

Heuristics Based Usability Testing of a Virtual Reality Application Evaluation Report

1. VR App Info and Two-Pass Process

VR App Information

VR Space Stalker is a virtual reality space combat simulator designed for mobile platforms. The application transforms the user's smartphone into an immersive VR gaming experience when used with cardboard VR glasses.

Purpose: The game places players in control of a space fighter, tasking them with completing combat missions in a virtual space environment. Players must navigate through space, engage enemy ships, and complete mission objectives while managing their ship's systems.

Technical Structure:

- Platform: Android (Play Store) and iOS (App Store)
- Hardware Requirements:
 - Smartphone with gyroscope and accelerometer
 - Cardboard VR headset compatibility
 - Minimum 2GB RAM
 - Android 7.0+ or iOS 11.0+
- Display: Stereoscopic 3D rendering
- Audio: Spatial audio system

Controls:

1. Head Movement

- Look around the space environment

- Aim weapons at targets
- Navigate menus through gaze control

2. Input Mechanisms

- Automatic firing when target is in crosshairs
- Head tilt for spacecraft movement

Time Requirements:

- Tutorial completion: 7-8 minutes
- First mission completion: 12-15 minutes
- Average gameplay session: 20-25 minutes

Two-Pass Process Explanation

First Pass: As recommended by Nielsen (1994), the first evaluation pass focused on getting a "feel for the flow of the interaction and the general scope of the system." Activities included:

- Initial 30-minute gameplay session
- Flow analysis of main interaction patterns
- Preliminary usability issue identification

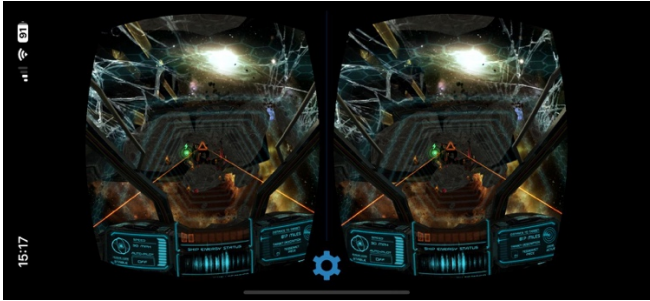
Second Pass: Following Nielsen's structured approach, the second pass focused on "specific interface elements and comparing them with the list of usability heuristics" (Nielsen, 1994).

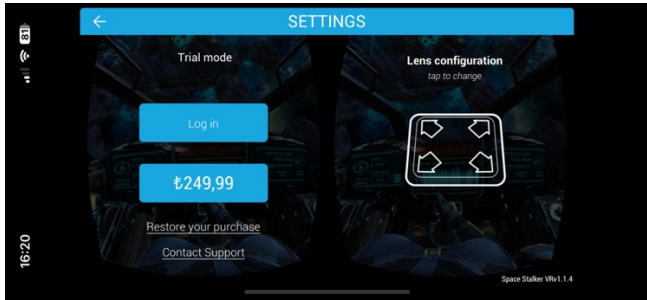
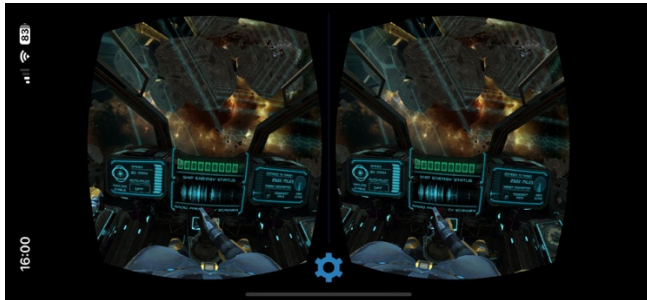

This included:

- Systematic evaluation using combined heuristics
- Detailed documentation of each issue
- Severity rating assignments

