

K E L L Y   L A I

C O M P U T E R   E N G I N E E R  
&  
I N D U S T R I A L   D E S I G N E R

P   O   R

T   F   O  
L   I   O



P R O J E C T S

# < / Sonoro >

## VR Music Therapy for Special Education Need (SEN) Students

CEO Jun 2022 - Sep 2023

- Developed ergonomic light weight VR headset with 50% weight of Oculus Quest 2 but same functionality and customised VR

Unity keyboard software for recording and predicting emotions with RNNs/ Transformer neural networks to achieve music therapy

in a team of 5, proposed to benefit 50,000+ SEN students in Hong Kong

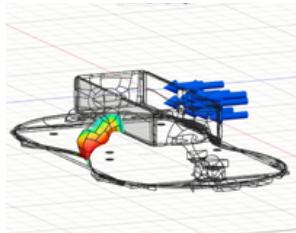
- The James Dyson Award 2023 - Hong Kong entry | entry opportunity for HKSTP x HKUST Co-ideation Program 2023

- HKUST-Sino One Million Dollar Entrepreneurship Competition 2023 - won the top 25 out of 234 teams internationally

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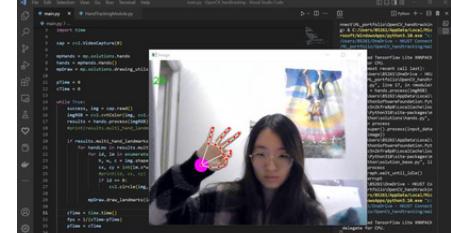
Headset Overview



Weight Analysis



Render



Hand tracking



Watch on YouTube

<https://www.youtube.com/watch?v=PYHfMpjVbi0>



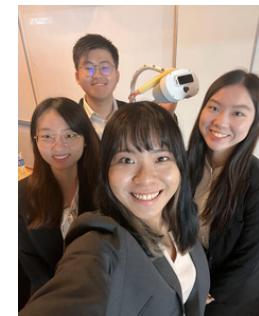
Watch on YouTube

[https://youtu.be/6yFc\\_5c7F5Q](https://youtu.be/6yFc_5c7F5Q)

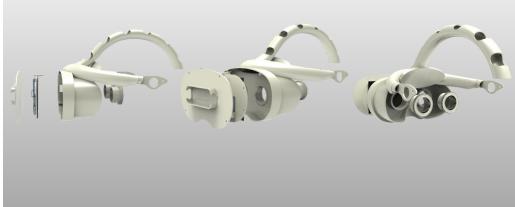


Watch on YouTube

<https://youtu.be/kS4lx4TLOX8?si=PT6Rwna6FhdFdrAH>



## VR Headset Design



Link: <https://www.jamesdysonaward.org/en-US/2023/project/sonoro-vr-music-therapy>

Link: <https://github.com/kwlaial/VR-MIDI-PRODUCTION-UE5>



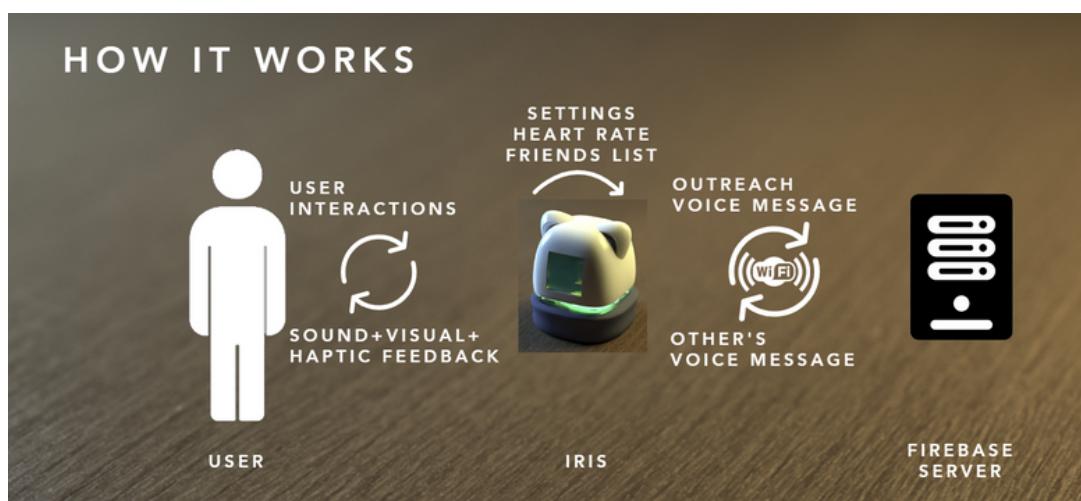
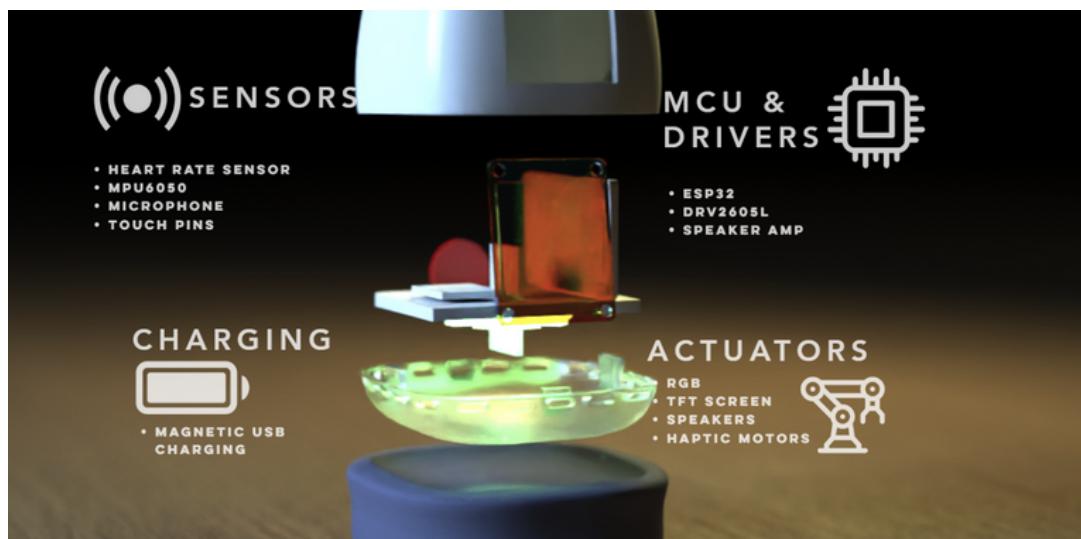
# < / Emotional Digital Pet >

