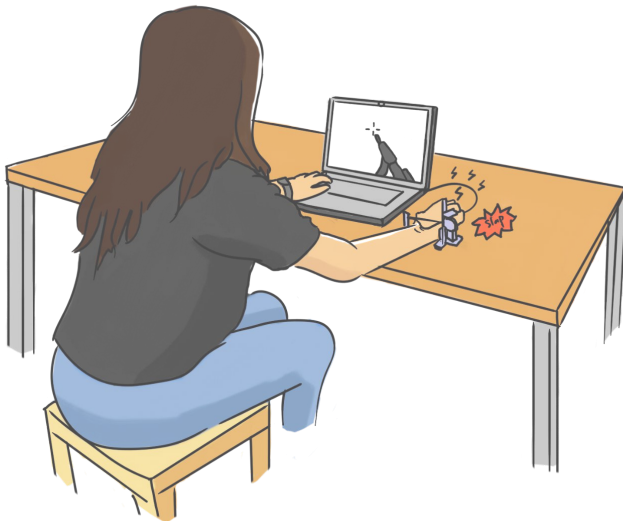


PainMouse: Feeling the Trigger

Exploring Pain as an Embodied Output Modality for Real-Time
Violence Awareness in FPS Games



MAS.S60 How to AI (Almost) Anything

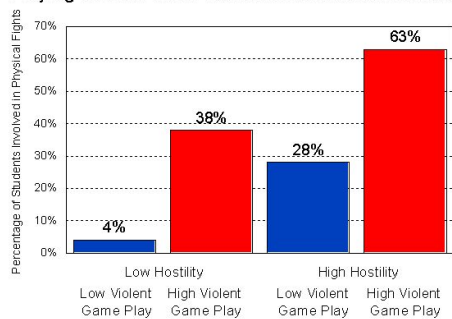
2025 Spring

Jianing(Nomy) Yu, Quincy Kuang, Qingyun Liu, Qiyao(Melo) Chen

Problem



Playing Violent Video Games Makes a Difference



Prolonged exposure to violent and gory video games can lead to increased aggression and harmful cognitive patterns in adolescents, posing a risk to their mental health.

- Mental Health and Conditioning

monitoring and warning mechanisms

lack of tangible, interactive strategies that actively guide users toward behavioral change

- Pain as Modality

characteristics, passive observation object

active, embodied, communicable modality

- AI-Driven Haptic Interaction

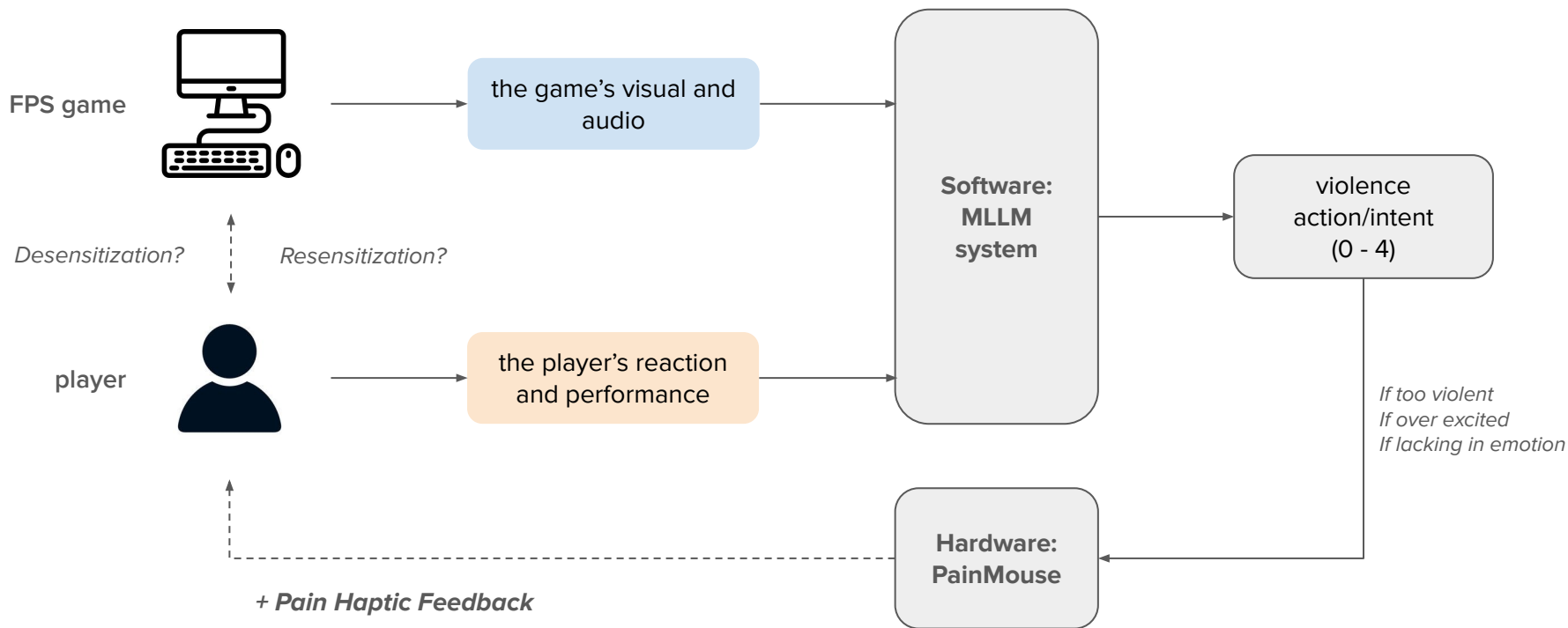
achieving perceptual alignment and mutual understanding between humans and AI