2-Heuristics Evaluation

Table 1. The Detailed Heuristics Evaluation Analysis

Heuristics	Explanation of the Problems Add related visuals of problems from screenshots	Propose Solution(s)	Seriousness of each problem. (Low, Middle, High) Why?
Visibility of system status	<p>1- Health and weapon status hard to track, violating principle that "VR apps should communicate clearly about what is happening" (Joyce, 2021).</p> <p>2- "Game state information should be clearly visible" (Joyce, 2019), but mission progress is unclear in VR view.</p> 	<p>1- Implement dynamic status indicators in player's field of view.</p> <p>2- Add spatial audio cues for critical status changes.</p>	<p>High - Players miss vital information during combat (Nielsen, 1994).</p>
Match between system and the real world. ...	<p>1- Unrealistic space movement with sudden stops/starts (Joyce, 2021).</p> <p>2- Menu icons inconsistent with space theme.</p>	<p>1- Implement momentum-based movement.</p> <p>2- Redesign UI with space theme.</p>	<p>Middle – Does not prevent gameplay but breaks immersion.</p>
User control and freedom. ...	<p>1- User control and freedom1- No "emergency exit" (Joyce, 2021) from VR experience.</p> <p>2- Missing "clearly marked exits" (Nielsen, 1994) from missions.</p>	<p>1- Add universal exit gesture.</p> <p>2- Implement quick-save and exit points.</p>	<p>High - Critical for user safety and comfort.</p>
Consistency and standards. ...	<p>1- Controls do not follow "established VR conventions" (Joyce, 2021).</p> <p>2- Violates "platform conventions" (Nielsen, 2024) for VR games.</p>	<p>1- Align with common VR control schemes.</p> <p>2- Follow VR gaming standards.</p>	<p>Middle - Increases learning difficulty.</p>
Error prevention. ...	<p>1- "System should prevent errors" (Nielsen, 1994) but accidental actions common.</p> <p>2- VR gestures trigger unintended actions (Joyce, 2021).</p>	<p>1- Add confirmation for critical actions.</p> <p>2- Improve gesture recognition accuracy.</p>	<p>Middle - Disrupts gameplay experience.</p>

Recognition rather than recall. ...	<p>1- "Minimize the user's memory load" (Nielsen, 2024) violated by complex controls.</p> <p>2- "Game mechanics should be discoverable" (Joyce, 2019).</p>	<p>1- Add visual control reminders.</p> <p>2- Implement tutorial overlays.</p>	High - Creates cognitive overload.
Flexibility and efficiency of use. ...	<p>1- Lacks "shortcuts for experienced users" (Nielsen, 1994).</p> <p>2- No "efficiency options for advanced players" (Joyce, 2019).</p> 	<p>1- Add comprehensive VR settings menu.</p> <p>2- Advanced control options.</p>	Middle - Cannot optimize experience.
Aesthetic and minimalist design.	<p>1- VR interface cluttered with "unnecessary elements" (Joyce, 2021).</p> <p>2- Information overload breaks "minimalist design" principle (Nielsen, 2024).</p> 	<p>1- Streamline VR interface.</p> <p>2- Show only essential information.</p>	Low - Visual distraction issue.
Help users recognize, diagnose, and recover from errors	<p>1- Error messages not "constructive" (Nielsen, 1994).</p> <p>2- "Players should understand why they failed" (Joyce, 2019).</p> 	<p>1- Implement clear error feedback.</p> <p>2- Add visual guidance for recovery.</p>	Middle - Impacts learning curve.
Help and documentation	<p>1- Help system not "easy to search" (Nielsen, 2024) in VR.</p> <p>2- Lacks "contextual assistance" (Joyce, 2021).</p>	<p>1- Add voice-activated help.</p> <p>2- Implement contextual hints.</p>	Low - Core mechanics learnable through play.

3- References

Joyce, A. (2019, May 19). *10 Usability heuristics applied to video games*. Nielsen Norman Group. <https://www.nngroup.com/articles/usability-heuristics-applied-video-games/>

Joyce, A. (2021, July 11). *10 Usability heuristics applied to virtual reality*. Nielsen Norman Group. <https://www.nngroup.com/articles/usability-heuristics-virtual-reality/>

Nielsen, J. (1994). *Usability engineering*. Morgan Kaufmann.,

Nielsen, J. (2024, February 20). *10 Usability heuristics for user interface design*. Nielsen Norman Group. <https://www.nngroup.com/articles/ten-usability-heuristics/?lm=usability-heuristics-applied-video-games>