Noah's Capsule CHK001

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Outline

1. Introduction
2. Motivation and application
3. Architecture
4. Technology
5. Market Analysis
6. Task Partition
7. Reference

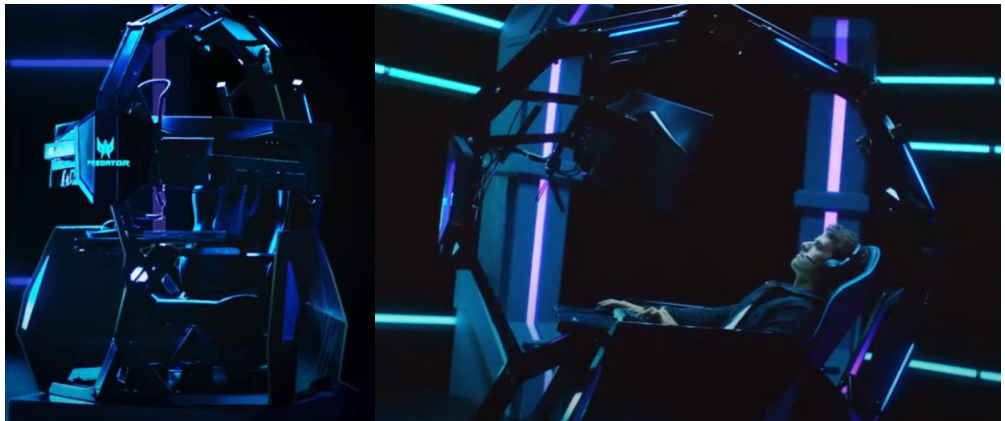
Part 1
Introduction

Introduction

- Is there a product that can meet all these requirements at the same time?
  - Provides a comfortable immersive entertainment environment for people
  - Provides a place for people to have a good rest and sleep
  - Provides a secluded paradise for people to escape from external disturbances


01
02


STATION
BOOTH
Supported by
NESCAFÉ
睡眠カフェ



Part 2
Motivation and Application

Motivation and Application

1. High house Prices in City
2. Hight pressure in Modern Life
3. Self-quarantine at your home
4. Need a place for your own ?

Motivation and Application

Pleasant Modern Age

IoT Environment, Interactive Technology

1. immersive experience
   - Working experience
   - Gaming experience
   - film viewing experience
2. Smart home
   - home automation
   - Easily control
   - a truely home experience
3. Self-health Monitoring
   - Avoid sitting too long
   - drinking water period
   - Heart rate …etc.

Motivation and Application

1. immersive experience - working experience
    - working at any place you want .
        - In the ocean working with fish
        - on the beach working with Ocean Waves Sea Sounds
        - In the coffee shop working with Jazz
        - near the onsen ...etc
    - working with Huge monitor .
        - improving your efficiency

Motivation and Application

1. immersive experience - gaming experience
    - Playing with 144 Hz QLED Curved Monitors
        - Ultra-large, ultra-wide curved screen
        - HDR changes the game
        - Built for speed
        - with other monitor keep in touch with your friend.
    - Gaming workstation
        - Science zero gravity, release your pressure
        - Touch screen control, control your own station.

