

## Story worlds and virtual environments: Learning from oral storytelling

Ilda Ladeira  
 CVC Laboratory  
 Department of Computer Science  
 University of Cape Town  
 iladeira@cs.uct.ac.za

David Nunez  
 ACSENT Laboratory  
 Department of Psychology  
 University of Cape Town  
 david.nunez@uct.ac.za

### Abstract

*Oral storytelling is an effective way for engaging audiences in imaginary story worlds and has been used to create a sense of presence in non-real environments in audiences long before the advent of virtual reality (VR). We present techniques used by storytellers to create and maintain a sense of presence in story worlds and interact with audiences as observed in an ongoing ethnographic study of professional storytellers in the District Six Museum in Cape Town, South Africa. Four techniques are presented: repertoire and improvisation, accommodating specific audiences, interaction with audiences, and holding audiences' attention. We propose that these techniques may be applied to virtual environments (VE's) to facilitate presence and user interaction. We conclude that these techniques are effective in oral storytelling because they serve to maintain a continuous interactive feedback loop between the storyteller and audience. We propose that VEs which are similarly aware of and reactive to users can be effective in the same way. Specific ways in which these techniques can be implemented in VR are also discussed.*

**Keywords---** oral storytelling, virtual reality, avatars, virtual environments, presence, engagement, interaction.

### 1. Introduction

The study of presence arose from virtual reality (VR) researchers' interest in understanding human experience in non-real environments. However, this phenomenon is certainly not new to human experience; feeling present (usually) occurs in the real world [1]. Presence only became an explicitly interesting concept when researchers realized that it is possible for someone to feel as though they are present in places other than the immediate real world, as happens in compelling virtual environments (VEs) [2]. Indeed, the 'presence as illusion of non-mediation' is one of the best accepted definitions of virtual presence. This definition posits virtual presence as occurring when the user does not perceive a VE as being mediated by a computer system [3]. On the whole, presence has traditionally been discussed and studied in the context of virtual or non-real environments. But, even this is not new to human experience: presence in non-real or imaginary places has existed since

before digital VR through the phenomenon of storytelling. Storytelling aims to draw an audience into a story world which is distinct from their immediate, real environments. Historically, this process has been implemented through many different media, namely text, radio and film, as well as combinations of media [4]. Accordingly, various techniques have been devised to exploit each medium to draw audiences into story worlds. However it is the first, and most fundamental, medium which provides an exemplar for engaging, interactive storytelling: the human storyteller. Oral storytellers use the spoken word and their physicality to convey a story world. Furthermore, they create story experiences in collaboration with their audiences through a variety of direct interactions. In this paper we will discuss techniques used by oral storytellers to create a sense of presence and engagement in a story world and interact with audiences. Examples of these techniques will be illustrated through observations from an ongoing ethnographic study of professional storytellers at the District Six Museum in Cape Town, South Africa. We shall discuss how these techniques may foster the effective creation of presence and meaningful interactions through avatars and VEs.

### 2. Presence and engagement in oral storytelling and virtual reality

Most fundamentally, storytelling deals in conveying narrative content from a storyteller to recipient(s). In other words, the process of storytelling may be seen as having three major components: a sender (the storyteller), a receiver (the audience) and a message (the story) [5]. In order to ensure that the message reaches its receiver(s) as intended, the sender employs a number of techniques to focus an audience's attention on the story world and to convey the message as vividly as possible. An obvious example is one we can observe in almost any young children's school story time. To engage and hold a group of children's attention, a teacher will likely use animated voices along with exaggerated hand gestures and facial expressions. A really enthusiastic teacher might even involve the children in the storytelling by asking questions such as "What do you think happened when the princess kissed the frog?" along the way.

A Celtic definition posits a storyteller as:

*“...someone who can enter into another reality and who promises to negotiate between the audience and that other reality – to tell the audience into another place and time.”* [6]

Furthermore, the term ‘transportation’ has been used in narrative theory as:

*“...the extent to which recipients were ‘transported’ into the world of the narrative and became involved with its protagonists.”* [7]

This definition certainly shares some similarity to the ideas of presence and engagement in the presence literature. [7] goes on to emphasize the extent to which the ‘world of the narrative’ is ‘some distance’ from the audience’s ‘world of origin’. In terms of engagement, [8] argues that the quality of story and game experiences may vary according to a number of factors, such as the inherent interest of the content, presentation and the extent to which it directly involves the audience. Compelling storytelling aims to draw listeners’ attention away from the real world which physically surrounds them and engage them in an imagined, or virtual, world created by the storyteller. Similarly, to achieve presence in VR, one must draw the attention of the subject to the VE [9], while simultaneously excluding as much conflicting information from the outside world as possible [10].

