

# UC Irvine

## Software / Platform Studies

### Title

Rules for Role Play in Virtual Game Worlds Case Study: The Pataphysic Institute

### Permalink

<https://escholarship.org/uc/item/3x99c2zt>

### Authors

Eladhari, Mirjam P.  
Mateas, Michael

### Publication Date

2009-12-12

Peer reviewed

# Rules for role play in Virtual Game Worlds

## Case study: The Pataphysic Institute

Mirjam P Eladhari  
Gotland University  
Cramergatan 3  
Visby, Sweden  
mirjam.eladhari@hgo.se

Michael Mateas  
University of California Santa Cruz  
1156 High Street  
Santa Cruz, CA, USA  
michaelm@cs.ucsc.edu

### ABSTRACT

The Pataphysic Institute (PI) is a prototype MMORPG developed in order to experiment with game mechanics enhancing the playing experience. In this paper aspects of the design the prototype which support players' expression of consistent interesting characters are reported. The design of these features builds upon results of user tests of a previous iteration of the prototype. The game-play in PI is based on the semiautonomous agent-architecture the Mind Module.

### Categories and Subject Descriptors

I.2.0 [Artificial Intelligence]: General—*cognitive simulation*; I.2.1 [Artificial Intelligence]: Artificial Intelligence—*games*

### Keywords

character, multiplayer, affect, virtual game worlds, design, role-play, software studies, MMORPG

## 1. INTRODUCTION

The darkest force in the Pataphysic Institute are the traumas that linger, the ones buried alive, forgotten, working their way from the shadows. Defeat their manifestations by balancing your mind and join forces with your friends. The people at PI need your help. Meet Karl Sundgren, the former head of staff, who clutches results of the FFM personality tests of all PI's inhabitants, and tries to work out how personality is connected to the emergence of 'Mind Magic'. Meet Teresa, the former PhD student who studies 'Affective Actions' - the social interactions between people suddenly result in acutely concrete emotional reactions - there seem to be patterns to discover.

\*\*\*

Role-play (RP) in commercial massively multiplayer online role-playing games (MMORPGs) is seldom supported by the game mechanics. The game play is based on rule-sets following design paradigms set back in the seventies [15, 1] which encourages instrumental game play. In role-playing persons change their behaviour to assume a role. In role-playing games (RPGs) players act according to adopted fictional roles. Participants in a RPG determine their actions in a game based on the characteristics of the adopted role.

The actions' success depend on formal systems of rules specific to a particular game. In table-top RPGs a game master can create settings for participants, and can also interpret the rules of specific games in ways that are fitting for the setting. In live-action role-playing (LARP) players perform their characters' physical actions, and the avatar is the player, enacting a character in ways similar to improvisational theatre. In single-player role-playing computer games the rule-systems are provided by computational operations rather than game masters. Role-playing in single player games has a different meaning, since there are no other players to perform with. The concentration on the role-aspect is that of a playable characters' advancement within a game world, where choices made by players affect the properties and action potential of the avatar. In computer multi-player RPGs and MMORPGs the game rules are computed, but sometimes scenarios and settings can be designed by game masters for groups of players. RP in MMORPGs mostly rely on meta-game rules since RP is hard to capture in a system. In fact, Copier [7] described a specific MMORPG play-style as characterized by negotiation of principles of these meta-game rules.

However, the majority of players in MMORPGs do not role-play at all, but self-play, that is, play as being themselves without adopting a fictional role. The nature of the game world and players' in-game representations, their avatars, are defined by design and fiction of the world. To illustrate the difference between self-play and role-play, suppose that the player Mirjam, who self-plays, chooses an avatar who is good at hunting. When she plays she 'is' a hunting orc, acting as she would if she was an orc in the given setting. Suppose that the player Michael, who role-plays, chooses a similar avatar. Michael thinks about the history of the orc, what he wants and likes, why he likes hunting, how he relates to others, and other things Michael considers characterising. When Michael role-plays he makes sure to 'stay in character', that is, only act in such a way as his fictive orc would. As Mirjam and Michael plays the orcs' personalities become more distinct. In Mirjam's case, she might act differently when 'being' the orc than she would have acted in the ordinary world as her orc-identity develops. In Michael's case, his orc character develops both as a result of Michael's performance and continuous authoring, and as a result of the orc's experiences. After long periods of play (hundreds of hours during several years) avatars in MMORPGs often become characters of 'their own', animated by their players,

no matter whether the player set out to self-play or role-play when starting to play.

One of the aims with the prototype MMORPG Pataphysic Institute (PI) is to experiment with game mechanics that support role play and can be played according to its own rules. That is, accommodate for characterising actions that players can perform that are part of the game-play. (It is common that role-players go to areas which normally are empty of avatars where the role-play while ignoring the game play of the world, basically using the VGW as a platform for communication.) Another aim is to experiment with ways to accommodate self-play where players' own personalities come into play in interesting ways. The PI prototype support players in characterising avatars in consistent ways, aiming to help role-players to stay in character, and to help self-players characterise their avatars' personality in interesting ways. Much of the game mechanics characterise avatars as persons through which actions are possible to perform under different circumstances.

Experimental research and evaluations of rules and game mechanics in MMORPGs are rare in the academic realm due to the large effort required for the development. Researchers are often constrained to using existing code bases that enforces traditional game mechanics. One example is the level design tools of Neverwinter Nights [3] that enforce the D&D rule set, used for research project by among others Castronova [5] and Tychesen [33]. For exploration of truly innovative game mechanics it is key to take into consideration what type of game play an underlying engine and framework lends itself to. Choices that seem convenient in the development process are risky for the design of innovative (digital) game experiences – the conventions in the rule sets can 'kill' the innovation. Experiences from using five different virtual world game engines led to the decision to build PI as much as possible 'from scratch'.