Motivation and Application

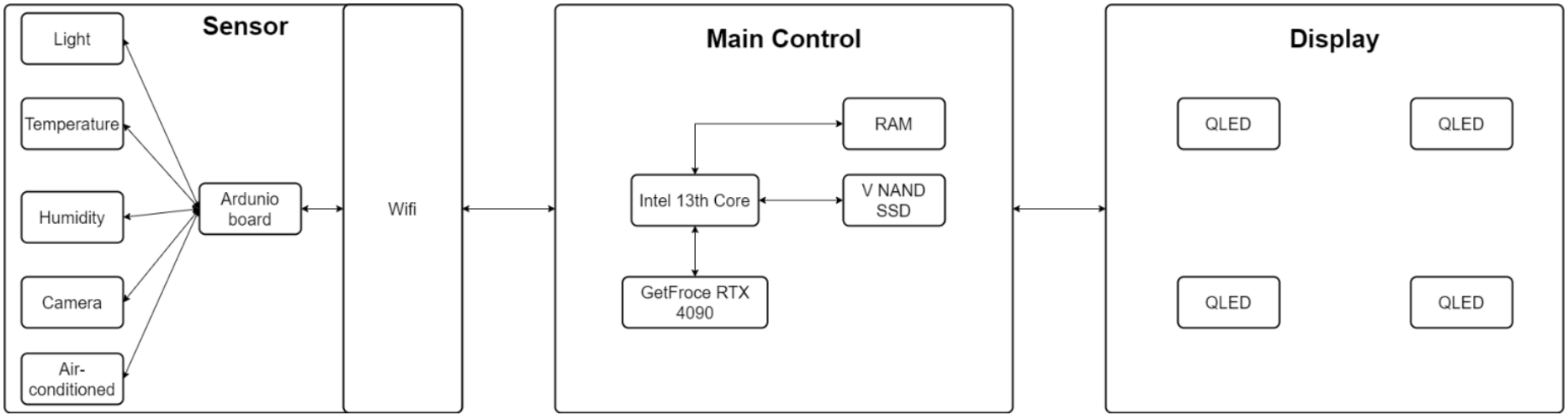
2. Smart home
    - A home that takes care of your task
    - Lights up your way
    - Knows how to help
    - Automatically control the lights and ERV
    - Gives you the best experience than your home.

Motivation and Application

3. Self-health Monitoring
    - Control your smart home with control system.
    - The future of health On full display.
        - Blood oxygen, heart rate …etc.
        - Drink water period.
    - Manage your task, and give you remind.
    - Also manage your pressure.

Part 3
Architecture

Architecture System



Architecture System

Sensor:
- Temperature
- Humidity
- Air-conditioned
- Camera
- Light

Display:
- QLED

Main Control:
- Intel 13rd core
- GeForce RTX 4090
- RAM
- SSD

Part 4
Technology

Technology - IOT Control system + Entertainment devices

1. Storage Device
    - 8 TB V NAND SSD
2. Display
    - QLED Curved Monitors *2 (Main)
    - QLED Curved Monitors *2 (Side)
    - QLED Curved Monitors cover all around

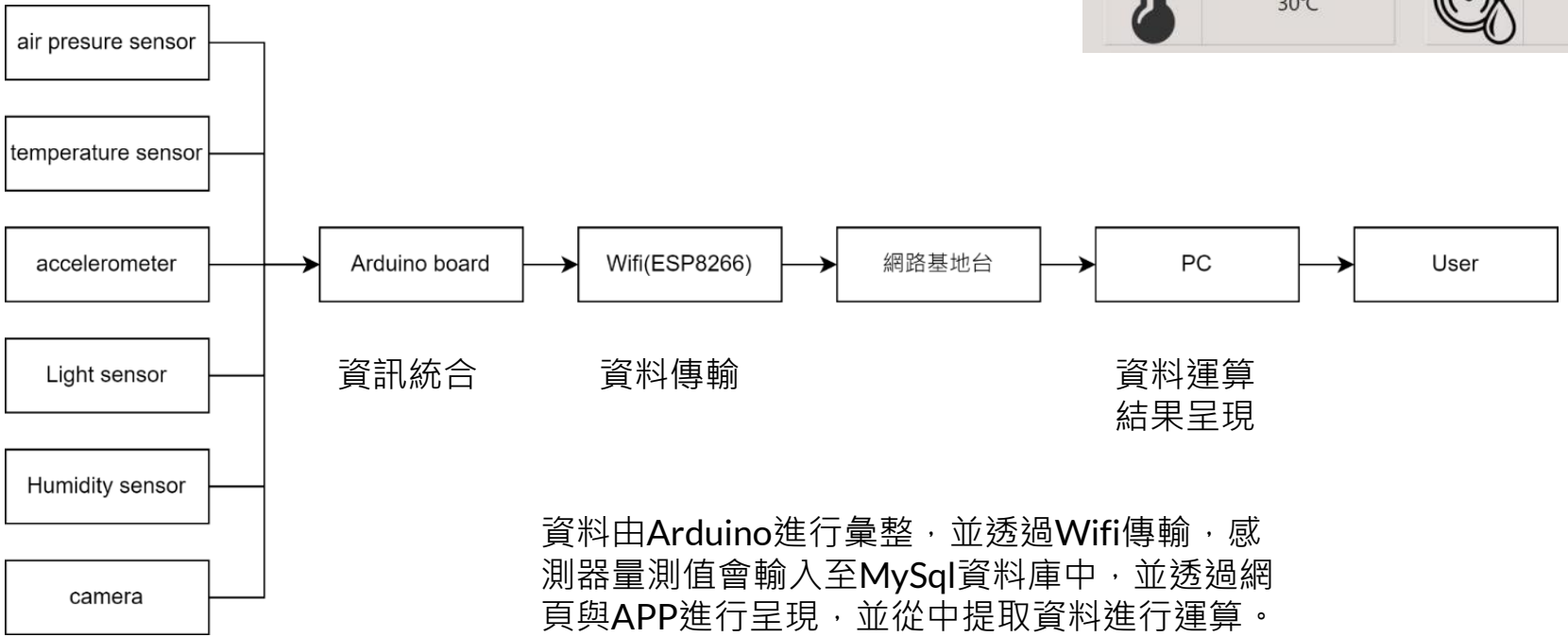
3. CPU: Intel 13rd Core
4. GPU: NVIDIA GeForce RTX 4090
5. RAM: DDR5 up to 32GB
6. WIFI : WIFI 6
7. Blue tooth: Blue tooth 5.3
8. VR: Valve Index
9. Sensing
    - Camera
    - Temperature sensors
    - Humidity sensors
    - Light sensors
    - Air quality monitoring sensor