Chinachem PrimeMovership Award

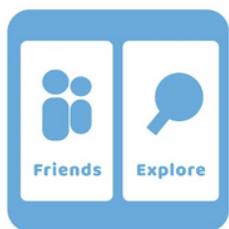
Data Scientist Jun 2022

- collected data and performed statistical analysis on Heart Rate Variability to explore its correlation with students mental pressure using R and Tensorflow
- collaborated with HKUST Wellness Centre, proposed benefiting 14,000+ HKUST student's mental health

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# < / Emotional Digital Pet >



## Nice Voice

Our main function is to create a safe space for our users to create human-human interactions and with this function users are able to talk anonymously.

Your HRV: 69.39

You have  
**MILD Anxiety**  
**MILD Depression**

## Mental Health Assessment

Using Heart Rate Variability, we could use algorithmic methods to find your stress level to raise awareness on your mental health.



## Record Voice

Let Iris be your tree hole. You can vent out your stress here no one will judge you and you can allow your negative thoughts be gone.

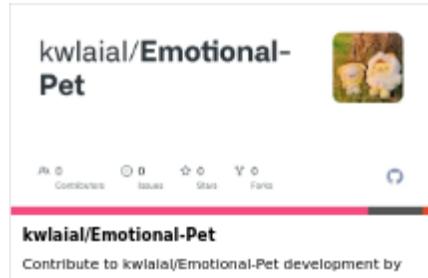
## Emotional Assessment

By recording your daily emotion, we could enable a journey of your emotions and create suggestions plans to reduce stress and anxiety.

Are you feeling  
relaxed/stressed?



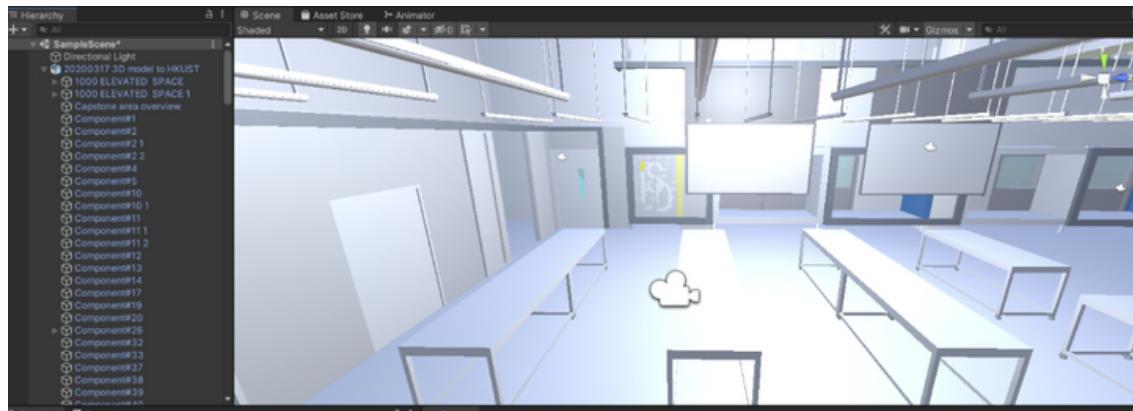
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<https://www.youtube.com/watch?v=7pX77gLQvWM>