delivering object haptic information to the user

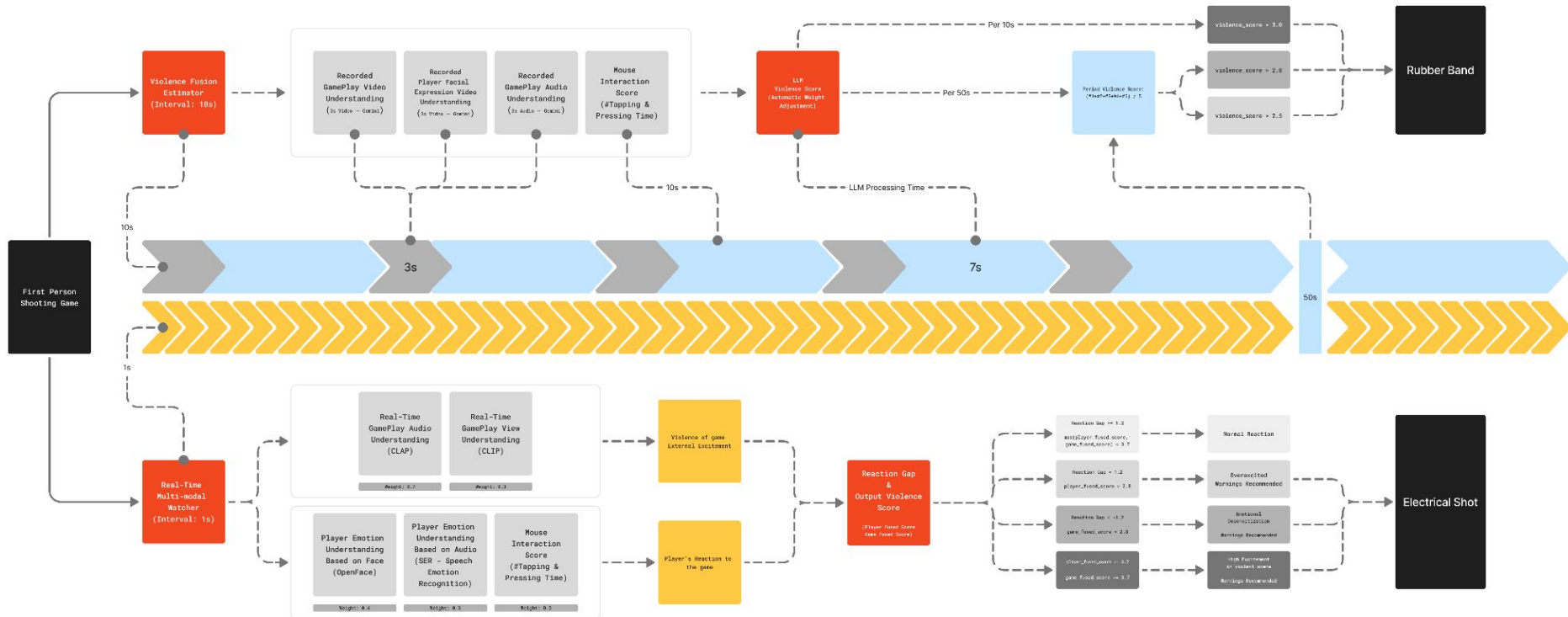
- Existing anti-addiction systems rarely address the detection of violent content or players' violent intentions,
- nor do they implement in-game tangible warnings,
- or take pain as an active modality.

Haptic pain as an output modality—using AI for tactile expression of pain to bridge behavior and cognition.

