Rim: Explore a Change of Perspective in Virtual Reality

Thesis Presented

by

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ABSTRACT

Player perspective is a vital and rudimentary component of game design. Perspective defines points of view (POV) and what the player as a particular character can both see and interact with. Perspective can greatly affect player agency in making decisions and getting feedback from the game world. However, the change in perspective and character embodiment as a part of player agency is rarely explored in video games. In the paper, Rim is introduced as an adventure spatial puzzle game in VR which uses the core mechanic of changing perspective as the principal form of player agency.
1. Introduction

Player perspective is a vital and rudimentary component of game design. Perspective defines points of view (POV) and what the player as a particular character can both see and interact with. POVs convey visual information in distinctive ways that lead to a myriad of possibilities to perceiving and engaging with the game world [2]. However, despite its expressive capabilities, the option to change perspective and character representation during gameplay, with a few exceptions, is rare in video games. In some cases, changes of perspective take place in preset cinematic sequences and functionalities such as zooming-in/-out and rotating camera [5]. For example, the game Fallout has a cinematic storyline in the third-person POV before the actual gameplay; inside the game, the player is given the ability to rotate the camera to view surroundings and choose between the first-person or isometric perspectives; however, the player still stays embodied as the same character throughout.

Perspective defines what the player experiences as a certain character, and the extent of his or her agency such as what choices he or she is able to make during the game. This can be further extrapolated to suggest that changes in perspective can be a form of agency as well. In fact, there is a rudimentary aspect of game design implied in the change in POV and character representation: a certain perspective or character ability could be the key to helping the player solve a problem. For instance, a closer POV to a piece of diary enables the player to read a text; the player has to become a character -- fire -- in order to light up the cave. These goals give the player real reasons to change the POV and character representation. It is a mechanic that is rarely explored in game design.
Rim, a virtual-reality (VR) adventure spatial puzzle game, focuses on this novel mechanic of the change of perspective and character representation. The game motivates players to switch from one character to another within the same space in real time, shifting between different POVs and acting upon the game world via different characters’ skills to solve puzzles. In contemporary puzzle games, players usually have limited perspectives and avatar choices in a single game. Rim aims to break this convention by providing more layers for exploration and discovery, and by giving players constant immersion in the first-person POV in the nascent VR medium.

2. Background

Perspective is intimately tied to the camera’s position in the game. The common camera options are top-down, isometric, bird’s eye, trailing, first- and third-person POVs [2, 5]. These views approach the game space from distinct angles, which gives players different perception and understanding, even with similar game mechanics. For instance, the Pac-Man game in 2D offers a god’s-eye view of the game state, allowing players to play strategically against the AI, while the virtual-reality version of Pac-Man: Arcaid, as described in [11], provides players with limited situational awareness, more surprises and immersive play in the first-person POV.

Generally, first- and third-person POVs are the most widely used in computer games. First-person POV enables players to take the viewpoint from the character and interact closely with nearby objects. Alternatively, third-person POV provides a more global view and is usually used for exploration and observation in the whole game space [2]. These POVs result in different
sensations in representation or embodiment. Denisova and Cairns’s study shows that despite player preference of perspectives, people feel more immersed when looking through the character’s eyes and getting feedback directly from the surroundings; the first-person POV leads to higher presence and a greater sense of ownership [2]. Some biology studies also show that the first-person POV is correlated to the constituent of human self-consciousness [7].

The medium of virtual reality (VR) has taken POV to a particularly exciting new level. With the interface of one headset and two controllers [12, 13], VR augments immersion by enabling players to view the environment in 360 degrees, interact with the world with their hands and even view their own virtual body. Many VR games equip players with the ability to “teleport” so that they can see the space from different angles, like in the game Robo Recall, where players can teleport to various locations to glimpse strategical angles. VR is also a powerful tool to study representation and embodiment [3]: seeing through eyes of different characters reveals unique visual and interactive experiences, which can create an empathetic resonance in players. For example, journalism VR empowers people with first-person experiences in news crises [19]; biology VR allows people to see through the eyes of someone with a brain injury [20]; therapy VR has successfully treated people diagnosed with PTSD [21].