## < / VR-Laser-Cutter-Traning >

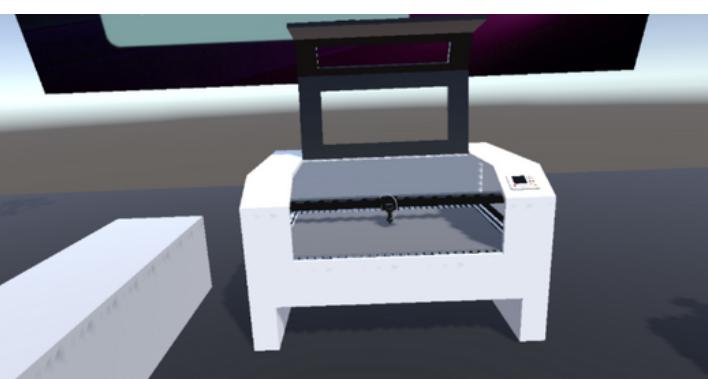
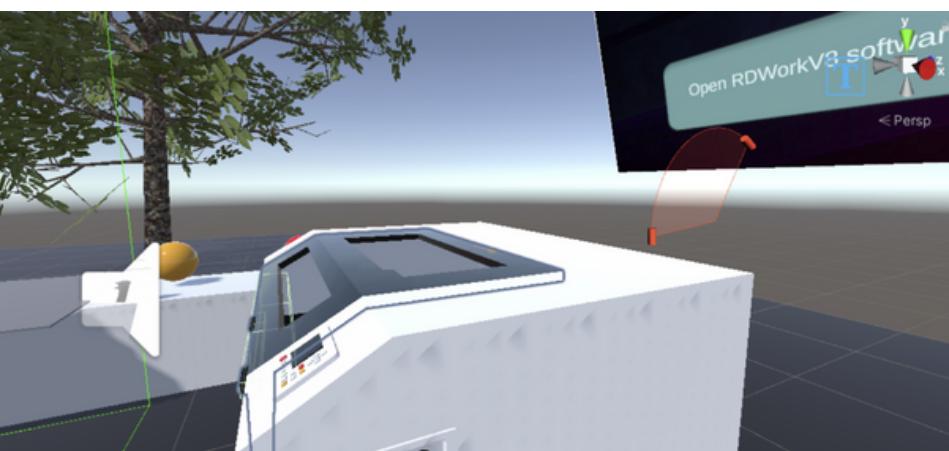
- Built 3D step-by-step laser cutter training in VR Unity game engine in C#, benefited 100+ students from my department to have an
- interactive learning experience on how to use the industrial laser cutter - UROP Undergraduate Research Opportunities Program



Studio environment



Laser cutter CAD models  
Hand-movement animation  
Unity VR gameplay environment



**kwlai/VR-Laser-Cutter-Traning**



A GitHub repository page for 'kwlai/VR-Laser-Cutter-Traning'. It shows 1 pull request, 0 issues, 0 forks, and 0 stars. There is a link to contribute via GitHub.

<https://github.com/kwlai/VRLaser-Cutter-Traning>



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# < / AirFlexi >

Drone Delivery Service

Co-Founder Jun 2023 - Present

- InnoX Summer Camp - Best Project Prize (sponsored by Sequoia Capital China: investment from leading VCs, up to USD \$63,000 Seed funding, startup training over USD \$12,500) provide fast drone delivery in one tap

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# AIRFLEXI

Elevating Possibilities: Transforming Everyday Tasks with Novel Drone Ecosystem

## AirFlexi, transforming the drone industry

Currently, drones cannot collaborate effectively with each other



### Ineffective Communication System

Current drones are good at performing individual tasks, but not group tasks

### Extensive Human Involvement

Widespread adoption of drones in an automated supply chain is not realized due to lack of coordination system

### Limited Operational Capabilities

Current UAV design has very limited payload and battery life

## Better How?

### Ease of Drone Control

- Request drone service with a few clicks
- Streamlining the entire process in one app

### Versatile Drone Fleet

- Self-developed propeller
- Cater to various tasks, payload capacities, and specialized requirements
- Support lightweight cargo deliveries to heavy-duty logistics operations

### Seamless Integration System

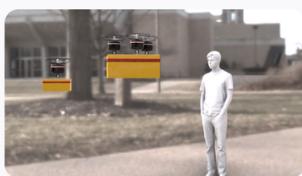
- Easily integrates with existing logistics and workflows
- Supports various parties for collaboration

## AirFlexi, the most efficient and flexible drone system

A user journey of AirFlexi drone delivery service



Step 1: Open the AirFlexi app and input your cargo's info and sending address. The order is ready to checkout.



Step 2: Our propellers system will pick up your cargo promptly with the closest propellers available and set off to their destinations.



Step 3: You may pick up your cargos from the drone directly or from any storage points.

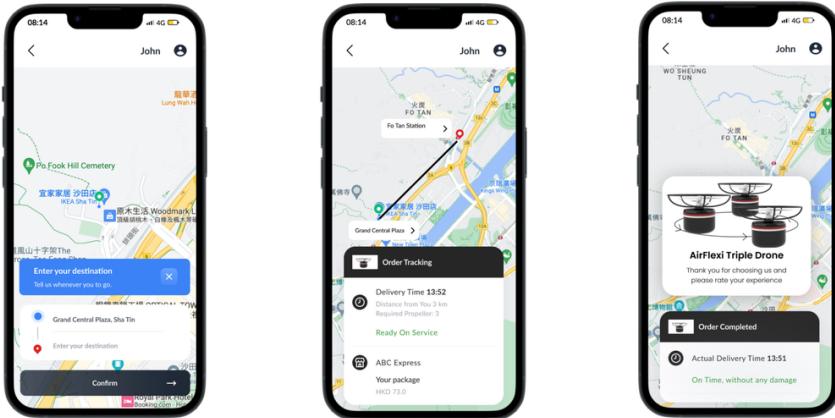
# < / AirFlexi >



## How to use?

An easy-to-use UX/UI design that enables customers to request drone services with just a few clicks, streamlining the entire process from scheduling to delivery

