Emotional Attachments for Story Construction in Virtual Game Worlds

Sentiments of the Mind Module

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ABSTRACT

In the virtual game world prototype World of Minds that uses the Mind Module, a semi-autonomous agent architecture, the notion of sentiments, or emotional attachments between objects, is what constitutes the deep structure in the game world. In this paper a play test is presented where sentiments are instantiated in three different ways; randomly, by choice of the player and through interaction. The test indicates that the sentiments that are instantiated through interaction between entities in the world are those that create meaning for they players of a quality that would be useful for the co-creation of narrative potential in virtual game worlds.

Keywords

Story Construction, Virtual Worlds, Experimental Methods, MMORPG, OCC, Emotion Modelling, Expressive AI

1. INTRODUCTION

Even if all games do not contain a story, just as films, plays and novels, they all contain a deep structure. Games like chess and solitaire contain deep structures; there are driving forces and constraining rules for achieving the goal which in most cases are the winning condition. In these games the goals that drive the mechanics of game play are part of the predefined conception of the game. This is not always the case in virtual game worlds (VGWs) where the players may define their own goals that are not always be foreseen by the designers. VGWs, sometimes called massively multiplayer role-playing games (MMORPGs), are realised by networked computers that simulate environments. In these worlds players have graphical representations, playable characters, often called avatars, that represent them in the world. All interaction with the world and with other players is done through the avatar.

This paper concerns the deep structure of elements that can construct narrative potential in VGWs.

The concepts of *deep structure* and *surface structure* are used by Greimas [21], summarised by Rimmon-Kenan [46]: 'Whereas the surface structure of the story is syntagmatic, i.e. governed by temporal and causal principles, the deep structure is paradigmatic, based on static logical relations among the elements'. Greimas' actantial model describe relations among Actants. Actants are entities that accomplish or submit to an act. The number of actants is six in Greimas' model as shown in Figure 1.

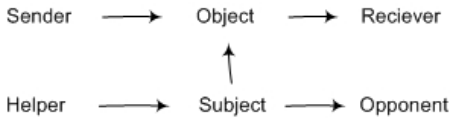

Figure 1: Greimas' Actantial Model

VGWs are places rather than narratives, where the world is actual and has materiality rather than possible as it is in novels which often are analysed using Greimas' actantial model. In VGWs there are elements in the world that give *narrative potential*, a term used by Laurel [32] and described by Fencott [18] as the integration of agency and narrative. Fencott elaborates on narrative potential in [19] as the "accumulation of meaningful experience as a result of agency - allows participants to construct their own appropriate narratives. Narrative potential thus arises from agency but is not determined by it." The term *agency* was defined by Murray [39] as "the satisfying power to take meaningful action and see the results of our decisions and choices". All entities in VGWs, such as avatars, non player characters (NPCs) and other dynamic entities, as well as inanimate objects are elements which hold narrative potential. Avatars realize the existing narrative potential, and create new narrative potential by acting in the VGW. It is the relationships between the elements in the VGWs which constitute the deep structure. These relationships are partly governed by the rule-systems of VGWs and partly by goals, desires and motivations of players controlling avatars.

The work presented in this paper builds upon a framework where relationships between elements from a systemic point of view are based on a rule-set including emotions. In this respect the work have a strong kinship with the OCC model[41], witch is further expanded upon in the text.

The Mind Module(MM) is a semi-autonomous agent architecture built to be used in a VGW as a part of the avatar. It gives avatars personalities based on the Five Factor Model (FFM)[37], and a set of emotions that are tied to objects in

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the environment by attaching emotional values to these objects, called sentiments. The strength and nature of an avatar's current emotion(s) depends on the personality of the avatar and is summarized by a mood. The term *semi-autonomy* is used because the agent structure is designed to be used by an avatar, and is thus partly controlled by the system and partly by the player. The overall aim of the development of the MM is to, through experimental applications, explore techniques for creation of character driven story construction and drama for persistent VGWs. Part of this experimental work is to explore the possibilities of combining the art and craft of characterization, which has it home in the arts, with the knowledge we find in the field of psychology.

