M7.450 - Design of user experience and interfaces

The importance of the physical interface: rhythm games

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1. Game presentations

Frets on Fire

An open-source music rhythm game where players simulate guitar playing using a keyboard. By holding the keyboard like a guitar and pressing function keys as frets while using the Enter key to strum, players aim to hit notes as they scroll down the screen. The game includes a humorous tutorial and allows for custom song creation.

1. Frets on Fire on Wikipedia.

- **Controls:** holding the keyboard like a guitar and clicking the function keys as the frets and the intro like picking the strings.
- **Gameplay:** It is a basic rhythm game. Notes come to the player, and they must click the key of the correct string plus the intro button to make the sound. There are two type of notes: simple (just clicking once) and long (you must hold the picking key)
- **Controller:** PC keyboards don't allow haptic feedback (well, any of the proposed games do and I think it would be a great feature)

Guitar Hero

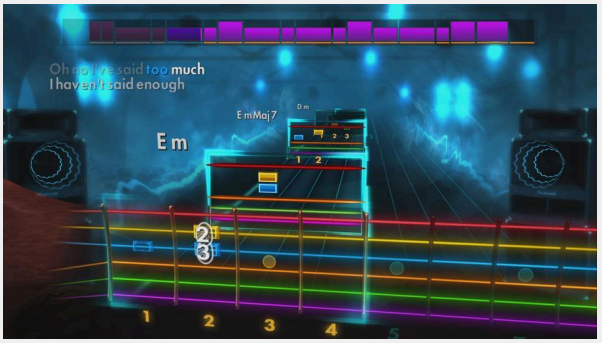
A pioneering rhythm game that utilizes a guitar-shaped controller with fret buttons. Players match notes displayed on-screen by pressing the corresponding fret buttons and strumming in time with the music. Sustained notes can be altered using the whammy bar, adding expressive control. The game's distinctive controller design has become iconic in popular culture.

2. How Guitar Hero works.

- **Controls:** guitar hero defined the controls of this genre. There are three key components: the Fret buttons, the Strum bar and the Whammy bar.
- **Gameplay:** what is interesting about this gameplay is that the Sustained notes must be faced rotating the Whammy bar. What is appealing about this is that the player receives instant feedback, listening to the notes bend with their movement.
- **Controller:** it is a simplified and gamified version of a real guitar. Its aesthetics have become a pop culture icon and have a strong marketing appeal because it goes beyond conventional controllers.

Rocksmith

An educational rhythm game that allows players to use a real guitar as the controller. By connecting an electric guitar to a console or PC via a special cable, players follow on-screen prompts to play notes and chords, effectively learning guitar techniques while playing.



3. Rocksmith 2014

- **Controls:** what is appealing about this game is that you use your real guitar to play songs with a really intuitive 3D layout that represents all the frets and strings of a guitar.
- **Gameplay:** notes come to you in a highway similar to all this games of the genre. It also shows what strings you must mute or hold. It works both as an educational resource (like Yousician) and a video game with gamification elements like scoreboards and appealing environments and feedback effects.
- **Controller:** to use your own guitar you must have a PL to USB cable to connect the (electric) guitar to the console, PC or smartphone in latest releases.

Unplugged VR

A virtual reality rhythm game that simulates air guitar playing using hand-tracking technology. Players position their hands as if holding a guitar, with the VR system detecting finger placements and strumming motions.

4. Unplugged VR

- **Controls:** your own hands. It is an “air guitar simulator”: you place your hands in a certain position and the hand tracking detects the position of your hands and fingers, which you must place correctly to play the notes.
- **Gameplay:** a virtual circular track placed in the augmented reality space that moves with your left hand (or right if you are left-handed) that shows how you must move your fingers to score points and play the song. The other hand is also detected to do guitar strums.
- **Controller:** Your own hands. Peoples’ reviews say a big downside of this game is the lack of physical feedback.