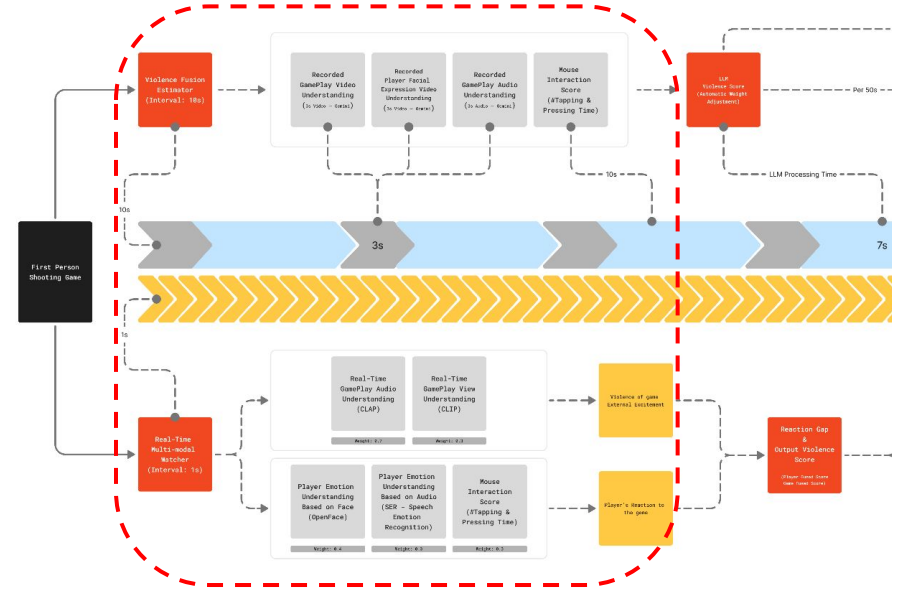
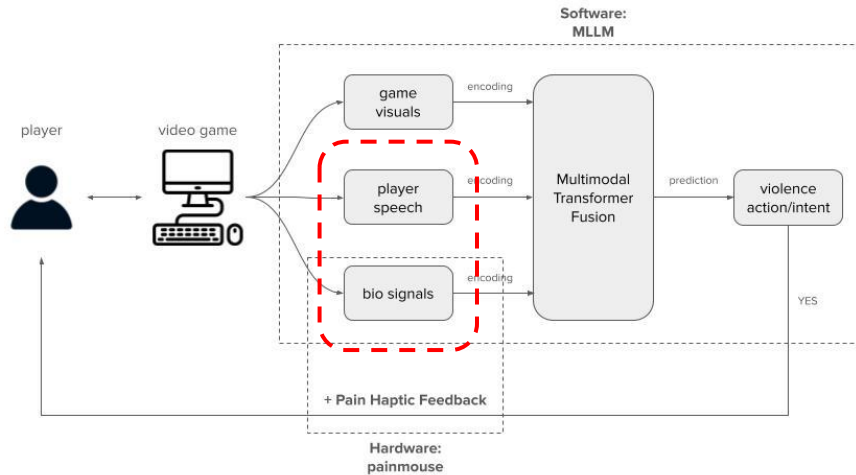
Overview



System design

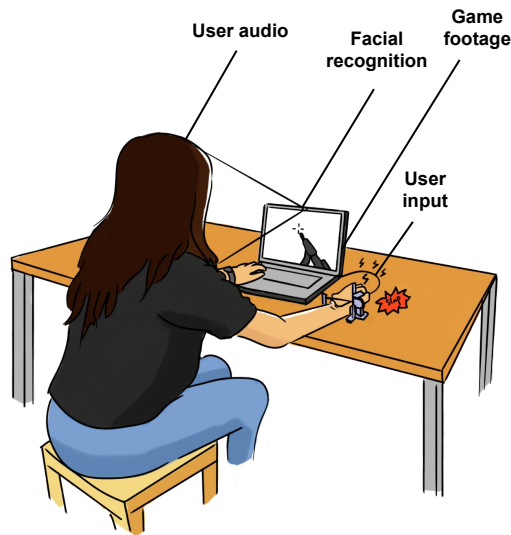


Vs. Previous System



- Remove Bio Signals as it causes misunderstanding and it contains serious latency
- Include both Gameplay Audio and Player's Audio to have a better understanding
- Include the Facial Expression Understanding as the 4th main modality
- Two Modes running simultaneously to enhance the accuracy

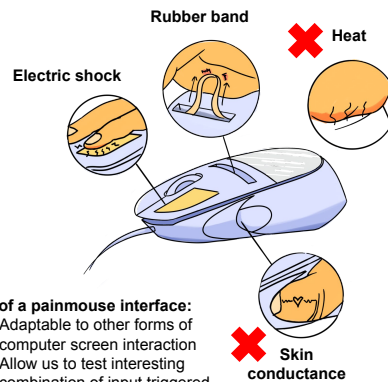
Experimental design



Data collection

Input data like facial, audio gameplay footage and user tactile input will be collect to train future more refined models

Input



Advantages of a painmouse interface:

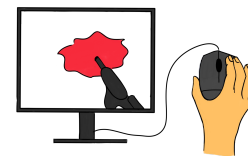
- Adaptable to other forms of computer screen interaction
- Allow us to test interesting combination of input triggered output

Violent behavior/scene trigger pain haptics

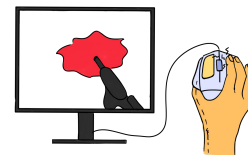
We will test a series of different combination of output to see which output most effectively helps condition the user. These variations are intended to create associations between complex behavioral patterns and pain, moving beyond simple stimulus-response conditioning.