Smart Cockit

- Cockit
  - Heat therapy ：the use of infrared or heating pads to help alleviate muscle fatigue and relieve muscle spasms.
  - Air pressure massage ：the use of pressure sensors to control air pressure for massaging muscles.
  - Vibration massage : the use of vibrations to relax muscles.
  - infrared lamp , air pressure sensor and temperature sensor, accelerometer, preasure sensor.



Sensing - Structure

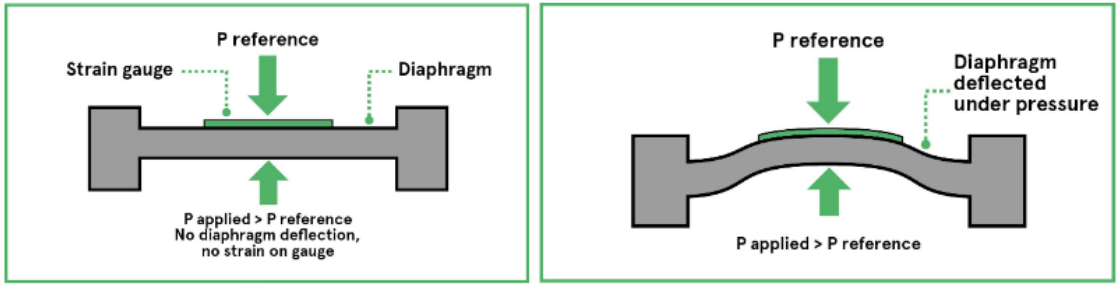


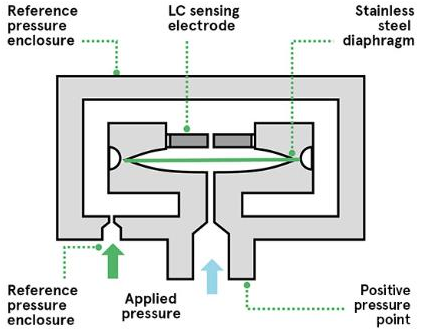
資料由Arduino進行彙整，並透過Wifi傳輸，感測器量測值會輸入至MySql資料庫中，並透過網頁與APP進行呈現，並從中提取資料進行運算。

Sensing - air pressure sensor

- For greater accuracy and control, air pressure sensors which convert pressure's effect into a proportional electrical signal.
- Transducer / Capacitive air pressure transducer.
- use air pressure sensors to control air pressure for massaging muscles.
- We use **Capacitive air pressure transducer**.