In storytelling, this process relies on a medium (such as a storyteller or text) conveying sufficient information for the audience to parse and create an image of the story world and events in their minds. In presence the process is normally thought to involve maximizing immersion [11], although more recent work also suggests that presenting enough information of an appropriate type may also be a factor [12]. In oral storytelling, a storyteller tells a story to an audience in person. The storyteller employs various techniques to convey the story content and describe places, characters and events. A storyteller may use pacing, intonation and gestures in various ways to both convey the story content and engage their audience. The audience typically takes in the information given by the storyteller and synthesizes it into a mental picture of the story world and events. The skill of the storyteller lies in engaging the audience’s attention, conveying sufficient information for the audience to synthesize a coherent, vivid story world and incorporating audience interactions into the storytelling [6]. In this sense the receiver is a collaborator in the storytelling, since they contribute directly and it is their cognitive processing, or imagination, that completes creation of the story world [13]. Additionally, the audience may experience some sense of being present in the story world by token of focusing their attention on and being engaged in it. Depending on the extent to which characters are conveyed, audiences may become

attached to them and experience them as real (social presence). While it seems less likely, audiences may even experience a sense of the physical story world (spatial presence) depending on the amount of descriptive information received.

In contrast, VR systems provide information about the VE not through language or cues of voice and body, but through direct sensory stimuli, which may vary in terms of their immersive properties [11]. From a human information processing perspective, this is an important distinction. Language is highly symbolically coded, abstract, high-level information about the story world. Decoding it may require reference to physical properties and creating a spatial model, but it may also require reference to value laden or comparative concepts. For instance, the sentence “He saw a green, glowing orb more beautiful than anything he had ever seen before”, requires imagining not only a physical object, but also making comparisons to previous complex knowledge. VR systems, on the other hand, generally present perceptual information which does not require a great deal of symbolic decoding to process. Following on from our example, a user of a VR system would be presented with a three-dimensional green, illuminated virtual sphere, but the VR author must hope that it is perceived by the audience as more beautiful than anything they/a protagonist have seen before. The differences between oral storytelling and VR are therefore not simply differences in immersion (as one might argue the difference between graphical VR systems and MUDs is [14, 15]), but rather one of what forms of information are presented (for example symbolic or perceptual; tied to or independent from an audiences’ world view, etc.). We therefore seem to have two paths to creating a sense of being transported to a virtual world: by use of immersive displays, as is done in traditional VR systems, and by the highly interactive, audience centered techniques of oral storytelling.

Regarding mediation, one can argue a fundamental difference between oral storytelling and VR again. In VR the aim is to saturate the senses in an attempt to ‘hide’ its medium (the computer). However in oral storytelling, the medium (the storyteller) is constantly perceptible by the audience. Despite this seeming contrast between non-mediation and visible mediation, both forms do in fact aim to make the content that is being conveyed more salient than the medium being used. [6] argues that, to facilitate audience’s transportation to the story world, the storyteller should primarily act as a ‘transmitter’ and their individual person should be ‘invisible’. While the storyteller can not be physically invisible, a skilled storyteller should place emphasis on narrative content rather than themselves:

*“...the audience sees the story, not the person of the teller”* [6]

Again where VR aims to saturate with direct sensory information, storytelling aims to saturate with abstract, high-

level information coded linguistically. However both these forms aim to place *focus* on the content being conveyed rather than the medium that is rendering or conveying it.

In the remainder of this paper, we will identify a number of oral storytelling techniques used to ‘transport’ and engage audience in a story world while allowing them to collaborate in their story experience. We argue that these techniques may be successfully applied to VR systems to improve the presence and interaction experiences they produce.

### 3. Ethnographic study of professional storytellers in the District Six Museum

We have drawn the techniques we will discuss from observations gathered during the first month of an ongoing ethnographic study of professional storytellers at the District Six Museum. District Six was an inner-city suburb in Cape Town, South Africa, from which residents were forcibly removed before its buildings were demolished under the Apartheid regime. The District Six Museum, housed in a former Methodist church on the outskirts of the former area, commemorates the history of District Six and the forced removals. The museum is highly community-driven; most of the artifacts are donated by former District Six residents and a number of former residents also work at the museum. In particular, guided tours of the museum are given by two ex-residents. These tours are not focused on shepherding visitors around the museum space, but rather as a means of conveying narratives on the history of and daily life in District Six. Thus, guides are regarded as resident storytellers who contextualize visitors’ museum experience by conveying their personal memories of the District Six history.

