Game Mechanics and Dynamics of Social Actions in a Prototype Multiplayer Game World

Mirjam P. Eladhari
Gotland University
Cramérgatan 3
621 57 Visby, Sweden
mirjam.eladhari@hgo.se

ABSTRACT
This paper describes the social actions called 'affective actions' that are implemented in the prototype multiplayer game world The Pataphysic Institute (PI). An aim of this paper is to demonstrate how a game mechanic can result in a certain set of dynamics or play patterns. Affective actions are but one feature of the many that make up the game world of PI. In this paper, the feature is used as a vertical slice into the game design. The aim is to, by using this slice, show the founding the principles of the game, the play tests that informed the design, as well as the play patterns that were observed as they emerged in a series of game mastered play–test sessions.

Keywords
game design, play testing, game mechanics, game dynamics, experimental prototypes, expressive AI.

INTRODUCTION
This paper describes a feature of game mechanics representing social actions in a multiplayer prototype game world, the Pataphysic Institute (PI). The feature is named Affective Actions (AAs) and has been designed and play-tested in several iterative cycles of design. Salen and Zimmerman (2001) have described iterative game design as a play-based design process. A prototype is "played, evaluated, adjusted and played again, allowing the designer or design team to base decisions on the successive *iterations* or versions of the game. Iterative design is a cyclic process that alternates between prototyping, play-testing, evaluation, and refinement."

The PI prototype uses the semi-autonomous agent architecture, the Mind Module (MM), which gives all characters and avatars personalities, moods and emotions. Players need to defeat manifestations of negative mental states by cooperating – the spells they can cast depend on their personalities and states of mind. Characters have sentiments, which are their individual likes and dislikes for objects and object-types in a world, such as fear of spiders or love for another character. Avatars' strong emotions manifest as autonomous beings in the world, and players can also author autonomous creatures, specifying their behavior. Players can cast spells on the creatures that affect emotions directly, such as `Laser Pen of Clarity´ which diminishes confusion. Figure 1 show a screen from PI where the avatar Bella interacts with a manifestation of confusion. The player can cast spells by using the F-keys on the keyboard, and by clicking active `dots´ in the mood wheel to the

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bottom right. On each others' avatars players can do affective actions. These also affect the emotion values, but they have more complex requirements and can have multiple effects, being metaphors for social actions. For example, the affective action `comfort´ which diminishes sorrow cannot be used by a player in a furious mood, and it only has an effect if the targeted avatar is sad.

Figure 1: A screen from the Pataphysic Institute software prototype.

In this paper, two play-tests are described: a test of a paper prototype of the game world and a test of the software prototype PI. The descriptions are focused on the feature of AAs, since it would not be possible to describe the whole design in detail given the limit of text-length of this paper. The aim of this detailed description of one feature of a larger design is to use the feature as a vertical slice into the whole.

Central terms when describing this process are those of operational logic, game mechanics, game dynamics, and affordances. Operational logics has been defined as follows (Wardrip-Fruin and Mateas, 2009): "An operational logic defines an authoring (representational) strategy, supported by abstract processes or lower-level logics, for specifying the behaviors a system must exhibit in order to be understood as representing a specified domain to a specified audience."

In the case of AAs, the authoring strategy is to provide means to characters in a game world to influence values representing characters' emotions by choosing from a range of actions that can increase or decrease the intensity of an emotion, where the strength of the emotion is assigned by a numerical value that is represented graphically.

By observing types of game play dynamics and game play experiences it can be possible to see what a certain, mechanic, feature, approach, or method can result in. Game mechanics has been described by various authors, among them Brathwaite (2008). She describes the `core' of a game is what the game play is about. A core *mechanic* (such as flipping over tiles or selling items to another player) of a game results in a core *dynamic* when it is played. A core dynamic is a particular pattern of play. An influential text describing game mechanics and dynamics coins the MDA framework (Hunicke et al. 2004) where the game design process is divided into layers of mechanics, dynamics and

aesthetics. Mechanics are described as the design counterpart of rules in play and mechanics being the affordances given to players in terms of what they can do. Dynamics are described as the run-time behavior of the player and the game system acting upon each other's inputs. Aesthetics, in the MDA framework concerns the players' experiences of playing the game.