2. Comparative analysis of different types of interface

2.1. Introduction

Drawing from *The Art of Game Design: A Book of Lenses*, this analysis evaluates the feeling of control provided by the interfaces of *Frets on Fire*, *Guitar Hero*, and *Unplugged VR*. Using lenses such as **The Lens of Physical Interface (Lens #60)**, **The Lens of Feedback (Lens #63)** and **The Lens of Transparency (Lens #62)**, I will examine how each game facilitates the interaction between player and game world. Key focus areas include:

1. **Physical Input → World Mapping**:

   This evaluates how naturally player actions translate into in-game outcomes. *Guitar Hero* excels with its tactile strum bar and whammy bar, making the mapping precise and responsive. *Rocksmith* uses a real guitar, providing authentic physical input, and the videogame adapts its aesthetic to it. *Unplugged VR* focuses on how you move and creates all the experience around your gestures. *Frets on Fire* uses a keyboard, which, while accessible, feels less intuitive and lacks the tactile feedback of other games.

2. **World → Physical Output**:

   Feedback from the game world enhances player control and immersion. All the analyzed games complete this feedback with the audio dimension, but lack in haptic feedback (e.g. vibration).

3. **Virtual Interface → World**:

   This aspect focuses on how the virtual interface supports player interactions. *Frets on Fire* and *Guitar Hero* provide intuitive input-output mappings, with *Guitar Hero*'s dedicated controller offering a more seamless and enjoyable experience. *Rocksmith*'s virtual interface mirrors a real fretboard, making it both educational and immersive. Meanwhile, *Unplugged VR* attempts to replicate a guitar interface virtually, but the absence of physical references makes interactions less intuitive compared to the others.

4. **Player Imagination**:

   The ultimate goal of an interface is to "disappear," allowing players to immerse themselves in the game world. All games can excel in this area since the promise is clear: you are going to be a rockstar.

2.2. Comparative analysis of the feeling of control

Frets on Fire vs. Guitar Hero

- **Action Execution**: In *Frets on Fire*, players use the keyboard, holding it like a guitar and pressing function keys as frets while strumming with the Enter key. In contrast, *Guitar Hero* employs a dedicated guitar controller with fret buttons, a strum bar, and a whammy bar.
- **Control and Feedback**: *Frets on Fire* lacks physical feedback due to the standard keyboard, making it harder to develop a tactile sense of action timing. *Guitar Hero's* strum and whammy bars provide haptic and auditory feedback (e.g., note bending), offering a more immersive and precise experience.
- **Player Perception**: While *Frets on Fire* is accessible, its unconventional setup may feel awkward. *Guitar Hero's* controller, designed to emulate a guitar, enhances the player's sense of immersion and control.

Guitar Hero vs. Rocksmith

- **Action Execution**: *Guitar Hero* simplifies guitar playing, with buttons corresponding to frets and the strum bar mimicking picking. *Rocksmith* uses a real guitar, requiring players to physically play actual strings and frets.
- **Control and Feedback**: *Guitar Hero* offers immediate feedback through its simplified controls, while *Rocksmith* provides authentic tactile feedback from a real guitar. However, *Rocksmith* demands higher skill, as it involves real-world guitar mechanics.
- **Player Perception**: *Guitar Hero* appeals to casual players with its gamified approach, while *Rocksmith* bridges gaming and real-life skills. The second may intimidate beginners due to its steeper learning curve.

Guitar Hero vs. Unplugged VR

- **Action Execution**: *Guitar Hero* allows players to perform actions with precision with its guitar-shaped controller. In contrast, *Unplugged VR* relies on hand-tracking technology, where players mimic fret positions and strumming gestures without a physical controller.
- **Control and Feedback**: *Guitar Hero* provides tactile feedback through its strum bar and fret buttons, along with auditory cues like note bending via the whammy bar, creating a strong sense of control. *Unplugged VR*, while innovative, lacks physical feedback, making it harder for players to gauge their actions accurately, and occasional tracking issues can disrupt gameplay.
- **Player Perception**: *Guitar Hero* immerses players by emulating the feel of a real guitar with a tangible interface, fostering a strong connection to the game. *Unplugged VR* offers novelty and freedom with its hand-tracking technology, but risks breaking immersion due to its lack of tactile elements and inconsistent detection.