Output



Gameplay with regular mouse and no output, measure degrees of violence through qualitative and quantitative means



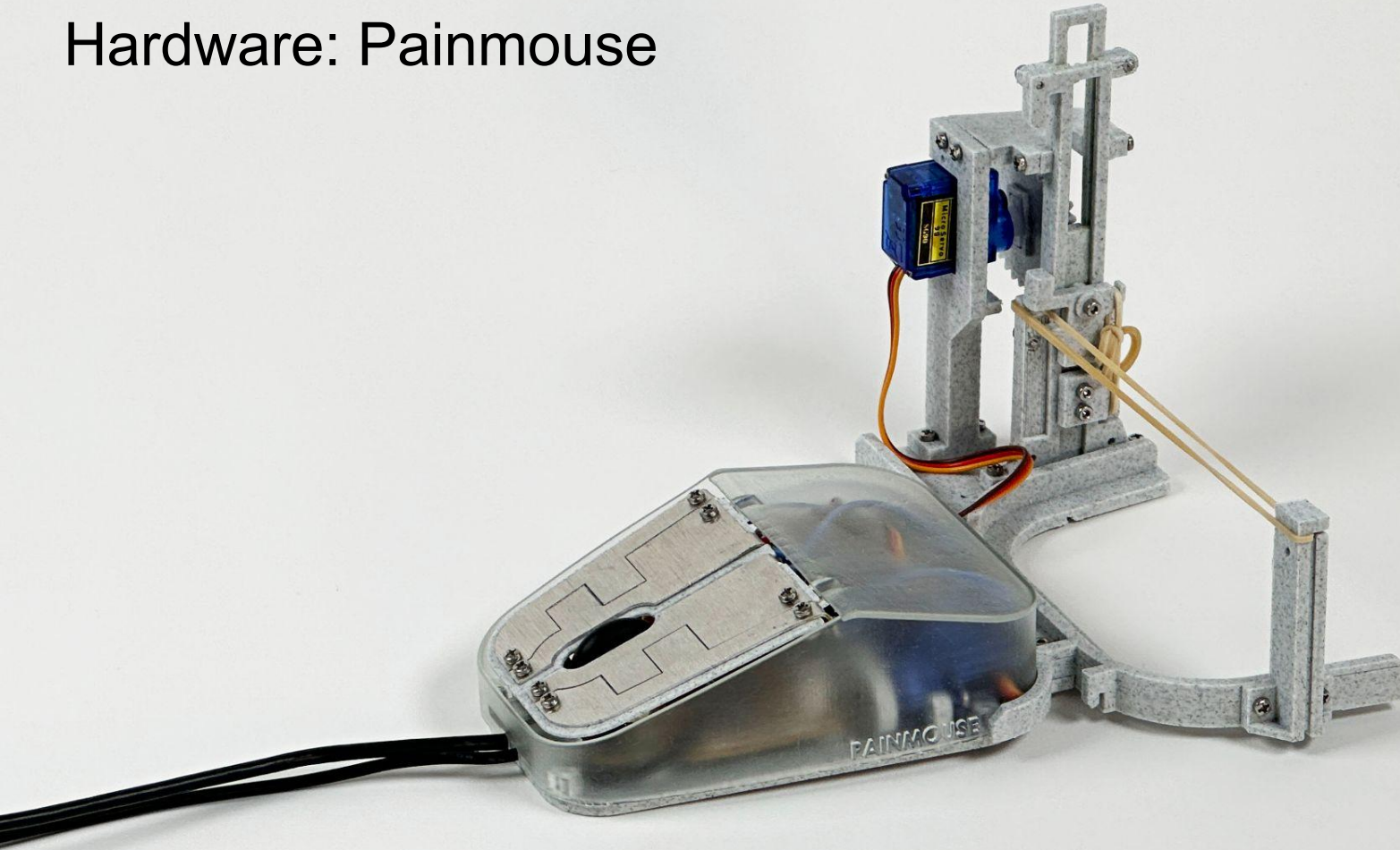
Gameplay with painmouse, measure degrees of violence through qualitative and quantitative means