Sicart (2008) describes game mechanics as the methods invoked by agents designed for interaction with the game state. In this definition both representations of human players and agents who have some kind of agency in the game are included as actors that, by their involvement may decide what could, or not could be considered a 'game mechanic.' When the term *game mechanics* is used in this paper it concerns all functional aspects of the game system design, not only those directly afforded to entities that have agency. Consider a hypothetical feature representing weather. Whether and how the weather changes in a game world may not be tied actions afforded to agents or players, but can still have an effect on the game play dynamics in the world. A control question in two steps that can be of use when in doubt whether something is a game mechanic is `Is it possible to tune?' If it is tuned, is the change likely to have an effect of the dynamics of play?' If the answer is `yes,' it is probable that there is an issue of game mechanics at hand.

Another central concept used in the descriptions in this paper is that of *affordances*. Affordances are the action potential of an entity in a given moment, that is, what it can or cannot do. The design of affordances is at the heart of the design of game mechanics. In multiplayer worlds with players represented by avatars of various types, their affordances give very different potential play patterns, or dynamics, given their individual vertical slice of the totality of the game mechanics of the world. Character class, level and social network can for example, determine the vertical slice of affordances of an avatar. For instance, in *World of Warcraft* (Blizzard Entertainment 2004) a non-guilded level-30 mage has very different potential actions available compared to a level-80 warrior who leads a guild. These differences in affordances lead to that the players who control these avatars have very different strategies and styles when playing, probably also doing different things in the same game world.

The paper is organized in the following way. First, some pointers to related work are given. Second, the overall design of PI is described. Third, the play testing approach taken is presented. Then, the play-test of the paper prototype is presented along with the dynamics or patterns of play that was observed for the affective actions in the test. Next, the changed design for the game mechanics of the software prototype is described, followed by observations in the play-test of this prototype. In particular, the tests showed that players shift their approach to the deployment of AAs based on context. Finally, the dynamics of play that emerged in the tests are discussed. The results may be advisory for the design of direct and indirect social automated behavior for avatars, and for degrees of autonomy versus player-control.

RELATED WORK

When it comes to experimental game implementations the work with the PI prototype share both the goals of exploring new game design spaces using AI, as well as the methodological stance of iterative prototype development with, among others, Prom Week (McCoy et al. 2010), Rathenn (Smith et al. 2011) and Mismanor (Sullivan et al. 2011).

As described by Gillies et al. (2008) the work in the field of semi-autonomous agents is inspired by the AI agent community and uses two main approaches: top-down, planner based deliberative or symbolic architectures on the one hand, and autonomous control architectures that are bottom-up and come from non-symbolic AI (referred to as behavioral architectures). The former approach is often used for simulated multi-agent systems where users can give high-level commands to actors (Strassmann 1994), while the second is most often used for avatars in virtual worlds. Both types of approaches often use psychological models as part of the agent architectures, providing agents with personalized behavior preferences.

A majority of semi-autonomous agent architectures for virtual environments use psychological models that provide agents with a framework that can result in individualized responses. The nature of the psychological models is dependent on the aims of the research and of the success criteria for particular implementations. A common nominator for many projects along with the MM, such as work by Vinayagamoorthy et al. (2006), Guoliang et al. (2006), El Jed et al. (2004) is that inspiration is taken from the OCC model (Ortony et al. 1988). Another common source of inspiration is (personality) trait theory, pioneered by Allport in the 1930s (Allport 1961). The Five Factor Model (FFM) is a standard personality trait model in psychology; the clustering of traits via factor analysis into five factors has been empirically validated repeatedly. A prominent assessment test for the FFM is the NEO PI-R questionnaire, which uses 30 traits (McCrae and Costa 1987). While the FFM was originally developed to describe the personality of individuals in real life, it has been applied to a number of autonomous characters and conversational agents (Egges et al. 2004, El Jed et al. 2004, Mairesse and Walker 2007). Like the MM, many of these implementations build upon the FFM, and take inspiration from the affect theory (Tomkins 1962). In systems where facial expressions are used (Eladhari and Sellers 2008, Imbert et al. 1999) it is common to select an emotional model based on basic emotions, derived from facial expressions observed in human populations (Ekman 1994), which also is the case of the MM. The distinguishing feature of the MM is that it is specially designed for use with avatars in VGWs, giving them a 'mental physics,' that can be used to create preferred individual responses for characters depending on immediate circumstances in a game world.