Rocksmith vs. Unplugged VR

- **Action Execution**: *Rocksmith* requires a physical guitar connected via a PL to USB cable, while *Unplugged VR* relies on hand-tracking technology to simulate air guitar. Players in *Unplugged VR* position their hands to mimic frets and strum gestures.
- **Control and Feedback**: *Rocksmith* offers direct physical feedback through the guitar, which is totally real. *Unplugged VR*, while innovative, suffers from the absence of physical feedback, which makes it relay in pure virtual world feedback.
- **Player Perception**: *Rocksmith* fosters a sense of control rooted in reality, whereas *Unplugged VR* delivers freedom and innovation, but risks reduced immersion due to tracking limitations and lack of tactile response.

Frets on Fire vs. Unplugged VR

- **Action Execution**: *Frets on Fire* uses a standard keyboard with predefined keys, while *Unplugged VR* employs hand-tracking to detect finger placements and gestures in a virtual space.
- **Control and Feedback**: Both interfaces lack physical feedback. However, *Frets on Fire* benefits from the tactile nature of keyboard keys, while *Unplugged VR* struggles with the intangibility of hand-tracking, which can lead to inconsistent note detection.
- **Player Perception**: *Frets on Fire* is more stable and accessible, but its lack of immersion limits player control. *Unplugged VR* offers novelty but risks frustration due to technological limitations.

2.3. Comparisons conclusion

Each game's interface uniquely impacts the player's feeling of control:

- *Frets on Fire* prioritizes accessibility but sacrifices immersion and feedback.
- *Guitar Hero* balances simplicity and engagement with its intuitive, tactile controller.
- *Rocksmith* emphasizes authenticity, creating a realistic and educational experience but with a steeper learning curve.
- *Unplugged VR* innovates with freedom and novelty but struggles with consistency and physical feedback.

Evaluating physical interfaces requires focusing on responsiveness, immersion, and feedback. The best designs, like *Guitar Hero*, seamlessly connect the player's input to the game world, fostering an intuitive and immersive experience.

Having said all mentioned in this section, it may seem like Unplugged VR's features are being shortchanged, but the ability to play a rhythm game like this without having to invest in a physical controller is very appealing. Especially if the player is not a profile of gamer who is very dedicated to this type of experience and just want to try it out. VR systems allow this variety easily, and it is something to take into account.

3. Accessibility Issues Analysis for *Unplugged VR*

3.1. Usability and accessibility analysis

Learnability
Upon launching *Unplugged VR*, players are introduced to a tutorial designed to teach the basics of gameplay, such as finger positioning and strumming techniques. However, the absence of physical controls can make these concepts abstract, potentially leading to a steep learning curve. Players must rely on visual cues and hand-tracking feedback, which may not be immediately intuitive, especially for those unfamiliar with VR interfaces.

Simplicity
Unplugged VR features a minimalist user interface that centers the player's attention on the virtual guitar and the incoming notes, effectively reducing on-screen distractions and enhancing immersion. This streamlined design allows players to focus on their performance, creating an engaging experience.

Efficiency
The lack of physical buttons means that actions like pausing the game or adjusting options require specific gestures, which may not be immediately apparent or easily executed, potentially disrupting the gameplay flow. However, the "Take Control" update introduced controller support, allowing players to use physical controllers instead of relying solely on hand-tracking gestures. This addition provides more straightforward access to in-game menus and settings, enhancing overall efficiency and user control.

Aesthetics
Visually, *Unplugged VR* offers a vibrant and engaging environment, with dynamic stages and responsive visual effects that react to the player's performance. The audio design complements the visual elements, providing an energetic atmosphere. However, the absence of tactile feedback can detract from the overall aesthetic experience, as players might miss the physical sensation associated with playing a real or simulated instrument.

Accessibility
The game's reliance on precise hand-tracking poses challenges for players with limited hand mobility or dexterity. Additionally, the necessity for specific lighting conditions for optimal tracking can be a barrier for some users. The immersive VR environment may also cause discomfort for individuals prone to motion sickness or those with visual impairments, as the game heavily depends on visual cues without offering sufficient alternative feedback mechanisms.

