DEPARTMENT OF INFORMATICS

TECHNISCHE UNIVERSITÄT MÜNCHEN

Bachelor's Thesis in Informatics: Game Engineering

Observing the effects of first-person exploration in narrative gaming environments

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Fallstudie über die freie Erkundung von Story-basierten Spielumgebungen in Ego-Perspektive

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Submission Date:	15.04.2016

I confirm that this bachelor's thesis in informatics: game engineering is my own work and I have documented all sources and material used.

Munich, 15.04.2016 René Schleese

Abstract

In this study we observe player behavior in Narrative Environment-Restricted First-Person games (NERFPs). Hereby we construct a NERFP section on basis of predefined design decisions and analyze the way our participants respond to it. By using movie material as base of our narrative segment, we also draw conclusions to the popular cut-scene presentation style. Among others our results show the tendency of players' goal-oriented expectations overshadowing parts of narrative information gain. In contrairy to the determined and well-understood cut-scene instance, players reported an increased feeling of immersion as well as uncertainty within the NERFP playthrough.

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1 Introduction

> „We've nailed the engagement part of games – Who hasn't played Tetris for too long? – but once people felt it was better to put some context to all these mechanics, the Pandora's box was opened. The more story-telling we inserted into games, the more it clashed with the gameplay part."
> – Adrian Chmielarz, game designer of *The Astronauts* [Hou]

Although *Narrative Game* is believed to be a contradicting term, the genre's share of the gaming market is enormous. Looking at Google's directory of games 2015, the portion of titles specifying directed stories as one of their key-features accounts for 59%. In addition, reports state that the overall sales in digital games equal 61 billion US Dollar within that same year [FN]. Considering the law of supply and demand, it seems illogical that a medium of such monetary dimensions would struggle in delivering a product's core aspects to their customers. One could think that if novels and movies are able to deliver compelling stories with far less of a budget, gaming should have the possibilites to go head to head with its media-specific competitors.

This is less an assumption than it is a fallacy. As writing moviescripts differs from writing a novel, traditional storytelling methods can only partially be applied to gaming. Looking at the state of the art, games' repertoire of text-boxes, cut-scenes and vocal narration feels like borrowing already existing storytelling methods from other media, rather than adapting them to their intrinsic claims.

In his article *Narrative Structures in Computer and Video Games: Part I*, Barry Ip states that „[...] the use of cut scenes continues to dominate as the most popular method of narrative delivery. In some cases, the use of cut scenes amounted to over 70% of the total prescribed narrative." This seems to work well because both games and film share the benefits of screen-based-media. Despite their similarities they show undeniable differences in aspects essential to their definition. It is questionable whether restricting input on a medium based on interaction is an optimal solution for solving the conflict which is narrative game.

Although many academics looked into the matter, storytelling in games has not yet been fully understood. Britta Neitzel summarized the current situation in her article *Narrativity of Computer Games*:

> „So far, there are divergent approaches but no schools, nor is there a consensus on central issues. This is due not only to the novelty of computer games, but also to the diversity of scholars' disciplinary backgrounds.“ [Nei14]

Critizing scholars' predominantely theoretical approaches, she conlcudes that the subject needs further investigation in form of narrative-game analyses and case-studies.

Concurring with her arguments, we designed a user-study aiming at gaining further information about narrativity in digital games. Contrairy to the trend of cut-scenes and other input-restricting narrational methods, we specialized on a lesser known game-type. Inspired by the success of *Valve's Half Life* in 1998, we wanted to explore how pre-directed story is perceipt in games of such genre, specifically addressing the continuous occupation of the first-person perspective.

2 Related Work

2.1 Defining terms

Before continuing it is necessary to define several key terms inherent to the subject. Some definitions might differ from those of other papers because of their context or complexity. These definitions will hold over the course of this thesis.

- Narrative
  „A chain of events in a cause-effect relationship occurring in time and space“ [Gel]
- Narration
  „The process through which a [medium] conveys or withholds narrative information, the way a story is told.“ [Gel]
- Embedded Narrative
  „The narrative that is pre-defined by the game’s designers and which the player only discovers during [game progression]”
- Narrative Game
  A game featuring an embedded narrative
- Interactivity
  „[...] the users’...ability to directly intervene in and change the images and texts that they access“ [Che07]

As already mentioned by Britta Neitzel, the number of game studies regarding embedded narratives remains sparse. With our focus on story perceiption through continuous first-person perspective we are addressing a field which seems largely unexplored. Factorizing our targetted genre into its core components however grants multiple scholarly subjects of theoretical background.

2.2 Viewpoints in games

Reacting to the machine’s current state is based on interaction, and therefore an essential part of videogames. Users perceive said state mostly through sound and visuals, functioning as the output part of the overall input-output-system. What gets displayed on screen however depends on the game's viewpoint. The viewpoint is the virtual camera through which the player sees the gameworld and gains information. In their paper *Screen Play: Film and the Future of Interactive Entertainment*, Andy Clarke and Grethe Mitchell addressed the importance of the viewpoint when displaying narrative in games. They propose the aspects narrative, immersion and empathy are linked in a triangular correlation (Figure 2.1). By positioning the player/viewer more towards one corner the significance of both remaining items diminishes. According to them, „most games and virtual environments position their user firmly in the immersion corner". As a result, players feel the strong sense of being in the gameworld, but struggle to care about its characters or the embedded storyline. By stating that the first-person perspective is the most immersive of all established viewpoints, they simultaneously imply that it is the least favorable for narrational purposes. In our study we address this assumption by analyzing story perception through first-person perspective, as well as directly comparing our results with those of the filmic cut-scene method.

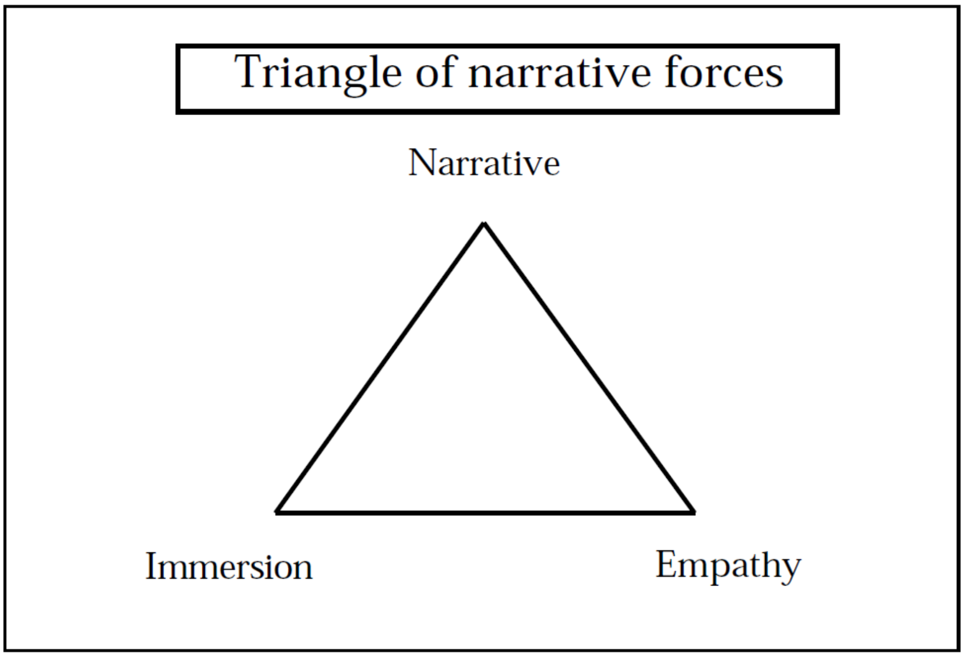

Figure 2.1: Screen-based viewpoints. Game designers and movie directors need to position their user/viewer within the triangle

2.3 Storytelling through game design

Narration is the tool for writers and designers to shape the quality of a story. To quote Mitchell and Clarke, „the most exciting of stories can be made dull when presented in an uninspiring way, while the plainest of events can be made interesting and exciting through its presentation." Narration in videogames however depends on the viewpoint. As a result of the continuous first-person perspective, games like *Half Life* seldomly take away control from the player, which in return restricts the tools a storyteller can work with. Consequently games of such genre need to fall back on other ways to present their narrative in a compelling way. In his book *More than a game: The computer game as fictional form* [Atk03], Barry Atkins describes the reasons why he thinks *Half Life* was successful in conveying its embedded narrative. He argues that as a result of the game relying solely on aural and visual cues, the story needed to be told through both game- and level-design. The player's experience is enhanced by the level of immersion, provided by the game's horror-esque soundtrack as well as its deformable environment. In addition he states that although the game is „relentlessly linear" and constructed around „corridors with single entrances and exits", it achieves to create „an illusion of individual agency" [Atk03]. The same subject is also addressed by author Henry Jenkins in his article *Game design as narrative architecture* [Jen04]. He argues that a game's narration does not need to rely on filmic methods like flashbacks or foreshadowing in order to increase its tension. By introducing game environments as narrative data carriers, he presents the world itself as a new storytelling tool for games to use. Within their works, both authors provide suggestions on how these games could increase their limited repertoire of narrative presentation. In the process of designing our study we included several of their proposals in order to simulate a more accurate experience to our participants.