The first iteration of the MM was developed in parallel, but separately, from the game world it was planned to be used in. Though this first iteration got an enthusiastic reception from the test players [28] the user tests showed that the affordances given by the MM as part of the avatar needed a tighter connection to the game mechanics of the world. For this purpose the VGW prototype World of Minds (WoM) was designed where the game mechanics and the rule-set are entirely derived from the MM. During the design and implementation of the WoM prototype several questions regarding the game design in relation to the development of the AI have arisen.

This paper concentrates on the practical use of sentiment objects in WoM. Three different ways of instantiation of the sentiment objects are evaluated through data gathered through analysis of videotaped play tests. Also the different ways of interacting with the sentiment objects are discussed. Previous publications focus on the mood aspect[15] in the same context, and on the use of personality traits[14].

The content of this paper is structured in the following way: Related work, The Mind Module, and the design of World of Minds are described to give a background. In the Mind Module section the approach to sentiments is compared to the approach of the OCC model. Then the paper prototype is described as well as the test scenarios te players went through. The results of the play-test are summarized. The final discussion concerns implications for the use of emotional attachments as connections between entities in the deep structure that make up the basis for story construction in VGWs.

2. RELATED WORK

Related work from a theoretical angle tend to lean on different basic theories depending on in which field the work has its origin. In the area of games, there have been classification spaces offered, comparisons presenting similarities to other media, and differences have been pointed out (e.g. analyses of interactive from a cultural studies perspective including Aarseth [1], Murray [39], Juul [26], and Ryan [47]). Publications by authors with backgrounds in screenwriting and filmmaking usually refer to the Hero's Journey[8, 52] and the restorative three-act structure of drama [11]; papers and books published by game designers usually refer to the Koster-Vogel Cube [29], while publications in more technical venues on the issue of narrative often refer to The Oz Project [4] and to the Facade Project [36]. Prominent traditions of narrative analysis include the structuralist perspective beginning with Propp's morphology of the folk tale [43] and including Greimas' actantial model [21], as well as the tradition of hypertext theory [6, 31, 22], i.e. systems for causal (interactive) relationships between story elements in multi linear stories.

Practical related work include the work by Brisson and Paiva [7] who's system I-Shadows use affective characters to through interactions inspired by improvisation theory explore the natural conflict between the participants freedom of interaction and the system's control as the participants collaboratively develop a story. Another related project is Scheherazade [17] that, as it draws upon theoretical work on the morphology of the narrative, models semantics such as timelines, states, events, characters and goals. The system can detect thematic patterns in both the deep structure of the story as well as in the manner of the story's telling. However, maybe the most related work right now is that of Ian Horswill who argues, from a hypothetical perspective, that AI Characters should be 'just as screwed-up as we are' [24], thus tying in the notion of believable agents [3], and ways of building these[35, 27, 48, 44]. Also the work conducted by Marsella et al [34, 45], as well as the work done at Miralab [30, 33] on the subject of virtual humans has been an important source of inspiration.

3. THE MIND MODULE

According to Moffat emotion can be regarded as a brief and focused (ie. directed at an object in the context) disposition, while sentiment can be distinguished as a permanent and focused disposition [38]. Mood can be regarded as a brief and global disposition, while personality can be regarded as a global and permanent disposition. Hence emotion, mood, sentiment and personality are regions of a two-dimensional affect plane, with focus (focused to global) along one dimension and duration (brief to permanent) along the other.

The Mind Module (MM) consists of a weighted network of interconnected affect nodes of four types; traits, emotions, sentiments and moods. While the traits are static, the intensity of each of the other nodes decays over time. In this respect the MM is built similarly to a spreading activation network[10]. Figure 2 summarizes the decay rates of the four node types.

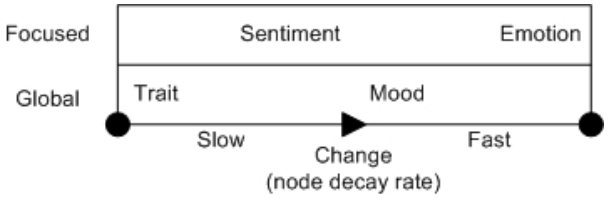

Figure 2: Two-dimensional affect plane

That a node has a fast decay rate means that the node is active only for a short time. This is the case with the emotion nodes - they affect the rest of the network only for the time when they are active. That the emotion and sentiment nodes are focused means in the context of the MM that their activation is dependent on a relation to or an interaction with another entity (for example, A 'feels anger' toward

B), as opposed to the trait nodes which are independent of entities situated in the context.