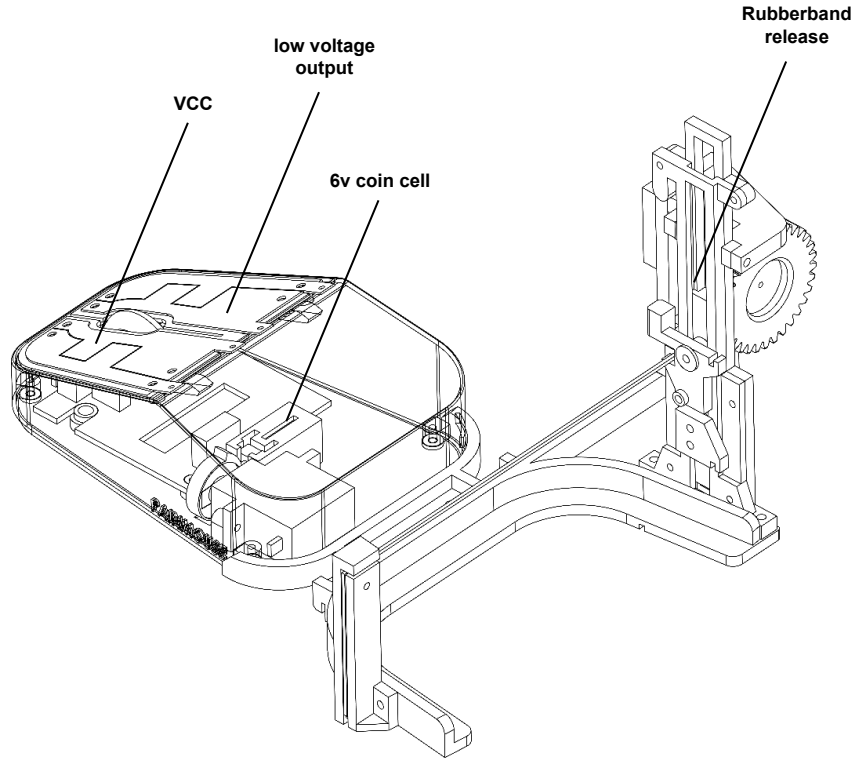
Gameplay with regular mouse and no output, measure degrees of violence through qualitative and quantitative means

Testing

Hardware: Painmouse

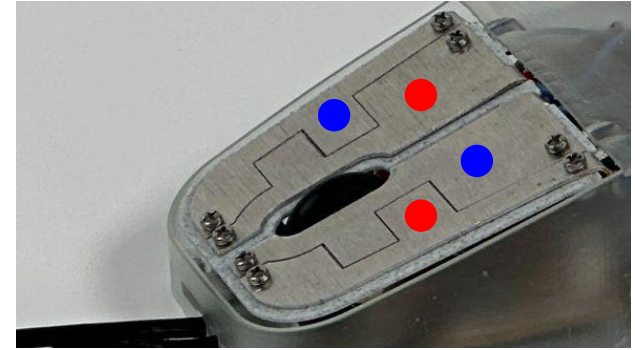


Hardware: Painmouse



Pain mouse

The painmouse is designed to be modular and customizable for the user to adjust the level of pain that can be induced. The electric shock circuit is controlled by a mosfet and features a transformer that can step up or down voltage output at the cost of draining the battery quicker.



Electric shock design

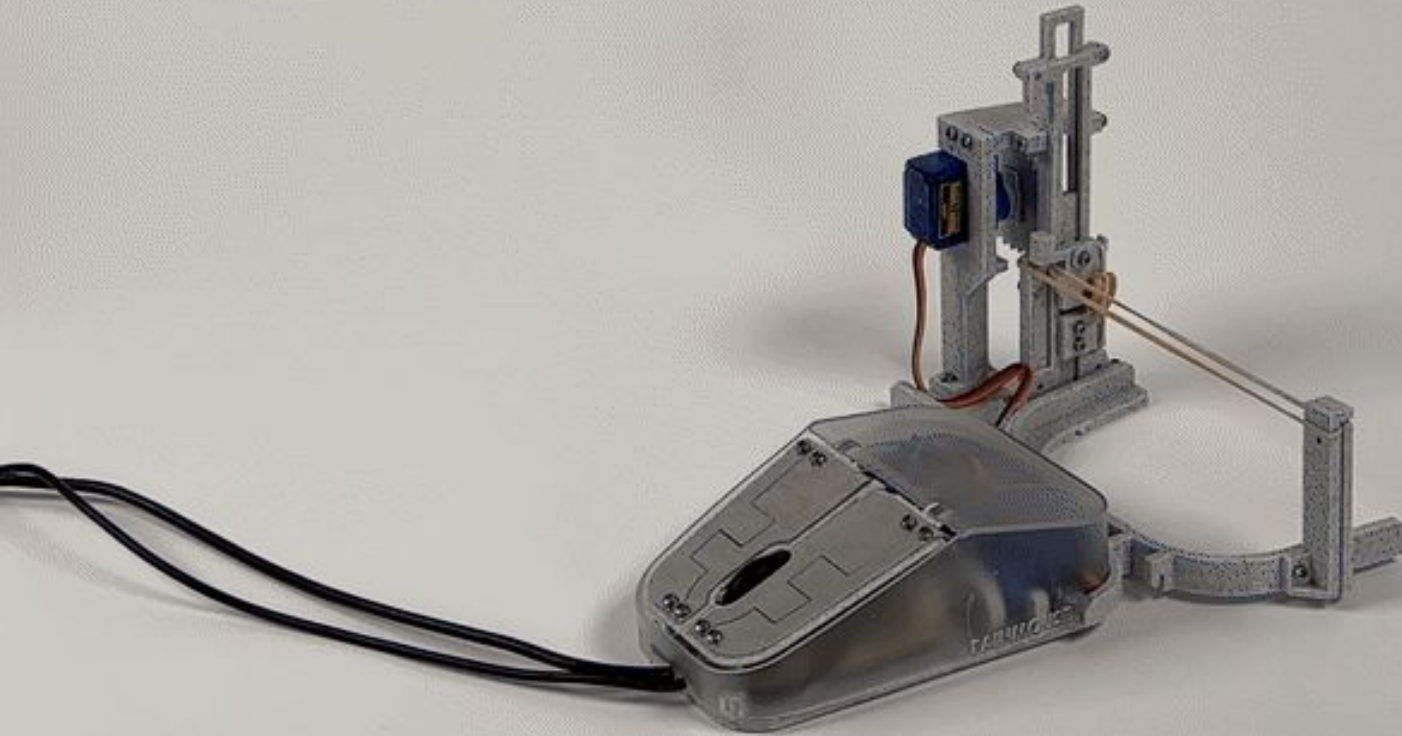
These aluminum sheet metal pattern ensure the user will have to complete the circuit with their finger no matter which part of the mouse they touch during gameplay.