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1 Enter Address & Cargo Information

2 Price Quotation

3 Receiving Cargo

## AirFlexi, the ultimate automated drone solution

Our system can be utilized in various use cases including but do not limited to



Point-to-Point Cargo Delivery



Surveillance Services



Advertising Solutions

## AirFlexi, our development progress is promising and projected to launch in 2024 Fall

Hardware Development

Software Development



### Current Prototype Specifications

- Payload 1kg per AirFlexi drone
- 10-min battery life span per delivery

### Specifications to be ready to launch

- Payload 3kg per AirFlexi drone
- 30-min batter life span per delivery
- Passed stability test for light rain and light wind



### Current Software Capabilities

- Central server to control AirFlexi drones
- Limited aerial traffic rule

### Software Capabilities to be ready to launch

- Enabling decentralised communication
- Aerial traffic rule for corner cases
- Precise location technology for point-to-point delivery

## A Commitment to Excellence and Innovation

Our Team



Likey



Kelly



Marco



Norris



Brian

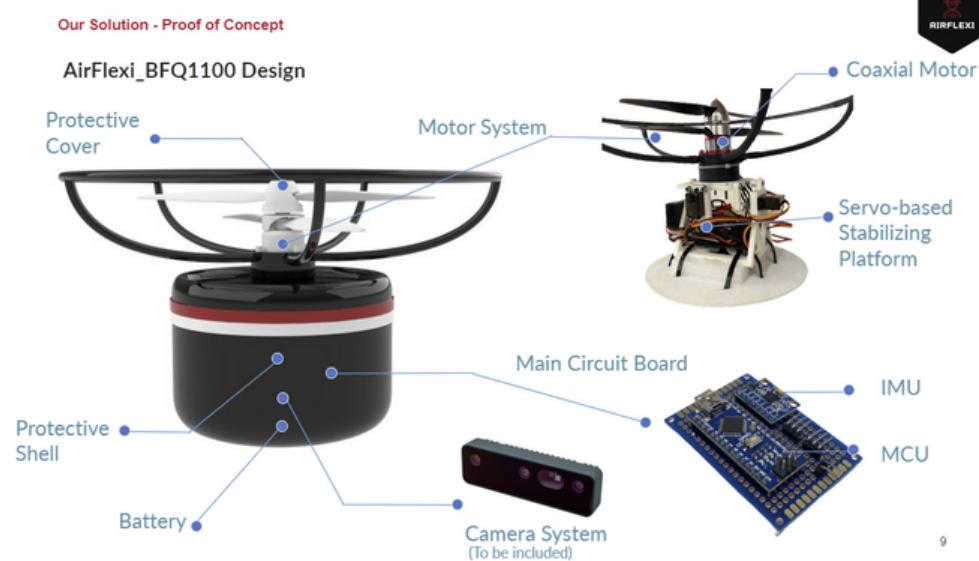
Our Team is from



# < / AirFlexi >



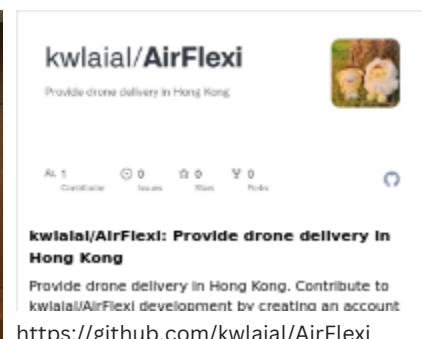
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<https://www.youtube.com/watch?v=U9Q5CYv17Fw>

