

# Narrative, agency and observational behaviour in a first person shooter environment

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## Abstract

A pilot study was carried out which, in part, aimed to identify patterns in observational behaviour amongst players of Half Life 2, a contemporary first person shooter (FPS) game. Participants played for ten minutes in one or two environments and their eye movements were recorded. Subjective observational questionnaires were also filled in. Although the small number of participants (n=8) precludes drawing any firm conclusions, a number of interesting potential patterns are discussed that may have important ramifications for game design and theory, particularly in regard to agency and narrative.

## 1 Introduction

The relationship between narrative and play is frequently debated amongst game researchers, often in relation to the discussion of narrative's role in knowledge acquisition, memory, perception, consciousness and subjective reality (Ryan, 2001; de Mul, 2005; Pinchbeck, 2006). Although some researchers have concluded that it is a mistake to apply narrative models to the ludic experience (Juul, 2005), an understanding of how different narrative devices and content affect play is nevertheless crucial to the ongoing development of the field.

It has been argued that perception and narrative are fundamentally linked and, in theory at least, manipulations of narrative devices should result in alterations to perception and play. This appears to be a common sense argument that is exploited regularly by game designers. Schank (1990) suggests that both memory and consciousness can be anchored within the process of telling stories, to others and oneself; Sarbin (1986) speaks of the "storied nature of human conduct" and Dennett (1991) conceptualises consciousness as the illusion of a linear, causal output of a massively parallel system. All of these models find resonance with Tulving's conceptual distinction between episodic and semantic memory

(1972). In particular, Schank and Sarbin consider autobiographical memory as narrative in nature. If one accepts the basic premise of schema as behavioural management systems (Bartlett, 1932), then a relationship between perceptual behaviour and the schemas that translate information into knowledge seems to follow naturally. However, whether such a relationship is reciprocal and whether an inherently narrative memory means observational behaviour is somehow attuned to narrative devices and structures in the environment is another matter altogether. Simply because we remember narratives well, it does not follow that either narrative information is privileged in perception, or that narrative has any impact whatsoever on the act of perception.

A pilot study investigating various aspects of game play in First Person Shooter (FPS) environments was recently carried out. In particular, the study was an initial investigation into the relationship between presence, narrative and player behaviour in such environments. FPS games were selected as a form of mass market virtual environment, where the avatar is minimally intrusive and thus a greater projection of the player into the game world is potentially enabled. The relationship between the narrative of the game and the experience of the player is likewise more direct than third person per-

spective game experiences, as the avatar is less explicitly implicated or impacted by game events. In other words, it is less a case of controlling an avatar than undertaking actions oneself. Under such circumstances, it is reasonable to expect a less abstract engagement with the game than would be expected with the filter of a third person, visible avatar.

Although FPS games have historically tended to forgo much in the way of narrative, using only a very superficial framework to initiate action; more recent games have explored the value of more complex, even intrusive, narrative. *Deus Ex* (2000) effectively combined FPS action with a highly successful branching narrative structure, actively encouraging ethical engagement in the player over mindless violence, and is still frequently cited as one of the pinnacle achievements of the genre. The sequel, *Invisible War*, is a failed attempt to replicate this success, suffering primarily from both an overly obtuse and intrusive narrative which results in constant interruptions to play and over-frequent environment loading screens. Both *Half Life* (1998), and *Half Life 2* (2004) reduce the active disruption of play by excluding narrative cut-scenes entirely, but nevertheless rely on strong narrative to drive play forwards and have been applauded for their narrative strength and focus. *Half Life's* developers, Valve, have also hinted strongly that the follow-up to *Half Life 2* will involve a greater emphasis on interaction with non-player characters, something which suggests an ongoing focus on narrative importance. Regardless of the ongoing popularity of minimally narrative, single-player FPS games such as *Black* (2006), *Doom 3* (2005) and *Quake 4* (2005), narrative is certainly not a discounted aspect of successful FPS design.