We are currently conducting an ethnographic study of the museum’s guides in order to gain an insight into real-life oral storytelling. We are particularly interested in storytelling techniques and situations which lend themselves to engaging audiences in a story world and facilitate audience interaction. This is particularly interesting at this museum since a great deal of the storytelling is centered on essentially creating a sense of presence in District Six for the visitors. There are two guides at the museum who, apart from giving general tours, handle different types of organized groups. Noor handles school groups consisting of young children and focuses on personal narratives about growing up in District Six. Joe, on the other hand, handles groups of high-school and university students and focuses more on a more impersonal, factual history of Apartheid and District Six, including the urban and social consequences of the forced removals.

The ethnographic study will last three months in total during which three to four field visits are conducted each week. The focus of these visits is to observe the guides telling stories to both organised and ad-hoc groups. For organised tours, the guides’ spoken narrative is also digitally recorded. Participant observation is used in that the researcher participates in the tour as an audience member.

Field notes are taken to record the researcher’s observations regarding the guides’ storytelling style, explicit and implicit interactions with the museum visitors as well as variations and similarities across different retellings. The storytelling techniques we will present in this paper are largely drawn from these observations.

## 4. Techniques for creating story worlds

There are many techniques used by oral storytellers to create a sense of engagement and presence in an imagined story world for their audiences. Many of these deal with how the storyteller uses language, voice and their body. For instance a storyteller might use hand gestures, noises, character imitations and variances in tone, speed and breathing [6]. These all serve to convey the story world and events more vividly. Such methods, however, are more features of the human storyteller, and therefore likely to be too strongly linked to oral storytelling to be transferred to VR. Instead, we will focus on four techniques which may be employed by human-like avatars *or* by the VE itself.

### 4.1. Repertoire and improvisation

Oral storytelling is a structured activity, which is guided by social conventions and the competence and experiences of the storyteller. Within those broad limits, each storyteller can show a great degree of variability, which is often emergent in their interactions with the audience [16]. In effect, each storyteller develops a pool of stories over time, which they dip into for each performance [6]. While a storyteller might tell the same story many times, each retelling will vary according to the storytelling situation and the audience. In many sub-Saharan African cultures, audiences will eagerly listen to stories they have heard before under the expectation that the storyteller will bring some novel aspect to the way the story is presented (Mbothwe, M., personal communication).

This notion has been supported by our observations at the District Six Museum. Each guide has a stable repertoire of narratives and a fairly constant routine for each tour (this is especially reinforced by the fact that the guides usually speak to a great number of groups each day). The tours almost always incorporate the same two or three locations within the museum in the same order, and these are selected by each guide to fit in with their own narrative style and focus. Additionally, each guide has a repertoire of stories which are delivered in very similar ways, but are carefully varied according to the specific storytelling situations. For instance, Noor’s core repertoire is told, either in an abbreviated or extended format, to almost every group. This core repertoire consists of pointing out, on a map, where his house used to be in District Six, describing the museum’s origins, detailing the life of his immigrant grandfather and the demolition of his house. If a particular group has a long amount of time to spend, Noor will delve into his substantial extended repertoire, which includes stories about his father’s

job in the family ginger beer factory, financial hardships of his family, District Six gangs and stories of how personal friends were affected by Apartheid. However, the stories chosen from this extended repertoire vary according to the specific group. The specific form of improvisation is usually shaped by the storytellers' perception of the audience or their interactions with the audience during the storytelling.

#### 4.2. Involving the audience

A defining characteristic of oral storytelling is that the audience influences the course of the storytelling [6]. The storyteller will make conscious adjustments to their storytelling based either on their assumptions about the audience or ad-hoc adjustments based on interactions with the audience during the storytelling.

**4.2.1. Accommodating the audience** based on explicit assumptions about a particular audience group occurs very often at the District Six Museum. For groups of adults (as opposed to school groups), Noor attends to include more information about the history and social consequences of forced removals whereas this type of content is kept at a minimum for group of young school children. Adjustments are not just made based on age but also the audience's background. For instance, if Noor is speaking to a group of American tourists, he will specifically draw comparisons between Apartheid in South Africa and segregation in America. In another tour, Joe spoke to group of students from the Cape Flats. The Cape Flats are made up of the unfavorable suburbs and townships where most forcibly removed residents were made to live. In this tour Joe occasionally used the dialect of Afrikaans spoken in District Six and, now, the Cape Flats when directly engaging the audience. He also diverged from his usual repertoire to discuss the specific suburbs the students live in as a social consequence of the forced removals. Thus, Joe made a conscious effort to tap into this particular group's background and endear himself to the audience by showing that he has an inside knowledge of Cape Flats' origin, areas and dialect. These examples specifically show how explicit assumptions about certain groups consciously shape how the storytellers present content and which parts of their repertoire are included.