2.4 Differences of playing and watching

Besides our goal of analyzing player-behavior in narrative first-person environments, we also want to compare our results with those of the popular cut-scene technique. The subject of juxtaposing the interactive with the solely visual however was not only in our interest. Miki Nørgaard Anthony et al., authors of *Comparison of Narrative Comprehension between Players and Spectators in a Story-Driven Game* [ABC14], investigated the matter by comparing the differences of narrative comprehension when playing and spectating the story-driven game *Skyld*. In their findings the group of players showed a more goal-oriented approach, partially underreading non-interactive story elements. The spectators on the other hand had no problem in picking up narrative details and constructing possible worlds. Their observation of story-related clues even led to partially overreading resulting in misinterpretations. While their study shows that there is a difference in playing and spectating, their results cannot be fully translated to our experiment, since different viewpoints and overall unlike genres can affect the outcome of our study.

3 User Study

The study focuses on understanding player behavior when getting confronted with a narrative segment, embedded in an unknown gaming environment as well as being explorable in first-person perspective. At this point we want to introduce a new term and label games of this genre as Narrative Environment-Restricted First-Person games, or in short: NERFPs. Since this is the first study directly addressing the effects of narrative perception in NERFPs, we needed to determine specific design decisions on how to set up our experiment. Due to the lack of existing studies these decisions were made in a way to gather as much information as possible, rather than focussing on one specific causality. Our results could then later be used for examining direct correlations when testing one variable at a time. The methodology followed in this study is in line with similar studies in human-computer interaction [Kat+15; Ohn+12; Kat+12; Kat+13].

3.1 Design decisions

Our intention is to gather and evaluate data by realizing two tasks:

1. **Observe and examine player behavior within a NERFP game**
   We try to get insight into why players behave the way they do, which factors are responsible for said behavior and as a result, draw conclusions on how to tell better stories in videogames.

2. **Compare NERFP with cut-scene**
   An extended comparison of both techniques would be beyond the scope of our study. Nonetheless, due to its significance in modern narrative games, we want to understand basic similarities and differences of both methods.

Consequently we were searching for a game featuring attributes of NERFP, as well being useable with an open-source license. We could not find any existing videogame meeting our criteria, and thus needed to create our own program. We figured that the personal edition of Unity game-engine provided every tool necessary for us to create the interactive coreloop of our experiment.

Since NERFP already defines the viewpoint and basic character constraints, we decided to use a standard first-person controller as player avatar. As a result our participants were able to look, run and jump, while only being affected by collisions and gravity.

3.1.1 The narrative

We figured that our mapdesign heavily depends on the storyline we want to embed. Following the definition of narrative, its sequence of connected events needs to take place in a narrative environment. Therefore it makes sense to first look at the story and the resulting spatial dependencies, before building the surroundings for our players to navigate through.

The narrative we are searching for has two requirements to satisfy:

1. **Based on film**
   Comparing the effects of NERFP and cut-scene presentation requires a cut-scene to begin with. None of us is an educated movie director, therefore we need to base our scripted ingame sequence on an existing shortfilm which reflects the benefits of film language as well as different camera perspectives. We assume that using a movie-type storyline within NERFP should have no significant influence on our results.

2. **Easy to reproduce**
   Realistic environments would take much longer to visualize. Since we need to rebuild the story segments inside Unity within a small time-frame, they need to consist of simple shapes.

Fulfilling our demands we agreed on the shortfilm *Balance* being suitable for our experiment. *Balance* is a stop-motion animated film, released in 1989 by the twin brothers Wolfgang and Cristoph Lauenstein. The film depicts five individuals living on a small platform floating in space. These men are all identical apart from a number on their back. Whenever one of them moves, the platform tilts and the others must move as well to ensure that the platform does not tip over. The narrative progresses after one of the men acquires a jukebox and places it on the platform. From then on, everybody wants to get close to the box and use it, with the rest needing to reposition themselves in order to keep the platform in balance.

3.1.2 Leveldesign

Game environment
We noticed that the narrative enviroment sets specific limitations to our experiment.

Figure 3.1: The shortfilm Balance.

The aspect of balancing out the platform - which is inseperably woven into the narrative itself - prohibits anyone from entering it. If we allow players to enter the platform while respecting the physical rules of gravity, they would be able to tilt the platform with their interference, possibly altering the pre-defined narrative. If we allow them however to enter the platform without keeping the rules of physics intact, the narrative would lose its conflict due to the impossibility of imbalance. Consequently, the only possible solution is to seperate the space our players can interact with from the space our story segment takes place. As a result we need to isolate the platform, and add explorable structures for the players to walk upon. These structures need to restrict players' movements, function as interesting gaming environments, as well as provide observing spots for the players to experience the embedded narrative.

In order to keep consistency and easen further explanations, we want to introduce a new label: From this point on, the isolated plaform and its encompassing narrative space is named **Stage**.

With our goal of analyzing player behavior it is important to design a level which encourages exploration and freedom of choice, but simultaniously stays observable to guarantee meaningful data. On the one hand an area too small would lead to a forced behavior, contradicting our intentions. On the other hand a vast area could lead to a spectrum too broad to interpret, therefore nullifying our results.

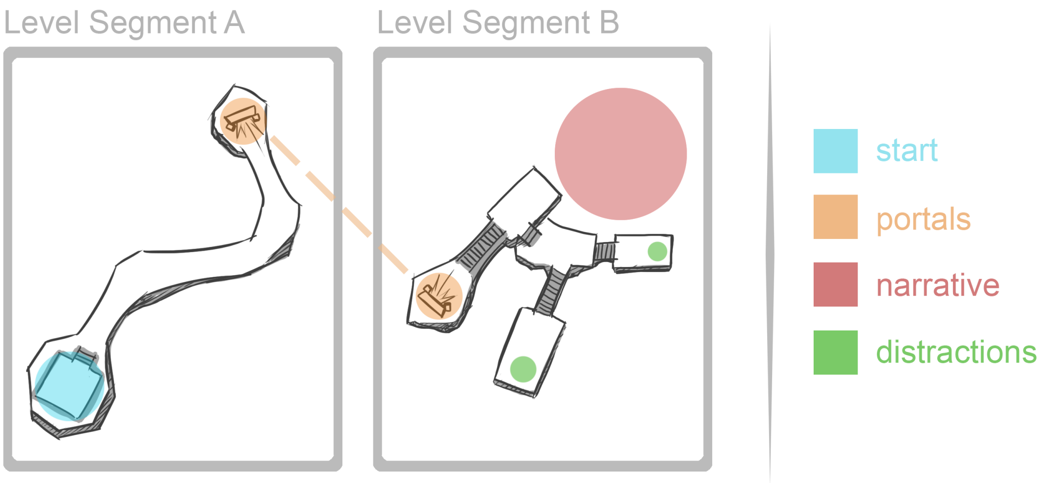

Figure 3.2: Levelsegments.

As demonstrated in Figure 3.2 we designed our level as a set of connected pathways and decided to split it into two distinct segments. In both segments the corresponding portals can be used to bridgeover onto the other area. Switching areas depends on the portals' activitiy status, which in return is controlled by the current state of the game. While each segment fulfills different tasks, their seperation further increases control over the experiment.