In terms of game mechanic structures, operational logics might be useful for recognizing related work. *Sims 2* (Electronic Arts 2004), and later versions of the game, has many similarities to PI regarding the use of emotional states in the game mechanics and the representation of these. Players can choose from a selection of actions representing social actions and direct the action from one character towards another character. The domain of representation is that of social interactions between human-like characters. The availability of what social actions the player can choose from depends on the properties of each character, and the relationship between the character who is commanded to perform the action and the one who is the target for the action. The representational strategy for displaying the emotional state is similar between Sims and PI, using colored fields by the heads of the characters and showing status bars representing values that have maximum and minimum borders for properties affecting the action potential of the characters. A difference in the operational logics in the domain of understanding is the role of the player. While in Sims the player can settle in the tradition of games of resource handling and single player simulation games, the players in PI are placed in the tradition of multiplayer computer role-playing games. Important aspects of these differences is that the players of Sims have access to complete information about all the characters in the world, while players of PI only have access to full information about their own avatar.

The players of Sims have god-like powers over all the characters, while the PI player is but one inhabitant of the game world. Many of these differences echo in other related implementations such as PsychSim (Pynatadath and Marsella 2005) which also is a multi-agent simulation.

THE PATAPHYSIC INSTITUTE

The Pataphysic Institute (PI) is a research prototype multiplayer game world. In PI, the personalities of the inhabitants are the base for the game mechanics (Eladhari 2010). When interacting with other characters the potential emotional reactions depend upon avatars' current mood and personality. PI is built with inspiration from personality psychology and the affect theory in an attempt to mimic possible emotional responses in order to give the player support in role-playing. The mental states of characters depend on their personalities and on their current moods. Moods differ according to context and 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 avatars' 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. PI is built in Pixeltamer's framework for web based multiplayer games and it is played in a web browser through a Java applet. The trait nodes define characters' personalities and affect through weighted relationships to the emotion nodes; on how strongly individual characters `feel' about events involving them. The emotion nodes' weightings to the two mood nodes, inner- and outer mood summarizes the characters' states of mind in a mood-coordinate system as displayed in Figure 3. The sentiment nodes couples emotion nodes to entities in the game world and are instantiated for characters as results of events that cause increased values in respective emotion nodes. The activity rate of the nodes diminishes with time. Where the trait nodes are permanent, the emotion nodes diminish within minutes, but leave activity in the mood nodes that are active for hours. This results in that, recent events affecting emotions 'stays' with the characters mood even when the context for the characters changes.

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, a non-player character (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[1], and studies what types of abilities these persons get, abilities he calls Mind Magic Spells. Another NPC in PI, Teresa, focuses on the finding that social interactions between people suddenly result in acutely concrete emotional reactions. She calls these Affective Actions, 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 avatars' personalities, current moods, and by how far avatars have progressed in learning new abilities. Each avatar has mind energy (mana) and mind

resistance (health 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 illustrated in Figure 2.

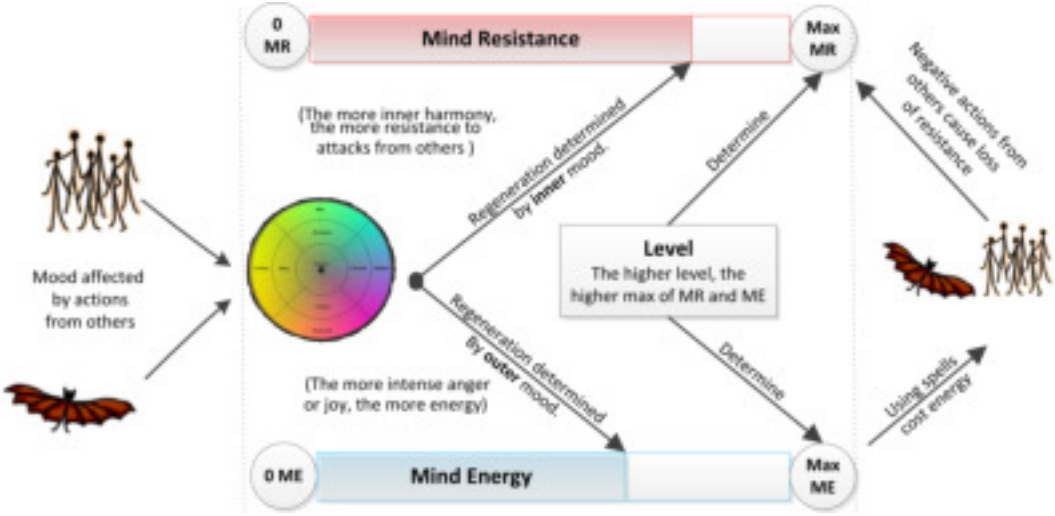

Figure 2: Regeneration of MR and ME.