In terms of the game design, current puzzle games consist of a large variety: action/arcade, hidden object, picture reveal, physics, tile-matching, etc [14]. In a lot of contemporary games, puzzle types are integrated into level design. For instance, there is a level in Rusty Lake - Birthday where the player needs to see the texts under the ice at the front door. In order to do this, the player is tasked to fill the kettle found in the key case with water and heat it
on the stove, and then use the hot water to melt the ice. The process includes: action -- player manipulates game pieces in real time in the game space; hidden object -- player needs to find the kettle; tile-matching -- player needs to decode a case to get the key; picture reveal -- player needs to find the connections among different game objects (see Figure 2-1).

However puzzle design is integrated, games still have their focus in puzzle-solving mechanics. Games like *Fez* and *Monument Valley* typically use 2D/3D view illusion for the base of puzzle; *Portal* uses spatial relationship to create its puzzles; *Braid* enables time manipulation as the main mechanic to solve all its puzzles; VR games like *Job Simulator* and *I Expect You to Die* are more open-ended, encouraging players to try different possibilities in solution searching.
Among the puzzle-solving mechanics, the change of perspective and character representation seems to be the least developed, in spite of the presence of popular games like *The Sims*, where players are able to switch among characters. The agency, defined as “perceivable consequences” in [16] how much the player is able to make an impact in the game, is not really about the POV change as the game maintains a god’s-eye-view the whole time. In my definition, perspective contains information about both the present avatar’s degree of agency and the viewpoints obtainable from this character: it is a mechanic that enables players to inhabit another character and do something in that role. Perspective is therefore not just an enhancement, but a form of player agency.

As discussed in the previous sections, perspective and character representation carry a great deal of information and they are closely relevant to the design of a space. I chose to develop this mechanic in a spatial puzzle game in the first-person POV in VR that will enable a greater sense of presence and immersion [3].

3. The Design and Development

3.1 Overview

*Rim* is an adventure spatial puzzle game that uses change in perspective and character representation as its primary mechanic. During the game, the player is motivated to switch between characters and use their points of views and distinct abilities in puzzle-solving. For game references, POV in *Portal* contains information on spatial relationships; the in-game...
change of characters in *Never Alone* and *Puzzle Bots* presents good examples of the use of different character abilities to solve puzzles.

3.1.1 Premise

*Rim’s* narrative premise is based on the Orwell story of *Animal Farm* [17], where the pig takes charge of the farm after their successful revolution against prior human farm owners and some animals are killed for not submitting to their new pig tyrant.

3.1.2 Goal

The player starts as a spirit of a dead horse who was recently killed for fighting against the pig’s abuse of power. Players need to explore the space by moving their embodiment between characters and using each character’s unique abilities to set up traps in a bid to overthrow the pig’s authority.

3.2 Design

3.2.1 POV and spatial storytelling

POV determines what the player can see and interact with, thus using sightline to tell a story within a space.

3.2.2 Character representation and POV

Characters have distinct POVs or sightlines based on their sizes, and likewise function differently in their abilities to perform certain tasks. For example, heavy-weighted animals like
cows can push heavy stuff but not the light-weighted spiders; spiders can use web magically but a cat cannot.

3.2.3 The MDA Framework

The game design follows the *Mechanics-Dynamics-Aesthetics* framework [15]:

1) Aesthetics
   · Main: Challenge and discovery.
   · Sub/Minor: Stealth, player-generated narratives.

2) Mechanics:
   a. Farm equipment: grassland, barrels, trees, etc.
      The spatial design implies the solution to the puzzle.
   b. Boss: the pig that patrols on the farm and can react to emergencies.
   c. Types of animals:
      ● Can physically move in the space and carry things.
      ● Stationary but provides a good POV that helps players discover some other characters.
      ● Stationary but can do something else interesting such as singing.
   d. Objects for manipulation, such as stones, wood sticks, fire, etc.

3) Dynamics:
   The game starts at a graveyard with the player as a ghost horse who died recently from its fight against the pig’s abuse of power and wants revenge (see figure 1). The ghost finds out that he is able to inhabit the bodies of other animals in order to direct them to set a trap for the pig.