- **Level segment A**
  This is where the player's starting point. The entire segment serves two purposes:
  1. To address possible noise resulting from unfamiliarity with the game's controls. If players are unfamiliar with first-person controls they first need to practice it. This process could falsify our results. Within segment A the player gets taught how to move and look around. When entering the portal, the player will not only progress in terms of our study, but simultaniously proves that he understood the basic principles of controlling his character.
  2. It is believed that switching from interactive gameplay to passive cut-scene may potentially disrupt the flow of the game. With the narrative taking place in B, segment A can buildup a possible flow to be disrupted and measured afterwards. Without A, the player would be instantly confronted with the narrative, resulting in no possibility of developing flow in advance.
- **Level segment B**

The Stage is located within B – this is where the narrative takes places. Shortly after arriving through the portal the scripted set of story-driven events will start running its course. During story progression the portal is inactive, resulting in the players' inability to leave segment B until it has finished. Other than that they have full freedom of exploration, excluding environmental restrictions. To further enhance our results we decided to implement distractions for players to look at and interact with. We figured that if there is no other option than observing the narrative, the players will most likely observe the narrative. Therefore offering no other options would render the study's information gain to zero.

Addressing the cut-scene
One of a cut-scene's advantages lies in the director being able to control the viewpoint of the player. This in return provides a wide variety of tools for the director to showcase the narrative's current point of interest. NERFP prevents this due to its continuous first-person perspective. However, there might be the possibility that when watching scripted events in NERFP, players naturally grasp the points of most importance and adjust their view accordingly. We want to address this hypothesis in our observation by artificially modifying the narrative space in several ways:

- Increase the scale of the Stage and all its components (men, jukebox, etc.)
- Decrease the distance between Stage and player structures
- Decrease the first-person camera field of view to 60° (originally 90°)

The mentioned changes make it harder to fit the entire narrative space into the player's field of view. In theory, this should force them to actively search for the current point of interest and bring it within range of vision by manually moving their viewpoint.

3.1.3 Game structure

Comparing narrational methods:
In order to directly compare the effects of NERFP and cut-scene, we decided it would be reasonable to implement two instances of the game, and let each participant play both of them:

- NERFP playthrough
  The players start in segment A. After entering the portal the scripted story-driven events get triggered. Players remain in control over their character and are free to either explore or watch the narrative.

- Cut-scene playthrough
  The players start in segment A. After entering the portal, a cut-scene starts, featuring the same scripted events as in the NERFP playthrough. In contrary, the players' inputs are disabled, with their viewpoint imitating the directed-camera movements of the original shortfilm. After the cut-scene ends, players still have the possibility to move around and explore the area.

The layout of our game now depends on the way we want to measure player data. Gathering information solely through a questionaire feels unreliable since its results are heavily influenced by factors like mood, understanding and personality of our attendees. In the end we decided to use a mixture of both questionaire as well as a tracking-system, logging ingame player data over time.

Agreeing on using a realtime tracking-system results in our final structure of the study:

1. Gather personal data (age, et cetera)
2. NERFP playthrough
3. Cut-scene playthrough
4. Questionaire

Since we need each participant to play both playthrough instances – and they cannot be experienced simultaneously – the playthroughs need to be put in a specific order. Recapitulating, we are only interested in player behavior during the scripted narrative event. In the cut-scene instance players can't move during story-progression, resulting in having no use for tracking. Additionally, if we had decided to let our participants play the cut-scene first, they would have seen our emphasis on the embedded narrative as well as where to look at, due to the scripted camera perspectives. As a result, their behavior in the subsequent NERFP playthrough would have been rigged.
By procedure of exclusion it was necessary to make them play the NERFP instance first and the cut-scene playthrough afterwards. Concluding, the overall playthrough-structure is demonstrated in Figure 3.3.

3.1.4 Visual cues

As in *Half Life*, we wanted our NERFP game to have as few instruction text-prompts as possible. Instead we relied on giving visual cues to guide our players through the level.

Readable objectives

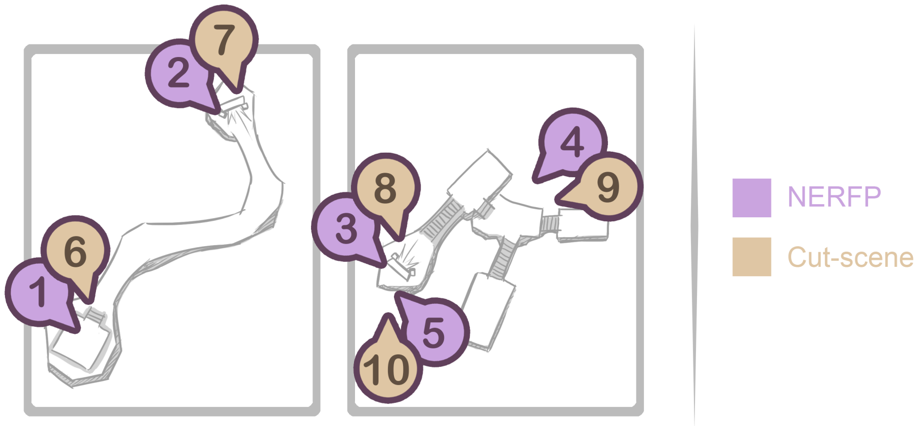

Figure 3.3: Game Structure: Players need to replay the game twice. Both instances begin on segment A and end with reentering the portal on segment B. First comes the NERFP playthrough with data tracking, then comes the cut-scene playthrough

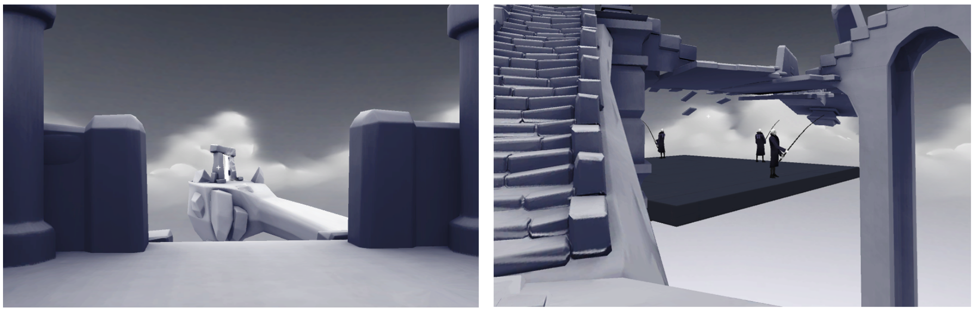

Figure 3.4: Every time the player was confronted with a new environment, he could immediately see the next objective.

Locations and objects of importance are placed in line of sight of the player. This method is applied two times, as illustrated in Figure 3.4.

1. When spawning, players face the portal which they need to enter in order to progress to segment B.
2. After getting teleported to segment B, players immediately see the Stage our embedded narratives takes place.

Distraction-design
The visual representation of our distractions was chosen in a way to blend in with the environment and its embedded narrative. Inspired by the methods Jenkins described in his paper, we thought that players should come to their own conclusions of what happened to the owner of coat 42, or learn that the jukebox was interactable and played music upon activation by observing the narrative. The appearance of our instructions was deliberately linked to the narrative as a result of applied environmental storytelling (Figure 3.5).

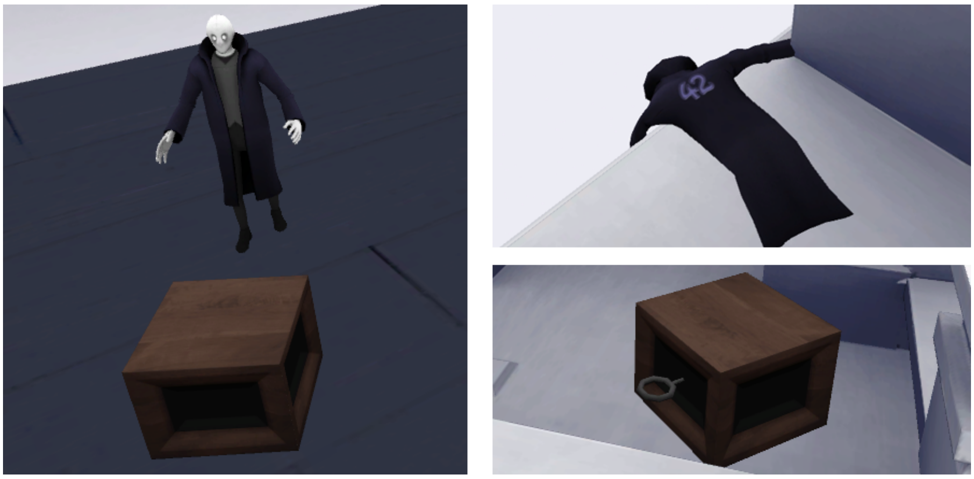

Figure 3.5: Left: Embedded narrative. Right: Environmental distractions.