Avatars can affect each other's moods by using 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 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.

Display of Mind Module Values

In the screen shown in Figure 3 the MM information of an avatar is displayed. In the top left column, the values of the personality trait nodes are displayed. In the middle column, the values of the emotion nodes are displayed. The column to the top right shows the avatar's mood, displaying the value of the inner and outer mood nodes as well as the mood coordinate system. The white dot in the mood coordinate system shows which mood space the avatar currently is in: gloomy on the inner scale, and cheerful on the outer. In the column to the lower right, effects of recent actions are displayed. The list to the bottom left displays sentiments towards others in the world and any active curses or blessings.

Figure 3: Display of MM information in the PI client.

Prerequisites and Success Criteria for AAs

Some AAs can be performed at any time and at any target. Others can only be performed as response to other AAs, such as `Laugh at Joke.' However, there may be prerequisites whether the action has an effect, depending on the mood of the target. These can also be called the success criteria for the AAs. For example, a character in a depressed mood cannot respond with the AA Laugh at Joke. The success criteria can also depend on the relationship. In PI, players can, for example, assign avatars to be friends, a linking between the avatars on a computational level allowing them to, for example, use the AA `squeeze hand' on each other.

Figure 4 shows the interface in PI for using AAs. The screen capture shows the avatar Emil who has targeted the avatar Neurotica and performed the AA Calm Down. The system says (in the bottom left of the picture) that this is unsuccessful, since Neurotica's Outer Mood is higher than −5 (meaning that she is not angry). The avatar Emil is new in the world and therefore has few AA's available for use. As he gains experience and `levels up,' more AAs become available, expanding his action potential while also increasing the complexity as well as his potential repertoire of expression. The expanded action potential also allows more fine-tuned and strategic choices when using AAs as a means to change the mood of other avatars when necessary for defeating negative manifestations in the world.

Once an AA is available to a player due to the avatar being of a high enough level to `know' if the possible prerequisites and success criteria for AAs are the following:

- mood and emotions of target (success criteria);
- mood and emotions of performer (prerequisite for performance);

- relationship to target (success criterion); and
- other AA (other action as prerequisite).

TESTING AND TUNING

A play-test of the AA feature was conducted in 2008 using a paper prototype. In the test, the participants used AAs in combination with Mind Magic Spells, and were presented to sets of AAs in steps in order to make the feature more accessible and not to overwhelm the participants with too many AAs. At each step, the participants were asked whether they missed any AAs. The results of this test were the basis for the next iteration of the AA feature.

Figure 4: Affective Actions window.

A small functional test was conducted by three persons working with the development of the digital PI prototype. This functional test was partly done in order to find which AAs had effects that duplicated each other so that they could be considered for removal from the system. Another aim with the test was to refine the order in which players learn AAs and to make sure that at each step contained AAs affecting the mood coordinate system in all four directions of the mood node axes. The design and test process resulted in 48 AAs of three categories that are learned by players in six steps. A subset of this design was tested in game mastered multiplayer sessions in 2010, then in the software prototype stage.

Play-Testing Approach

My approach for evaluating the game design prototypes combines features from several approaches of User-Centered Design where users' experience is the main driver for the design, as well as from rapid prototyping and play testing approaches that are common in game design (Fullerton et al. 2004, Salen and Zimmerman 2001).

In the test of the paper prototype, I used scenarios using the Wizard of Oz method to simulate user-interaction. When conducting this I had real players playing the game individually. I used scenarios and a game master/test leader, who simulated the game events. Players were asked to think aloud while playing the game; additionally, the test leader (me) stopped the game at several points and conducted interviews. The approach that was taken is described in detail in (Eladhari 2010).

In the test of the software prototype PI, three players were, in each test-session, guided through a number of scenarios by a game master. In the prototype, the game play mechanics were fully implemented, but the content was limited to a starting area where players could be acquainted with the basic game play and the game interface by interacting with two NPCs and performing the task given to them by these NPCs. Because of this, the classical approach of using the Wizard of Oz method to simulate the system was not necessary, but game-mastering was, in order to create the content for the sessions, namely to provide a guiding through, and interaction in, the scenarios of the test.