PI is built with inspiration from personality psychology and affect theory in an attempt to mimic possible emotional responses in order to give players support in role-playing. The mental state of player characters depend on the own personality and on the current mood – a value that differs according to context and to recent experiences. Emotional experiences become memories and define the relationships between characters. The mental state is the sum of the character and governs what actions can be performed in a given moment. In order to do certain things the characters need to be in certain moods – and for this the players need to game their emotions, and game their relationships. PI employs the Mind Module (MM), a semi-autonomous agent architecture for the 'mental physics' of the inhabitants. The MM consists of a spreading activation network with nodes of four types: traits, emotions, sentiments and moods. The game rules of PI are designed to accommodate for these properties. PI is used as a platform for conducting experimental game design research. It is our hope that this work can provide us with insight into the design space of virtual game worlds, specifically how alternative rule sets can support role-play in virtual worlds.

## 2. RELATED WORK

Related work include the work by Brisson and Paiva [4] 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. Other related work include Ian Horswill who argues, from a hypothetical perspective, that AI Characters should be 'just as screwed-up as we are' [16], thus tying in the notion of believable agents [2], and ways of building these [22, 18, 30, 27]. Also the work conducted by Marsella et al [21, 28], as well as the work done at Miralab [19, 20] on the subject of virtual humans has been an important source of inspiration.

## 3. CHARACTERISING ACTION POTENTIAL

The action potential of a character is what it can do at a given moment with it all the circumstances inherent in the context taken into account. The *characterising action potential* (CAP) defines what a character can do at a given moment that characterise it, both in terms of observable behaviour and in expression of 'true character' (as described by McKee [24] — a character's essential nature, expressed by the choices a character makes. The observable characteristics include visual appearance, what body language it uses, what sounds it makes, what it says, and most importantly, what it does and how it behaves.

We believe that CAP is essential to how avatars in MMORPGs can be supported in expressing consistent and interesting characters. This is also crucial for addressing how role-play can be supported by the rule-systems of MMORPGs.

Normally in MMORPGs the foundation of the CAP of avatars is chosen by players in the very beginning of the game, at the character-creation stage, where players choose gender, visual appearance, class and skills for their avatars. It is the choice of class and skills which will define what the player can do in terms of game play and what the avatar may become particularly good at doing in the MMORPG. These skills normally define which roles players take in groups where players co-operate. An avatar's role in co-operation with others is important since it impacts other players' interactions with a particular avatar. Interactions with others become part of the player's journey in the virtual world while creating the identity, possibly second self or persona, that the avatar represent.

CAP is the means players have for expressing their personalities, or the character of their avatars, to other players, but it is also via CAP the players gets to know and develop their own avatars - a process which is an interplay between players and the game system. The design and architecture of CAP for avatars in MMORPGs is crucial for game-playing experience from many angles. The nature of the CAP defines what role and what impact an avatar can have in the creation and realisation of the narrative potential in a MMORPG. It is also defining for the progress of the avatar in terms of achievement and role-differentiation in a MMORPG, as well as for how this process is interpreted by players while potentially constructing alternate identities or second selves. CAP has a profound impact on the role-playing possibilities provided to players — to what extent

the role-playing activity is supported.

CAP ties into Glenberg’s [14] and Schubert et al.’s [29] work about presence in virtual environments, where they propose that representation of users is understood by what actions are possible to perform in the environment. The users construct, by assessing their action potential, meshed sets of patterns of action. This is comparable to strategies of action in MMORPGs which rely on the nature of the CAP of avatars. The meshed sets of patterns of actions are constructed by the users, constituting the mind models the users have of their action potential. The mental construction of CAP is in MMORPGs crucial since this governs how players use it.

#### 4. THE PATAPHYSIC INSTITUTE

Pataphysic Institute (PI) is a prototype game world where the personalities of the inhabitants are the base for the game mechanics. When interacting with other characters the potential emotional reactions depend upon avatars’ current mood and personality.

The core game play draws upon the Mind Module, a semi-autonomous agent architecture built to be used in a multiplayer environment as a part of the player’s avatar. All characters in Pataphysic Institute are equipped with Mind Modules, both avatars and non-playable characters (NPCs). The design of PI and the architecture of the current iteration of the MM builds upon lessons learned from play tests of the prototype predecesing PI, the World of Minds (WoM) [12, 13, 11]. PI is built in the company Pixeltamer’s framework for web based multiplayer games and is played in a web browser through a Java applet. PI is an application developed for conducting experimental game design research using iterative design and guided play tests.

While the architecture of the MM to a large extent relies on theoretical work from the field of psychology it has been an important design goal to make the MM into more than an experiment of different theories of psychology applied to agent structures, that is, to integrate the MM to MMORPG prototypes, with emphasis on the gaming aspect. Another important aspect of the design has been, to use Bates’ expression, the believability of the semiautonomous avatars to their players.

The design of PI and of the current iteration of the MM is informed by work conducted constructing earlier prototypes. An early prototype, Ouroboros [34] focussed on expression of character performed to other players through gestures and another, the Mind Music prototype [10] explored expression of a player’s own avatar to the player herself, the focus of PI is on expression of character — to both self and others — through fluctuations of CAP and of manifestations of the avatar’s mental state that become part of the game world. In the playtesting of WoM a strong focus was put on understanding the meshed patterns of actions Schubert et al. [29] describe, that is, whether players could construct mental models, or ‘reverse-engineer’, the game mechanics derived from the MM [12]. The test players’ understanding of the impact of personality trait nodes on their CAP in WoM was very important for the design of the digital PI prototype.

In the following, we describe the MM, and some of the features of PI which potentially can support RP.

#### 4.1 The Mind Module

The Mind Module (MM) is a semiautonomous agent architecture built to be used in a MMORPG as a part of avatars. The MM gives avatars personalities based on the Five Factor Model [23], and a set of emotions that are tied to objects in 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 summarised by a mood. The MM consists of a spreading activation network of affect nodes that are interconnected by weighted relationships. There are four types of affect nodes: personality trait nodes, emotion nodes, mood nodes, and sentiment nodes as shown in Figure 1. The values of the nodes defining the personality traits of characters governs an individual avatar’s state of mind through these weighted relationships, resulting in values characterising for an avatar’s personality.