3.1.5 Data measurement

Online distribution
To reach as many participants as possible within the given timeframe, we decided to value the benefits of online distribution over the control of local observation. We figured

that providing a way to access our study over the internet and participate through a homecomputer would take less time and reach more people than inviting attendants to visit our faculty and letting them play the game locally. In addition we assumed that the results to be more natural and unbiased due to the normality of participants playing games on their personal computer in an environment familiar to them. On the downside we were reliant on the participant's honesty in terms of them answering questions to their person and the experiment.

The data we were planning to receive from our participants can be classified into two groups:

- **Questionaire Data**
  Information players were asked to provide filling out input-fields, based on person and opinion.
- **Tracking Data**
  Information logged by an algorithm during participants' NERFP playthrough.

Questionaire data
It is important to us that during the study participants would retain their anonymity. That is why we ask only for their age and estimated gaming-experience, measured in average hours playing videogames per week. In order to prevent possible falsification due to sending multiple data submissions, we use of the players' MAC addresses as an unique identifier when receiving data. This method both respects the anonymous nature of our study, as well as provides an unique digital fingerprint for possible damage limitation.

In addition to the participants' personal information, the most interesting question we want them to answer is which playthrough they personally prefer; NERFP- or cut-scene. A provided text input-field should then be used to give reason on why they favor one technique over the other.

Tracking data
Within the Game structure section we pointed out that the narrative development during our NERFP playthrough is the only segment reasonable for tracking player data. To guarantee high precision measurement we decided to take 30 samples per second during the tracking procedure. With the narrative's total length of 270 seconds, a log requires 8100 samples in total.

The next step is to determine what attributes to include in one sample. Since possible player interaction was mostly confined to exploring, the log has to contain at least the following attributes:

Name	**Datatype**	**Description**
Current Time	float	Time passed since application was started
Player Position	Vector3	Player coordinates in world space
View-Direction	Vector3	Normalized direction the player is facing

At this point it is necessary to define the new term **Point of Interest**
The study's embedded narrative is based on a shortfilm. A film is composed of different shots, captured by a camera. The current Point of Interest (POI) is hereby defined as the cut-scene camera's FoV projected into 3D space, represented by a sphere collider (See Figure 3.7).

In order to receive significant information regarding player narrative perception, we included two additional attributes *StageHit* and *POIHit* to our sample. From a storywriter perspective it is important to know whether players in NERFP are watching the events on Stage, and if so, whether they are able to identify the event's current POI. In order to answers these questions we implemented a system which simulates the simplified idea of looking at something.

First we emit a ray with its origin set to the player's position and its direction set to the player's view-direction vector. This represents the player's line of sight. If the ray intersects with a collider on its path, we know that the player is currently looking at it. We then add invisible colliders enclosing the Stage as well as the current POI (see Figure 3.6 and Figure 3.7, respectively). In order to track whether the player observes the Stage or the current POI, all we need to do is to scan for intersections between the player's line of sight and our specified colliders. The result of those scans is stored as boolean value within the *StageHit* and *POIHit* attributes of our sample.

Since every change in camera perspective results in a new camera FoV, POIs must be updated in position and scale. In order to identify the scene's current POI we added both an integer value **POIIndex** and a Vector3 **POIPosition** to the sample.

Later it occured to us that our simplified "looking-at"-simulation is inaccurate. There is

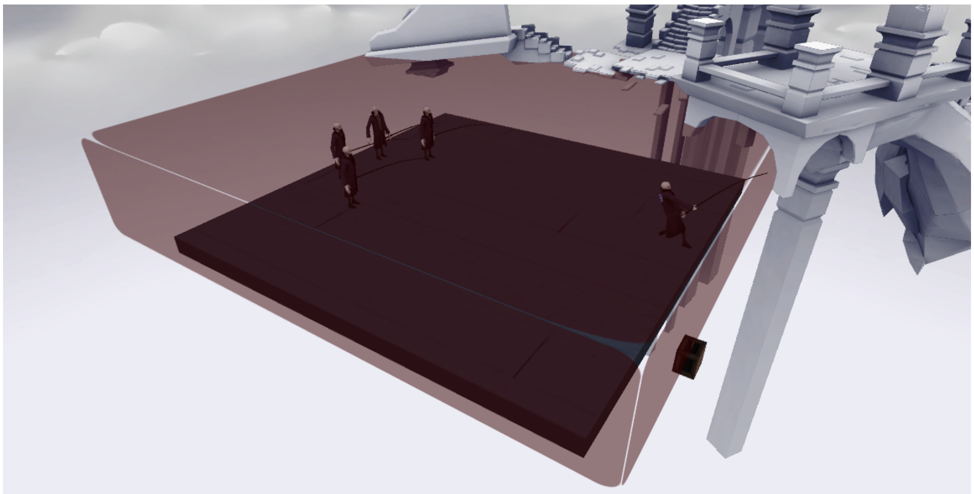

Figure 3.6: Highlighted in red: A to the player invisible collider, enclosing the Stage. If it registers an intersection with the player's viewdirection, the *StageHit* value of the current sample is set to *true*.

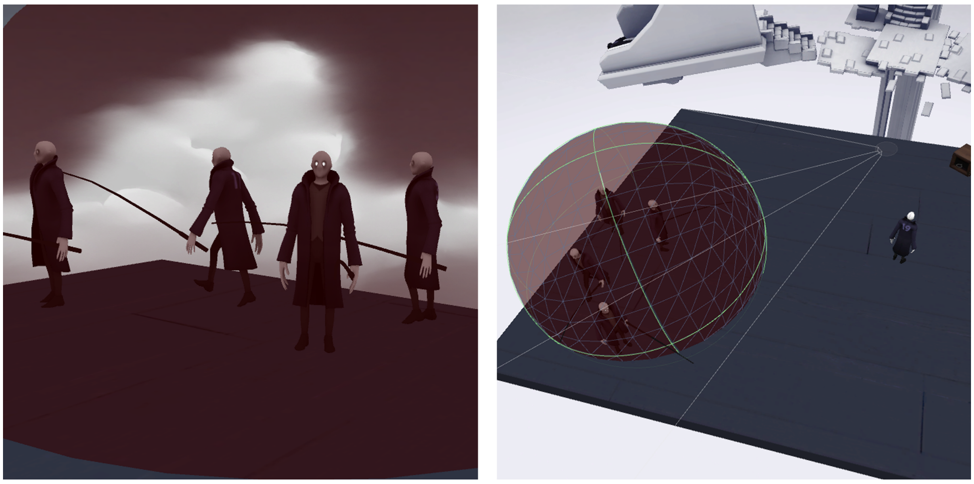

Figure 3.7: Left: Current narrative portayed through cut-scene perspective.
Right: The current POI, based on cut-scene camera.
Invisible POI collider visualized as red sphere.

a high chance of the POIHit reporting false (indicating that the player did not look at the current POI), although its content is clearly visible on screen and therefore observable by the player. This is due to the player's view-direction vector having its origin in the center of the screen. If a POI collider is partially visible on screen but does not cross its center, the scan results in a false-negative. An example of this phenomenon can be seen in Figure 3.8

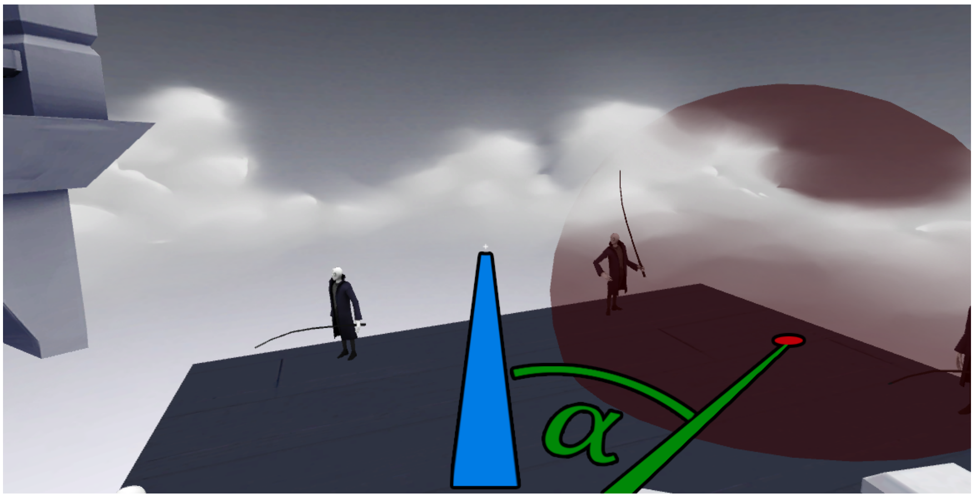

Figure 3.8: Blue: View-direction vector.
Red: POI position and collider.
Green: POIDA.
In this case the player can see the events happening within the POI, although the view-direction vector doesn't intersect with the POI collider

To counteract this unwanted behavior we added our last attribute **ViewPOIAngle** to the sample. The ViewPOIAngle (or POI Deviation Angle, short: POIDA) is the angle span between the player's view-direction vector and the vector pointing from player position to the current POI position. Figure 3.9 shows its formal calculation, whereas Figure 3.8 visualizes it as α. If the player looks at the exakt position of the current POI, the POIDA would be zero degrees. If the player however would look at the exact opposite direction, the angle would be 180 degrees. Consequently this angle should provide an increase in accuracy and significance regarding our POI-specific measurements.