Participants

The ten participants of the play-test of the paper prototype were graduate students and staff at UCSC and their spouses. Participants had a mean age of 28 with a standard deviation of 5.6. Of the ten participants, four were female and six male. All participants were residents in California, USA.

In the play-test of the software prototype 25 players participated, the majority of them being undergraduate students at the Gotland University in Sweden. Their mean age was 23.4 with a standard deviation of 4.4. Fifteen participants were male and ten were female. All participants were residents of Gotland, Sweden.

Materials and Data Gathering

For character creation, the paper prototype used an online form of a short version of the International Personality Item Pool Representation of the NEO PI-R (IPIP-NEO) as constructed by Johnson (2004), a method for evaluating personality traits using a survey with 120 items of the user rates on a binary scale. The IPIP-NEO was implemented in the software prototype, using the code kindly provided by Johnson. Participants in the test of the software prototype were instructed to create their characters in the game client prior to the test.

Participants in both tests filled in surveys both prior to the test and immediately afterwards. The first survey used concerned demographical data and prior play experience while the second survey focused on the play-experience. In the test of the paper prototype participants were also interviewed.

The play tests were videotaped. In the test of paper, prototype one camera was used, focused on the player. In the test of the software prototype, two cameras were used in order to capture the three players and the game master. Also, the activity of each player was captured by recording videos of the screen using the software Camtasia. For each participant the event- and chat logs as well as text files containing the data for each avatars' state prior to and after the play sessions were stored.

Affective Actions in the Paper Prototype

In the play-test of the paper prototype, players were exposed to AAs in two of four scenarios. Players were introduced to AAs by the NPC Teresa who was played by the test leader. Teresa had an identical character sheet as the player but with values showing that she was depressed. The players were able to see where Teresa's marker was on her mood coordinate system.

Teresa initiated the interaction with the player by saying that she was very sad, and asking for a `hug.' Seven of the players chose to `hug' Teresa, while three of them started the sequence of performing AAs in the scenario with using `comfort.' The AA `comfort' would diminish the emotions of sadness and anguish in the targeted character. No one chose the AA `Look at target with dismay' that would have created an increase in the nodes confusion and sadness. Some AA's were to be used in a reciprocal fashion, such as a `joke' where the target could respond by either `Laugh at joke' or `Refuse to laugh at Joke.' Using such an AA included a risk, since if the target chose to, or had to refuse due to the mood, the effect on the joker would be an increase in distress and sadness. Laughing on the other hand would give both the joker and the target an increase of amusement, plus an increase in the satisfaction node of the successful joker. However, if the target of the AA `Joke' had her mood marker in the leftmost row in the mood coordinate system sheet used in the play-test (see Figure 5) it was not possible to use the `Laugh at Joke' reciprocal AA.

The play-test situation in this scenario changed in the majority of the ten tests from the think-aloud protocol to more resemble a situation of participatory design. Players suggested other types of AA that they would like to use instead of the ones provided. These suggestions were immediately added to the prototype and the participant could try them on Teresa. Figure 5 shows the second scenario where Teresa asks for a hug. The marker on Teresa's mood co-ordinate system in the top left of the picture shows that she is in a depressed mood. The markers symbolizing the AAs are placed in the lower part of the picture. The pink and the lilac AA markers were the ones provided in the start of the scenario; Comfort, Look at Target with Dismay, Hug, and two AAs reciprocal to Hug; Be Hugged and Shrink Away. Some of the players thought these actions too extreme given that this was the first time they met Teresa; for example, one of them requested to respond with Stunned Silence (see hand-written note in Figure 5), another to be able to Small Talk.

The feedback from the participants was used when the AA feature was reiterated for the digital PI prototype. In the software prototype, the initial meeting of the NPC Teresa was also different; she did not ask to be hugged. In the software prototype, the first set of AAs the player can learn is Small Talk, Calm Down, Look at Target with Dismay, Ignore, Joke, and the reciprocal Laugh at Joke and Refuse to Laugh at Joke. This set of initial AAs affects the mood of the target in all four directions of the mood coordinate system, allowing players to try out the feature on each other's avatars. Specifications of which AAs a player has access to in the five subsequent steps of learning AAs in PI are presented in (Eladhari 2010). Based on the pace indicated as comfortable in the play-test for introduction of new AAs, sets of eight AAs are introduced at each step in PI except for one of the steps where only four are introduced. In this step players are introduced to AAs with more properties than the others; they affect all entities close to an avatar and are only available if an avatar is in an extreme mood.