The role of the MM is to provide the system with emotional output from the individual avatar and to process the events and objects in the avatar's surroundings in emotional terms. The MM performs computational operations on the input values, which come from virtual sensors and outputs in the form of emotional fluctuations and/or potential emotional reactions that in turn become inputs to the sensors of the MMs of receptive entities.

The *personality* of a character defines the nature and strength of the emotions a character 'feels' in different situations. The MM gives each avatar 30 trait nodes, inspired by the Five Factor Model (FFM)[37], where the 30 trait facets are organized into five factors; Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism.

The choice of *emotions* is based on research into affects and affect theory by Tomkins[49], Ekman[13] and Nathansson[40] where expression of emotion is studied. The MM gives each avatar 13 emotion nodes; Amusement, Interest, Joy, Relief, Satisfaction, Confusion, Surprise, Distress, Fear, Anger, Shame, Sadness and Guilt.

The *mood* is a processed summary of current state of a character's mind. The mood of a character is measured on two scales that are independent of each other, an inner (introvert) and an outer (extrovert). Hence it is possible to feel harmonic and annoyed at the same time, or gloomy and cheerful. Having two scales for nodes opens up the possibility of more complex states of mind than a single binary axis of moods that cancel each other out. To the player this can be conveyed by for example a fine grained coordinate system of the two axes showing the avatar's mood as a position.

Sentiments are nodes which couples an emotion with another entity in the environment. If the avatar is in proximity of the other entity the sentiment node activates the coupled emotion node.

The affect nodes are interconnected by weighted relationships. The values of the personality trait nodes governs the individual avatar's state of mind through these weighted relationships, ideally resulting in values characterizing for the avatars personality.

More detailed descriptions of the emotion, personality, and mood nodes can be found in [15] and [14].

3.1 Sentiments - Emotional attachments

An avatar can have an emotion associated with an object or a certain type of objects in the world. The emotion *Fear* tied to objects of type spiders would create a sentiment that simulates arachnophobia. In the MM a sentiment node is an association between an emotion and either a certain individual object or a certain type of objects. When the character who owns the sentiment perceives either of these objects within perceptual/influential range, there is an immediate change in the value of the emotion node Fear. Let us picture a scenario where avatar A performs an action toward avatar B that her MM interprets as very amusing. The level of amusement in the emotion node Amusement will be high, for a brief period, i.e. the decay rate is fast. The mood node 'Outer mood' of B will get a higher value, but decrease slower than the emotion node. B might get a sentiment, towards A, that will decay at a very slow rate, but eventually disappear. While the sentiment of Amusement toward A lives, B would get a slight increase in her Amusement node if A came in proximity. The amount of the increase in the Amusement node is defined by the intensity of A's trait nodes Emotionality, Cheerfulness, Depression and Imagination, which are the trait nodes that are weighted to the emotion node Amusement. This example instantiation is illustrated in Figure 4 in Section 4 where it also is tied to some of the game play mechanics of WoM.

3.2 MM compared to the OCC model

Emotion modeling have during the past decades emerged as a field of study, where the theory presented by Ortony et al in *The Cognitive Structure of Emotion* in 1988[41] proved to be an important landmark, now often referred to as the OCC model. The OCC model is purely theoretical, written in the field of psychology, but several applications in the fields of AI and cognitive science have used it as an inspiration for frameworks for autonomous agents that simulate human emotion, among them [51, 23, 16]. In this section the features of the MM are compared with the framework of the OCC model in order to clarify the presented approach to emotion processing.

Ortony et al argued that the notion of 'basic emotions' was vague. They presented 14 theories of basic emotion that all list *different* emotions as basic, each theory with different basises for selection. Some of these theories use the concept of having mixed states [42] or compounds [2]. Ekman opposed the notion of the definitions of basic emotions being 'vague' in 1990 [12] and successfully defended his standpoint of defining certain emotions as 'basic'. When discussing emotion modelling it is however important to bear in mind that what is refered to as emotions and sets of emotions are based on the *expression of emotion*.