An overview of the tracked attributes per sample can be seen in Table 3.1.

```
Vector3 playerPosition;
Vector3 playerViewDir;
Vector3 poiPosition;

Vector3 playerPOI = poiPosition - playerPosition;
return Vector3.Angle(playerViewDir, playerPOI);
```

Figure 3.9: Calculation of POIDA in Unity C#

Name	**Datatype**	**Description**
Current Time	float	Time passed since application was started
Player Position	Vector3	Player coordinates in world space
View-Direction	Vector3	Normalized direction the player is facing
StageHit	bool	Indicates whether player watches the Stage
POIIndex	int	Current POI unique identifier
POIPosition	Vector3	Current POI coordinates in world space
POIHit	bool	Indicates whether player watches current POI
ViewPOIAngle	float	Deviation of viewdirection measured in degrees

Table 3.1: Attributes tracked per sample during NERFP

Receiving data
At this point the study was uploaded onto a filehoster and available for everyone to participate. As a result of allowing users to play the game on their homecomputers, we did not have direct access to their logged files and playerdata. Therefore we needed to think about a way to export and access the data in automated fashion.

In our approach we took advantage of *Simple Mail Transfer Protocol* (SMTP) methods provided by the C# library *System.Net.Mail*. The idea behind it is simple. After the users finished the study on their local PCs, our application executed the following tasks:

1. Save the log entries into a Comma Seperated Value (CSV) file
2. Attach the file to an auto-generated email
3. Send the email to a study-specific email account via SMTP

3.2 Results

3.2.1 Participant data

During four days of online distribution we received a total of 45 submitted logs. The majority of our participants were between the age of 21 and 24. The overall mean age equals 24. An accurate visualization regarding the age of our participants can be seen in Figure 3.10

Our participants' average gaming experience – measured in hours of playing videogames per week – equals 17.
Considering that the NPD labels persons playing 22 hours weekly or more as coregamers[1], the average participant of our study is experienced in gaming.

3.2.2 Questionaire data

The preferred-technique distribution turned out almost even. With 23 out of the 45 votes in total, NERFP was just slightly more favorable among our participants than the cut-scene presentation.

[1]https://www.npd.com/wps/portal/npd/us/news/press-releases/the-npd-group-reports-34-million-core-gamers-spend-an-average-of-22-hours-per-week-playing-video-games/ (in: 2016)

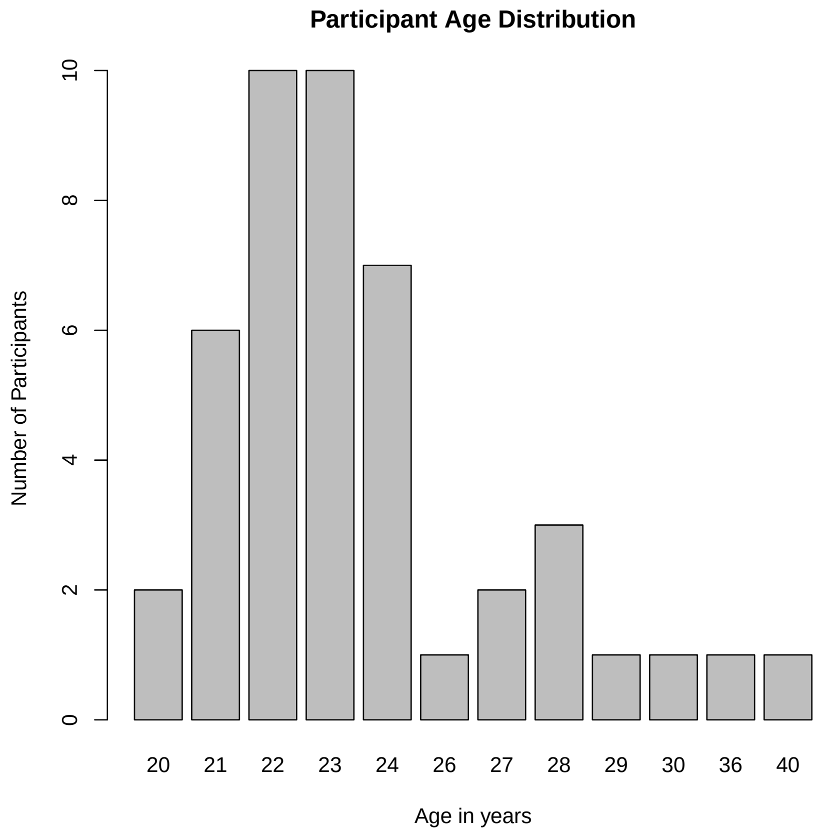

Figure 3.10

NERFP	(23)	**Cut-scene**	(22)
Being able to move and explore	(10)	Clear focus and determination	(12)
Freedom of choice	(9)	Not missing any parts of the story	(8)
Increased feeling of immersion	(7)	Certainty regarding gameplay	(7)
Felt more mysterious	(3)	Narrative easier to understand	(7)

Table 3.2: Reasons why participants preferred one type.

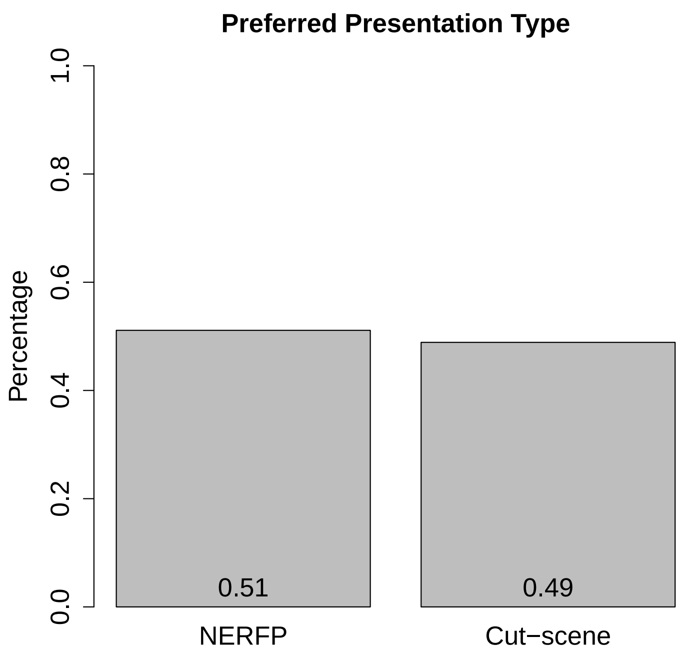
Preferred Presentation Type
Percentage
0.0
0.2
0.4
0.6
0.8
1.0
0.51
0.49
NERFP
Cut−scene

Figure 3.11

Table 3.2 shows the main arguments people stated for favoring one narration-style over the other. For example: Twelve participants justified their preference of the cut-scene because of its clear determination, in contrairy to NERFP which left them clueless on what to do.

3.2.3 NERFP tracking data

By evaluating the logfiles we came to the following results.

Stage watch rates:
During the 270 seconds long tracking-procedure, players on average looked at the Stage 69% of the time. That means for every minute of observing the narrative, players spent 27 seconds on doing something else.

As seen in Figure 3.12, the amount of players interested in the events on Stage increased over time. In the beginning 60% watched the Stage for 160 seconds at a semi-stable rate. From then on the graph shows an increase of 25% within the next 110 seconds, disrupted by a 10% decrease inbetween.