Another scenario of the paper prototype play-test was designed to focus on the introduction of mind energy and mind resistance and on using spells on single sentiment mobs, as well as on evaluating how the participants would take to the `spawning' of new single-sentiment manifestations. While designing the scenario I was concerned about adding too much complexity due to a multitude of features and concepts in a single scenario. However, in the test situation all players used the game system to its fullest, even using AAs in combination with the spells. The behavior of and the comments from the participants gave useful feedback about how to limit the use of AAs in the PI prototype. Several players noted that players might `misuse' the system by repeatedly hugging each other, something that hardly would be a believable behavior.

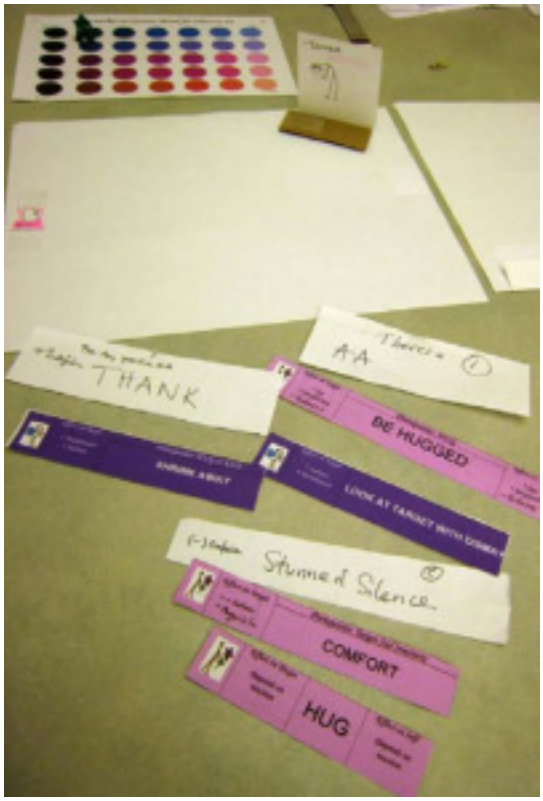

Figure 5: The first set of AAs introduced to participants of the test of the paper prototype.

In the paper prototype play-test the players enjoyed monitoring the fluctuations of the mood in their own avatars and Teresa and experimenting with different AAs. In a survey that players filled in immediately after the test-session, which did not include any questions about the AAs, the majority of the players pointed out the use of AAs as their favorite part of playing the prototype. This was written as a response to the question in the survey about what they particularly enjoyed in the play-test. Several of the participants used the expression `make sense' when discussing the mood feature in relation to the AAs in the interviews conducted in relation to the tests.

Tuning the AA Economy

In the paper prototype-test, players could use an unlimited amount of AAs. The reason for this was to observe the potential patterns for the use of AAs. Many ways of restricting the use of AAs are possible, among them the following were considered:

- restrictions based on cost of mental energy;
- limiting the total number of AAs that can be cast by a performer on any target;
- limiting the number of AAs that can be cast on a single target, by a single performer, or by all potential performers; and
- limiting the number of each type of AA that can be cast between performers and targets.

The play-test indicated that, in terms of game mechanics, it could be good to be able to use AAs even if the pool of ME is running out. In terms of believability, it might be good to restrict the number of identical AAs possible to use in the sequence so that characters are restrained from using AAs of similar types too many times.

These considerations resulted in the following restrictions suggested by Christoph Pech, developer at Pixeltamer:

- each AA is active for a limited amount of time, depending on its specified decay rate;
- characters can receive a maximum amount of eight AAs that are active at the same time;
- characters can only have one of the same type of received AA active at the same time; and
- characters can perform a maximum amount of four AAs that are active at the same in a single target.

The aim with these changes was to tune the game mechanics to give the affordances that in turn could result in dynamics, that when played, would be in resonance with the design goals.