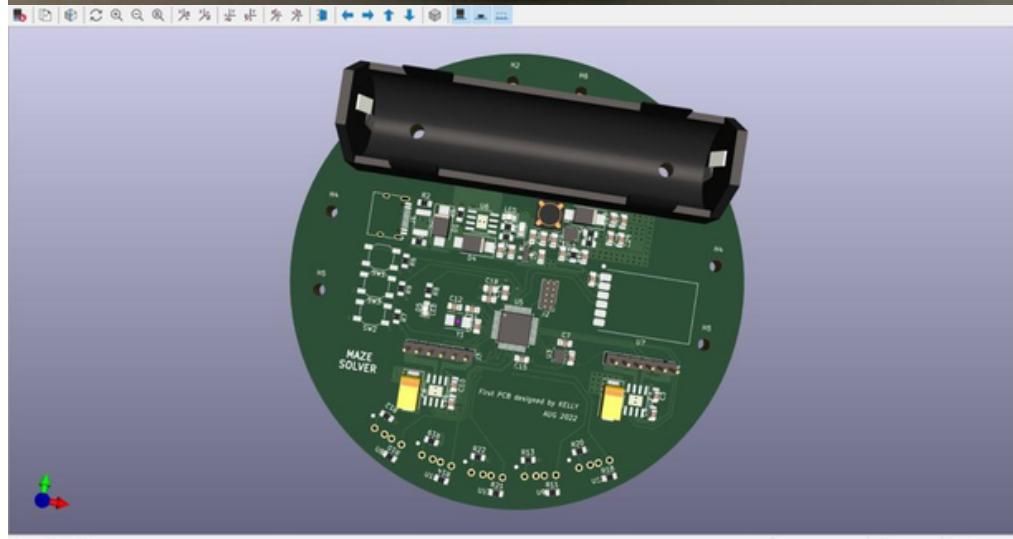
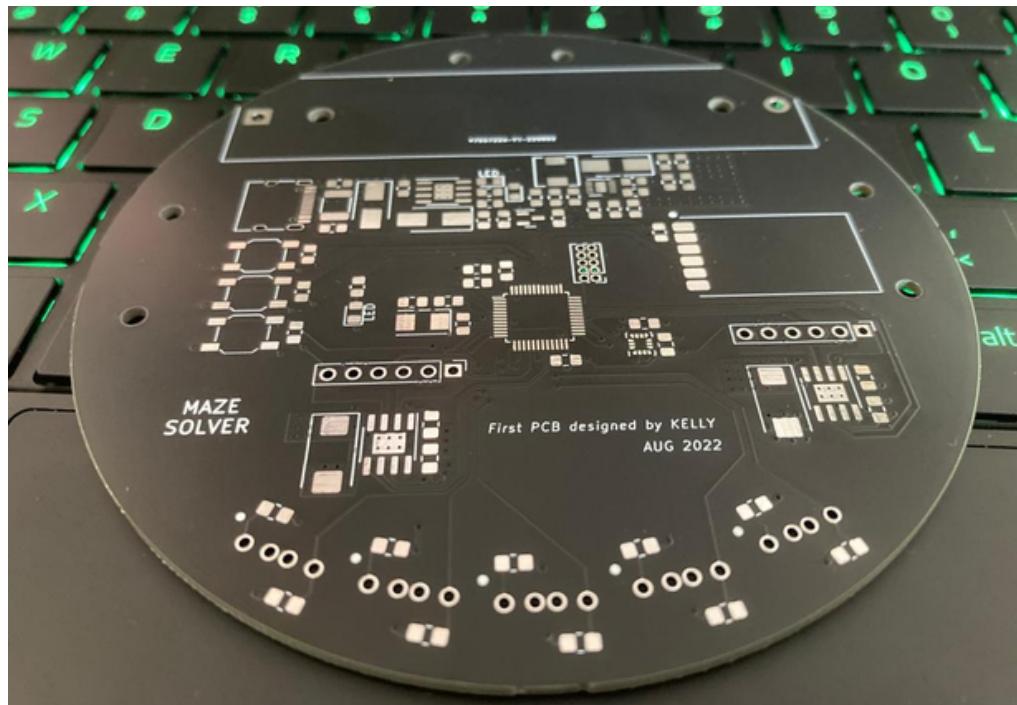


# < / Maze Solving PCB Robot Design >

First PCB designed in KiCAD and assembled to solve a single-lined maze Aug



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<https://github.com/kwlaial/MAZE-SOLVER-PCB-DESIGN>

# < / CADgpt >



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- Used ChatGPT 4.0 API/ LLaMA in Blender to create a 3D model auto code generation plugin, aided the creation of all CAD models in Blender and graphics design, reducing modelling time significantly. Utilized Stable Diffusion, ICON and Shap-E for mesh model creation from AI-generated images
- Entirely self-proposed USD \$31,000 funding from HKUST Center for Education Innovation: Education and Generative AI

**CADgpt**

code origin: <https://github.com/gd3kr/BlenderGPT>

blender addons tut: <https://www.youtube.com/watch?v=dm5T5aOIO8Y>

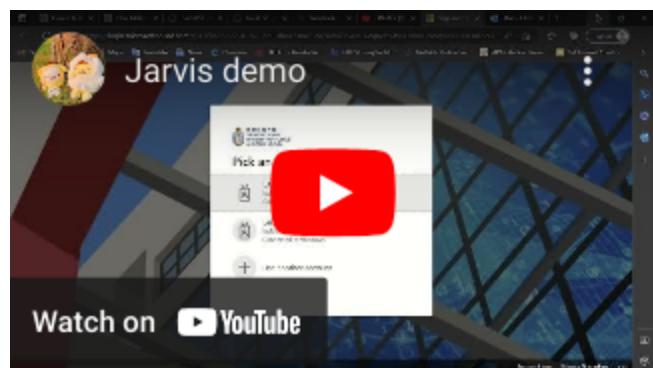
The screenshot shows the GitHub repository for 'kwlalai/CADgpt'. It includes a flowchart illustrating the AI tool's process: Text visual input leads to AI model (ChatGPT), which generates tool description of file type (Image, Mesh 3D model, ICON). These descriptions lead to Mesh 3D model, Image, and ICON respectively. The Image path goes through Stable Diffusion to create a Mesh 3D model. The Mesh 3D model path goes through Mesh 3D model, command extracted, and then to Mesh 3D model. The ICON path goes through ICON and then to Mesh 3D model. There is also a feedback loop from Mesh 3D model back to AI model (ChatGPT) for 'Reweighting' and 'Rewire code generation'.