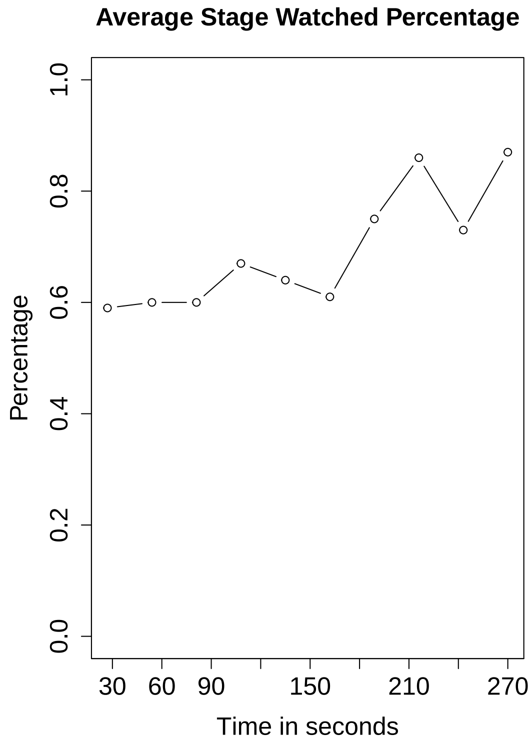

Figure 3.12

POI watch rates:
On average, 34.8% of the time player's view-direction vectors intersected with POI colliders - indicating that during a third of the tracking duration POIs were identified and watched.
This statistic also includes entries of players not watching the Stage but e.g. interacting with the jukebox. We wanted to know how many of those players who already observe the narrative also watched the current POIs. After removing entries holding *false* in their *StageHit* variable, the POI observation rate increased to 49.5%. That means about half of the time players who observed the narrative also looked at the current POI.

POI deviation angles:
When watching the Stage, the average POIDA equals 30.44° (see Figure 3.13). The mean POIDA of ignoring the Stage holds 87.64°. Figure 3.14 illustrates both angles by means of example player- and POI-positions.

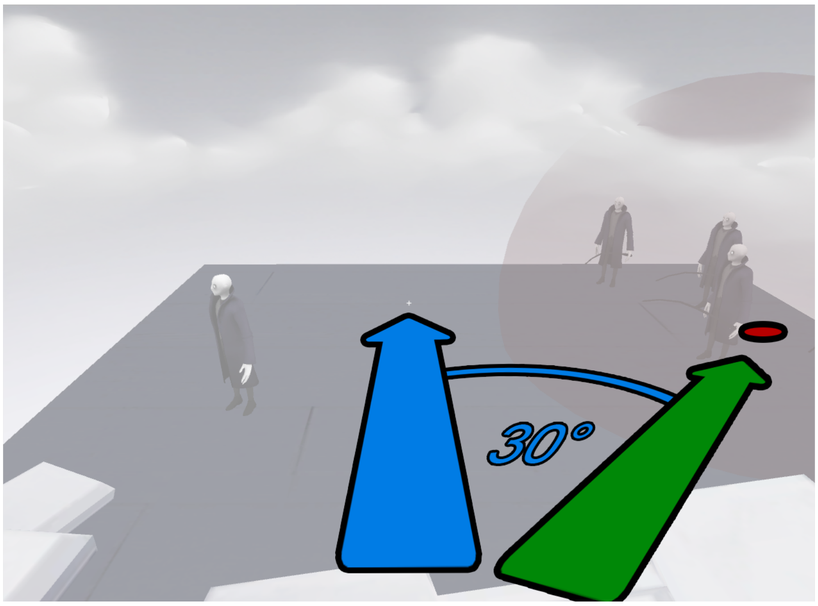

Figure 3.13: Average angle difference in player view-direction and POI position when watching the Stage. Illustrated from the players' first-person perspective

Player movement:
In order to comprehend player movement, we analyzed the *PlayerPosition* variable of our survey reports. Therefore we set up a frequency table covering tiles of non-vertical position data (X,Z) and plotted them into a heatmap. Figure 3.15 shows a heatmap visualizing average player-positions over the full tracking duration. Please note: To increase the heatmaps' readability the color distribution is not entirely linear. As seen in the legend of Figure 3.15, a shift from yellow to orange is of much more significance than blue to teal.

Although averaging the total player-positions helps to identify hotspots within our game-environment, an over-time representation would provide indications on our participants' decision-making. Hence we divided our narrative's total length into ten uniform segments and plotted heatmaps for each segment individually. Figure 3.16 and

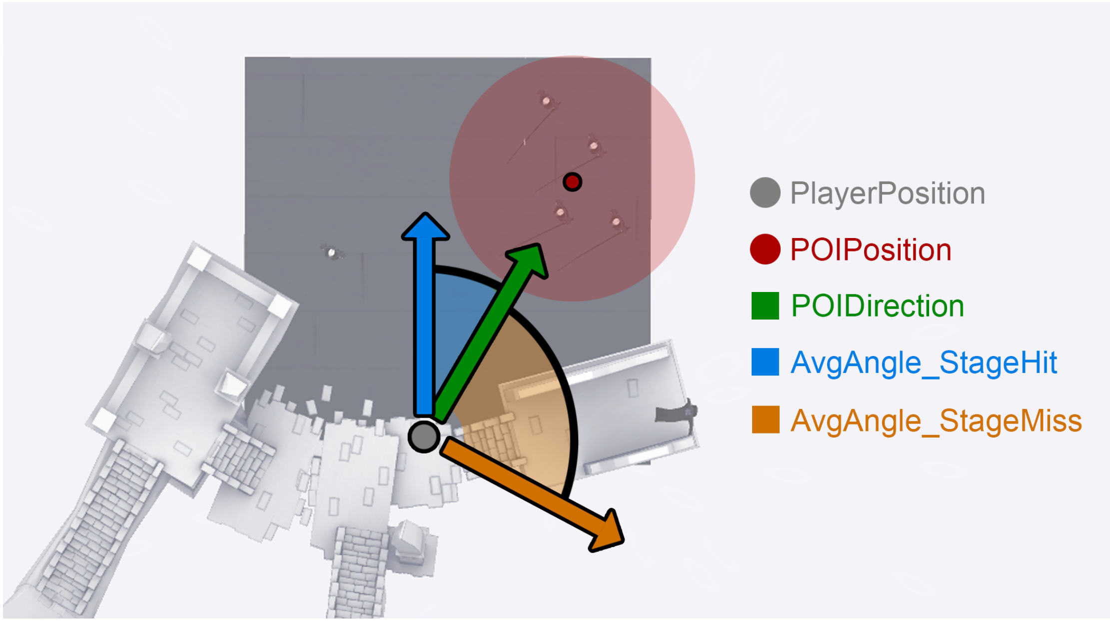

Figure 3.14: Visualization of angle deviations between player view-direction and POI position

3.17 show the resulting heatmaps, covering average player-positions over time within a scope of 27 seconds each.

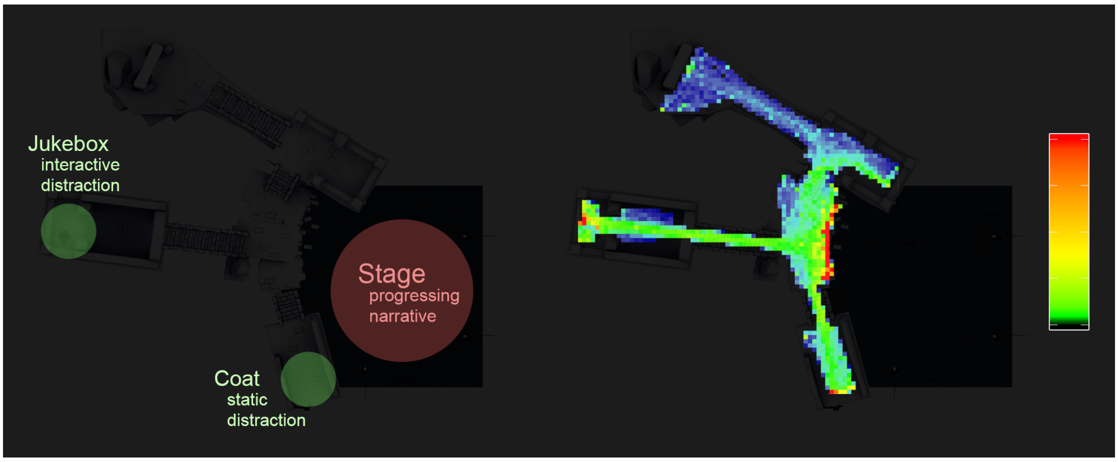
Jukebox
interactive
distraction
Stage
progressing
narrative
Coat
static
distraction