3.2.4 Storyboard
Optimally, the player needs to follow a particular path more or less to solve the puzzle.

Here is a storyboard that illustrates the game progression.

a. Graveyard scene (see Figure a-1 to a-4).
b. Farm scene (see Figure b-1 to b-6).

Figure b-1: The duck POVO(2): a peak at the farm – a peaceful view.

Figure b-2: The cow POV(1): a fierce pig that patrois, a cow that is producing milk, a cat that is jumping on the tree.

Figure b-3: The cow POV(2): a chicken whose eyes are always following the pig.

Figure b-4: Cast a laser to select to become the chicken.

Figure b-5: The chicken POV(1): view the farm.

Figure b-6: The chicken POV(2): spotting a spider between the trees on the side.
c. Fire scene (see Figure c-1 to c-6)

![Figure c-1: The spider FOV(1): spotting the man-eating flower.](image1)

![Figure c-2: The spider FOV(2): cast a spider’s thread to pick the flower up and place it under the pine tree on the right. This flower should be the key to trapping the pig.](image2)

![Figure c-3: The spider FOV(3): spotting the fire.](image3)

![Figure c-4: The spider FOV(4): move closer to the fire.](image4)

![Figure c-5: The spider FOV(5): Find out that adding some wood or clustering barrels can make a bigger fire.](image5)

![Figure c-6: The spider FOV(6): the fire will lure the pig to come over.](image6)

3.3 Technology

This game is developed with Unity3D and Oculus SDK. The controllers are Oculus Touch.
4. Playtest

4.1 Goals and Methods

In order to test the mechanic exemplified in *Rim*, in total 10 people were recruited as playtesters and 15 playtest sessions were organized including repeat players. The applied game research methods were think-aloud, video recording and interviews [18], where information about their prior gaming experience was also taken into consideration in playtest results analyses.

With this set up, my goals were to find out if players could: 1) interpret their situations and use character abilities in a goal-oriented way; 2) experience a greater impact on game space driven by the mechanic of changing perspectives and characters; 3) provide feedback and advice on the overall game design.

4.2 Results

Through the initial playtests for an early prototype with just the farm and the fire scenes built up, there were several experiences mentioned (see Figure 4-1):
<table>
<thead>
<tr>
<th>Experience</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fun</td>
<td>Players gained a sense of fun in becoming other characters and experiencing dynamic POVs.</td>
</tr>
<tr>
<td>Immersion</td>
<td>Players felt immersion in the first-person POV in being able to see their virtual bodies in VR.</td>
</tr>
<tr>
<td>Disorientation in the scene</td>
<td>Limited visual feedback on the transformation. The player did not know whether he or she had transferred to another character.</td>
</tr>
<tr>
<td>Disorientation in the goal</td>
<td>Hints were rarely provided in the game. It was hard for players to realize the goal.</td>
</tr>
<tr>
<td>Little interaction</td>
<td>Players were not able to act on the game space besides the ability to transform into other characters in the very early prototype.</td>
</tr>
<tr>
<td>Little tutorial</td>
<td>There were no tutorials on the controllers, which gave the playtesters a hard time to understand how to control.</td>
</tr>
<tr>
<td>Little feedback</td>
<td>Little feedback on what characters players were pointing at.</td>
</tr>
</tbody>
</table>

Figure 4-1. Initial Playtest Results.
Several changes in the design were made based on the initial playtest feedback (see Figure 4-2):

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disorientation in the scene</td>
<td>1) A fading glow was added to the character from which the player transforms to another one; 2) Sound effects were added to indicate what animal the player is currently playing as.</td>
</tr>
<tr>
<td>Disorientation in the goal</td>
<td>1) The graveyard scene was added to the game, providing more hints such as the fire that implies the solution to the puzzle in Figure a-2; 2) More interactions and feedback are added, as described below.</td>
</tr>
<tr>
<td>Little interaction</td>
<td>1) Unique functionalities were added to different characters, such as spider casting threads and</td>
</tr>
<tr>
<td>Little tutorial</td>
<td>1) Added leveraged challenges in the graveyard scene to teach players about basic interactions, such as moving, casting threads, pushing stones as the spider character; 2) Added voiceover.</td>
</tr>
<tr>
<td>Little feedback</td>
<td>1) Visualized the laser beam for selecting characters; 2) Added haptic feedback on the Touch Controllers; 3) Highlighted the silhouettes of selected characters; 4) Animated the pig to react to certain character actions.</td>
</tr>
</tbody>
</table>