Ortony et al proposed a hierarchical structure of emotion where the top level is a distinction of positive/negative and where the in total 22 emotions are valenced toward either an event, an action committed by self or another agent, or toward an object. The emotions vary in intensity depending on different factors, among them the sense of reality, proximity, unexpectedness and arousal. The appraisal of objects, events and actions are done in terms of desirability, praiseworthiness and appealingness. Desirability depends on the goals of the actor.

The sentiment nodes of the MM uses a mixed approach, allowing for several sentiments, that is, of different emotions to be attached toward another entity, thus creating a compound set of sentiment. Though valenced in this way, as directed toward another character or object in the world, the sentiment set does not make a difference between types of entities in the world. The same type of sentiments can be set toward objects as it can be to characters or towards abstract principles.

Sentiments in WoM are created in two ways. Some emerge from interactions with other entities in the world, thus creating emotional memories of the entity, whose nature is an *emergent compound set of sentiments* that depend on what has happened in the interaction between the entities. The other type is *authored sets of sentiments*, that are similar to the valenced emotions in the OCC model since they contain constraints on the type of object they can be set toward, and have certain combinations. For example the authored sentiment set 'Infatuation' is a combination of Interest, Amusement and Joy toward another character.

The intensity of the sentiment is in the MM different for each avatar depending on the context since the intensity is defined not only by the context in form of sentiment objects in proximity but also via weightings between personality trait nodes and emotion. Thus the intensity of an emotion depends upon the avatar's personality, and the nature of the emotion is defined partly by events, objects and agents in the game world and partly by the individual avatar's interpretation of her environment in term of sentiments.

4. THE WORLD OF MINDS

World of Minds (WoM) is a prototype VGW where the personalities of the inhabitants are the base for the game mechanics. When interacting with other characters, the reactions depend upon the character's current mood and personality. It is the player's choice whether the avatar is a reflection of herself.

The basic game play of the current prototype of WoM is fairly straight-forward: Players need to defeat physical manifestations of negative mental states. In order to do so, they can cast spells on them, but the spells available are constrained by the avatar's personality, her current mood, and how far the avatar has progressed in learning new spells. Each avatar has mind energy (mana) and mind resistance (hit points). Each spell costs mind energy to use, and attacks reduce mind resistance. The experience of the character defines how large the possible pool of energy and resistance is at a given moment. The regeneration rate of resistance depends on the inner mood while the regeneration rate of the energy depends on the outer mood, as shown in Figure 3.

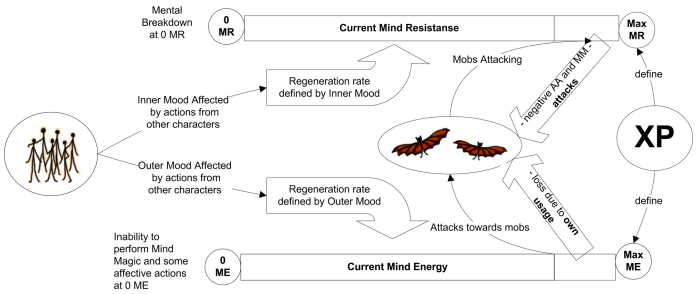

Figure 3: Fluctuations of Mind Energy and Mind Resistance

Players can affect each others' moods by using affective actions (AAs), thus controlling the selection of spells available. AAs are actively chosen by the players; they are not effects of other social actions. If a player targets another avatar, she can choose from a selection of AAs. For example the AA 'Comfort' can be used successfully on targets that have an active emotion node of Sadness, but only if the player's own avatar is not in the area of Furious in the mood coordinate system. If the AA Comfort is used successfully, the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character. AAs can be compared to emotes in other virtual environments, being social actions, but in WoM these have direct effects on the mental states of those interacting. Player character's cannot cast mind magic spells on each other that affect the emotion nodes, this in order to not make it too easy to affect the mental states. The aim is to use the AA's as a system reminding of 'real' situations of interaction between players that can affect the mood, where the use of spells in interaction with computer controlled characters adds a more game-like experience, but where the systems are intertwined.