Figure 3.15

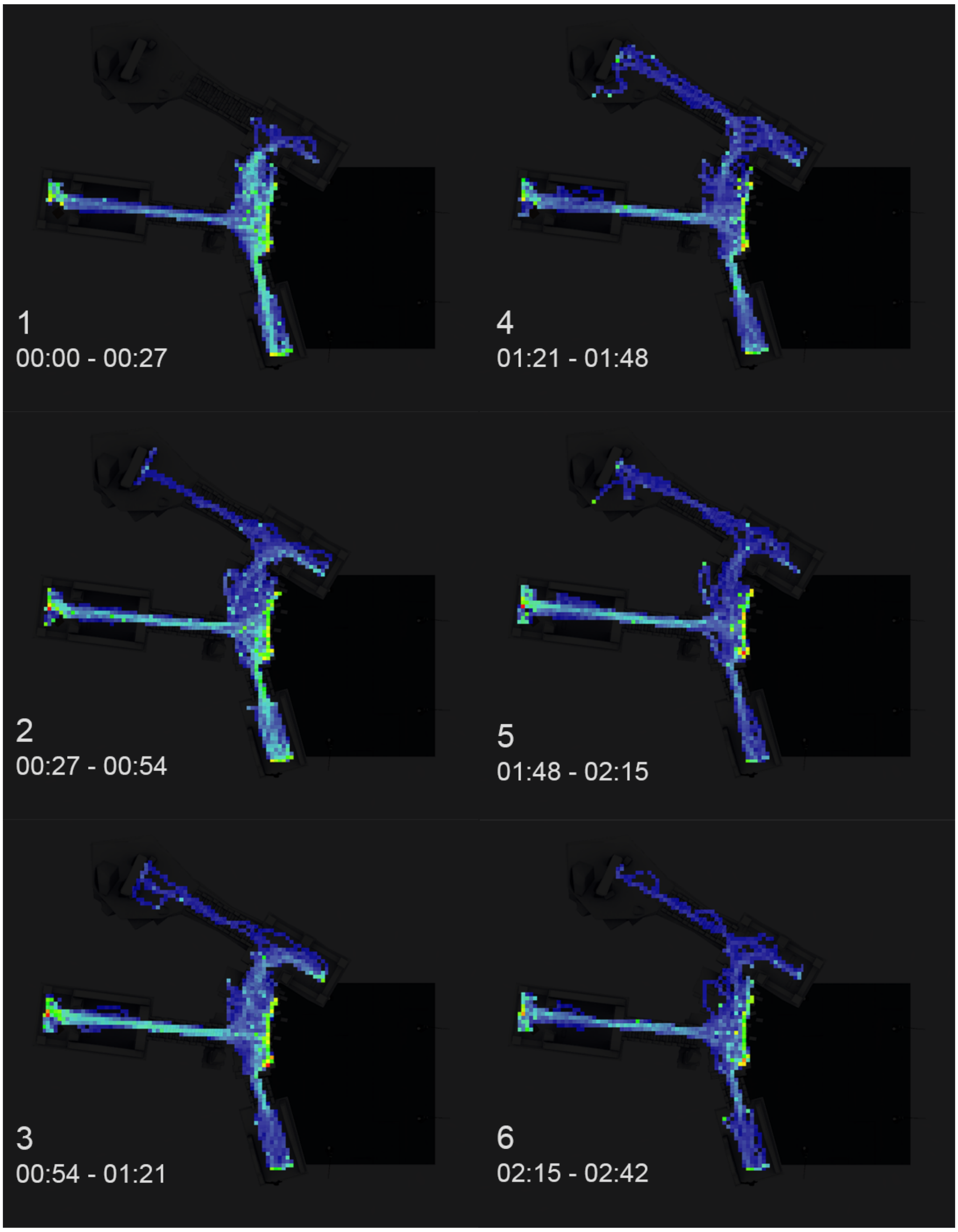
1
00:00 - 00:27
4
01:21 - 01:48
2
00:27 - 00:54
5
01:48 - 02:15
3
00:54 - 01:21
6
02:15 - 02:42

Figure 3.16

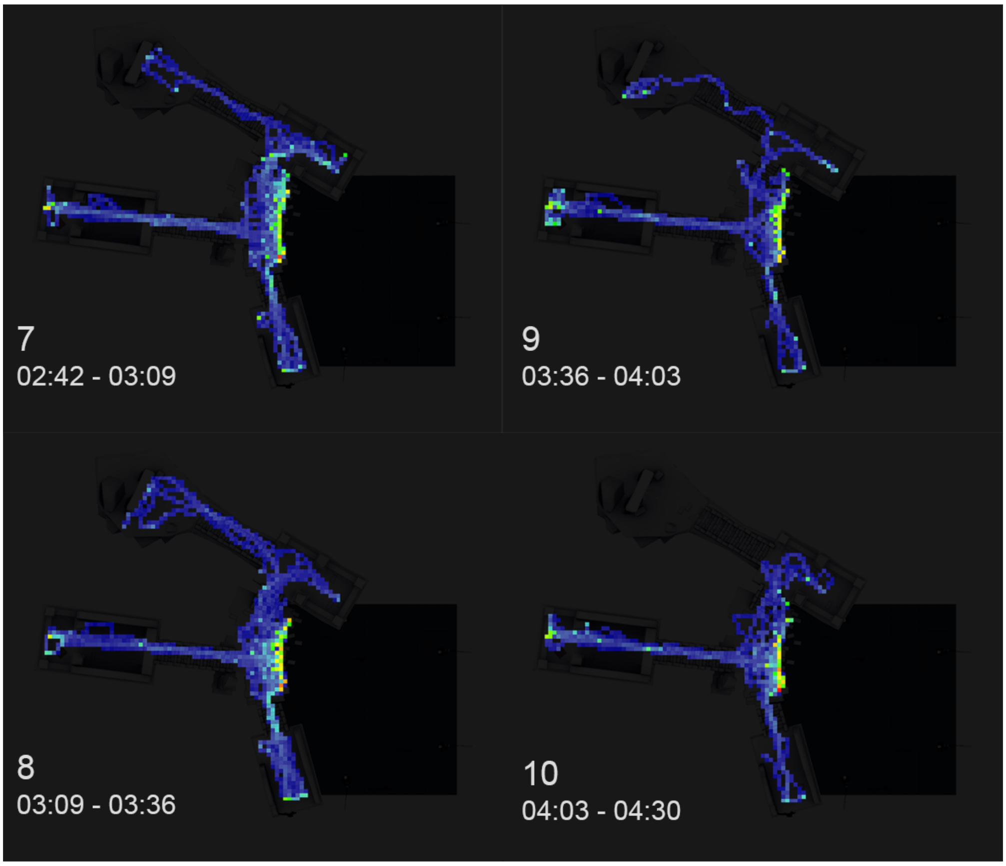

Figure 3.17

4 Discussion

4.1 Heatmap Interpretation

The heatmap displaying player-positions over full duration (Figure 3.15) shows three clear peaks:

1. In front of the Stage
2. At the static distraction (coat)
3. At the interactive distraction (jukebox)

This matches our expectations and confirms our decisions regarding leveldesign. The aggregation in front of the stage shows that the embedded narrative was recognized as well as seen as a matter of importance. Hotspots on both distractions on the other hand indicate them being objects of interest, therefore fulfilling their purpose.

Looking at the series of heatmaps illustrating player-positions as a whole (Figure 3.16 and 3.17), two facts stand out:

1. Portal activity checks
   With the exception of heatmaps # 1 and # 10, every plot shows players trying to leave the segment before the narrative has finished.
2. Distraction effectivity
   Every plot shows at least one person lingering in the area of a distraction.

Matching with our data of Figure 3.12, at no point during the story-progression every participant observed the narrative. This indicates a guaranteed loss of narrative information when placing story in a NERFP scenario. This assumption gets encouraged by the fact that a considerably high number of players would have left the segment if they weren't restricted by the portal's inactivity.

Comparing each heatmap within their temporal context, we could identify multiple patterns.