Details: <https://www.notion.so/39bddbd5e74c48088a0676d543f9f3d7?v=692dbffd41b24464a1417f97bbfa9bfd&pvs=4>

**Installation:**

- Clone this repository by clicking `Code > Download ZIP` on GitHub
- Open Blender, go to `Edit > Preferences > Add-ons > Install`
- Select the downloaded ZIP file and click `Install Add-on`
- Enable the add-on by checking the checkbox next to `GPT-4 Blender Assistant`
- Paste your OpenAI API key in the Addon preferences menu.
- To view the code generations in realtime, go to `Window > Toggle System Console`

<https://github.com/kwlalai/CADgpt>



[https://youtu.be/20KzHoz\\_PrQ](https://youtu.be/20KzHoz_PrQ)



<https://youtu.be/uRDzXAlBKdc>

## < / MIT Entrepreneurship and Maker Skills Integrator >



VR Game Developer Jan 2023

- Cooperated with Massachusetts Institute of Technology (MIT) students in a team of 6 to build an immersive VR experience about local food culture for Hong Kong International Airport in Unreal Engine 5, proposed to benefit 75,000,000+ passengers

<https://github.com/kwlaial/MIT-Entrepreneurship-and-Maker-Skills-Integrator>



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<https://youtu.be/Ms9bC0yaXKg?si=tqY4So6wVJ5x2y0F>

## < / ASPIRE League Undergraduate Engineering Design Challenge >

Hong Kong national participant (sole engineering student among 5 nominees selected by HKUST)

- Engineering design challenge on Japanese culture at Tokyo Tech with students in a team of 6 from ASPIRE League member universities (Tokyo Tech, KAIST, Tsinghua University, Nanyang Technological University, and HKUST)



# < / Smart Traffic Management System >



Used UWB radio network and MQTT create communication, backup data suggests route to prevent traffic jam using Dijkstra's algorithm, source coding and channel coding

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The screenshot shows the GitHub README page for the project. It includes sections for 'Introduction' and 'TODOs', and a 'Usage' section with terminal command examples.

**Introduction**

We are planning to use UWB radio network as well as MQTT to create communication between vehicles to prevent traffic jams and traffic accidents.

---

**TODOs**

- Implement map\_loader to load map into the server
- Implement UWB radio network and check if the vehicle has passed the node through getting its coordinates on the map.
- Implement MQTT communication between the vehicle and the server.
- Implement server code to add weight to the edge map and send commands to vehicles.

---

**Usage**

1. Start the server.
2. Initialize each of the vehicles by typing in the following syntax in the server serial monitor:

```
i <VEHICLE_ID> <STARTING_NODE_INDEX>
```

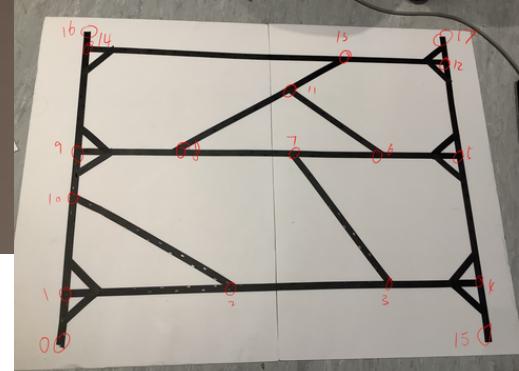
3. The vehicles are set by default to receive destinations instructions manually. To enter the destination manually, type in the following syntax in the server serial monitor:

```
d <VEHICLE_ID> <DESTINATION_NODE_INDEX>
```

<https://github.com/kwlaial/Smart-Traffic-Management-System>

The screenshot shows a YouTube video player. The video title is 'ISDN4000G Smart Traffic Management System Demo'. A red play button is overlaid on the video frame. On the left, there is a purple circular icon with a white letter 'R' and the text 'Renault Luk'.

<https://www.youtube.com/watch?v=gXlfc1FAico>

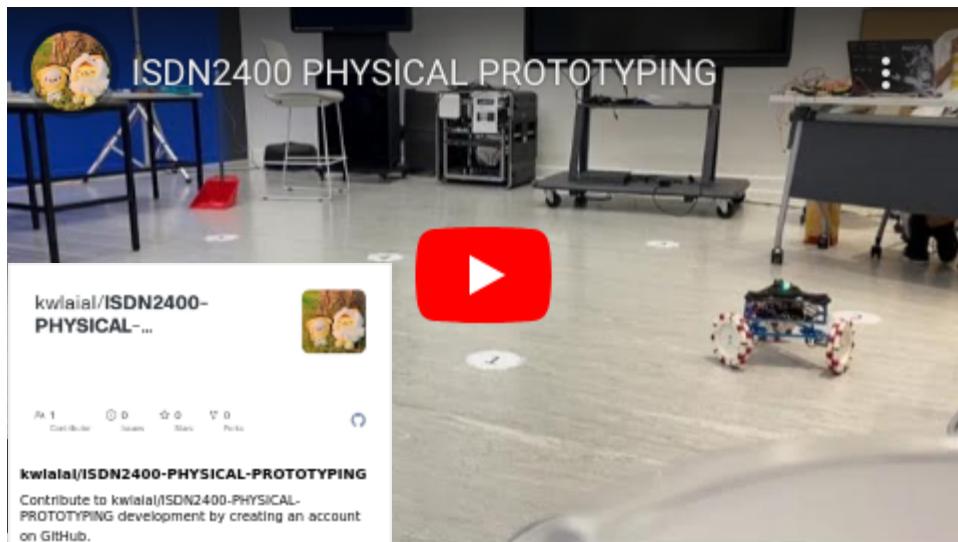
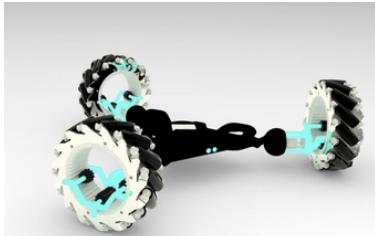