Eye tracking was initially put forward as an additional, objective, real-time measure that could be used to cross-validate subjective measures, in the form of post-test presence questionnaires. However, the data yielded some intriguing suggestions of patterns that are worth examining in more detail. In particular, three sets of patterns stand out:

1. Differences in perceptual behaviour between experienced players and novices;
2. Relative importance of architectural and agent-based objects in the environment;
3. Shifts in perceptual behaviour in action- and exploration-based sequences.

These patterns will be discussed in more detail, and some inferences regarding the relationship between play, narrative and agency will be put forwards. It will also be discussed whether the results obtained suggest whether it is indeed possible to predict and manipulate player behaviour on a long and short term basis by making alterations to the distribution of narrative elements within a temporal and environmental span. Such manipulation and prediction would, it is suggested, enable more engaging and rich experiences in game worlds to take place.

## 2 Embedded Devices

Jenkins (2003) postulates four types of narrative inherent to game experience: embedded, enacted, evoked and emergent. The terms correspond to:

1. Devices distributed throughout the play environment that convey narrative information;
2. The narrative act formed by experiencing the environment as a whole;
3. Pre-existing narratives from the player's previous experiences, which are not limited to game play and that are triggered by events or objects during play;
4. The narrative that is created as a result of play.

It is the relationship between the first, second and fourth that this study will focus on, a relationship which has elsewhere been identified as the most obvious nexus between narratology and ludology (Brand and Knight, 2005). In particular, several pertinent questions are raised by the initial study: can a coherent, stable narrative emerge from play, without play itself being conducted in a consciousness narrative manner? In other words, does the player play narratively, or just become aware of the narrative after the experience? Secondly, how holistically does the player engage with the narrative embedded in the environment, or do they privilege certain types of device and delivery? Is there a correlation between the perceived post-experience importance of narrative and behaviour during play; are players who have strong recollections or empathic responses to in-game narrative distinguishable from those with little narrative retention or empathy during the act of play? This may be re-phrased slightly; does enacted narrative really exist to the player, as opposed to the observer?

Narrative must be distinguished from story in order to enable a discussion of the comparative influence of short-term goal achievements on longer term, plot-based goal achievements upon player behaviour. Narrative is defined here as a linear sequence of actions or events, linked in a causal manner, which yields meaning. Two points need further clarification: firstly, that this causality may be projected or implied, rather than inherent in the actions or events themselves; secondly, that narrative is to be seen as a type of schema, an information management device. The definition therefore draws upon the distinction first made by the Russian Formalist school, between *fabula* and *sjuzet*, or the events and the telling. This has been alternately described as a relationship between story and discourse. However, we suggest that the conceptual baggage of story is both inappropriate and misleading when considering narrative within an environmental context. The story and discourse distinction implies that linearity or causality is inherent in the former, that it carries its own internal logic. Game and virtual environments, however, are comprised of a network of related elements, with not just potential for the emergence of linear causality, but usually a deliberate predilection for its emergence. However, the sequence remains only a probable emergent factor in the experiencing of the environment, not a given. Story, according to the former model, always contains the sequence; distinct discourses may be applied but will not fundamentally affect it. Game environments frequently do not share this functional nature. Given this, we can either attempt to describe games such as *Deus Ex* as a large number of identifiable branching narratives interwoven with an overall ludic architecture, or seek an alternative conceptualisation of narrative, where story is embedded as a potential within an environment. Rather than a story being something which, when combined with discourse, creates a narrative, we define a narrative as a particular type of structure occurring when events are linked causally into a sequence. Thus, narrative precedes story, which we see as a stable set of narratives capable of repeat, independent enactment. By defining narratives as structures that may exist both as nested and independent elements within a story, therefore, narrative structures can be used to examine both long and short-term goals within an environment. Within an overall story none, some or all narratives may be engaged with, yielding a subjective outcome, which nevertheless falls within a constrained framework. It is the stability of this outcome, how closely one experiences resembles another, which would define it as a story or not. A story is stable and exists as an abstract media object; a narrative by contrast is unstable and subject to reformation or reinterpretation each time the events are called into sequence.