Sentiments for avatars in WoM are generally instantiated as a result of a player character's action or of a result a player's choice. In the current implementation, sentiments are instantiated when an emotion node reaches a threshold value, in most cases set as 90% of its maximum. Figure 4 is an illustration of how either a spell or an AA causing amusement is interpreted by the MM. The values on the arrows between the nodes are weights.

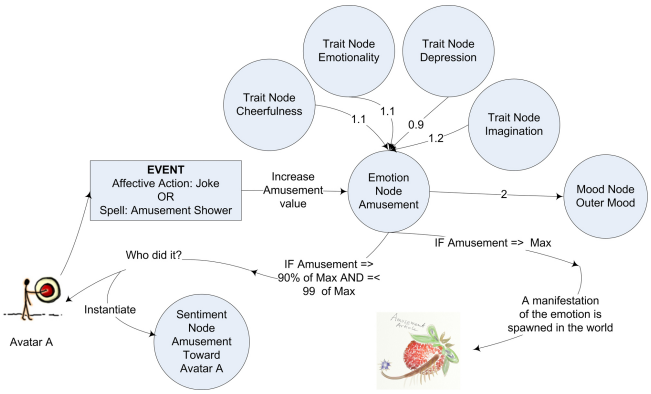

Figure 4: An example of how an amusing action is interpreted by the MM

5. GUIDED PAPER PROTOTYPE PLAY TEST

The correlation between the results of a test of a paper prototype and a computational system cannot be taken for granted. Experimental research and evaluations of rules and game mechanics in VGWs are rare in the academic sphere due to the enormous work effort required for the implementations. Researchers are generally constrained to studying existing VGWs or using (e.g.[50], and [9]) existing systems, such as the Aurora scripting system of Neverwinter Nights [5], that through their architecture enforces very traditional computer role playing game mechanics. When building new game mechanics from scratch where the system need to support a large number of simultaneous players it is necessary, unless the research funds are unlimited, to find alternative evaluation methods, such as paper prototyping. The test presented in this section was conducted in order to get pointers relevant for the construction of a limited digital prototype, which is part of the next stage of this research.

My approach for evaluating the game design via a paper prototype combines features from several approaches of User-Centered Design where the users experience is the main driver for the design, as well as from rapid prototyping and play testing approaches that are becoming more common in game design [20]. In the test of the WoM prototype I used scenarios and role taking, using the Wizard of Oz method to simulate user-interaction. When conducting my tests I had real players playing the game individually. I used scenarios and a game master/test leader, who simulated the game events. The approach is described in detail in [28].

Prior to the guiding the players were asked to think aloud as they were playing. In the scenarios the player is guided

through using the main categories of actions in the game, AAs, navigation in a landscape of sentiment and mind magic spells. In these scenarios the test leader and the player was continuously updating the state of mind of the avatar and the NPC she meet, showing the player the effect on her actions in the game in terms of fluctuations in emotions, mood, mind energy and mind resistance.

Ten guided paper prototype play tests were conducted. The course of action for each participant contained the following steps, where the participant:

1. filled in a short (less than ten questions) survey about demographical data and previous play experience;
2. took the IPIP NEO Personality test and emailed the results to the test leader;
3. filled in a short survey about their opinions about using personality traits for avatar creation;
4. went through the guided play test (Each test was video taped and took between one and one and half hours. The player was guided through three scenarios. After that the participant was interviewed, 14 questions were asked. Then the player was guided through the remaining two scenarios. The test was concluded with an interview with nine questions.);
5. filled in two more short surveys, one on the subjects of sentiment objects, the other about general impressions of the experience.

The video analysis tool Transana was used to analyze the 15 hours of video of interviews and play sessions. For character creation WoM uses a short version the International Personality Item Pool Representation of the NEO PI-R (IPIP-NEO) as constructed by Johnson, a method for evaluating personality traits using a survey with 120 items that the user rates on binary scale [25]. The full IPIP contains 1,699 items assembled by Dr. Lewis R. Goldberg. For the purposes of WoM the short version was considered sufficient. Prior to taking the test the players were advised to decide whether they wanted to play as being themselves or if they wanted to role play a character that they design the personality for in the IPIP-NEO. The players emailed their results to the test leader so that the 'system' could create an avatar for the test session.

The remainder of this section describes the scenarios in more detail. The avatar Mastaya's traversal through the scenarios is used for illustration.

