Haptic-Augmented Keyboard for Gaming Experience Enhancement

CSED499I-01 과제연구I

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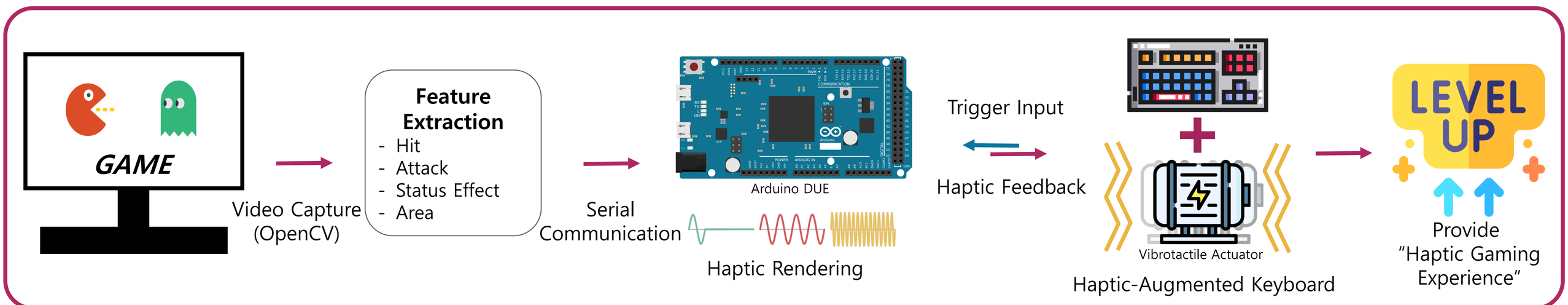
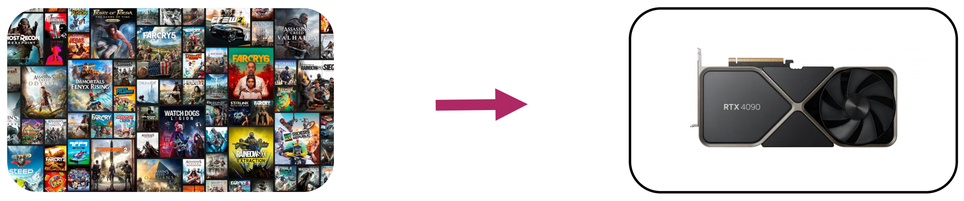


1. Motivation & background

A. AAA Games*



- **AAA games** require more **GPU** performance.

* AAA Game : big-budget, high-quality video games with top-tier production values

B. PC vs Console

- **Consoles are not powerful** enough to run AAA games.

C. Haptic Gaming Experience

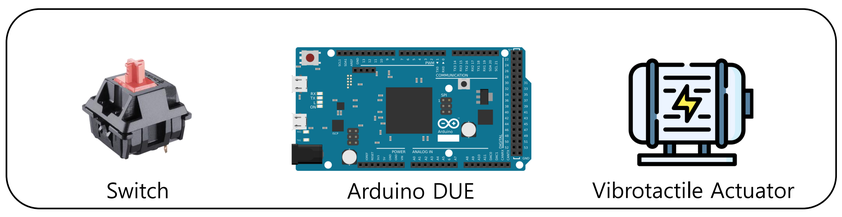
- It is **difficult** to achieve a haptic gaming experience with a keyboard.
- Also, the console's controllers **don't function properly on PC**.

Therefore, it is **difficult** for PC gamers **to feel the haptic experience.**
So, I designed a **haptic augmented keyboard** that **provides haptic feedback** to the **keyboard button area**.