**4.2.2. Interacting with the audience.** According to [6], there are numerous ways in which an oral storyteller may interact with an audience during storytelling:

*Ritual participation* is a structured device for involving audiences, and usually takes the form of chants or songs which the audience are invited to take part in. This kind of participation is most often used when telling stories to young children [6]. One instance where ritual participation is regularly incorporated at the District Six museum is around the memory cloth exhibit. The memory clothes a large white sheet on which ex-residents of District Six were invited to

write messages. The following message is very often pointed out to groups:

*Happy Days  
District Six  
Living was cheap  
Life precious  
Now in Hanover Park  
Living's expensive and  
Life is cheap*

Usually the message is read aloud to visitors and the meaning then discussed. But, occasionally the guide will point the message out and invite the group to read it along with him.

*Coactive participation and banter* refers to the spontaneous, unsolicited reactions of the audience during storytelling. Coactive participation includes gasps, repeating of the storytellers' lines, mouthing along with the storyteller, body movements, and joining in chanting a song or rhyme with the storyteller [6]. This kind of participation may be taken by the storyteller as an indication that the audience is engaged and participating in their story experience. Banter is a more complex form of interaction which involves some dialogue between the storyteller and audience. For instance, the storyteller may make editorial comments about a narrative in response to spontaneous comments or reactions from the audience. In this way the audience is able to interact in the storytelling process, and shape the experience for themselves.

*Questioning* maybe considered a form of banter which is initiated by the storyteller. Typically the storyteller will ask questions which fall in the context of the story [6]. There are numerous examples of questioning used at the District Six Museum. In the tour discussed in 3.2.1 above, Joe spoke to a group of students from the Cape Flats area. He included a question session on the specific suburbs that the audience members live in:

*"Who lives in Atlantis? (a number of audience members put up their hands) You have to take a bus and a train and two aeroplanes to get here [downtown Cape Town]! (Joe and audience laugh) Yoao! Which part of Atlantis? (girl responds) ...I thought as much! Ahh, I making it lighter, but I mean it's a hell of distance to travel.... Just think three hours of your life is taken away from you just sitting in a taxi! [Joe imitates a current pop song blaring in a taxi] (the audience laughs uproariously)" (Afrikaans has been translated in places)*

This questioning prompted the audience to engage with Joe and also contribute to the storytelling by allowing the audience to negotiate the context of the narrative to include details from their lives. It also illustrates a special situation where Joe banter with the audience making in-jokes about

the particular areas mentioned and their distances from the downtown parts of the city. We have also observed questioning used consistently at the memory cloth exhibit. Once Noor has read the 'Happy Days' message, he usually asks his audience "Do you think that's true?" While audiences usually respond affirmatively, this question is essentially rhetorical as it is clear that, since it is written by an ex-resident, it is probably true. This question usually leads to some banter between Noor and the audience which will end with Noor taking back the 'floor' by saying "I think it's true" and explaining his interpretation of the message.

*Eye contact* is a powerful way in which a storyteller can maintain a direct and intimate connection with their audience. Observing the District Six Museum guides carefully, we have noted them employ eye contact extensively. The trend is generally to move their gaze across the audience making momentary contact with most of the audience members. But eye-contact can also be more specific, for instance if the guide is asking a specific audience member a question they will look directly at them and hold their gaze until an answer is given.

### 4.3. Attention control

The last item we will address is part technique but also a result of the oral storytelling situation. Why do audiences in real-life oral storytelling situations pay rapt attention to a storyteller besides genuine engagement in the story? We believe that many audiences may feel required to pay attention out of politeness or social obligation to the storyteller. In ordinary conversations, participants will take turns to speak and focus their attention on the other parties. A storytelling situation is an extension of this mode of communication. When a storyteller is speaking to a group of people, there is a good chance that the group, particularly those in closest proximity to the storyteller, will listen, or appear to listen, attentively to the storyteller. In fact, we have observed this phenomenon in large groups of even young children at the District Six Museum. This may be due to genuine engagement or simply due to their understanding of the storytelling situation's social protocol. A very general understanding of this protocol has the storyteller 'in charge' of the situation and requires the audience to listen and participate appropriately (usually when cued by the storyteller). One can argue that, if the audience was given the impression that the storyteller didn't care whether they listened or not, bored members would be more likely to stop paying attention, or move to other exhibits in the museum. Indeed, for situations where one is disinterested in the story but feels compelled to pay attention, we are capable of *appearing* to pay attention while not actually listening. Why bother with the act if not to adhere to the storytelling protocol?