Scenario 1 - Sentiments The avatar meets the character 'Gate Keeper' (GK). Via prewritten dialog script GK gives information about the game world. GK searches his bucket to give the player two random sentiment objects. The player represented by the avatar Mastaya got a sentiment of Anger toward mittens and Amusement toward socks. GK also asks the player to picture an unnerving scenario where she can choose which of three different objects would be most scary. Mastaya picked garden gnomes and got a Fear sentiment towards them. Finally, GK asks Mastaya to fetch him a glass of water from the water cooler down the corridor.

Scenario 2 - Affective Actions The avatar meets the character Teresa who says she is too sad for explaining what affective actions (AAs) are, and asks the avatar for a hug. A selection of AAs is presented to the player. Teresa and the avatar exchange AAs until threshold values for emotions results in the generation of sentiment objects between the characters. Mastaya chose to comfort Teresa instead of hugging her. Teresa's Distress and Sadness decreased, and her mood improved. After a few exchanges of AAs a threshold value for Mataya's emotion Interest was reached and the system generated a sentiment for Mastaya of this emotion toward Teresa.

Scenario 3 - Facing the Sentiments The player needs to guide the avatar through an environment with sentiment objects in order to reach the water cooler. The state of mind of the avatar changes according to which sentiments are encountered in proximity of the avatar. Mastaya avoided her Fears (garden gnomes) on her way to the water cooler, and then moved close to the sock in order to gain Amusement before moving on.

Scenario 4 - Using Spells and Affective Actions The player finds Teresa in distress as she is attacked by a manifestation of Confusion. The player finds a spell, Laser Pen of Clarity, which reduces Confusion and mental resistance in the target. The player is introduced to the concepts of mental energy and resistance through seeing the mind values on Teresa, the Colossus of Confusion and her own avatar. When the Colossus of Confusion is defeated a new foe enters the scene, the Sail of Sorrow. When this is defeated Teresa explains that when an emotion goes out of bounds a manifestation of that emotion is created.

Scenario 5 - Trait based spells Gate Keeper accepts the glass of water and gives the avatar two spells that he claims are based on the personality of the avatar. Mastaya learns an 'Interest/Excitement Shower', based on that her highest factor except Neuroticism is Openness. She also learns the 'Soothing Hand', which lowers Fear in the target, based on that the highest value of her traits in the Neuroticism factor is Anxiety. GK tells her that she will be particularly good at defeating manifestations of Fear, the Terror Trolls.

During the scenarios the players were presented with the interaction objects and given minimal explanations about how and what to do, in order to capture confusions, and even more importantly, implicit assumptions about the game play. At any point the users could tap the 'manual' button and ask any question, whereupon the dialog with the test leader temporarily left the think aloud protocol.

5.1 Sentiments in the play test

As shown in the recount above of the script of the play test and in the exemplification of the avatar Mastaya's performance the sentiments came into play in a number of situations: In the first scenario GK gave Mastaya two random sentiments by pulling out objects from his bucket. The natures of the objects are deliberately chosen to have little emotional charge. Pulling out a spider from the bucket would for example have the given preconception of fear towards it. The objects in the GKs bucket are as follows: a ping pong ball, a hat, an eraser, a sock, a mitten, a pencil, a pair of scissors and a sock. When the item is drawn from the bucket, one emotion is randomly picked. This combination constitutes a sentiment, i.e. for Mastaya a sock is tied to Amusement. After this GK tells Mastaya the following: *'At night you wake up by an unfamiliar touch. There is a damp*

smell.' Mastaya is then asked which of three objects would be most disturbing to find in the bed: a garden gnome, an empty noodle container or a small chair. Mastaya chose the garden gnome, and recieved a sentiment of Fear toward garden gnomes. In the second scenario Mastaya interacted with the NPC Teresa who was puppeteered by the test leader. Mastaya chose AAs such as 'gossip', 'tell small secret' and 'flaunt big secret', and the test leader chose reciprocal AAs that resulted, for Mastayas part, in a sentiment of Interest toward Teresa. Teresa gained a sentiment of Interest toward Mastaya.

