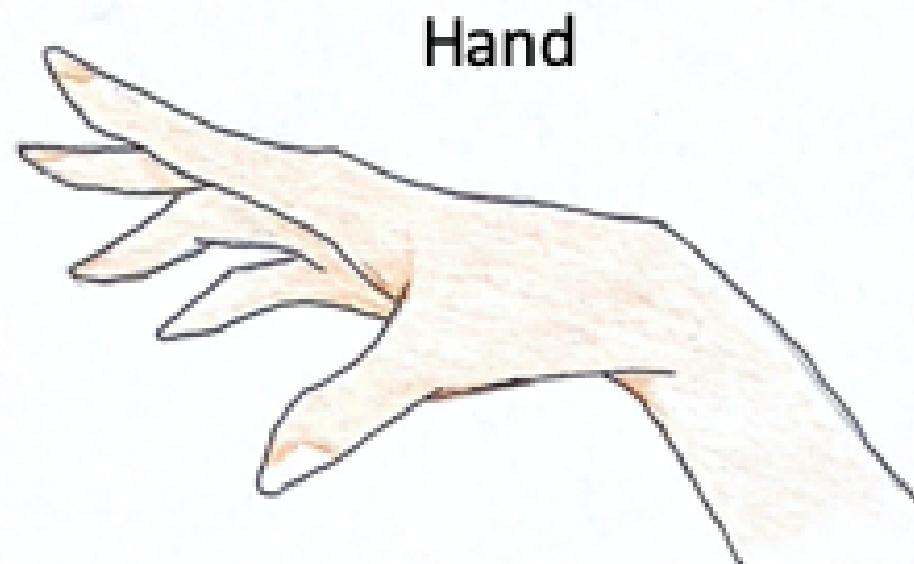
A UI interface to allow users to configure/customize the products. Provide user testing experience through easy personal calibration. It can be used in combination with other devices such as Oculus Rift, Kinect, Leap Motion, etc. in different scenarios.