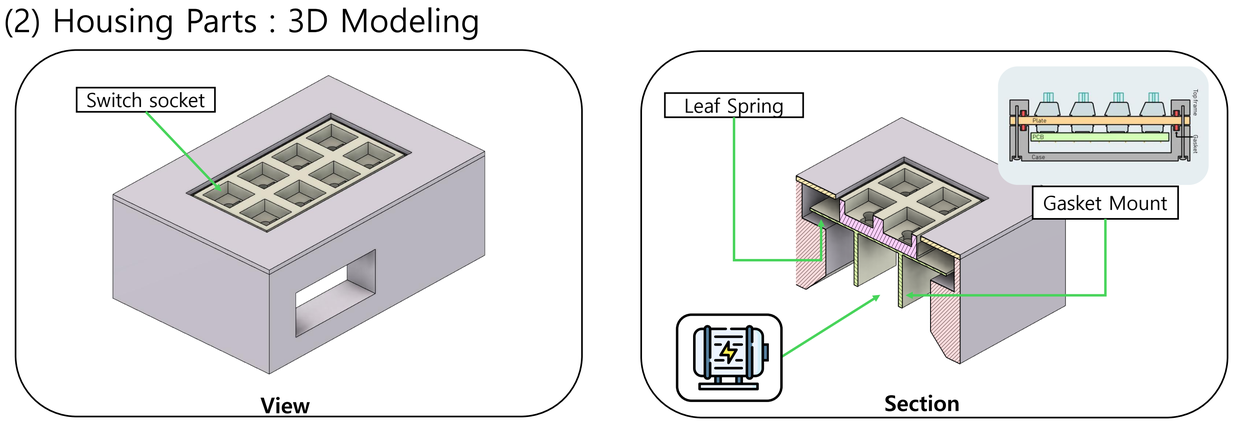
2. Design & Implementation

A. Hardware

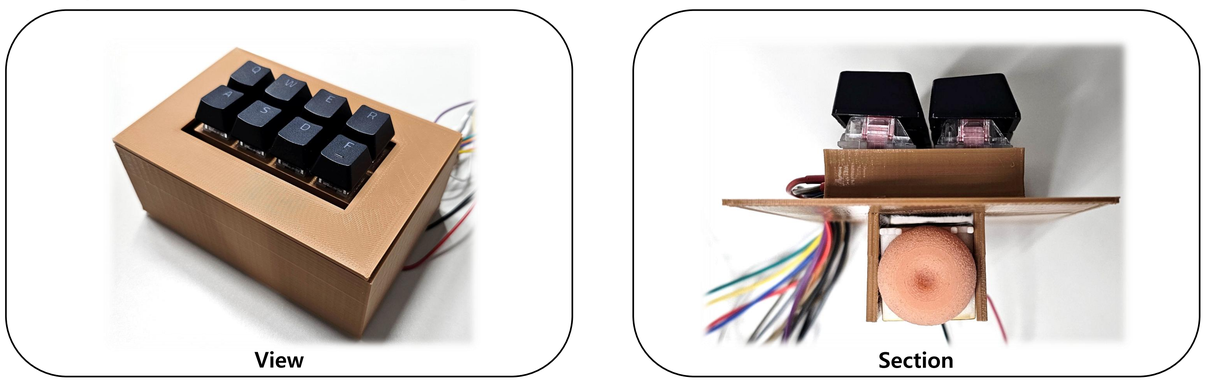
(1) Operating Parts



(2) Housing Parts : 3D Modeling



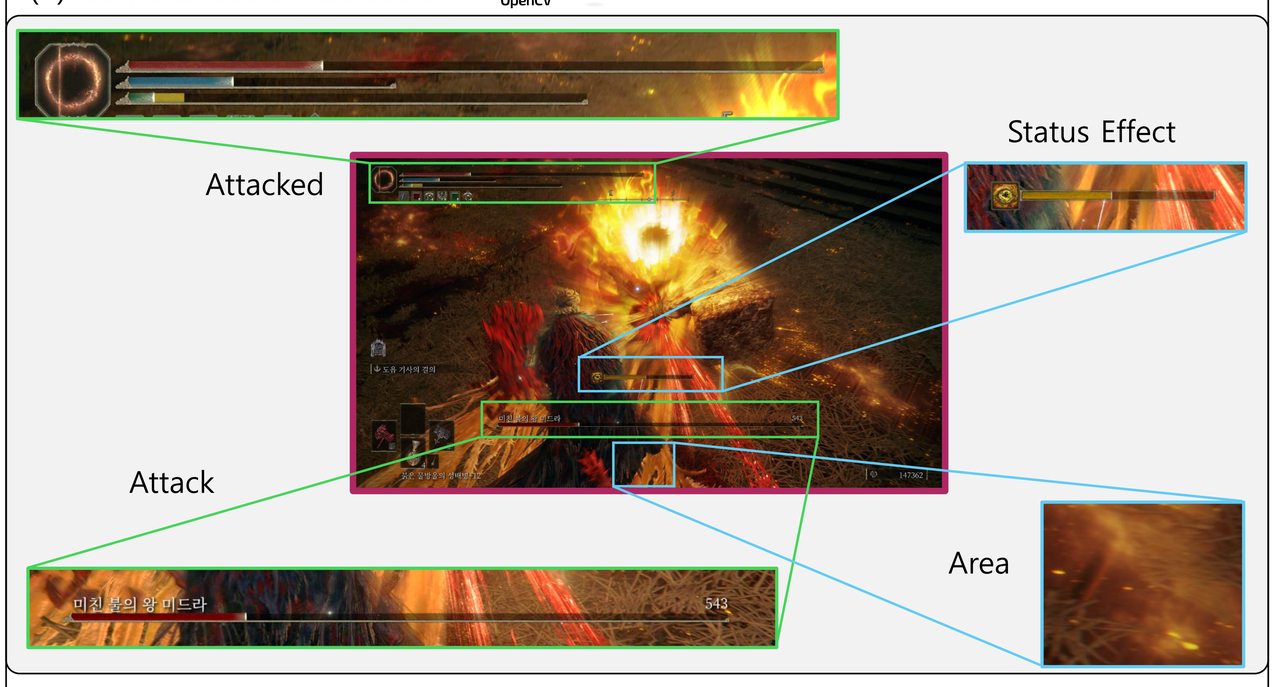
(3) Implementation : 3D Printing



- Inspired by the **gasket mount** of a keyboard.
- By using a **leaf spring**, the vibration was prevented from leaking out.
- **Low-noise linear switches** were used to deliver effective haptic feedback.
- Complies with keyboard standard specifications.

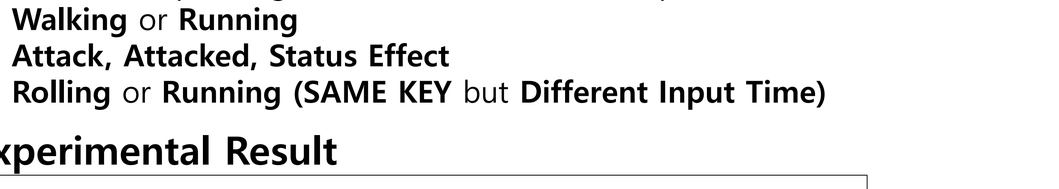
B. Software

(1) Game Situation detection



- The following in-game information is transmitted:
  - When the **character is attacked**
  - When a character **successfully hits**
  - When the character is inflicted with an **abnormal status**
  - In-game **region changes**

(2) Haptic Rendering



- When receiving **serial communication** or a **specific switch input**