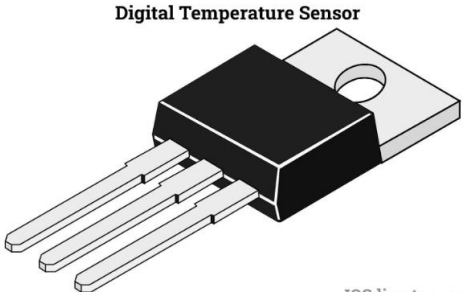
Resistive air pressure transducer or strain gauge





A cross-section of a capacitive air pressure sensor

Sensing- temperature sensor



- Contact-type temperature sensors and non-contact temperature sensors.
- Use **contact-type temperature sensors**
  - simple structure, low cost, fast temperature detection speed, and high accuracy
  - suitable for measuring the surface temperature of the massage chair.
- Use **non-contact temperature sensors**
  - infrared thermometers or thermal imagers
  - measure skin or vascular temperature of the human body.
  - Using an infrared thermometer to monitor the temperature of the air in our cockit.

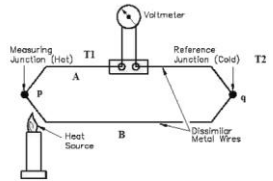
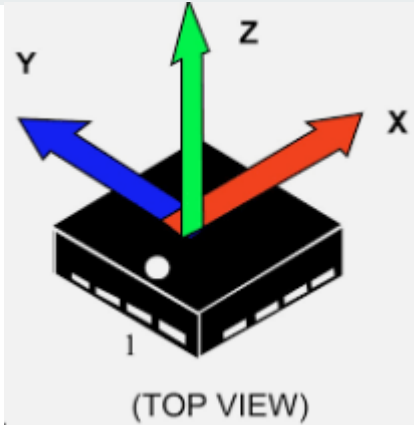


Diagram of a thermocouple. Source: Bright Hub Engineering

Sensing - accelerometer



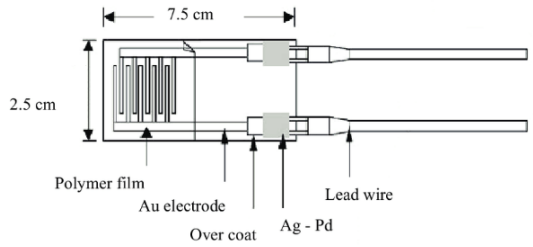
- measures the acceleration of an object.
- It typically consists of a **mass suspended on a support and a sensor**
- measures the displacement of the mass.
- We use **three-axis accelerometer.**
  - three axes measure acceleration along each of these axes (X, Y, Z).
  - accurately detect the posture and movement of the human body
  - adjust the intensity and frequency of the massage based on the body's movement.

Sensing - Light sensor

- photoresistor or photodiode
- We use **photodiode in dark mode**
  - light intensity in a room is weak -> photodiode may result in decrease in the accuracy
  - photodiode -> Higher sensitivity and accurately measure weaker levels of illumination
- We use **photoresistor for light mode**
  - higher sensitivity in strong levels of illumination and lower noise
  - allowing it to accurately measure strong levels of illumination.
  - In a room, the light is generally stronger, so using a photodiode can provide more accurate measurement results.

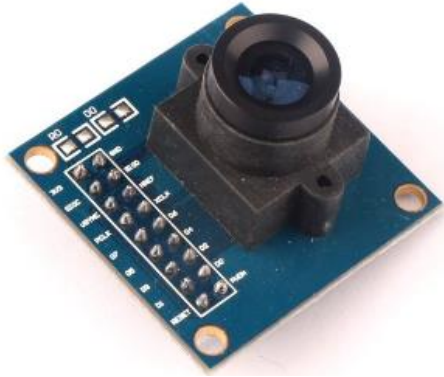
Sensing - Humidity sensor

- capacitive / resistive humidity sensors.
- We use **resistive humidity sensor**
  - the resistance value changes with changes in humidity.
  - low-priced
  - easy to use
  - fast response speed
  - often used in smart homes to monitor humidity.