Thus, in the case of *Half Life 2*, the overall story is the player's ongoing battle to free a city from an occupying alien force. This can also be seen as a long-term goal, but it is impossible to conceptualise without engagement with the narrative material contained within the story. Within this are episodic structures, each with a distinct narrative (i.e. linear sequences that are mediated by subjective experience) and long-term goal, such as escaping hostile pursuit, or rescuing a scientist. The narrative elements of these episodes may be more or less crucial to their successful completion. For example, the episode "We Don't Go to Ravensholme" can be completed without the slightest attention being paid to the narrative goal of joining up with rebel forces elsewhere in the city. Each episode can then be broken down into short-term goal sequences, defending a computer terminal or crossing a bridge, which reduce the need for narrative further. Finally, there are micro-goals, too short to contain any real narrative function, such as shooting at an enemy or picking up a box. As Jenkins suggests, the carrying out of actions within the game also yields a subjective, emergent narrative to the player: the story of their game. It is therefore entirely possible that an emergent narrative may be formed in retrospect, following the accumulation and combination of non-narrative actions and micro-goals rather than through explicitly engaging with any of the narrative structures and devices.

Nevertheless, narratives are powerful schema. It could be argued that, as such, they share common features and potentially overlap those schema underpinning a great deal of human knowledge acquisition and even perception (Neisser, 1976). As a means of codifying information and imposing causality, their ability to evoke pre-determined, controlled sets of responses to events underlies most media artefacts. It should be expected that strong narrative will influence subjective experience in games, and evidence suggests that this is just the case (Schneider et al, 2004). It is both the relationship between goal and narrative and the relative importance of differing types of embedded narrative devices that are under scrutiny here.

We propose that embedded devices can be split into four categories: non-narrative, passive, active and dynamic. Each of these categories may be further defined by the temporal scale it predominantly affects. For example, Fig 1 contains a huge number of passive conveyers of narrative: the architecture positions the overall game world in time and space; the trees suggest a season; the huge alien citadel in the background (1) sets up both a long term narrative intrigue and sows the seeds of a long term goal.



Fig 1: Screenshot of “Point Insertion”, HL2

The public broadcast screen in the mid-ground is a good example of an active narrative device (2). Narrative information is actively supplied by this device; the player can, by listening to the broadcast, gain additional understanding of the situation. Whilst the device does not contribute anything to immediate goals, or short-term narrative, it actively establishes the game world further.

In the foreground, a humanoid agent (3) will dynamically respond to the player, usually aggressively. Whilst contributing towards long-term narrative as a collective, or type, the individual agent's role in FPS games is ordinarily short term and micro-goal orientated, such as fulfilling a combat function. Friendly Non-Player Characters (NPCs), such as Half Life 2's Alyx, operate dynamically and actively contribute to long and short-term narrative.

Finally, non-narrative items include barrels, crates and cans. These items can be manipulated and used to achieve goals, but really only exist as tools in the environment and do not carry any particular narrative significance in themselves.

A pertinent question when considering player behaviour and game design, therefore, is the relative impact of these diverse elements upon play. For example, do the narrative devices come together with evoked, pre-existing narrative information to form a coherent whole? Or, is Jenkin's emergent narrative defined only by a linear chain of events without any internal reference to its component narrative relationships? How much are players conscious of narrative devices during play, if at all? Or are they processed less consciously, with the overall game narrative functioning more as a memory structuring system, anchoring goals and actions together in a coherent and accessible way?

### 3 Description of Study

Eight participants were recruited to take part in the pilot study. Of these, three were novices, with little or no game experience and no FPS game experience. The other five all described themselves as regular game players with FPS experience. Two of the five had played Half Life 2 previously.