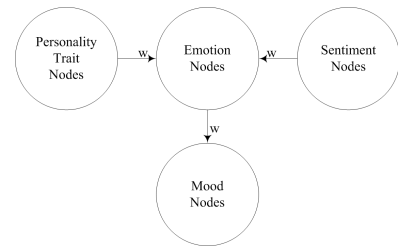


Figure 1: Affect Node Types

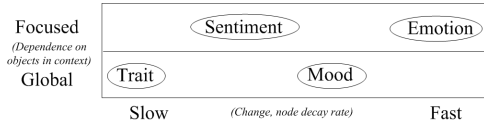
According to Moffat [25] *emotions* can be regarded as brief and focused (i.e., directed at an intentional object) dispositions, while *sentiments* can be distinguished as a permanent and focused disposition. Similarly, *moods* can be regarded as a brief and global dispositions, while *personality traits* can be regarded as a permanent and global dispositions. 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. Moffat’s model [25, p. 136] is illustrated in Figure 2.

		DURATION	
		brief	permanent
FOCUS	focused	<b>emotion</b>	<i>sentiment</i>
	global	<i>mood</i>	<b>personality</b>

Figure 2: Moffat’s illustration of how emotion may relate to personality.

The categories of affect nodes of the MM are inspired by Moffat’s model, both in duration (persistence and briefness) and focus (whether a value of an affect node is dependent of another object in a context or not). The sentiments are not in all cases regarded to be permanent, but certainly long lived, that is, their decay rate is very slow compared to the quick emotions. A value of an affect node in the MM with a fast decay rate, such as an emotion, is non-zero for only a short period of time after a stimulus that causes the

value of the node to change, and thus affects the value of other nodes in the network for only a short period of time. The two-dimensional affect plane of the MM is illustrated in Figure 3.



**Figure 3: The two-dimensional affect plane of the MM.**

If an agent receives information about something happening, for instance that an object is approaching, the following process cycle takes place.

1. The agent retrieves the identity and the type of the entity approaching. Suppose it is an avatar named Lena.
2. The agent searches its list of sentiments to see whether it has an emotional attachment towards entities of the type avatar, and whether it has an emotional attachment towards the entity Lena. Suppose that the agent has no sentiment towards avatars in general but a sentiment of amusement towards Lena, perhaps due to listening to a fun joke at a prior occasion.
3. The agent looks at its emotion node to see which personality traits may impact the change of the value of the emotion node. The emotion node Amusement is connected to four trait nodes with the following weightings: Cheerfulness: 1.1, Depression: 0.9, Imagination: 1.2 and Emotionality: 1.1. Thus, stimuli that would lead to Amusement will lead to more Amusement the higher the trait values for Cheerfulness, Imagination, and Emotionality, and less Amusement the higher the trait value for Depression.
4. The new value for the emotion node is calculated and the value of the node is changed accordingly.
5. The mood nodes check at each cycle of processing whether a significant change in any emotion node connected to them has happened since the last cycle. In this case this would be true in the case of mood node Outer Mood which is connected to the Amusement node with the positive weighting 2.0 (for connections between mood nodes and emotion nodes please see Figure 5).
6. The mood node calculates the change of its value based on the change in the emotion and the weight from the emotion and changes its value. In this example the mood node in question is the Outer Mood, calculating its new value based on the change in the emotion node Amusement and the weight between them.

Each node has a value, that is defined as a norm value; a value that the node changes to over time. For each cycle of the processing of the MM each node, if it is not already at its norm value, moves towards this value. The amount of movement towards the norm value is defined by the decay rate of the node.

## 4.2 Personality Trait Nodes

Adopting the FFM, the MM employs a trait-based theory of personality. In analyses of rich and complex characters in novels and screenplays, scholars have argued for the usefulness of defining characters’ personalities via traits. Chatman, for example, argues for a ‘conception of character as a paradigm of traits’, where a *trait* is a ‘relatively stable or abiding personal quality’, noting that in the course of a story, a trait of a character may unfold or change [6].

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 FFM, as shown in Figure 4. The traits are grouped into five factors, with the value of a factor being a weighted linear combination of the values of the traits.

**Figure 4: Traits from IPIP-NEO used by the Mind Module.**

Factor	Facet
Extraversion	Friendliness, Gregariousness, Assertiveness, Activity Level, Excitement-Seeking, Cheerfulness
Agreeableness	Trust, Morality, Altruism, Cooperation, Modesty, Sympathy
Conscientiousness	Self-Efficacy, Orderliness, Dutifulness, Achievement-Striving, Self-Discipline Cautiousness
Neuroticism	Anxiety, Anger, Depression, Self-Consciousness, Immoderation, Vulnerability
Openness	Imagination, Artistic Interests, Emotionality, Adventurousness, Intellect, Liberalism

In a role-playing setting for instance this system of traits can define how likely an avatar is to react in particular ways in particular situations. For example, a character who has a high value of the trait anger will more easily respond with anger than a character who has a low value.

## 4.3 Emotion Nodes

In certain situations, events that a particular avatar experiences will invoke emotions. What emotions are invoked and how strong they are depends upon personality and on the character’s likes, dislikes, and previous experiences (sentiments).

Through a mapping of weightings between emotion nodes and trait nodes, the MM defines how much the value of an emotion node fluctuates for each avatar. For example, the emotion node Amusement is connected to four trait nodes with the following weightings: Cheerfulness: 1.1, Depression: 0.9, Imagination: 1.2 and Emotionality: 1.1. Thus, stimuli that would lead to Amusement will lead to more Amusement the higher the trait values for Cheerfulness, Imagination, and Emotionality, and less Amusement the higher the trait value for Depression. Systematic information about the effects of personality on emotion from psychological research applicable for the MM is scarce. The weightings between traits and emotion is experimental and is evaluated with the goal to create interesting game-play experiences rather than simulating a set of beliefs of about the workings of the human mind.