During the second scenario players chose a higher variety of differentation in their choice of action than anticipated by the test leader. Teresas emotional memory in terms of sentiments may give a pointer; she has a sentiment of Amusement towards one character, Interest toward three, Joy toward three, and Satisfaction toward three characters. In the limited set of AAs availiable to the players it is possible to see which main types of AAs were chosen in the interactions. For instance, the three characters recieving a sentiment of Satisfaction chose to 'hug' Teresa several times.

During these two scenarios sentiments, or emotional attachments, was instantiated in three different ways. From the GKs bucket a *random sentiment* was instantiated (the Amusing sock), through a question a *sentiment of limited choice* was created (the Fearsome garden gnome), and finally sentiments were born as *results of interactions* (the Interesting Teresa character).

In the third scenario the player is navigating her avatar on a board. Present on the board is the goal, in form of a water cooler, and a number of objects. For each player three items were placed on the board, one that had a sentiment of Fear attached to it, one item that had a positive feeling attached to it, and one object that the avatar did not have any sentiments attached to. This scenario mainly functioned to confirm that the concept of sentiments and their effect in a spatial environment was understandable to the participants in the play test. All players successfully navigated the board toward the goal. An example transcription of one of the players reads as follows: *'I was like whatever there is a gnome and then when I got close to it, I was like, well not that close. But then you said I was close and you started moving my things* [note: the fear meeter] *and I was, oh my gosh, something is happening. Then I was like, oh whatever. What can a gnome do to me? So I tried to go right to it, then you like moved it up a lot and I was like, oh crap. So then I just tried to move away from it, and now I'm trying to walk around it cause I don't want to leave any spawns around that are bad* [note: an emotion out of bounds spawn manifestations that stay in the environment until defeated, in this case Terror Trolls].

The majority explored what effect all the different objects would have on their avatar's states of mind, and a few committed to reach certain moods in order to experiment on what effect that would have in the coming scenario.

In the fourth scenario Teresa asked for help in defending herself against the manifestations of Confusion. The avatars had reciprocal positive sentiments toward each other, resulting in giving both the avatars and Teresa a 'boost' in their state of mind, different according to the individual sentiments. This boost was helpful when they together defeated the Colossus of Confusion and the Sails of Sorrow and illustrated what effect a sentiment could have on the game mechanics.

6. SURVEY AND INTERVIEWS

A survey was conducted immediately after the play test. One of questions was whether the participants remembered the sentiment objects, and if so which ones? 100% of the participants remember the sentiment of fear they got by limited choice (garden gnome, small chair or noodle container). For the random sentiments the memory of the group was less accurate, of the total 20 random sentiment objects (2 for each participant) 15 were accurately remembered, or 75%. The players were asked to rate the three different types of sentiments objects according to their preference on a scale from Bad(1), Not so god (2), It was ok (3), Good (4), to Very good (5). There was a strong trend of of preferring the instantiation of sentiment objects as results of interactions, which got the overall score of 4.58, while the sentiments given by limited choice got 4.0 and the random sentiments only 3.33. A representative comment by a player asked the survey question *'What did you think about getting a sentiment toward the NPC Teresa when you interacted with her through using affective actionss via your avatar?'* was *'It was built through my actions and therefore made sense. I also felt a real emotional attachment to Teresa, whereas I could care less about pencils or garden gnomes.'* To the question of what sentiment object that had made most sense to the players and why, there was a strong trend to mentioning Teresa (70%), motivating it by that there was an effect of their actions that 'made sense'. Three of the players instead mentioned the chosen sentiments: *'because I picked it'*. When asked which sentiment object that had made least sense to them the majority of the players mentioned one of the randomly assigned sentiments: *'Anger towards mittens. What did they ever do to me?'*

The interviews conducted in the play test gave almost the same result as the surveys. 80% of the players strongly expressed their approval of getting a sentiment toward Teresa through interaction. One player said *'[...]even though it's a made up NPC, it's like just the way you are interacting, the way you are affecting her mood, it makes sense to have a lasting effect. Like I'm going to remember Teresa. [...] in this sense it was like I was on par with her so it was cool that it had a lasting effect on both of us. And it makes it feel more real because they remember me too...so I like that part a lot.'* In the interviews 50% explicitly expressed approval of the chosen sentiments, and 30% of the random sentiments, a similar result as in the survey, though in some cases some were silent on a certain subject in the interview and instead expressed themselves in the survey, and the other way around. The survey was conducted as a way to make sure that the results wouldn't be skewed by the fact that participants in face to face situations in tests often tend to want to please the one conducting the test and thus not express views that may not be 'pleasant' but relevant to the outcome of test.