The game engine was run on an RM PC with a 3.20GHz processor and 2GB of RAM. Participants used keyboard and mouse controls, which they configured to their preferred settings to interact with the game. The display was projected onto a screen approximately 6' from the player, with the overall display dimensions being 6' x 3'. Eye movements were recorded by an ASL 501 head mounted Eye Tracking System. The data is integrated in real time with the display, resulting in a positional graphic overlaid upon the environment, outputted to VHS. In addition to the eye tracking data, a short observational questionnaire was filled in, post-test, by all participants. All eight participants played the opening sequence of the game, “Point Insertion”. This is a non-combat, exploratory sequence with one embedded ninety second narrative scene. Four of the eight participants, of whom all were experienced gamers, also played an additional, combat orientated sequence, “Route Kanal”. Each sequence was played for ten minutes.

### 4 Observations

#### 4.1 Novices and Experts

A number of key differences to observational and exploratory behaviour were immediately apparent between novices and experienced players. The most immediate and expected was that the novices looked off-screen to the controls more frequently or positioned their point of focus (hereafter referred to as the focal point) at the bottom of the screen to keep the controls in their peripheral vision. Interestingly, however, two of the three novices stated in their post-test questionnaires that they felt they had not looked offscreen. This would suggest a moderate sense of presence was being generated, according to parameters to be found in the literature (Youngblut, 2003), and was corroborated by post-test subjective response. In the case of the third novice, the test was stopped after seven minutes due to simulator sickness. However, it was apparent that the participant, even though reporting that they were conscious of looking outside the screen often, felt a degree of spatial presence, as evidenced by whole head movements to attempt to gain better perspec-

tives on the environment, and moderate scores in post-test presence questionnaires.



Fig 2: Novices tend to track objects with focal point whilst avatar perspective remains fixed.

The second key difference was in the relationship between eye movements and avatar perspective. The novices' eye movements were jerkier and less tied to the avatar perspective, with a tendency to fix the latter and then use the focal point to explore the field of view in more detail (Fig 2).



Fig 3: Experienced players tend to centralise focal point and use avatar perspective to track objects.

By contrast, experienced gamers restricted their gaze to predominantly the central section of the display, using avatar perspective to explore their surroundings, i.e., moving the window around the virtual world. When coupled with their prioritising of dynamic elements, this seems to suggest that a specific set of observational schema for the medium are indeed in operation. Experts keep their focus close to the aiming mechanism (Fig 3).

Likewise, there was a clear structure to observation: the focal point saccaded from object to object

and the avatar perspective followed if the object attracts attention. The lag between focus and shift of avatar perspective was visibly reduced in all the experienced gamers compared to the novices. In a full study, it will be interesting to compare this lag with fixation and inter-fixation lengths and durations, something the small number of participants in the pilot study disallows.

None of these observations are particularly surprising. It is also important to note that manual, interface-ability criteria cannot be discounted from any discussion of how a player reads an environment. The suggestion that experienced gamers operate according to learned schema must be tempered with the understanding that it may be due in part to their simply being more adept at using the interface. Interestingly, as novices became more confident with the controls, it appeared that their gaze was beginning to centre. Whilst this is a largely unsupported observation, it is nevertheless an indication that it would be interesting to conduct a full study, allowing novices a greater time in an environment and seeing how long it takes for their more freeform explorations to settle into the more recognisable patterns of experienced gamers.

## 4.2 Hierarchies and Schema

There appears to be a clear hierarchy of embedded devices, as might be expected. NPCs and humanoid agents receive a disproportionate share of visual attention and were generally the first object within any area that was attended to. For some of the subjects, this seemed to be a deliberate tactic; they used agents to navigate through the environment, literally hopping from one to the next as they made their way through. For most of the participants, however, this attention appeared automatic. In all participants, there was a characteristic bobbing motion: when the focal point moved close to an agent, attention quickly shifted to that agent and back again. This behaviour appeared to be lacking in combat situations and may therefore be part of a threat assessment pattern. This idea is lent weight by the tendency of players to lock onto hostile targets and deal with them one at a time; a kind of tunnel vision. In both cases, examining the X and Y co-ordinates of fixations and determining whether this bobbing motion can be tracked through fixation and inter-fixation co-ordinates and durations requires full statistical analysis, something the sample size precludes.