The choice of emotions was based on research into affects and affect theory by Tomkins, [31, 32]; Ekman, [9]; and Nathansson, [26]. The emotions collected by Ekman and others builds upon studies of facial expressions. Research into basic emotions has shown what emotions that primates and humans *express*, but not necessarily what they *feel*. Definite knowledge of how and individual ‘really’ feels might be beyond the capability of current research in general. Regarding knowledge about someone’s ‘actual’ feelings, the information is limited to active areas (visible in MRI scans for example) of the brain and subjective narrative reports. However, the aim of the work with MM is not to simulate the *actual* workings of the human brain, but for use as a tool for the creation of interesting game-play experiences. It is the aim of believability that governs what parts from psychological research to use as inspiration for the building blocks of the MM. Figure 5 is an illustration of the emotion nodes used in this iteration of the MM, and their relations to the mood nodes.

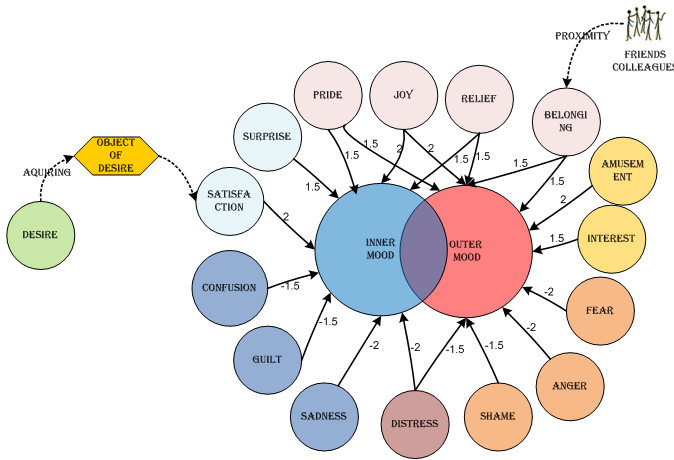


Figure 5: Emotions/Affects used in the MM, and their relations to the Mood Nodes

#### 4.4 Mood Nodes

The mood of a person in real life is a complex state. It is temporary and highly contextual, but can linger even if the context changes. It is also individual, in other words, the way mood changes and fluctuates depends on an individual’s personality and internal psychology, not just the context of the moment.

In the MM, mood is a computed summary of the 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* and an *outer*. Each scale ranges from -50 to +50; this corresponds to the range from Depressed to Bliss on the inner scale, and from Angry to Exultant on the outer scale as shown in Figure 8.

In the MM mood is a state that can be seen as ‘the tip of the iceberg’ of underlying emotions. Characters’ mood depends on their personality and on what they have experienced in particular contexts. A summarising display of a character’s state of mind is useful from a user’s perspective for viewing a concise display of the current state of mind that otherwise might be too complex to understand in a multi-tasking

game-world environment.

The *inner mood* node represents the private sense of harmony that can be present even if the character is in an environment where events lead to a parallel mood of annoyance. Reversely, a character in a gloomy mood can still be in a cheerful mood space if events in the context give that result. The nature of the *outer mood* is social, and tied to emotions that are typically not only directed towards another entity but also often expressed towards an entity, such as anger or amusement. The two scales for mood nodes open up the possibility of more complex states of mind than a single binary axis of moods that cancel each other out.

#### 4.5 Sentiment Nodes - Emotional Attachments

An avatar can have emotions associated with game objects. For example, a character with arachnophobia would have the emotion Fear associated with objects of type Spider. Such associated emotions are called sentiments. These are represented in the MM via sentiment nodes that link emotion nodes to specific objects or object types. Thus, if a player’s avatar has a sentiment of Fear towards Spiders, and a Spider comes within perceivable range, there will be an immediate change in the value of the Fear node; the exact value of the change will be a function of the strength of the sentiment as well as the values of the traits that modulate the value of Fear.

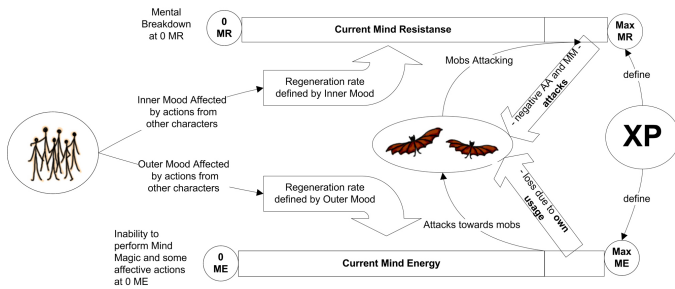
The intensity of the sentiment is in the MM different for each avatar depending on the context since the intensity is defined not only by the context in form of sentiment objects in proximity but also via weightings between personality trait nodes and emotion. Thus the intensity of an emotion depends 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.

#### 4.6 Pataphysic Institute Game Play Summary

Players are introduced to the back story of PI before they log on, by reading the diary of Katherine, an investigator who was sent in to PI to investigate the consequences of a mysterious event called the Outbreak. In PI, reality has been replaced by the inhabitants interpretation of reality, and their mental states are manifested physically in the environment. The head of human resources at PI, an NPC, has taken upon himself the task of understanding the new and unknown world by applying personality theories. He forces everyone in PI to take personality tests, and studies what types of abilities these persons get, abilities he calls Mind Magic Spells. Another inhabitant in PI, the NPC Teresa, focuses on the finding that social interactions between people suddenly result in acutely concrete emotional reactions. She calls these Affective Actions (AAs), and tries to understand her changed environment by studying the patterns of these.

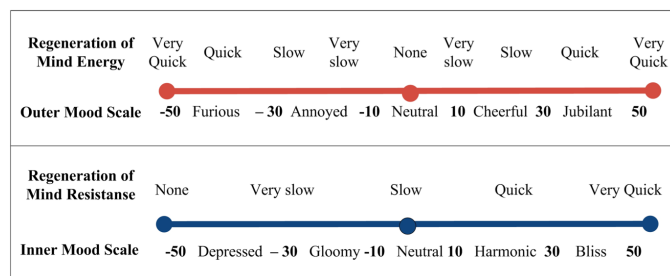
The basic game play is simple: players need to defeat physical manifestations of negative mental states. In order to do so, they can cast spells on them, but the spells available are constrained by the avatar’s personality, her current mood, and how far the avatar has progressed in learning new abilities. 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 6.