THE EXPECTED USER INTERFACE OF THE SOFTWARE

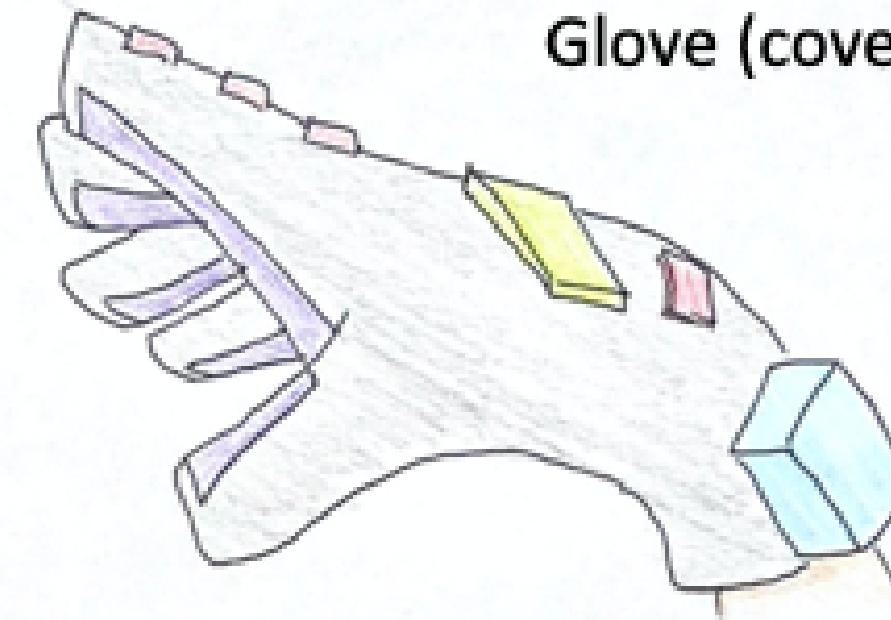


**This is the current scene we have developed in Unity

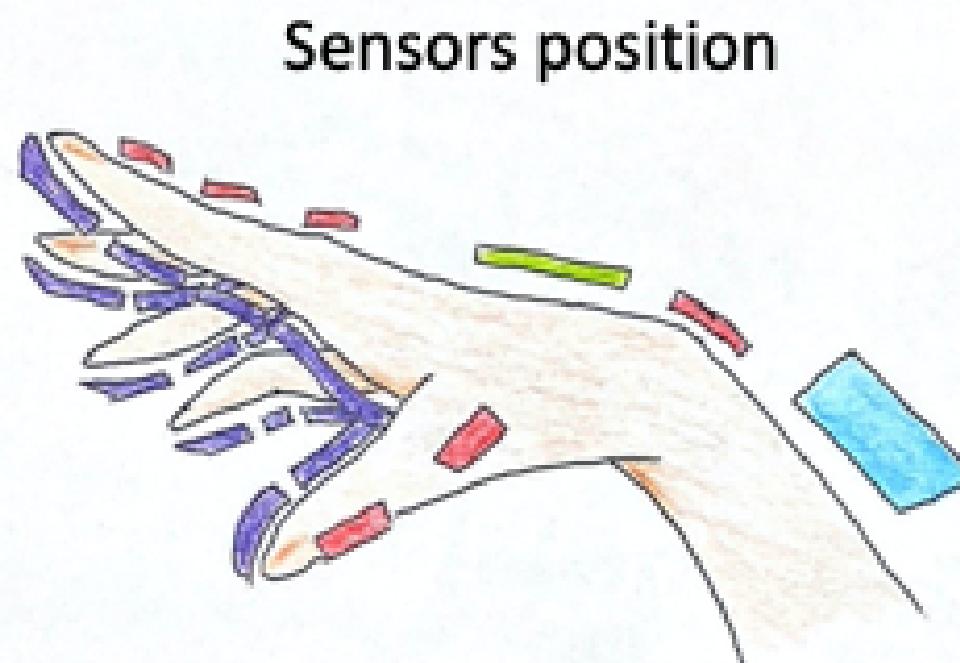
THE EXPECTED HARDWARE RESULT



Hand



Glove (cover all sensors)



Sensors position

- Flex sensor
- Tactile sensor
- 9DOF (MPU9250)
- Microprocessor + Wireless Module + Power Supply

These costs are measured in consumer prices

The actual prices will be cheaper in mass manufacture

BUSINESS PLAN ANALYSIS

Budget Estimation and Financial Analysis

Hardware Budget Estimation and Financial Analysis

Preliminary Budget Allocation

Allocation of Budget

Sensor: 9DOF (2 units for two hands)

RM 30

Flex Sensor

RM 200

Tactile Sensor

RM 10

Microprocessor (process sensor data)

RM 20

Wireless Module (5G or any others possible wireless methods)

RM 10

Others (Glove Fabrics, wires, ...)

RM 10

Total

RM 280

FUTURE PROSPECT

FUTURE DEVELOPMENT PLAN

To widen the glove's application to various softwares and incorporates arm movement and sensation

Incorporate With Machine Learning
To get a more accurate tactile output by training the M.L. model.