Non-human but moving objects seemed secondary in terms of attached importance. The flying Scanners found in both sections of the game were

attended to, but generally after human agents had been assessed, or in their absence. The giant television screens found in three separate locations in “Point Insertion” received comparatively little attention from most participants, and only one participant spent any more than a second or two observing them. It was noted that perhaps the information transmitted by the devices is primarily auditory, but they do remain a striking and active visual features of the environment. Security cameras were likewise observed only sporadically - all participants seemed to rely predominantly upon agents to push the action along and steer them forwards in the environment. There was a marked lack of attention from four of the eight participants to passive devices. This included the Half Life logos sprayed onto walls, which are designed to steer the player's attention to important parts of the environments, such as supply crates and hidden entrances. This could be argued to be something that players need to learn within the game, but it is interesting nevertheless that a highly visible marker remained so frequently unnoticed by participants.



Fig 4.: The post-cut scene environment with ladder.

Perhaps the most evident example of this hierarchy of importance was found following the narrative ‘cut-scene’ a few minutes into “Point Insertion”. Barney, a key NPC is introduced, who establishes the mid-term goal of the section: escape the station and find a secret laboratory. The scene ends with the player being ushered through a door with the verbal instruction from Barney to “pile up some stuff and get through that window”. The room beyond is split level, with a ladder reaching the upper level where the window is located. There are a number of moveable objects on both levels. With one exception, all participants immediately began stacking objects. No attention was paid to the ladder, even though it was in clear view (Fig 4). It appeared that direction from an agent, establishing a micro-goal was prioritised over the exploration of the immediate environment.

The evidence of hierarchical attention, especially in the experienced gamers, is more suggestive of an FPS schema than the focal point and avatar perspective relationship. The taxonomy of narrative devices appears to function as expected: those objects which enable the greatest projection of agency are prioritised in perception. Background narrative, however, is relatively minimal in importance. During “Route Kanal”, a looped announcer's voice is clearly and regularly audible, but participants struggled to remember if the voice was male or female, and one did not remember a voice at all. Likewise, the lack of attention paid to the television screens by most participants meant that a substantial amount of background material was not picked up on. Posters and signs were barely looked at; players were far more eager to approach non-player characters, such as the civilians in the station. This focus on those objects within the environment that enabled greatest projection of agency may even be interpreted as the player seeking out the most likely source of narrative information.

Another example of lack of attention to passive narrative devices occurred on leaving the station, into a large open city square. Behind the immediate buildings, in clear view, framed by the architecture and directly ahead of the player when they exit the station is a large alien structure that extends right into the clouds, way above the surrounding city (see Fig 1). Of the four who exited the station, only one participant paid attention to it. Given the effort Valve have recently expended into the extraordinary graphical enhancements of the Half Life 2 demo, Lost Coast, the lack of attention paid to non-dynamic objects is somewhat striking.

### 4.3 Exploration and Action

There appeared to be noticeable differences in perceptual behaviour in the combat orientated “Route Kanal” sequence in contrast to the exploratory “Point Insertion”. Again, these differences ranged from the expected to the less immediately apparent. The point of visual focus in the former tended to fluctuate more between being fairly static and central over the avatar perspective cross-hairs and rapid, staccato movements throughout the display area.