Schematic of a resistive humidity sensor. (ResearchGate)

Sensing - Camera



- OV7670 Colour Camera
  - low-cost image sensor
  - Low power consumption
  - High-quality image
  - On-chip image processing : built-in image processing features
  - ex: white balance, color correction, and gamma correction , improve the quality of the captured images
  - Versatility : parallel, serial, and USB.
  - 30 fps in VGA
- **Gesture recognition**, **posture recognition**, and **environmental object recognition**.

Sensing - Wifi

- ESP8266 Wifi MCU
- ESP8266 is a **low-cost Wi-Fi microchip** with full TCP/IP stack and microcontroller capability produced by Espressif Systems
  - capable of functioning consistently in industrial environments
  - integrated with a **32-bit Tensilica® processor**
  - low power consumption
  - Tensilica L106 32-bit RISC processor
  - extra-low power consumption
  - reaches a maximum clock speed of 160 MHz
  - The Real-Time Operating System (RTOS) and Wi-Fi stack allow about 80% of the processing power to be available for user application programming and development.

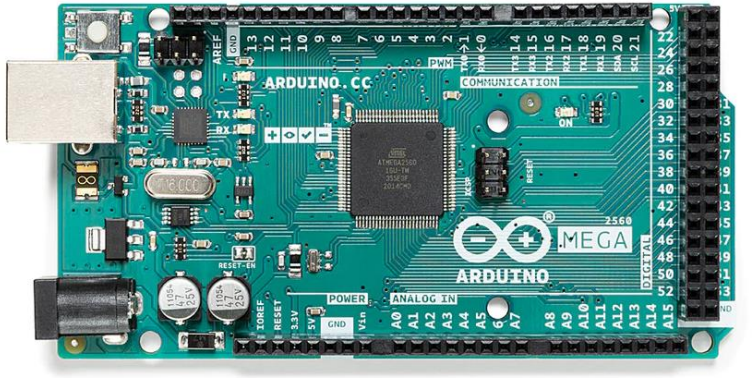
High Durability

Compactness

Power-Saving Architecture

32-bit Tensilica Processor

Sensing - Board



- Arduino Mega 2560 Rev3
  - microcontroller board based on the **ATmega2560 microprocessor**.
  - **54 digital input/output pins**
  - 16 analog inputs
  - 4 UARTs (hardware serial ports)
  - a 16 MHz crystal oscillator
  - a USB connection
  - popular choice for projects that **require more I/O lines, more memory**, and higher processing power than the Arduino Uno can provide.

Technology

Storage Device : QLED Curved Monitors
Display : 8 TB V NAND SSD

Technology - Storage Device

We use Samsung 990 PRO PCIe 4.0 NVMe M.2 SSD 2TB *4

- Interface : **PCIe Gen 4.0 x4, NVMe 2.0**
- **Storage Memory : Samsung V-NAND 3-bit MLC**
- Speed : 40% and 55% faster random read/write speeds than 980 PRO - up to 1400K/1550K IOPS,while sequential read/write speeds up to 7450/6900 MB/s reach near the max performance of PCIe® 4.0
- Smart thermal solution : Speed beyond the heat.The heat spreader label controls NAND chip heat, while Dynamic Thermal Guard keepstemperatures optimal.

Technology - Display

We use 98" Class QN90A Samsung Neo QLED 4K Smart TV to display.

It has 4K@120fps, Dolby Digital Plus, Active Voice Amplifier

- Neo Quantum Processor 4K : The Neo Quantum Processor 4K utilizes advanced AI based deep-learning analysis to analyze the signal, source, and scene-by-scene content to deliver best 4K optimized experiences.
- Quantum HDR 32x : Can helps reveal what you might have missed in particularly dark or light scenes, making them pop with vivid, breathtaking colour.
- Quantum Matrix Technology : By developing proprietary Mini LEDs shrunk to 1/40th the size of other backlights, and introducing a micro layer for precise light control. Has deeper blacks and brilliant brightness and contrast.