**Figure 6: Fluctuations of Mind Energy and Mind Resistance**

Mental resistance and energy is regenerated over time. The rate of the regeneration depends on the mood of the character. Inner Mood is tied to the generation of mind resistance while Outer Mood is tied to the regeneration of Mind Energy as illustrated in Figure 7.



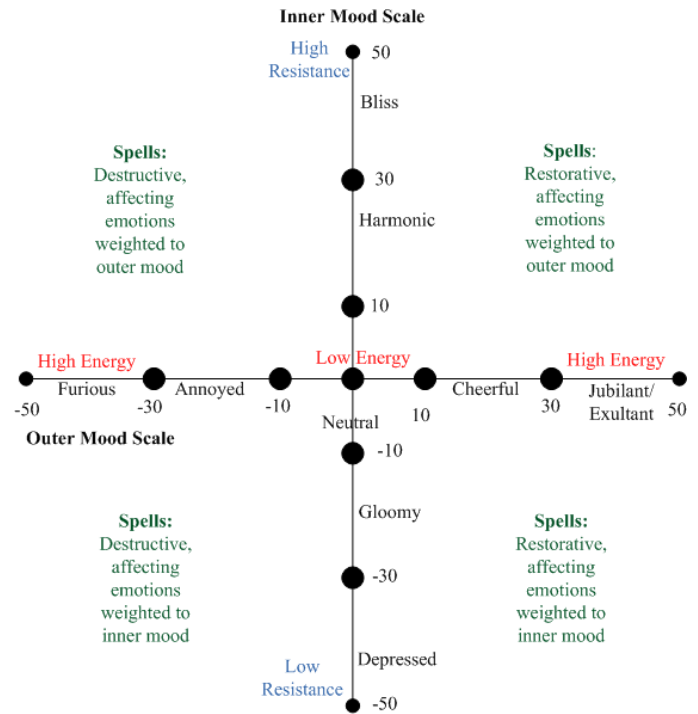
**Figure 7: Regeneration of Mind Energy and Mind Resistance**

The regeneration of mind resistance corresponds to the negative and positive values of the inner mood, meaning that the higher the value is of the inner mood, the quicker the resistance of the character is regenerated over time. In the case of the mind energy the regeneration is the slowest when the character is in the middle of the scale. The quickest regeneration of energy is achieved at the extremes of the outer mood scale, in the jubilant and furious moods.

Mind Magic can be performed in two ways: through social interaction with the use of AAs, and through spells. The AAs mimic the way humans affect each other emotionally through interactions such as encouragements or insults. The mind magic spells are more traditional from a game history perspective where the target of a spell not necessarily needs to have chosen this interaction. From a social interaction perspective a simile could be to use a love potion bought from a witch-doctor, in the belief that emotions can be forced. In PI they can be.

## 4.7 Spells

Spells can help or damage (in terms of mental resistance, energy and emotions) characters that the spells are used on. There is a standard set of spells. Benevolent spells can be used on Self, on other characters, and on Manifestations. Harming spells can be used on Manifestations. The spells that affect a target's emotions that avatars can learn depend on their personality traits.



**Figure 8: Mood co-ordinate system, mental energy and resistance regeneration rates, and usable spells**

The types of spells that affect the pools of mental energy and resistance which can be used differ with the mood of the spell-caster. The action potential regarding these spells reflect the mood of the casting character, as illustrated in Figure 8. For example, a character in a furious mood can cast aggressive spells, while a character in a harmonic mood can cast benevolent spells helping her friends.

In the play test of WoM participants expressed the worry that, in using the personality trait nodes of the MM as base for action potential, introvert and neurotic characters may be disadvantaged given the social nature of many game-play features. The action potential for spell-use for different personality types was a special concern when designing the spell system for PI. The mood of avatars who have dominant facets of introversion or neuroticism fluctuate towards depression more easily than for other types of personalities. The spells available to players in the depressed mood-state are both powerful and versatile enough that a depressed avatar who regenerates energy slowly is still of good use, even essential, to a group of players facing a challenge. Care was also taken to make sure that the actions possible to take in different mood spaces could be characteristic actions for avatars in these moods.



## 4.8 Affective Actions

Players can perform a social/affective action towards other characters in order to change their mental state in both positive and negative ways. By affecting others mood's the selection of their available spells is changed. 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 on the mood co-ordinate 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. In order to use an AA in PI players choose it from a menu in the interface while targeting the character that is to receive the AA.

## 4.9 Character Creation

When a player logs on to PI the first time she can take an IPIP NEO test consisting of 120 rating scale items in order to create a personality for her avatar [17]. Figure 9 shows a screen of the IPIP NEO in PI. In order to rate all items players need to scroll down in the dialogue window in the PI client.

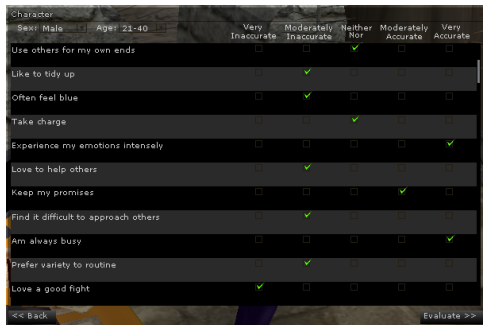


Figure 9: IPIP NEO in the Pataphysic Institute.

## 4.10 Display of Mind Module Information

In PI players can open a window displaying mind module (MM) information of their avatars by clicking the button which has a blue symbol of a human head shown Figure 10 in the top left part of the picture. The window displaying MM information is transparent, overlaid on the landscape shown in the PI client. In the screen from PI shown in Figure 10 the MM information of the avatar Emil is displayed.

In the top left column the values of Emil's personality trait nodes are displayed. In order to see the whole list it is necessary to scroll down in the list using the grey marker to the right of the column.