Of course, storytellers ideally would want to hold the audience's attention by genuinely engaging them, and not through protocol. Indeed, a measure of a storyteller's skill is

their ability to attract and hold an audience's attention without explicit disciplining of the audience. [6] strongly discourages against direct disciplining of the audience, particularly if it entails interrupting the storytelling. From a presence and engagement perspective, this would move attention away from the story world. Recall from Section 2, even though the storyteller is constantly perceptible to the audience, the aim is to keep their attention on the story not the storyteller. Direct disciplining of the audience would place focus on the medium (the storyteller), shattering any illusion of non mediation and reducing presence in the story world [3]. If audience members are not fully engaged, storytellers often have a repertoire of subtle ways to assert their control over the storytelling situation and draw them in, often by making responses which do not interrupt the experience [6]. For instance, the storyteller can make prolonged eye contact with offending audience members while continuing with the story. We have observed this technique used for groups of school-age children at the museum.

## 5. Possible applications of oral storytelling techniques in virtual reality

In this section we will explore ways in which the oral storytelling techniques we have discussed may be employed in VR systems. The application of these techniques interrelate with each other very cohesively since they all, in some sense, deal with a system which allows users to interact with a narrative and which expresses a constant awareness of and responsiveness to the user in the VE. Also note that these applications are intended to apply to human-like avatars as well as VE's in general.

### 5.1. Repertoire and improvisation

In order to create an avatar or VE with narrative repertoire, a combination of scripting and databases can be used. The VR system can be scripted to tap into a core set of narratives and a basic repertoire of possible interactions and experiences. For instance these could include "go to the beach", "visit a museum" or "solve a mystery". Each of these basic elements would have a common structure (for instance, all trips to the beach involve planning the trip, traveling to the beach, unpacking, engaging in some activities there, packing up, and traveling home again); however, the specifics of each of these elements (how one travels there, for instance) can be allowed to vary, perhaps also form a set of alternatives. Therefore, the users will be able to select, from within the basic structure of the "beach visit", how each step plays out. Which choices are made available might be influenced by user characteristics which are fed into the system, user interaction, or randomly in order to model the idiosyncratic, ad-hoc character which storytelling often has. By providing a large number of these dynamic points to each basic repertoire script, one can create a large number of

experiences based on the same generic structure. Of course the exact kind of variations should depend largely on the user of the system. We will tackle per-audience adjustments next.

## 5.2. Involving users

As with real-life oral storytelling, adjustments to VEs may be predetermined using broad information about the user(s) (accommodating the audience, see 4.2.1) or may be ad-hoc through interactions with the user(s) (see 4.2.2).

**5.2.1. Accommodating the users** A VR system can accommodate users by gathering initial information before a VE experience begins. Users' experience of the VE could then be adjusted as a function of that initial information. At the District Six Museum we have noted these kinds of heuristic adjustments often made in relation to the ages and country of tour groups (see 3 and 4.2.1): young audiences will receive a different kind of storytelling compared to older groups and foreign audiences receive different content to local ones. Age and culture are parameters upon which the presentation of a VE may be varied but there are many others such as gender or level of VR experience. For instance, if a VE featured interactive game-like activities, different games may be chosen to appeal either male or female users; in a storytelling VE, an avatar may invite a school-age child to sit on the floor to listen to their story while an older user will be allowed to stand (another distinction we have noted at the District Six Museum). The exact parameters and adjustments may be left up to a VE author's discretion just as real-life storytellers make their own explicit assumptions about what will appeal best to certain audience groups. Thus, the VE author is able to exert specific control over how the VE is presented and heuristically tailor the experience for different types of users.

**5.2.2. Interacting with users** Incorporating ad-hoc VE-user interaction in the fluid way an oral storyteller is able to poses more of challenge. However, this is certainly a challenge worth accepting. Compared with other narrative media (such as text, radio and film), VR may in fact be the first which is capable of approximating the storyteller-audience interaction that occurs in oral storytelling. Indeed this is an exciting prospect and this flexibility has led to plethora of virtual storytelling systems including digital books, games and artificially intelligent avatars simulating human storytellers [17-19].