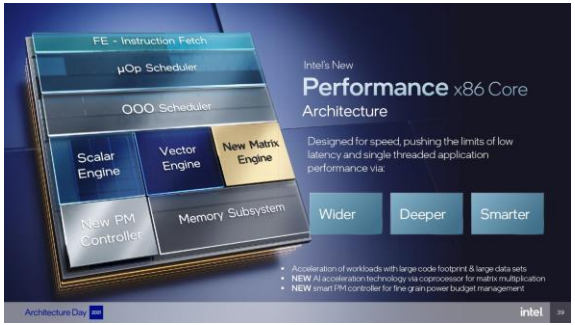
Technology - IOT Control system + Entertainment devices

Intel 13rd core

- 8 Performance-core
- 16 Efficient-core
- 16 PCIe 5.0
- DDR5 & DDR4

NVIDIA GeForce RTX 4090

- Boost Clock 2.52GHz
- Memory size 24GB
- Max Display Resolution 4K at 240Hz or 8K at 60Hz



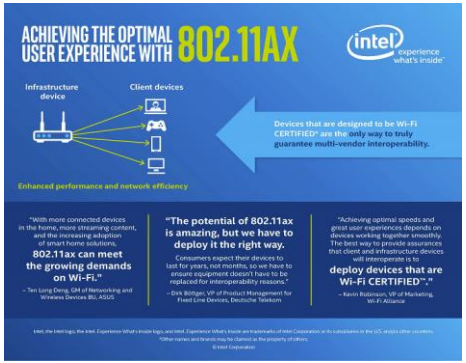
Technology -WIFI6 AND Bluetooth 5.3

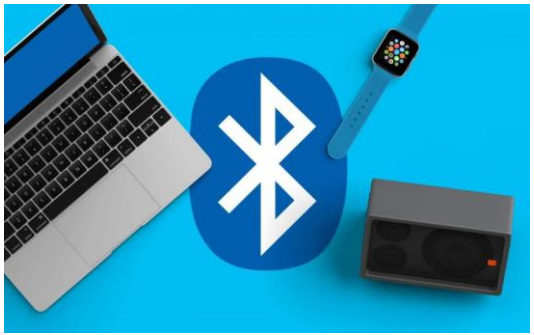
WIFI 6 : IEEE 802.11ax

- Speeds can be faster when compared to Wi-Fi 5.
- Wi-Fi 6 can result in up to 75% less latency
- Wi-Fi 6 brings wired and wireless signals closer to parity.

Bluetooth 5.3

- Periodic Advertising Enhancement
- Encryption Key Size Control Enhancements
- Channel Classification Enhancement.





Technology - Valve Index

Headset

Controllers

Base Station

Technology - Valve Index

Excellent screen and field of view:

Display: Two 1440×1600 LCD IPS Fast Switching Type Displays @ 80 Hz, 90 Hz, 120 Hz, or 144 Hz

Camera: Stereo 960 x 960 pixel, global shutter, RGB (Bayer)

Field of View (FOV): Optimized eye relief adjustment allows a typical user experience 20º more than the HTC Vive

Superb audio:

Sound: Integrated headphones, 3.5mm audio jack, built-in dual microphone array

Immersive, finger-tracking controllers:

Each controller uses 87 sensors to track hand position, finger position, motion, and pressure to determine user intent. All of these signals, combined with fine-tuned software and algorithms, give us a better understanding of how a player is holding and using the controllers.

Part 5
Market Analysis

SWOT

- Strengths:
  - Convertible environment
  - Multifunction
  - Safe for user
- Weaknesses:
  - Cost is expensive
  - Waste too much time on games
- Opportunities:
  - Reduce cost
  - Forced end mechanism
- Threats:
  - User range is too small
  - VR/AR

Part 6
Task Partition

Task Partition

1. Technology analysis
    - Smart cockpit : 許鏡瑋，黃柏凱
    - Entertainment devices : 陳峒羽，郭孟軒
    - Smart home Control system :許祐杰，許鏡瑋，黃柏凱，陳峒羽，郭孟軒
1. Report
    - 許鏡瑋，郭孟軒，黃柏凱，陳峒羽，許祐杰

Part 7
Reference

Reference

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Thank you