  - **Arduino** outputs a **rendered waveform**.

3. Methodology & Evaluation

A. Functions

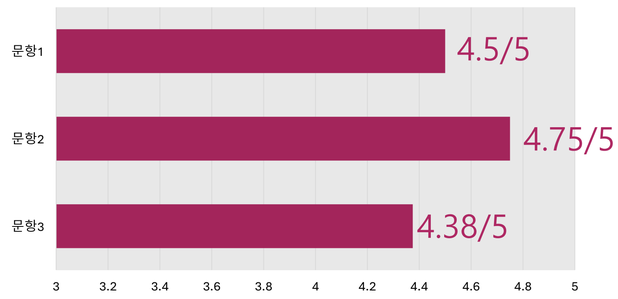
- The following **haptic feedback** is provided:
  - Different depending on the **area** (snow, water, poison, lava)
  - **Walking** or **Running**
  - **Attack, Attacked, Status Effect**
  - **Rolling** or **Running (SAME KEY** but **Different Input Time)**

B. Experimental Result

1. 피격, 타격, 상태 이상에 대한 햅틱 피드백을 구분 할 수 있었는가? (1~5)
2. 구르기, 걷기, 달리기의 햅틱 피드백 반응속도에 대한 평가(1~5)
3. 게임 몰입감이 어떠하였는가? (1~5)

실험 결과

2024.12.05 / 8 participants



4. Discussion and future work

- **Successfully implemented a methodology to analyze in-game situations and provide haptic feedback.**
- **Expect that further utilization of machine learning and various elements (voice, in-game signal data) will provide a more advanced gaming experience.**