## < / Three-omni-wheels Robot >

Three wheels feedback control, signal processing, and power management to ensure stability and functionality



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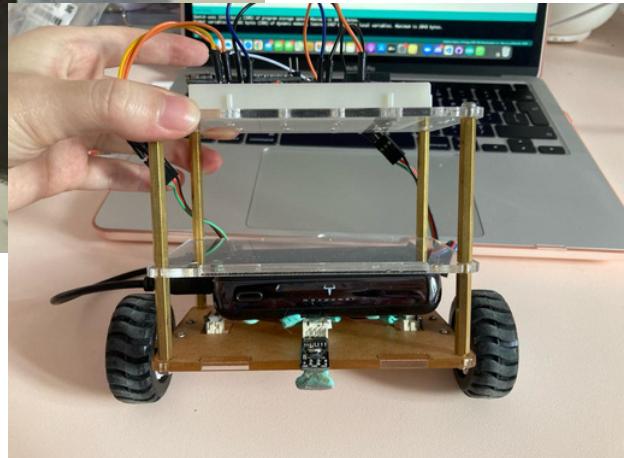
<https://www.youtube.com/watch?v=IAuPJGkF9a4>  
<https://github.com/kwlaial/ISDN2400-PHYSICAL-PROTOTYPING>

## < / Mechatronic Systems Design with Embedded Computing >

Created a two-wheel balancing robot with PID control



<https://youtu.be/Juclf12vDtE?si=lJnDiitY6OuNrctv>

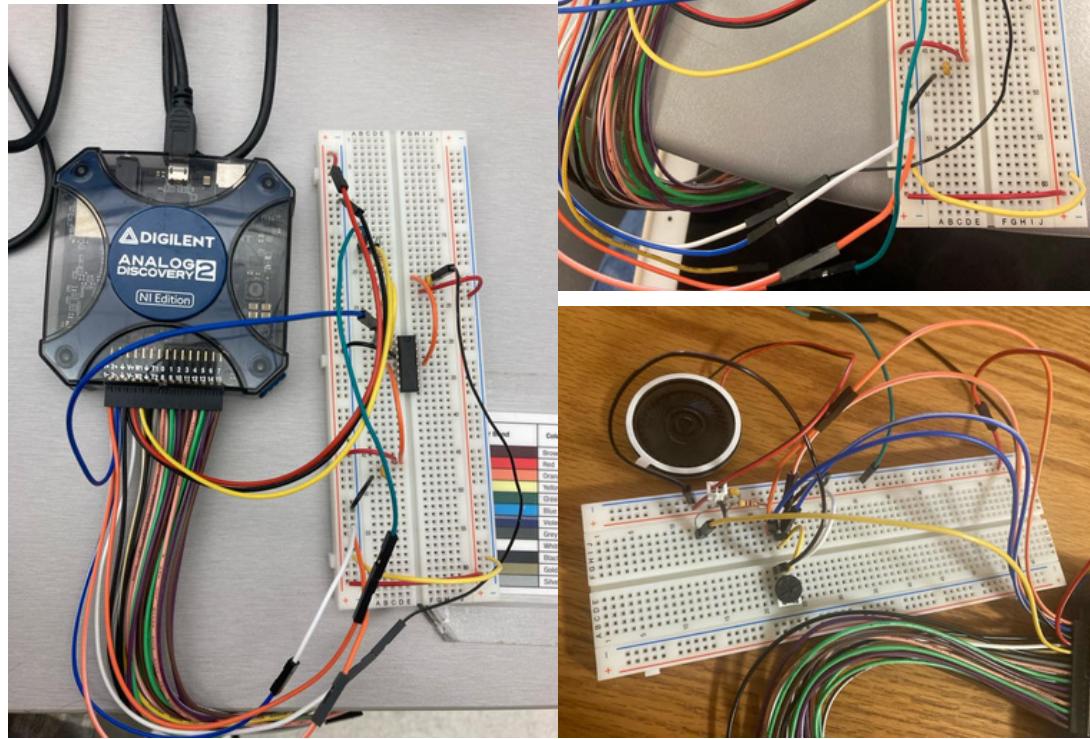
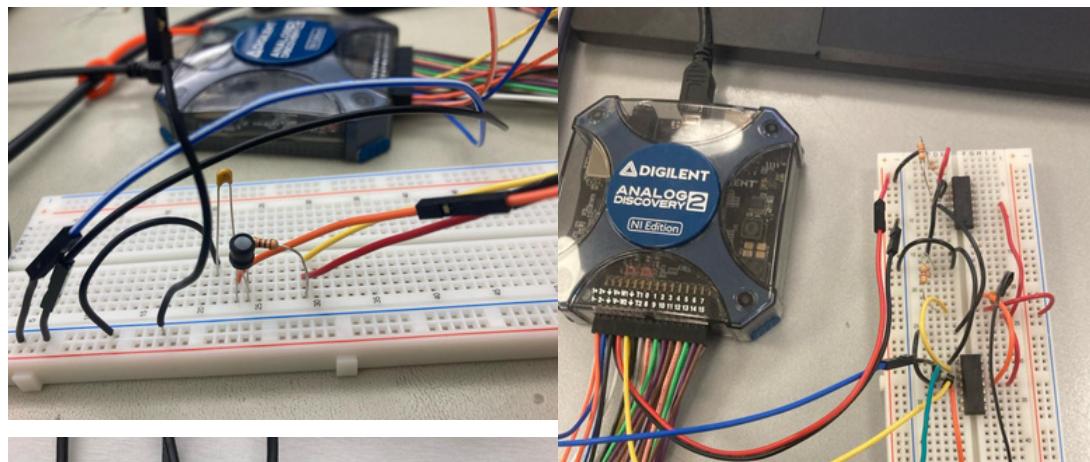
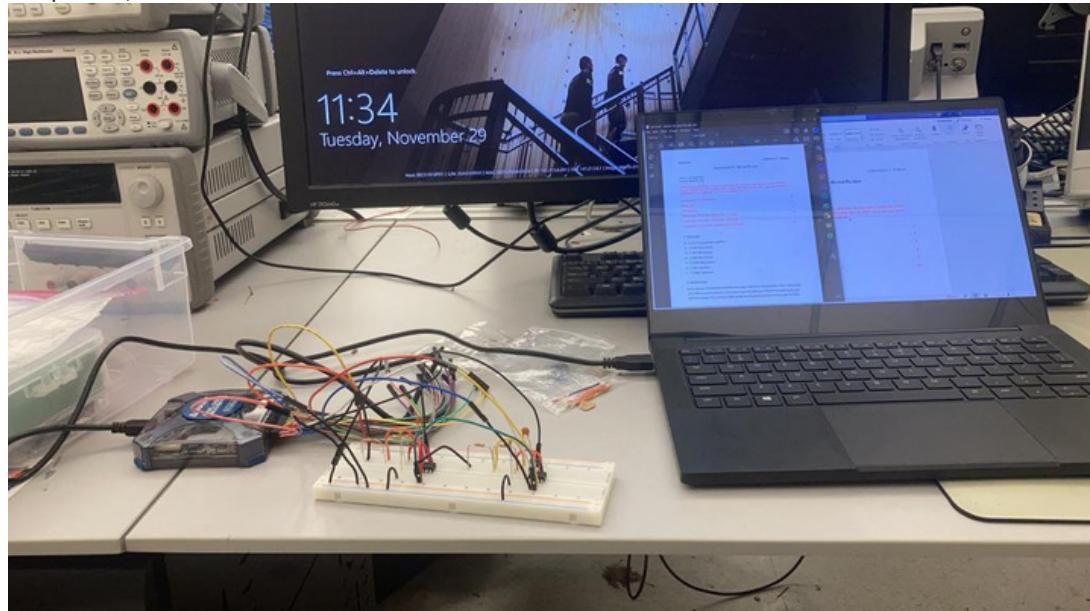


# < / University of Michigan Circuit Labs >



Built RLC circuit with POT, Sallen-Key Filter, Inverting/ Non-Inverting Amp, MOSFET Amplifier, DAC

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## < / HackUST 2023 >



OKX Web3.0 Special Mention Award Hong Kong