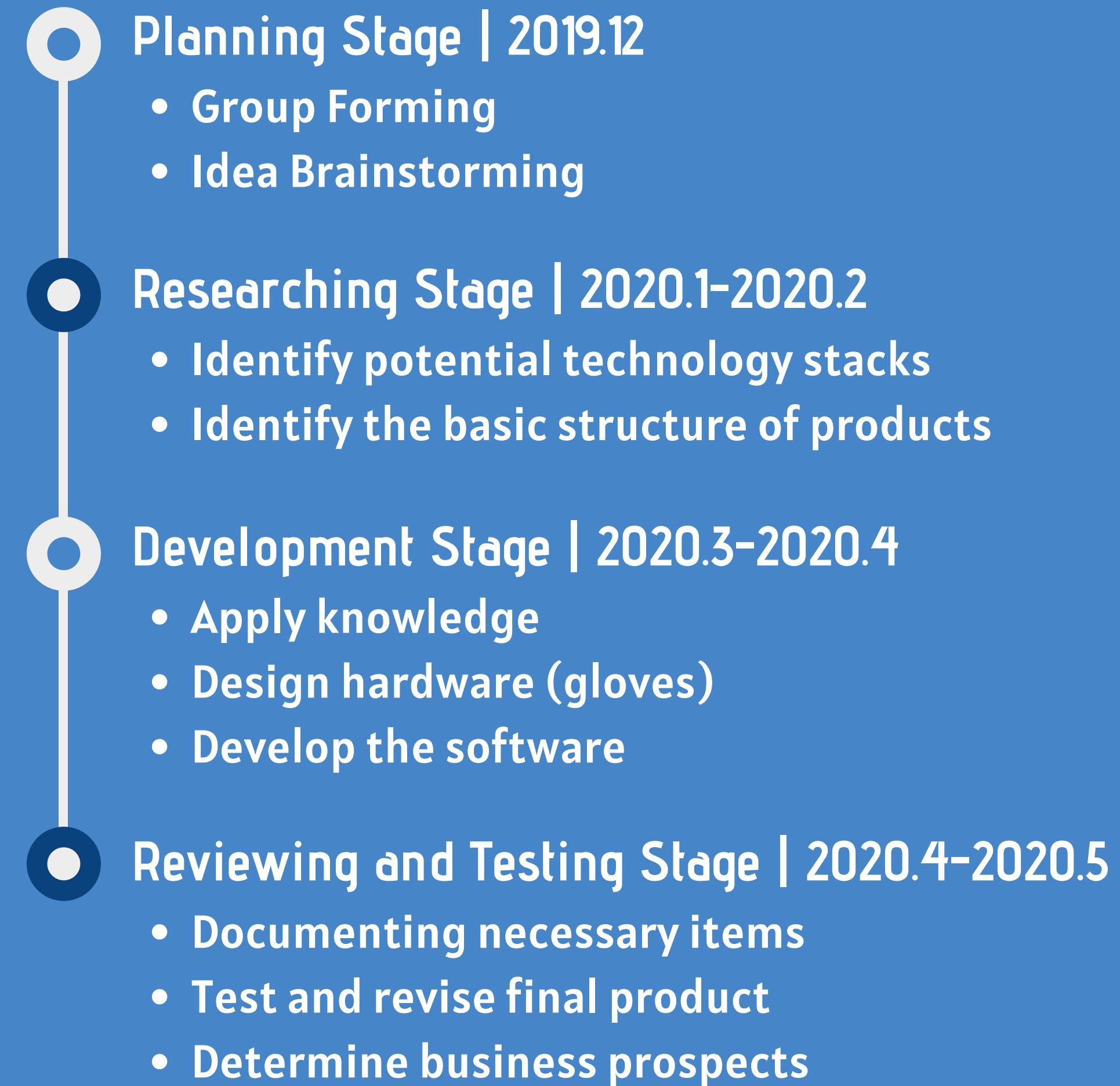
Step 1
Teach the model to output the relative feedback based on mass 2D images(eg, crocodile skin will have rough, dry tactile feedback)

Step 2
Get the regression and make prediction when the model perceive any 2D images

EXPECTATION OF FUTURE PRODUCT
Feel the tactile and motion of heart beating even with 2D images/streaming video.
The ability of the haptic glove to sense heat, cold, pain, and vibration throughout the whole hand instead of just by the palm

Project Schedule

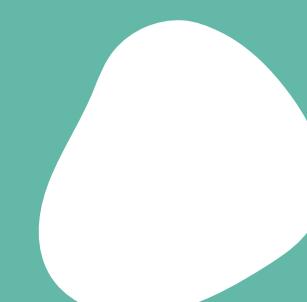
What are our next steps and goals



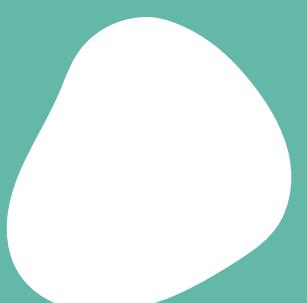
THE TEAM



DR. Ahmad Affandi Supli
Advisor



Gan Qi Wen
Project Leader



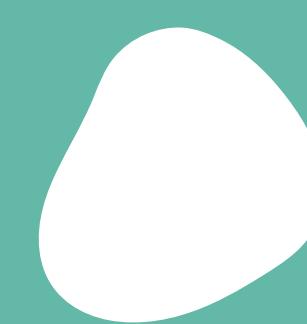
Leo Kee Lin
Hardware Developer



Mak Sue Suen
Hardware Developer



Chan Suet Man
Software Developer



Sharrukayshi Sharon
User Interface Developer

Advantages:

- Decent experiences in both programming and graphical knowledges.
- Cohesive character in a team.
- Experienced in similar innovative competition
<http://www.xmu.edu.my/2019/1105/c18694a385715/page.htm>

Experienced project:

- Fully Commercializable Website development
 - Hosted on digital ocean, this project include Mysql, XML, PHP to make the website manageable and fully functional on mobile platform.
 - <http://mrwater98.me/WebMobile/>
- 3D games development
 - Using Unity, this online 3D game is created with C# and decent computer graphics skill such as modelling, shader, lighting and texture.
 - <https://qiwen.itch.io/for-all-mankind>
- AI project
 - Using c++ language, the "sokoban" games was able to solve using A* algorithm.
 - <https://github.com/qiwen98/Sokoban-Game-Solver->



GAN QI WEN
PROJECT LEADER

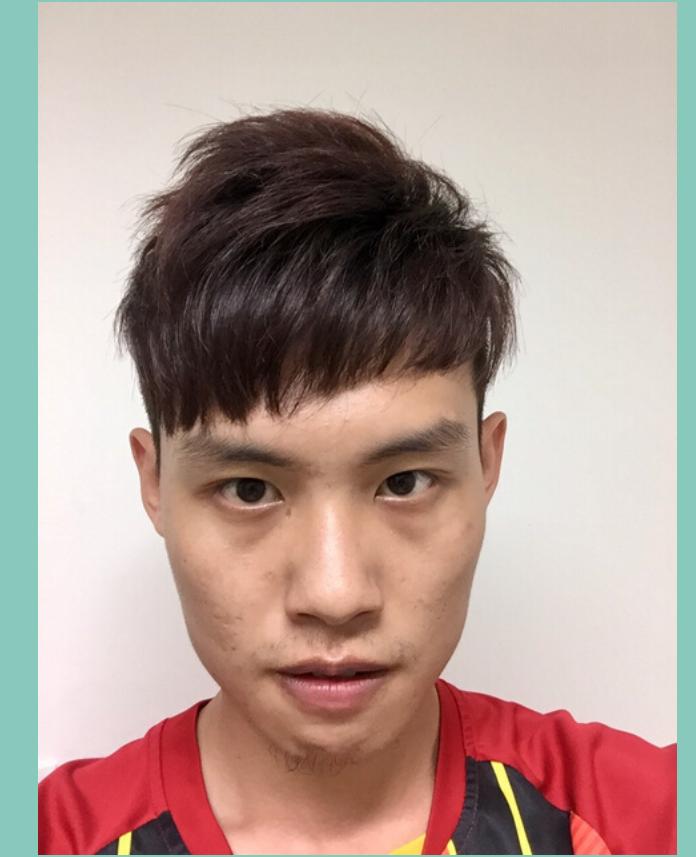
Student at Xiamen University Malaysia
Major: Digital Media Technology

Advantages:

- Computer Skills:
 - Programming skills: C, C++, Python
- Soft Skills:
 - Willingness to learn
 - Keen to explore

Experience:

- Participated in Brain-Computer Interface Contest Using Mind-Controlled Drones
 - This contest use two types of human signals namely electroencephalogram (EEG) and electrooculography (EOG) to write the program for remote drone operation.
- Some experiences in designing and building simple devices using Arduino.