In the bottom left column a list of sentiments are shown, where first the entity that the sentiment is directed toward is named, and then the emotion of the sentiment. The numerical value to the right of the text shows the strength of the emotion. Emil has a sentiment of Belonging toward Neurotica, and in proximity of her the value of his emotion node Belonging increases.<sup>1</sup>

<sup>1</sup>In PI the effect scales by proximity — the nearer the ob-



Figure 10: Display of Mind Module information in the PI client

In the middle column the values of Emil's emotion nodes are displayed. The pink high-lighted dot next to the emotion Distress/Anguish signals that it is clickable. If Emil's player hovers the mouse over the dot the text 'Dull Pain' is displayed. This is Emil's first personality based emotion spell. If the player clicks the dot the spell is cast on a targeted entity, reducing Distress in that target.

The column to the top right shows Emil's mood, displaying the value of the inner and outer mood nodes as well as the mood co-ordinate system. The white dot in the mood co-ordinate system shows which mood space Emil currently is in; Jubilant. The green dots in the right of the mood co-ordinate system are clickable spells of the type Resistance Aid, available when Emil is in the jubilant mood space.

In the column to the lower right effects of recent actions are displayed. Emil has performed the AA Squeeze hand on the avatar Neurotica, who has performed the same AA on him. The number to the right tells for how long the effect of the action persists. At the time when the screen was taken the effect of the Squeeze hand Emil performed on Neurotica will be active for a few more seconds.<sup>2</sup>

In PI, avatars can see what mood other avatars are in by the colour of the mood aura, which is a transparent half-bubble displayed on the head of avatars as shown in them middle picture of Figure 11. The colour and shade of the colour reflects the current position in the mood co-ordinate system. In the picture to the left the white dot in the middle in the mood co-ordinate system is the position of the avatar Emil's mood, which was neutral at the time when the screen was taken. In the figure to the right the white dot shows the avatar Neurotica's mood, which was in the blissful space of the mood co-ordinate system.

ject, the stronger the effect. The effect increases with 0.1 multiplied with the relative distance to the sentiment object per second.

<sup>2</sup>The value of the remaining AA is the remaining strength. An AA begins with the strength 1, and decrease once per second with the decrease value specified for the AA.



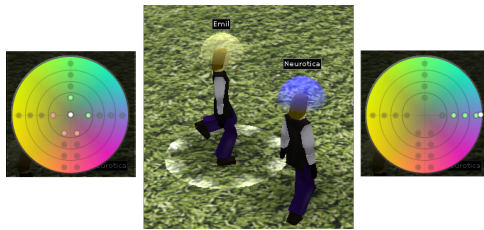


Figure 11: Mood Aura in PI.

#### 4.11 Manifestations of Curses and Blessings

Avatars can be affected by the spells Sentiment Curse and Sentiment Blessing. The spell Sentiment Curse gives an avatar a strong negative sentiment that has a zero decay rate. For example, it can be a curse of Guilt. The way to get rid of this sentiment is to create a manifestation of the sentiment, a compound manifestation (CM). If the CM is vanquished, the sentiment disappears.

Sentiment Blessings are different from curses in the way that the emotion attached to the sentiment is positive, it could for example be Joy. The player might want to keep the blessing or curse instead of 'externalising' it as a CM if it affects the mood of the avatar in a way that the player finds desirable. However, if a CM is instantiated it can cast beneficial spells on other players, or can help vanquish other CMs. Which spells CMs of the curse/blessing type can cast on entities in proximity depends on which emotion they represent. CMs cast the emotion spell that increase the emotion they represent.

Suppose that an avatar named Adam is afflicted by a sentiment curse of guilt. The player does not find the state of mind this results in desirable for Adam and decides to instantiate a Curse CM. While being in the location Entrance he uses an interface provided in the client software for creating a CM. Adam names it 'Grandmother' and describes it as 'Forgives you when you don't deserve it'. The spell 'True Sounding Accusation' is renamed to 'being so unselfish that you can never repay it'. He picks the AA 'Be martyr' and lets it keep the original name. He writes three custom exclamations: 'And I, who loved you so much', 'I never expected anyone to thank me' and 'I don't want to be a burden'.

When Grandmother is instantiated the following message is sent to all players online: 'Grandmother roams in the Entrance, being so unselfish that you can never repay it and being martyr! Adam needs help to get rid of the trauma!' If the CM instantiated would have been a Blessing CM the wording of the system message instead would have been: '[Name of avatar who made it] has blessed us! [CM Name] casts [custom spell name] and [affective action] in [Location]!'

The personality trait values of these CMs are mid-level, that is, the values in the trait nodes are in the middle between their possible minimal and maximal values. Each CM of curse/blessing type has a strong sentiment object of the emotion it is to represent. The sentiment is directed toward objects of type the avatar. This means that a CM associated to the emotion Joy 'feels' strong joy if an avatar ap-

proaches. A CM associated to Guilt, such as Grandmother, would 'feel' guilt under the same circumstances. The effect multiplies if several avatars approach. Exclamations of Curse- and Blessing-CMs are exclaimed issued per minute, and the dialogue line is randomly picked.

In order to vanquish Grandmother avatars would either need to get her mental resistance or the value of her emotion node guilt to zero. If Adam chose the strategy to reduce Grandmothers guilt value he would need to cast the emotion spell 'Forgive' on her, which reduces guilt. If he is unable to cast Forgive he would need to find an avatar who can. Suppose that the avatar Christine has a personality allowing her to cast Forgive, and that she comes to help. Christine, being the caster, would be targeted by Grandmother. Grandmother would cast the spells and AAs specified by Adam on Christine, as well as energy drain and resistance drain spells. Adam and other avatars coming to assist would want to make sure to give Christine both mental energy and resistance to ensure her ability to cast and for her to not suffer a mental break-down. In order to give Christine mental energy and resistance the other avatars would need to be in positive mood spaces on the mood co-ordinate system allowing them to cast spells of energy rush and resistance aid. In order to balance their minds to be in the positive mood spaces allowing them to do this they could perform positive AAs toward each other.