Figure 4-2. Changes made after 11 playtest sessions including come-back scenarios with 8 playtesters.
The feedback on the improved version are listed as follows (see Figure 4-3):

<table>
<thead>
<tr>
<th>Experience</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fun</strong></td>
<td>1) Players gained a sense of fun in becoming other characters and experiencing dynamic POVs; 2) Fun and immersive to play in VR.</td>
</tr>
<tr>
<td><strong>Playful</strong></td>
<td>1) Players obtained sufficient feedback from their actions on the game world; 2) Return players found much more interesting interactive items than that in prior playtests.</td>
</tr>
<tr>
<td><strong>Immersion</strong></td>
<td>1) Players experienced immersion in the first-person POV in being able to see their virtual bodies and hear the animal sounds in VR; 2) Ambience sound effects gave players an illusion that they were on an actual farm; 3) Being able to get feedback from the game space increased the level of immersion.</td>
</tr>
<tr>
<td><strong>Improved orientation</strong></td>
<td>Return players gained a better sense in: 1) orienting themselves towards the goal with the help of visual and audio cues; 2) knowing what to try and how to act on certain objects from the tutorial in the graveyard scene.</td>
</tr>
<tr>
<td><strong>Insufficient tutorial on the controllers</strong></td>
<td>Players had little practice on the controllers, especially for those who were new to Oculus.</td>
</tr>
<tr>
<td><strong>Motion sickness</strong></td>
<td>Some players experienced motion sickness for not having a visual reference point.</td>
</tr>
</tbody>
</table>

Figure 4-3. Feedback on the improved version.

After the feedback on the improved version, I made a change to minimize the motion sickness. Instead of using the joystick, I adopted the solution as point-and-move with the scene slightly faded out. As a result, two playtesters who experienced motion sickness in the previous version reported that the symptoms were greatly reduced.
5. Discussion

Generally in game design, the mechanic in a change of perspective is rarely explored with a few exceptions. In this paper, a change in perspective has triple meanings: firstly, it means the change of POV in 3D; secondly, it means a different subjective experience; thirdly, it means another way of thinking. Specifically, it is a mechanic that enables players to switch their embodiment to another character and do something in that role. Perspective defined here is therefore not just an enhancement, but a form of player agency.

In this project, I created an adventure spatial puzzle game in VR in order to explore the problem-solving aspect implied in the main mechanic of changing perspectives.

From the playtest results, it could be seen that the original objectives were mostly fulfilled in this game. First of all, the problem-solving aspect implied in the main mechanic was seen to be well applied in the game. For example, the playtesters were able to understand that they needed to become certain characters in order to obtain critical POVs as key to solving problems. Secondly, the main mechanic was proven to have driven player to meaningfully impact the game space as different roles in a myriad of layers in this game. For example, some playtesters realized that they were able to use skills as the spider such as moving objects with threads in a goal-oriented way. Additionally, the use of first-person POV and VR was greatly favored in this game. Playtesters commented that playing this game in such POV in VR felt very natural.

In summary, the mechanic of changing perspective is proven to work well with:
1) The first-person POV in VR.

2) A spatial puzzle setting where players use POVs to solve problems.

3) A spatial puzzle setting where players can play as different roles with the change of POVs.

In the process of addressing the design problem, I have learned to make fast prototypes to test ideas before making them official and various ways to communicate concepts to others such as sketches and storyboards.

In the future, I will primarily focus on implementing mini levels as part of the storyline of the game to teach players about different mechanics progressively. Secondly, I will add more interactive items to make the game more playful. Additionally, I will continue improving the immersive experience in VR, such as reducing the motion sickness and replacing virtual human hands with corresponding limbs in animal characters.
References