In both interviews and surveys players expressed that the more agency they felt in the instansiation of sentiments, the more they preferred it. One player said: *'This one made the most sense* [pointing at the sentiment toward Teresa]*, the satisfaction. Because with Teresa I had a history with her, whereas I did not have much of a history with these other things. I have a history with the garden gnome, but it seems just as likely it could have been any of these other objects.'*

In the think aloud parts of the tests most of the players were reasoning about each objects relevance to the rest of the context. The more impact they had had on the creaton of the sentiment, the more meaning they could read into it. In the case of the sentiments toward Teresa they did not reason at all when they were 'thinking aloud'. Teresa and the sentiment toward her was not problematized or discussed, but accepted at face value. She was explored rather than questioned. The chosen and the randomly assigned sentiments were on the other hand discussed and interpreted. The players attempted to come up with explanations for the random emotions toward the objects. For example one player said *'I'm angry at socks, because you always lose that one in the dryer, then you end up with mismatched socks.'* For the chosen sentiments half of the players tried to come up with an own back-story of why the particular object would hold a certain emotion for them, and 40% of the players came up with ad hoc explanations for the randomly assigned sentiments.

7. DISCUSSION

The interview and survey results showed that sentiments instantiated as a result of interactions made most sense to the players. However, the notion of the sentiments given by choice seem promising. In my interpretation of the data, the player's main dismay came from the reasonable standpoint that the objects didn't make sense in the environment. The fact that many of them created their own meaning, and seemingly enjoyed doing so, and that the actual choice gave them a limited feeling of agency is still unsatisfactory. My lesson is that any such object needs to be rooted in deep structure of a story driven game world. In the case of persistent VGWs the drivers need to be the players if the chosen objects are to carry meaning. Possibly the notion of life path systems, a feature used in some table top role playing games, could be experimented with as a formalized way of creating individual back stories for the player characters, where the entities tied into the back-story have functional representations in the virtual world. A sentiment or a set of sentiments toward such an object would function as a memory as well as have an effect on avatar's state of mind and thus give the player material that a planned course of action can be based upon.

The interactions between Teresa and the avatars in the play test were carried out in a context where several components were governing for the initial deep structure. The script of the play test gave the GK, in Greimassian terms, the role as sender when he asked for a glass of water in the first scenario. Teresa received a role where she in the first meeting functioned as a giver of information, and in the second meeting had a role of someone seeking help. The player character had, in being the subject, in the first scenario a need for information, given that she was new in the environment, and in the second one she got the role of helper to Teresa. In the third scenario the sentiment objects with negative emotions tied to them would be the opponents and the ones with positive emotions would be the helpers in the avatar's navigation toward the water cooler. In the fourth scenario the opponents would be the Colossus of Confusion and the Sail of Sorrow, while the avatar temporarily stays acting as Teresa's helper on her way to the Gate Keeper. As a subject the avatar could, in the last scenario, deliver the object (glass of water) to the sender (Gate Keeper).

The constitution and rules of the prototype governed the action potential of characters, which was a limited dialog, a set of AAs and a small sets of spells performing 'mind magic'. The actions of the avatars varied, and took place in the surface structure, but resulted in that new components were added to the deep structure: the sentiments, different in nature to each player character, depending on the choices of the player.

8. CONCLUSION

What potentially can be useful to add to the body of knowledge in the area is the notion of the quality of the connections between the entities: to the idea of having goal- power- and desire-fuelled connections between entities at the level of deep structure I add the idea of using emotionally valenced connections, that either single, or in combination, can open up possibilities of modeling plots between characters in VGWs. It is my hope that this architecture can prove useful when experimenting with ways of creating narrative potential in VGWs where the players can act as main characters, and where their stories are tied into the very deep structure of the world. The sentiments of the MM can in the setting of WoM emerge and decay as the VGW is inhabited, and would, in the ideal case, have meaning for players since the sentiments are directly based on the interactions of the avatars.

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