If Adam instead chose to vanquish Grandmother by reducing her mental resistance to zero he would need to make sure to either himself be or, have a group of assisting avatars who could be, in a depressed or furious space of the mood co-ordinate system. An avatar in a furious state can cast Grand Focussed Aggression while regenerating mental energy quickly. An avatar in the furious mood space might need assistance from entities that can aid in giving mental resistance in the case the conflict takes long time. An avatar in the depressed mood space can cast Grand Focussed Resistance Drain as well as Grand Focussed Energy Drain. Since an avatar in the depressed mood state do not generate mental energy and resistance over time the avatar would need to steal the mental energy and resistance from the opponent. In assembling a group of avatars for reducing Grandmother's mental resistance Adam might want to make sure to include members who because of their personalities deviate toward depressed states of mind, that is, avatars who have dominant neurotic facets. If the CM Grandmother ceases to exist in PI, Adams curse of guilt also disappears.

## 5. DISCUSSION

The CAP and the mental model of it are highly individualised in MMORPGs since it is normally possible to play in very different ways, depending on the chosen and developed action potential of avatars. The combination space of action potential results in highly differentiated patterns of behaviour. These patterns of actions characterise a particular avatar to other players, but also to the player herself. As mentioned, personality is in this context, in Moffat's words, 'the name we give to those reaction tendencies that are consistent over situations and time'. In MMORPGs, these reaction tendencies are results of players' strategies and habits they develop by inhabiting MMORPGs, but they are ultimately constrained by the action potential that a particular

player has chosen in the character creation stage, and how the player has refined the action potential during the development of differentiated skills of his or her avatar, and by what types of action potentials are provided by a specific MMORPG. In PI, action potential of players is provided by the design of the prototype MMORPG, but the individual CAP is governed by the combination space of the trait nodes in combination with the types of activity that are available in PI, mainly affective actions and spells. That is, the reaction tendencies are developed by players, but the range of action is restrained by the characters' combinations of personality-trait-node values. The values of the trait nodes are used to decide what type of emotion spells avatars can cast. The trait nodes are also the elements governing the tendencies of the mood fluctuations of the character. The CAP also depend on the position in the mood co-ordinate system towards which an avatar's mood has the tendency to fluctuate. This position governs the types of spells that they can perform that can affect mental energy and resistance in their targets. The CAP can guide players' choice of role for their avatar in situations where players co-operate. A player might find that his or her avatar's personality is specially useful in certain situations, while co-operating with players that have either compatible strategies or personalities which complement each other in certain situations. The reaction tendencies in PI are partly given by the personality, but players have the ultimate control of how they act in order to influence the mood of their avatars and that of other avatars.

Summarising, the nodes defining the personality traits of characters governs an individual avatar's state of mind through individually weighted relationships to the other affect nodes, including the sentiments which are results of interactions with and relationships to other avatars, resulting in values characterising for the avatar's personality.

The well-known notions of role taking from MMORPGs where avatars normally have functions such as 'tank', 'healer' or 'damage dealer' are comparable to possible avatar-roles in PI. However, where in MMORPGs the role normally is given by character class, it is in PI given by an avatar's personality. The role of tank in a group of avatars engaging in combat in a MMORPG means that the avatar tanking takes the damage dealt by opponents. The tank protects the other members of the group by making sure that the opponent's aggression is directed to her. The damage dealer normally lacks health and resistance to be able to be in direct contact with the opponent, but may be located a bit further away from the tank and the opponent while using powerful ranged attacks. The role of the healer is to heal the tank, and if needed also the damage dealer or herself. For an extensive explanation of the game-play strategies involved in these roles, please refer to Musse Dolk's MMORPG Gamer's handbook [8]. In PI, a neurotic introvert avatar would be an eminent damage dealer since the avatar's current mood would easily move towards the depressed mood spaces which are required to be in, in order to casts spell decreasing the mind energy of opponents. Another type of effective damage dealer would be an avatar with a neurotic extravert personality, who quickly could generate both energy and resistance if in a mood of fury while damaging the pool of resistance of the opponent. An avatar prone to extraversion in general might function

especially well as a healer if in a jubilant mood, being able to give mind energy to group members. Avatars who naturally deviate towards inner harmony might be able to function especially well as tanks given that they would regenerate mental resistance quicker than others.

The participants of the WoM play test, who all played as themselves rather than role-played, expressed that the results of their IPIP-NEO personality trait evaluation were close to their own self-images of their personalities. In MMORPGs playstyles where players play 'as themselves' are more common than that of role-playing. Perhaps personalities of avatars that resembles players' own views of themselves can make it more interesting to play since the self-playing might, via CAP and role-taking, display characterising behaviour and choices of action for particular players no matter whether they self-play or role-play. In play situations not only the own behaviour, but also other avatars' behaviour is an important part of the experience.

## 6. CONCLUSIONS AND FUTURE WORK

Potentially, the elements of CAP outlined in the discussion above could support players in expressing consistent characters, their second selves, and perhaps help them to stay in character while acting in the MMORPG. (Unless they play as an aspect of themselves, where they would already be 'in character'.) However, in role-playing the characterising of the avatar is not the only concern, building story lines that a group of role players can enact as well as establishing dramatic plots involving the avatars is equally important. Potential answers concerning the support of role-playing activity are thus tied into issues of story construction and plot-modelling in MMORPGs. Future work include user testing of PI focussing on the following qualities of PI. In PI, all interactions between avatars and between avatars and NPCs potentially result in sentiment nodes, where the emotional quality of the sentiment is dependent on the nature of the interaction, that is, the emotions that interactions have evoked. Potentially these sentiments emerging from interacting among avatars can serve as inspiration when role-playing scenarios where plots among characters are enacted. In PI, avatars can take part in the story construction of the world by creating compound manifestations. A fictive example of this was described where the avatar Adam created Grandmother, a manifestation spreading guilt to other entities in proximity by custom-written actions authored by Adam's player. The characterisation expressed by the creation of compound manifestations is potentially characterising for avatars, but depends on players' authoring style.

## 7. ACKNOWLEDGEMENTS

Christoph Pech programmed the client and the server of PI. Musse Dolk did the level design, implemented dialogues and various other tasks. Ola Persson made the graphics. The scoring system and report routines of the IPIP NEO test was kindly provided by John A. Johnson. The perl CGI scripts provided by Johnson were rewritten in C++ by Pech at Pixeltamer for use in PI.