Fundamental to interaction between an oral storyteller and their audience is the ability of information (usually verbal) to pass between the two parties. Furthermore, we have noted that information provided by the audience may be a response to the storyteller (as in ritual participation and questioning) or spontaneous (as in coactive participation and banter) (see 4.2.2). Allowing a VR system to output information to user is implicitly in place in most VR systems; more interesting is how the user might *input* information to a

VE – particularly spontaneous inputs. There are various possibilities here. A user could interact with a VE by manipulating objects, either using sophisticated data gloves or a simple point and click process on a desktop system [20]. Natural language interaction is far harder to implement. The use of a typing interface for desktop systems has been explored. However, users' proficiency and level of comfort with communication through typing might affect their sense of a VE's realism [3]. Furthermore, spontaneous verbal expressions (which might indicate surprise, anger, etc) are unlikely to be typed - typing has proven favorable with users who prefer to carefully consider their responses to an interactive system before they are entered [21]. In this sense, typing eliminates the spontaneous character of many audience interactions in oral storytelling. Still, typed input may be used effectively to respond to ritual participation and questioning scenarios in a VE.

Verbal interactions would be best done though voice recognition software. However current speech recognition systems may not possess the efficiency and accuracy required to make this interaction seem natural [22]. An interesting and effective way of circumventing of this problem is the use of a concealed (human) operator to listen to a user's speech and type their input into a VR system [21]. Processing speech may also introduce latency in a VR system, which could compromise its realism and immediacy. But, at the same time speech input would allow for more unfiltered, spontaneous responses such as those observed during oral storytelling's coactive participation and bantering. Interacting with users through eye contact is, obviously, only applicable to avatars in VR and may be implemented simply by tracking the user's position and point of view in a VE.

## 5.3. Attention control

Ensuring that VE content holds a user's attention links to one of the fundamental tensions in VR: allowing the user freedom to explore a VE as they choose, whilst ensuring that they experience the VE's content in the way the VE author intends [23]. For instance, an avatar may hold a conversation with a user during which the VE author may choose to allow the user freedom to move away, or to constrain them in the avatar's proximity to ensure the user doesn't miss that content. An ideal resolution for this tension would be a VE whose content engages and holds users' attention despite their being free to navigate as they wish. This can be achieved by, among other methods, inserting enough user attractors in the scene [24]. Another way to achieve this is through the VE keeping track of the user's movements and point of view and, subtly letting the user know that the VE is aware of them.

In a previous system, we developed a VE in which a user is presented storytelling avatar in a larger VE. We found that users would tend to either to stand motionless and listen to the story, or they left the storyteller and explored the limits of the VE while missing the narrative content [25]. We believe

that the storyteller avatar contributed to this since it was unaware of the user and would continue with its narration regardless of user action. Additionally, from the user's perspective, the storyteller did not appear to mind whether they stayed to listen to the story or not. Where an avatar such as this is involved, engendering a sense of social presence might make the user more likely attend to a narrative (see 4.3). The perception of the avatar or VE as an intelligent entity which operates according to similar social protocols as a real storyteller should foster social presence and the kind of audience attention that occurs in real life.

As with real oral storytellers, virtual avatars can make intermittent eye contact with the user (and any other audience avatars or users in the VE) to form a social connection. This could create the sense that the avatar or VE is aware of them. If the system detects inattentiveness or unresponsiveness, it could let the user know and provide feedback to encourage the user to pay attention to the VE content. For instance, if the VE highlights a certain object of interest but the user's point of view does not change, the object could be highlighted more intensely, or missed content repeated. As with oral storytelling, these actions should not be disciplinary, but rather subtle nudges presented in the context of the VE (see 4.3).

## 6. Conclusion

A fundamental property of real-life oral storytelling is that it is dynamic – no one telling of a story is the same as another. The storyteller is reactive to the audience and both parties are responsible for how the storytelling turns out. This sets oral storytelling apart from theatre or film which, although they convey narratives effectively, are non-interactive, static retellings of the same content. Interactivity and flexibility in content presentation is one way in which VR may set itself apart from other narrative media. By setting up a continuous interactive feedback loop between the user and an aware VE, the user is allowed shape their experience in a natural, implicit way. For this to happen, it is important the system notices the user, acknowledges their existence in the VE, is reactive to the user's movements and behavior, and allows the user to actively participate in the narrative.

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