LEO KEE LIN
HARDWARE DEVELOPER

Student at Xiamen University Malaysia
Major: Computer Science and Technology

Advantages:

- **Computer Skills:**
 - Programming skills: C, Java, Python
 - 2D and 3D computer graphics design with OpenGL

Part-time Work Experience:

- **Company:** Qube Apps Solution Sdn. Bhd
- **Position:** User Experience (UX) Tester
- **Jobscopes:**
 - Back-end and front-end usability testing of Qube Point of Sales (POS) System Software
 - Retail Management Qube POS user manual modifications
 - Food and beverage Qube POS user manual modifications
 - Provided feedback on system software and suggestions on software additional functionalities

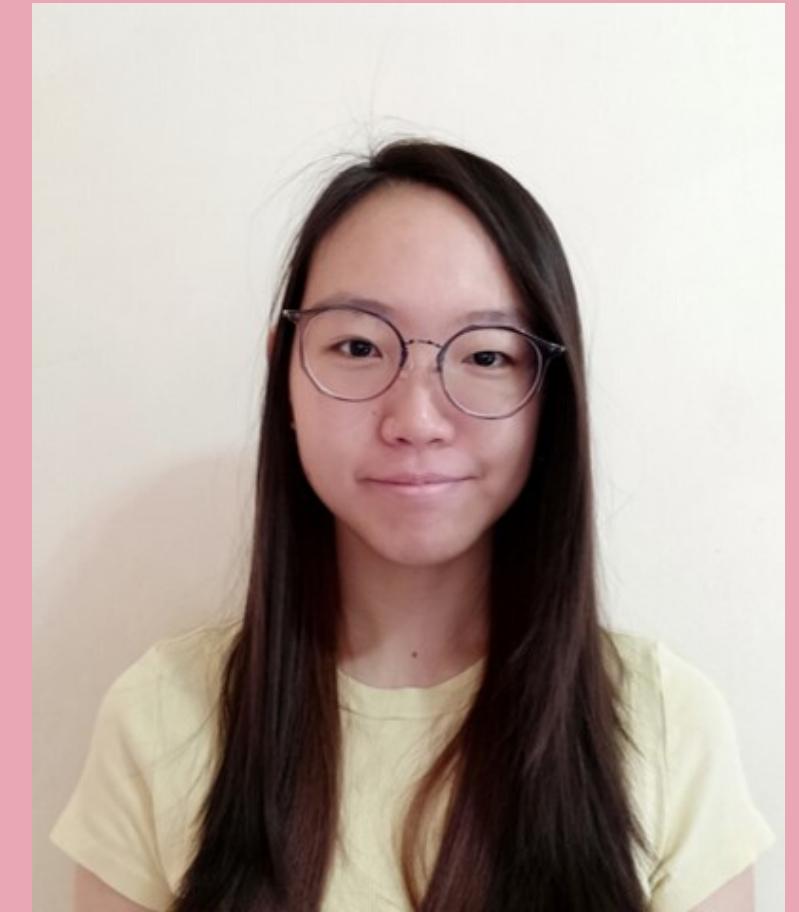


MAK SUE SUEN
HARDWARE DEVELOPER

**Student at Xiamen University Malaysia
Major: Computer Science and Technology**

Advantages:

- Soft Skills
 - Work well under pressure
 - Willingness to learn
- Computer Skills
 - Programming skills: C and C++, Java EE
 - Basic knowledge in Software Engineering, Human computer interaction, website design and Artificial Intelligence



Experience:

- Image/video processing project: Vehicle counting project
 - This project is a basic vehicle counting system in C++ language. It detects and counts the number of vehicles passing by in the video by blob detection using OpenCV. The software we used is Microsoft Visual studio.

CHAN SUET MAN
SOFTWARE DEVELOPER

Student at Xiamen University Malaysia
Major: Software Engineering

Advantages:

- **Soft Skills**
 - Collaborate with team members
 - Commit to the task provided
 - Focus on details
 - Open to new ideas
 - Meeting deadlines



Task Experience:

- Participated in an IT Training Class for 2months
- Have basic knowledge on:
 - C and C++
 - Java
 - Website Development
 - Digital Media Technology
 - Game Design and Development
 - Artificial Intelligence

**SHARRUKAYSHI
SHARON
USER INTERFACE DEVELOPER**

**Student at Xiamen University Malaysia
Major: Software Engineering**

THANK YOU