## 8. REFERENCES

- [1] R. Bartle and R. Trubshaw. *Mud - multi user dungeon*, 1978.

- [2] J. Bates. The role of emotions in believable agents. Technical Report CMU-CS-94-136, School of Computer Science, Carnegie Mellon University, Pittsburgh, PA, April 1994.
- [3] Bioware. *Neverwinter Nights*. Infogrames/Atari MacSoft [Multi-Player Role-Playing Computer Game], 2002.
- [4] A. Brisson and A. Paiva. Are we telling the same story? In *AAAI Fall Symposium on Narrative Intelligence Technologies 2007*. AAAI Press, 2007.
- [5] E. Castronova. A test of the law of demand in a virtual world: Exploring the petri dish approach to social science. *Social Science Research Network Working Paper Series*, July 2008.
- [6] S. Chatman. *Story and Discourse*. Cornell University Press, 1978.
- [7] M. Copier. *Beyond the magic circle : A network perspective on role-play in online games*. PhD thesis, 2007.
- [8] M. Dolk. *MMORPG Gamer's handbook*. [Electronic Publication] <http://www.tentonhammer.com/node/37607>, 2008.
- [9] P. Ekman. *The Nature of Emotion*, chapter All emotions are basic. Oxford University Press, 1994.
- [10] M. Eladhari, R. Nieuwdorp, and M. Friedenfolk. The soundtrack of your mind: Mind music adaptive audio for game characters. In *ACE2006*, Hollywood, USA, June 2006.
- [11] M. P. Eladhari. Emotional attachments for story construction in virtual game worlds - sentiments of the mind module. In *Breaking New Ground: Innovation in Games, Play, Practice and Theory. Proceedings of DiGRA 2009*, London, 2009.
- [12] M. P. Eladhari and M. Mateas. Semi-autonomous avatars in world of minds - a case study of ai-based game design. In *Advances in Computer Entertainment*, December 2008.
- [13] M. P. Eladhari and M. Sellers. Good moods - outlook, affect and mood in dynemotion and the mind module. In *FuturePlay Conference*, November 2008.
- [14] A. M. Glenberg. What memory is for. *Behavioral and Brain Sciences*, 20(1), pages 1–5, 1997.
- [15] G. Gygax and D. Arneson. *Dungeons and Dragons (D&D)*. Tactical Studies Rules, Inc. (TSR) [Table-Top Role-Playing Game], Lake Geneva, 1974.
- [16] I. Horswill. Psychopathology, narrative, and cognitive architecture (or: Why ai characters should be just as screwed-up as we are). In *AAAI 2007 Symposium on Intelligent Narrative Technologies*, 2007.
- [17] J. A. Johnson. *Screening massively large data sets for non-responsiveness in web-based personality inventories*. Invited talk to the joint Bielefeld-Groningen Personality Research Group, The Netherlands, May 2001.
- [18] A. Klesen, G. Allen, P. Gebhard, S. Allen, and T. Rist. Exploiting models of personality and emotions to control the behavior of animated interactive agents. In *Proc. of the Agents'00 Workshop on Achieving Human-Like Behavior in Interactive Animated Agents*, 2000.
- [19] S. Kshirsagar and N. Magnenat-Thalmann. Virtual humans personified. In *AAMAS '02: Proceedings of the first international joint conference on Autonomous agents and multiagent systems*, pages 356–357, New York, NY, USA, 2002. ACM.
- [20] N. Magnenat-Thalmann, H. Kim, A. Egges, and S. Garchery. Believability and interaction in virtual worlds. In *Proc. International Multi-Media Modelling Conference*, pages 2–9. IEEE Publisher, January 2005.
- [21] S. C. Marsella, D. V. Pynadath, and S. J. Read. Psychsim: Agent-based modeling of social interactions and influence. In *Proceedings of the International Conference on Cognitive Modeling*, pages 243–248, 2004.
- [22] M. Mateas and A. Stern. A behavior language for story-based believable agents. In *Intelligent Systems, IEEE*, volume 17, July 2002.
- [23] R. R. McCrae and P. T. Costa. Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology*, 52:81–90, 1987.
- [24] R. McKee. *Story: Substance, Structure, Style and The Principles of Screenwriting*. HarperEntertainment, 1 edition, December 1997.
- [25] B. Moffat. *Personality Parameters and Programs*, pages 120–165. Number 1195 in Lecture Notes in Artificial Intelligence. Springer-Verlag, 1997.
- [26] D. L. Nathanson. *Shame and pride: affect, sex and the birth of the self*. W. W. Norton & Company, 1992.
- [27] D. V. Pynadath and S. C. Marsella. Minimal mental models. In *Proceedings of the Conference on Artificial Intelligence*, 2007.
- [28] J. Rickel, S. Marsella, J. Gratch, R. Hill, D. Traum, and W. Swartout. Toward a new generation of virtual humans for interactive experiences. *IEEE Intelligent Systems*, 17(4):32–38, July 2002.
- [29] T. Schubert, F. Friedmann, and H. Regenbrecht. The experience of presence: Factor analytic insights. *Presence Teleoperators and Virtual Environments*, 10(3):266–281, June 2001.
- [30] W. Swartout, J. Gratch, R. W. Hill, E. Hovy, S. Marsella, J. Rickel, and D. Traum. Toward virtual humans. *AI Mag.*, 27(2):96–108, July 2006.
- [31] S. Tomkins. *Affect/imagery/consciousness. Vol. 1: The positive affects.*, volume 1. Springer, New York, 1962.
- [32] S. Tomkins. *Affect/imagery/consciousness. Vol. 2: The negative affects.*, volume 2. Springer, New York, 1963.
- [33] A. Tychsen, D. Mcilwain, T. Brolund, and M. Hitchens. Player character dynamics in multi-player games. In *Situated Play, Proceedings of DiGRA 2007 Conference*, 2007.
- [34] Zero Game Studio, Interactive Institute. *Ouroboros Project*. [Electronic Publication] <http://www.tii.se/zerogame/ouroboros/>, 2003.