- Within earlier illustrations, the space inbetween our pre-defined sources of interest takes up higher proportions of player activity. The data is scattered, more widely spread. It then gradually clusters until clear hotspots become visible. This indicates a state of disorientation, probably evoked by being confronted with an unknown area. With advancing time, our players became more familiar with their surroundings, resulting in target-oriented pathing.
- In later stages, distractions were visited less often than in the beginning. This could be due to players understanding that they were supposed to watch the story, or them simply losing interest after realizing that the distracting items have no influence in the game's objective.
- Six participants stated within the Questionaire that, despite our design decisions of actively trying to guide players' view, at start they simply overlooked the Stage due to its unobtrusive appearance. Considering the high amount of activity happening early on in locations of distraction, this is also reflected by our position data. More people might have changed their priorities if we had used different methods of drawing attention, e.g. visual or aural cues. In addition, their initial disorientedness could be a factor to the matter as well: Would have activity on Stage been more apparent if particpants were familiar with their surroundings at the time the event started? Introducing important game elements within a to the user unknown environment could be a matter of further research.

4.2 Questionaire Reasoning

Players reported increased feelings of threat, mystery, realism and helplessness during the NERFP playthrough. Out of the 23 participants who voted for NERFP as their preferred narration tool, seven reasoned their choice with an increase of emotional connectedness. In one case a player even reported the constant fear of being „attack[ed] from behind", although neither did we actively try to provoke such a feeling, nor did the original shortfilm. Contrairy, considering the fact that seven of those who favored the cut-scene claimed to have a better understanding of the narrative, as well as eight who stated they missed parts of the events on Stage during their NERFP playthrough, our results correspond to the assumptions of Mitchell and Clarke regarding the advantages and disadvantages of first-person viewpoint.

Probably the most significant hint we have gotten through the Questionaire was the amount of players reporting cluelessness about the game's objective. Twelve participants stated they were unsure what to do, because they thought they would have „to do something on [their] own". More remarkable, seven players also believed at first that the interactive jukebox was a tool to „achieve some reaction from the game"and „accomplish the quest". From their statements we derive the assumption that a big portion of our participants was expecting a conflict to resolve or a goal to reach, whereas we intended to present them a sequence of narrative actions within an interactive context. This assumption would reflect the findings of Miki Norgaard Anthony et al., which stated that within their experiment „[p]layers comprehended the story through goals and actions [...]" and that „[their] goal-oriented approach [...] lead to overlooking and underreading narrative elements which were not interactive."

Regarding the jukebox being associated with an inherent game-mechanic, we conceived two possible attributes responsible for that assumption:

1. Due to the object's interactivity
2. Due to the object having identical visual appearance as an item within narrative context

The jukebox was the only interactable object within the game-world. The box on Stage on the other hand shared the same model as the interactive distraction, which in return could have evoked a correlation between both objects in the mind of our players. Since both attributes were present from the start, we cannot trace back the reported experience to one of both possible origins. This could be a subject of future research.

4.3 Point of Interest Analysis

In order to fully grasp the meaning of our POI-related results, we needed to look at every partial aspect and bring them into a collective context. These mentioned aspects are:

- POI Watch Rate
- Stage Watch Status
- POI deviation angle

The overall POI watch rate of 34.8% was way more than we expected, considering that the narrative was not even watched in 31% of the time, and it being impossible to watch the current POI without watching the Stage. Consequently we were interested in the accuracy of players identifying and watching the POI in case of them already watching the Stage. To us, the resulting 49.5% of correctly observed POIs seemed both

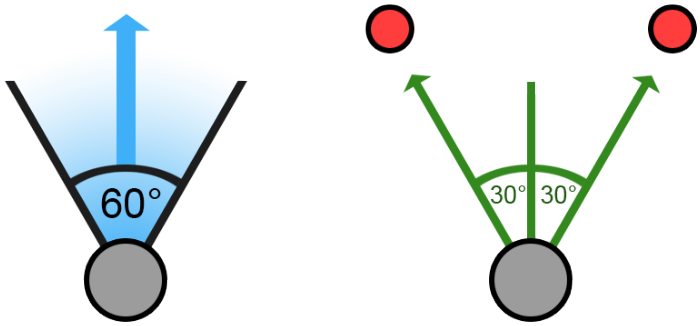

Figure 4.1: Blue: Player's view-direction vector and FoV.
Green: POIDA when watching Stage.
Red: POI positions, projected with POIDA

too high and inaccurate. This number basically states that in games, a story director, ordering and presenting narrative information for the viewers to be watched in the most compelling way, is redundant in 49.5% of the time due to the fact that players naturally comprehend what information on screen is of most importance.

That is why we consulted the POIDA. Our averaged POIDA of 30.44° when watching the Stage indicates a special case. As explained in the Design Decisions section, we artificially decreased the standard FoV from 90° to 60° in order to achieve more meaningful results regarding player POI observation. As it stands, the average POIDA of people watching the narrative is almost the exact half of their FoV. It is important to note that 30.44° is an absolute value, meaning it can be applied to a player's view vector in any direction (applying it in infinite directions would form a cone with a 60.88° apex). As illustrated in Figure 4.1, the angle implies that on average every POIs' center was located at the edge of the player's FoV. POIs on the other hand depend on the narrative and the movie's camera perspective. In our narrative, the theme of having one group balancing out the action of the other, caused our POIs to be positioned on the edges of the platform in bipolar fashion.

Concluding the statements above, we assume that players positioned themselves in such a way that both opposing edges of the platform lined up with the horizontal borders of their viewpoint camera (Figure 3.13). In that case their vision range would contain the entire narrative space. As a benefit of this method, the player would not need to adjust the camera since all narrative information has to happen within the limited narrative space which the player already observes. As a downside however it would mean that, projecting this technique onto other scenarios or games with similar story presentation environments, players would have to stand farer away in order to see the whole narrative spectrum, which in return limits both their perspective and their ability to see details.

4.4 Limitations

As we designed our experiment, we were not aware that our method of measuring players' watching-behavior is inaccurate. Registering collisions with rays emitted in a player's facing direction does not represent the full spectrum of a player's FoV, but rather its center. Therefore we suggest to include eye-tracking software within further research of the subject, in order to guarantee meaningful results.

In retrospect, because of its bipolar located events and its frequently used wideshots, our chosen narrative was not suitable for measuring POI observation rates as well. This is due to the way POIs represent camera angles. Wideshots - camera perspectives which encompass large spaces and whole sceneries - cause a POI's radius to be enormous. Since the shortfilm our narrative was based on used many wideshots instead of close-ups or more centralized perspectives, our POIs often times occupied large portions of narrative space. As a result we measured high rates of player-POI-observation, contrairy to our assumption that participants seldomly adjusted their viewpoint.

Additionally, the results of this study are influenced by the order we introduced both game-instances. All our data featuring direct comparison of NERFP- and cut-scene presentation style inherits a biased factor, caused by the fixed sequence of playing NERFP first and cut-scene second. This predominantly affects the Questionaire. Although we explained our reasoning behind this decision, it is important to be aware of this matter when using our data. An alternative approach would have been to let participants play only one single instance out of both possible playthroughs, preferably chosen by randomization, and compare the average results of both groups. This method would hold the advantage of having obliterated possible distortions regarding data dependency, but would also require a playerbase of at least double the size of ours in order to provide enough data to work with. Considering the small timing window this approach was not possible to carry out.

As the last limitation of this study we wanted to address the fact that within the Questionaire we asked our participants to justify their preference of choice in an open-ended-question. Our results registered those which deliberately understood their reasoning and managed to transform it into text. This however implies a high chance of our data being only partially complete, since players might have felt in a specific way but were unable to realize its significance or failed at expressing it. Consequently, absolute numbers regarding the Questionaire should be labelled as a minimum relative to our database. It is unlikely that participants knowingly reported false information, but likely they unknowingly witheld true information.

5 Conclusion

As demonstrated in our study, narrative in games remains a topic of controversy. With an almost even preference-distribution between unguided freedom of action and restricting filmic presentation, there is direct evidence that two parties make conflicting demands; which gaming has to satisfy both. No solution can be found however if there is no research, therefore we must continue to explore the contradiction which is narrative game.

In our study we provided insight to a genre which handles pre-directed storylines in a different way to the current state of the art. Although we have neither found direct causalities nor invented novel methods of storytelling, none of this was part of our intention. Our goal was to observe the effects of NERFP, as well as to compare our results with the popular cut-scene presentation style. Within our findings we unvealed new phenomena worthy of investigation as well as confirmed already existing theories. We showed that NERFP is capable of presenting embedded narratives to some degree, but is also assumed to, referring to Atkins reasoning behind *Half Life*'s success, require a truly immersive and flow-heavy gameplay in order present its inherent story with full potential.

Glossary

computer is a machine that. . . .

Acronyms

TUM Technische Universität München.

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