Rubber band design

The rubber band release mechanism is designed to be easily adjustable and exchangeable. User can attache differently tensioned rubber bands to increase or decrease pain levels

How it works



User testing

Phase 1: internal testing ($p = 4$) to evaluate the accuracy of the system

Phase 2 (to-do): user testing ($p = \sim 10$) to validate our hypothesis



Round 1 (Baseline): play with a standard mouse with in-game actions and physiological data recorded.



Round 2 (Intervention): play with Painmouse with AI detecting system and pain feedback



Round 3 (Post-test): play with a standard mouse with in-game actions and physiological data recorded.

Pre-game
questionnaire

Questionnaire

Questionnaire

Post-game
questionnaire

Examples of output labeling



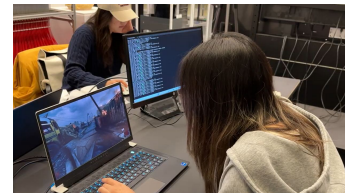
Labeled Facial expression:
Nonchalant, score 2.6



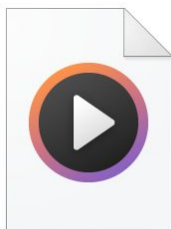
Labeled gameplay footage:
not that violent, score 2.5



Example of violent scene:
Very violent, bloody, score 3.2

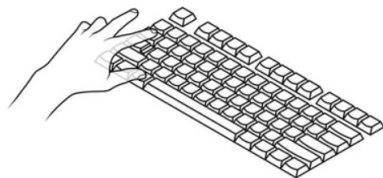


Live recording with time step
Very violent, bloody, score 3.2

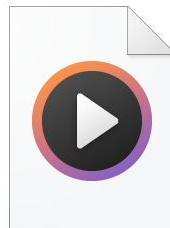


audio_2.wav

Labeled user audio:
Not intense, score 2.4

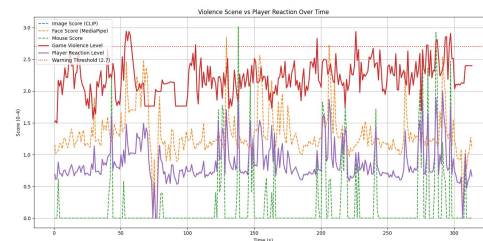


User keypress
active, score 2.8



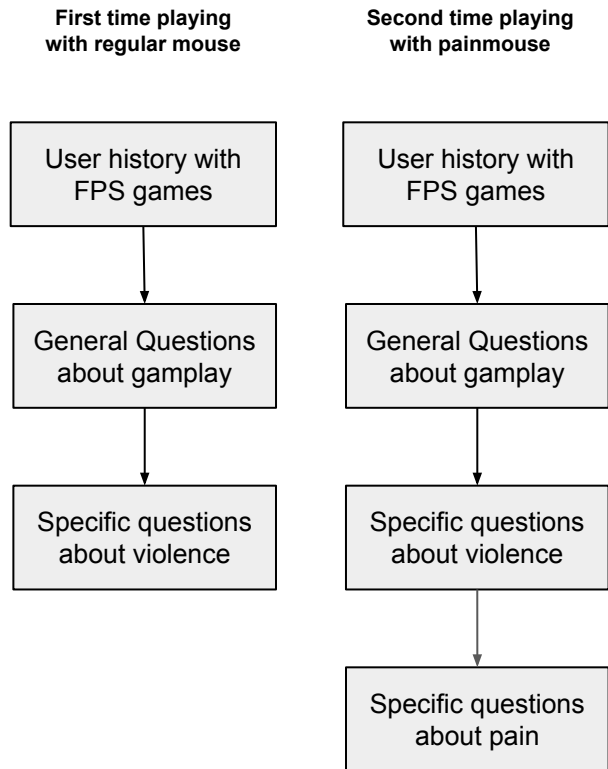
audio_2.wav

Labeled gameplay audio:
Not intense, score 2.4



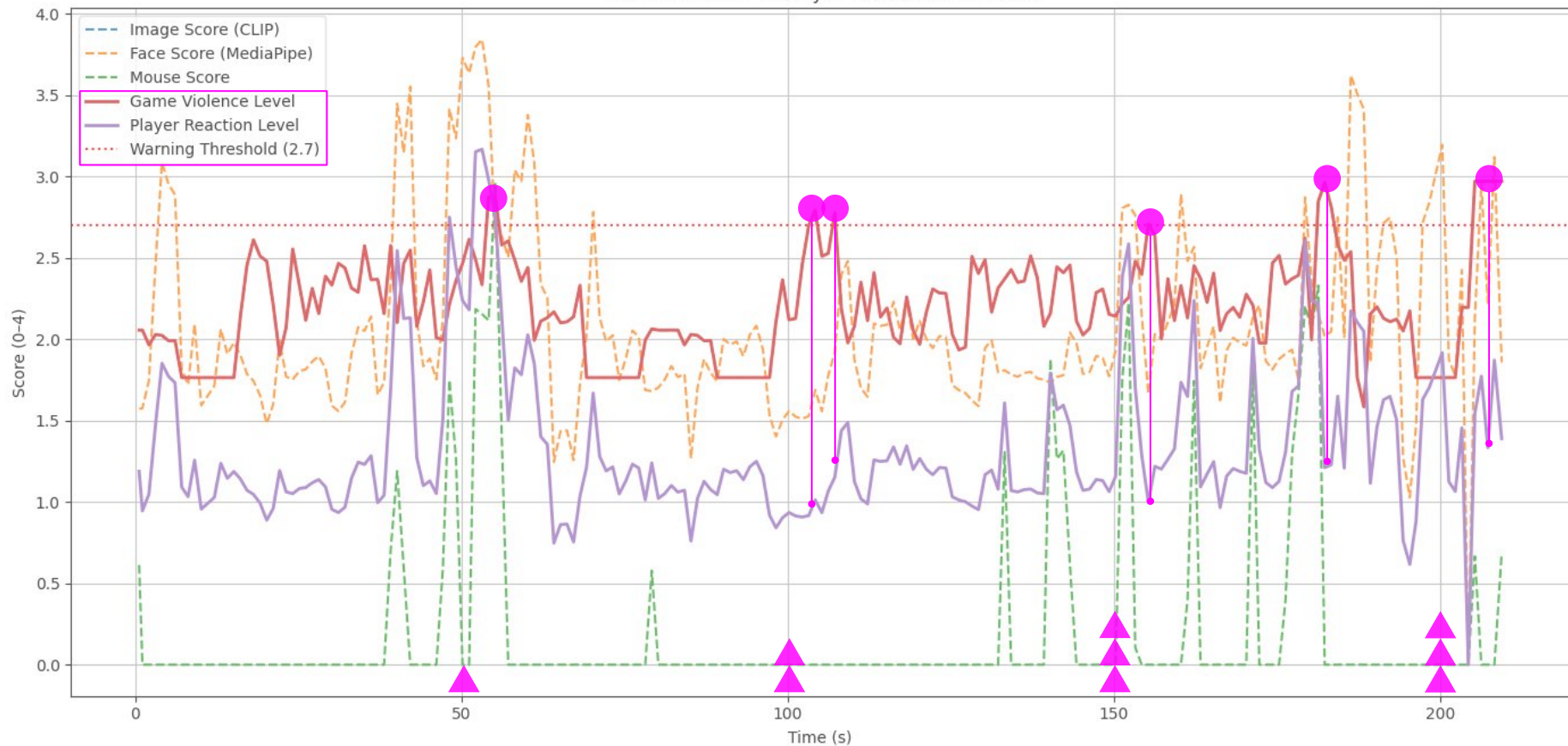
Plotted Chart: Collection
of all modalities