On entering each new area, participants could clearly be seen to be carrying out an assessment of the environment. This usually involved relatively static avatar perspective and highly mobile focal point. Any object that stood out from the background: boxes, crates and barrels were included in this sweep. Once the assessment was carried out, gaze movement tended to centralise and avatar per-

spective was used to visually navigate. Tellingly, these objects, characterised by being non-narrative but potentially useful for the completion of micro-goals, received very little attention in the exploratory sequence, with the exception of the box stacking sequence described above, which required specific player attention.

All participants tended to alternate between two distinct eye movements when faced with hostile dynamic objects, i.e. combat. Rapid visual searching, often with a relatively static avatar perspective, would be replaced with a less mobile focal point, with visual control determined predominantly by avatar perspective, once a target had been identified. It seems fair to assume this is due to the functional nature of the aiming mechanism. All the participants, for the vast majority of the time, locked onto one target at a time and dealt with threats in a linear manner. The alternative behaviour usually occurred when hostile targets arrived unseen and the player was alerted to their presence by audio and visual cue, such as the sound of gunshots or bullet holes appearing in the walls around them. It would be interesting to correlate pupil diameter and heart rate to these moments, as it was at these points that the relationship between gaze and avatar perspective seemed to break down, and both would move rapidly and independently until the source of the threat was identified.

Finally, some attention was paid to whether the moving targets in the combat sequences were observed in any detail, whether any semantic information about them was picked up. All participants correctly identified simple details in the agents' appearance, such as colour of uniform and type of headgear. Whether participants would correctly identify individual traits or more complex visual information may be worth examining in more detail, as a means of further investigating the relationship between the relative importance of object characteristics and perceived agency. Participants were also asked how many agents they had fought during the ten minute sequence, with varying degrees of accuracy. One participant estimated only half the actual number. It would be interesting to see how accurate players are at counting agents or other devices within a space, which may help ascertain the role of peripheral perception in play, as well as a corroborative measure of presence.

## 5 Goal, Agency and Narrative

It is possible to cautiously infer some patterns from the limited results detailed above. In particular, the question of how, and indeed whether, players respond to narrative devices can be addressed. It

would appear that although players perceive more than just moving objects, and both subconsciously and specifically use agents to structure their perceptual exploration, the narrative aspects of the game are, at the least, pushed to the background. The suggestion that media- and genre-specific schema are formed and used as players gain experience and confidence supports this idea. At one level, the agent-to-agent navigation demonstrated by experienced players may be explained as constant threat assessment, but this does not explain why objects in exploratory sequences are not treated to similar surveying tactics as the ones observed in action sequences. The fact that non-narrative devices are the focus of visual attention more than any passive narrative devices in such situations seems to suggest that achieving micro-goals far outweighs any importance attached to even short term narrative. How an object may be dangerous or useful seems to overshadow its meaning. Dynamic objects thus require closer observation. There also seems to be a prioritisation of dynamic objects that support the intentional stance, and easily lend themselves to a projection of agency; in other words, humanoid avatars. Although FPS games are replete with non-human and often non-humanoid dynamic objects, the flying scanners in *Half Life 2*, in both sequences, received less attention. In the combat sequence, this is easily explained, as they represent far less of a threat, but at least in the early stages of the exploratory sequence, they intrude upon the player to a far greater degree than the human avatars, who require provocation to actually act. It could perhaps be argued that human avatars are looked to as objects expected to deliver a high degree of narrative, but this would seem to initiate a greater degree of active interaction than was carried out.

Whether the hierarchy is based upon possible danger (i.e. a mechanical, ludic assessment of the environment), or a natural tendency to pay closer attention to human like forms may be tested further by placing players in situations where human avatars are dynamic but clearly unthreatening, but non-human avatars represent the greatest threat.

Regardless of this, what is suggested strongly by the results is that mid- and long-term narrative seem to matter little to players during the act of play. The lack of awareness of passive narrative objects was striking; especially in a game that is generally acknowledged to contain a strong narrative. Rather than steering play, the results may indicate that narrative has little to do with it, and is imposed post-experience. In other words, when we speak of narrative influencing play, it essentially translates to the narrative being used to position action in context for memory, but not actually being part of the play ex-

perience. There is no game narrative in the present tense, no enacted narrative in Jenkin's terms; it only exists prior to and after play.