3.2. Accessibility Issues Analysis for *Unplugged VR*

Virtual reality games like *Unplugged VR* introduce innovative gameplay experiences but face significant accessibility challenges due to their reliance on hand-tracking technology and immersive virtual environments. These challenges affect players with physical, visual, auditory, cognitive, or technological limitations.

Physical Accessibility
The game relies on precise hand and finger movements for actions like frets and strumming, posing difficulties for players with conditions such as arthritis or tremors. Continuous arm and hand movements can cause fatigue, disproportionately impacting players with limited stamina or mobility. Additionally, the game assumes players can stand and have ample space for hand-tracking, creating barriers for wheelchair users or those in constrained environments.

Visual Accessibility
Unplugged VR heavily depends on visual cues for gameplay mechanics, making it challenging for players with visual impairments like low vision or color blindness. The lack of tactile or auditory feedback alternatives further limits accessibility. Additionally, the fast-paced visuals may induce motion sickness or dizziness, hindering the experience for sensitive players.

Auditory Accessibility
The game uses auditory cues such as strumming sounds and crowd reactions, which deaf or hard-of-hearing players may miss. The absence of visual substitutes, such as subtitles or markers, creates a disadvantage for players with hearing impairments.

Cognitive Accessibility
The game's reliance on hand-eye coordination and complex gestures can overwhelm players with cognitive impairments or memory difficulties. The vibrant and fast-paced environment may also overwhelm players with sensory processing disorders, making it harder to focus and perform.

Technological and Setup Barriers
Hand-tracking technology can be inconsistent, affected by factors like poor lighting or unique skin tones, leading to frustration and reduced immersion. Additionally, the reliance on high-quality VR hardware with advanced tracking capabilities creates financial barriers for many players.

Social and Environmental Barriers
The immersive nature of VR isolates players from their surroundings, making gameplay challenging in shared or noisy spaces. Furthermore, the lack of cooperative play or alternative control options limits accessibility for players who require assistance.

4. Exhibit

4.1. Usability and accessibility comparative analysis

Learnability

- **Frets on Fire**: Utilizes a standard keyboard, with function keys serving as frets and the Enter key as the pick. The tutorial is engaging and humorous, aiding in quick learning. However, the unconventional control scheme may require an adjustment period.
- **Guitar Hero**: Features a dedicated guitar-shaped controller with fret buttons, a strum bar, and a whammy bar. The intuitive design closely mimics actual guitar playing, facilitating rapid learning for new players.
- **Rocksmith**: Requires a real guitar connected via a PL to USB cable. The game employs a 3D fretboard interface, providing a realistic learning experience. While it serves as an educational tool, beginners might find the initial learning curve steep.
- **Unplugged VR**: Employs hand-tracking technology to simulate air guitar playing. The lack of physical feedback can make mastering controls challenging, and optimal performance depends on specific lighting conditions and hand positioning.

Simplicity

- **Frets on Fire**: Offers a straightforward rhythm game experience with basic note patterns. The use of a keyboard may lead to issues with key combinations, as some keyboards may not register certain simultaneous key presses.
- **Guitar Hero**: Presents a balanced difficulty progression, with the dedicated controller enhancing simplicity. The physical strum and whammy bars provide immediate feedback, aiding in gameplay comprehension.
- **Rocksmith**: Integrates real guitar playing, which inherently adds complexity. The game's interface attempts to simplify this by displaying notes on a virtual fretboard, but the requirement of actual guitar skills increases difficulty.
- **Unplugged VR**: The absence of a physical controller simplifies setup but complicates gameplay due to reliance on precise hand tracking. Users may experience inconsistencies in note detection, affecting overall simplicity.

Aesthetics

- **Frets on Fire**: Features minimalist graphics with a focus on functionality. The community-driven nature allows for customization, but the overall visual appeal is modest.
- **Guitar Hero**: Known for its vibrant and dynamic visuals, it offers a polished and engaging aesthetic that enhances the rockstar experience.
- **Rocksmith**: Provides a realistic visual representation of a guitar fretboard, with a clean and educational interface. The focus is on practicality over flashy visuals.
- **Unplugged VR**: Delivers an immersive virtual environment with lively venues and responsive crowd animations, aiming to replicate the sensation of performing live. However, the visual experience can be affected by hand-tracking limitations.

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