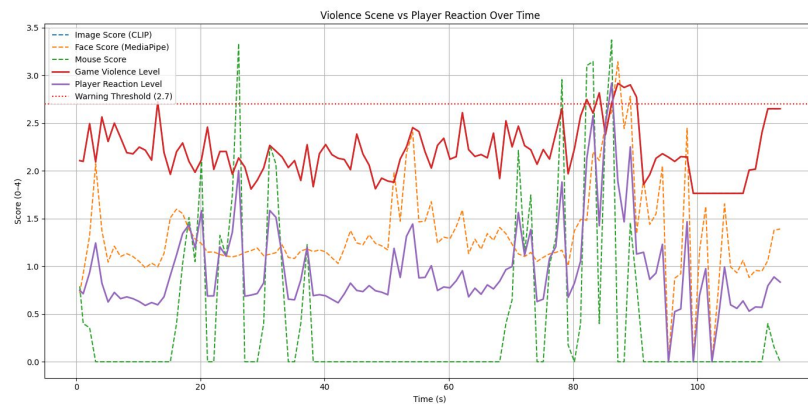
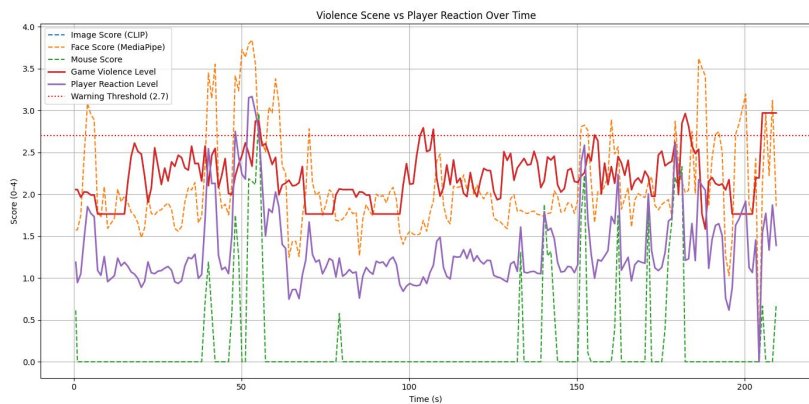
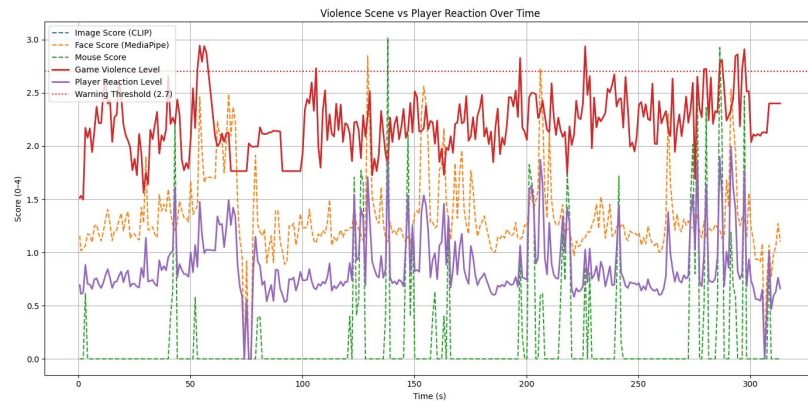
Initial user Questionnaire



- Provide a ranking of the violent moments you noticed during gameplay
 - Pretty much the same as before, everything feels less violent, because I felt physical violence
- What is the most exciting moment during your playthrough?
 - When I survive for a long time, I have a better command of the game, I feel more excited after feeling the electric shock, the rubberband is more like a punishment, the electric shock doesnt feel like a punishment, electric shock is in the game, rubber band is after the game
- One idea is to compare human decision for induce pain to AI's accuracy

Violence Scene vs Player Reaction Over Time





Nomy

Melo

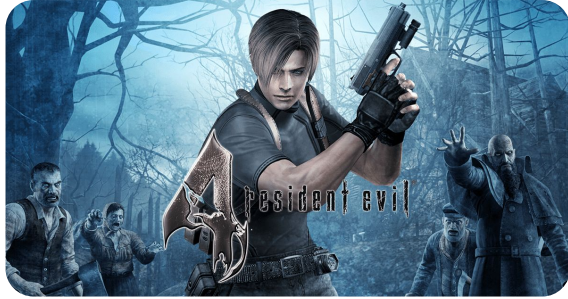
Next Steps

There is NO existing dataset about game violence or player violent intention. Thus, we are using pre-trained models for the current system.

- Establishing a customized dataset
- Fine-tune the model to increase contextual awareness and overall performance
- User testing with real FPS game players

Further Directions

Applying the system to other games



Applying the idea of "*pain haptic feedback*" to other non-game scenarios

Educational Training (e.g.,
traffic safety or medical
simulation)

Physical Rehabilitation

Behavioral Correction /
Psychological
Intervention

Human-AI Empathy
Development

Thank You!