If play is structured more by projection of, and interaction with, in-game agency, in pursuit of micro-goals that are more or less invisibly underpinned by narrative structures, this has implications for the relative importance attached to environment design and artificial intelligence within game worlds. If players consistently prioritise agents as sources of visual focus and information, the complexity and depth of passive or background devices may be to some extent superfluous. This would certainly find support in the argument that gameplay will always win over graphics, though it may well be that visual depth and complexity matter a great deal, but only in the periphery. Schneider et al (2004) found that highly narrative games (*Half Life* and *Outlaws*) evoked greater empathy and presence than non-narrative games (*Doom 3* and *Quake 3*). However, skin conductance was the only objective measure used and, furthermore, the only measure taken during the game experience. Other data was subjective and post-test. Schneider's results should then be no surprise, but do not necessarily mean that highly narrative games are actually engaged with on a narrative level during play. Alternatively, the strong narrative could make it easier to recall specific moments within play by acting as a more robust framework for retrieval, thus yielding more specific and potentially more vivid recollections of the experience. Additionally, each game was played for only eight minutes, a short space of time for any sense of long-term narrative to develop and certainly short enough for *Doom 3*'s limited narrative to remain unexhausted. Indeed, in a straight comparison between *Doom 3* and *Half Life 2*'s opening sequences, it could be argued there is little difference in terms of narrative strength. The former is certainly more clichéd in both its science fiction setting and testosterone levels but actually invests more depth into most of the encountered avatars. It may well be that it is the very strength of the narrative, in terms of genre conventions and cult appeal, that reduced subjects' empathy with the game.

## 6 Conclusion

The data from eight participants is not enough to draw firm conclusions, but the questions raised by this feasibility study confirm that investigating a player's perceptual behaviour is a valuable exercise. The role of narrative devices and structures during real time play appears to operate at least in the background, and may even be more or less negligible. Far more focus is given to agents, with dynamic

humanoid avatars receiving most attention, regardless of their narrative function, or lack of it.

Novice players appear to read the game environment in a different way to experienced players. This is probably due to unfamiliarity with the interface, but the results are also highly suggestive of media- and genre-specific schema developing to structure perception and interaction. Exploration and action sequences appear to trigger different modes of perceptual behaviour, with the latter actually appearing to yield more investigation of the surrounding environment, particularly non-narrative objects.

Finally, it is recognised that even though narrative may not play such a large part in the action of play as may be assumed, and may not affect player experience in real-time, it may nevertheless serve three very important functions. Firstly, it allows the information and affordances embedded in the environment to be structured in a meaningful way during the design process. Secondly, background narrative schema that pre-exist play, but may be the result of prior game experience, allows the projection of causality and, crucially, agency, that enable successful ludic experiences. Thirdly, strong game narratives may assist the structuring and management of memories of the play experience, by supporting actions with a robust, temporal and contextual framework. Thus, games with strong narratives may feel like they are more immersive, emotionally involving experiences whilst the in-game experience, in fact, remains indistinguishable from games with weaker narratives. It is also worth bearing in mind the crucial distinction between weak and strong narratives, and complex and simple narratives. A weak narrative, such as *Doom 3*'s may be delivered and maintained highly effectively, whilst a more complex narrative, such as *Deus Ex: Invisible War* is far weaker in comparison.

A full study will now be carried out investigating two of the three observations detailed here. The relationship between different narrative devices will be further explored, investigating whether different perceptual schema mean more or less narrative information is picked up from the environment. It would also be interesting and valuable to survey observational behaviour amongst a range of FPS games with varying degrees of narrative complexity and strength to see if more narrative games do, in fact, provoke, maintain and reward alternative perceptual schema.

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