- Team Leader/ Software Engineer - developed Web3.0 app solution (Solidity, Ethereum, MetaMask) for OKX in a team of 5

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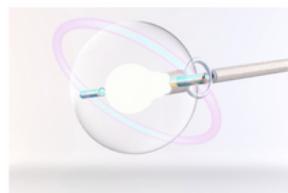


<https://www.youtube.com/watch?v=g2-nhFtAmeU>



<https://www.youtube.com/watch?v=8pti5KJ14d4>

# < / Human-centered Lamp Design >



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28 Kelly Lai ISDN 1006

29 Kelly Lai ISDN 1006

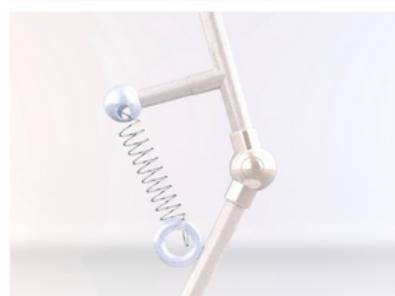
[https://www.youtube.com/watch?v=14hHgUOHnGk&ab\\_channel=DetectiveEngineering](https://www.youtube.com/watch?v=14hHgUOHnGk&ab_channel=DetectiveEngineering)



30 Kelly Lai ISDN 1006

31 Kelly Lai ISDN 1006

Rendering details



kwlalai/ISDN1006-HUMAN-CENTERED-INNOVATION

Contribute to kwlalai/ISDN1006-HUMAN-CENTERED-INNOVATION by creating an account on GitHub.

<https://github.com/kwlalai/ISDN1006-HUMAN-CENTERED-INNOVATION/blob/main/1006%20final%20report.pdf>

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