Affective Actions in the Software Prototype

The Play Test

The play-tests of the software prototype were conducted consisted of game mastered play sessions where a game master guided three players through a number of scenarios. Nine sessions were conducted, where 25 persons participated in the test. In those cases, one player of three had to cancel their participation a masters student working on the project acted as a stand-in player. The data gathered from the stand-in player is not part of the data analyzed after the test. In cases where two players needed to cancel, the play-session was cancelled. Each session took between one and two hours. The video materials gathered are approximately of 20 hours of video capturing players since two cameras were used, and approximately 30 hours of video capturing avatars on screen using the software Camtasia.

Prior to the tests, players were asked to enter the virtual world, create their avatar and play for a while. This was done in order to save time during the actual test, so that more

focus could be set on the game play rather than on understanding the graphical interface of the game world client.

Design Considerations Regarding Action Representing Social Behaviors

Actions in the metaphoric sphere of social behavior are used quite differently depending on context. In everyday life, when we communicate with each other unmediated by any system, we do so partly with verbal communication and partly using non-verbal communication, such as body language and pitch and pace when we speak.

Translating these non-verbal communications and making them available for use in mediated environments for communication, such as virtual worlds where users are represented by avatars, poses a number of challenges as described by Vilhjlamsson et al. (1998), Penny et al. (2001) and Gillies et al. (2008). In my experience of testing such a system, a very different set of actions are used depending on whether the user is in a context of communication like common everyday courtesy, or if they are performing role-play. In everyday courtesy, the user does not generally pick negative actions, though they would have used these in an unmediated conversation. In a role-playing context, however, these actions are accepted for use by common agreement of the involved players. By the agreement people will not be offended, for example, an action representing `look to with dismay' or some other action describing a more subtle social behavior, one that might not always be controlled or actively chosen to perform in an every-day conversation.

Because of this, in the test of the software prototype, players were asked to role-play already preset relationships in the groups. This allowed a testing situation where it was socially acceptable for players participating in the test to choose among the AAs that represented hostile, negative or reproaching social actions.

Scenario: Two avatars competing for the affections of the third

The first scenario was initiated by informing the players that their avatars were scripted for purposes of the test session. Each avatar was set to be level 15, and relationships in the form of sentiments were set among the three players. Being at level 15 gave all the avatars access to the same range of 32 AAs. The players were asked to picture a situation where two of them (Player 1 and 2) had played together for a while, and that the third (Player 1) was new to them, and that they were competing for the attention of, and affection from this new player. The purpose of the preset sentiments was to illustrate these relationships in the game. Figure 6 shows the values used in the test.[1]

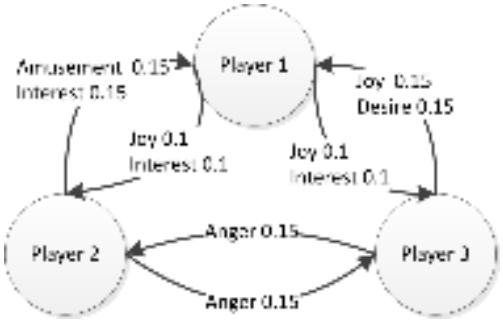

Figure 6: Preset Sentiments for players' avatars.

Positive	Counter	Negative
Joke with someone	Laugh at joke	
Tell a small secret	Refuse to Laugh at Joke	Uncontrolled Wrath
Hug	Be hugged	
Agree	Shrink Away	
Angry discussion abt. mutual nuisance	Agree enthusiastically	Misunderstand on purpose
Cheer up		Insult
Calm Down		Reproach
Radiate Bliss		Deep Lament
Exultant Jubilation Dance		Look to with dismay
Respect		Ignore
Praise		Disagree
Squeeze hand		
Group Hug		
Funny Walk		
Compliment		
Be attentive		
Stunned Silence		
Small Talk		
Thank		

Table 1: AAs available at level 15.

Players could choose among the actions displayed in Table 1, but they were only successful, that is, gave any effect in their target, if their prerequisites were fulfilled. The actions in the `counter' column in the target were only successful if given in response to certain actions.

Nine players in total had the role of Player 1, to be the new one, the object of desire. Generally, these chose to perform actions labeled as positive towards the other avatars. The players in the roles of competing for the new one's affections chose negative actions more frequently. These were, in this first scenario generally used between player 2 and 3.

Scenario: Single Sentiment Manifestations

In the second scenario, the group was guided to an area with negative single sentiment manifestations – entities that represent an emotion. Players cooperated, using the special spells to which they had access individually (given their avatars' personality traits), in order to defeat a number of these entities. The game master made sure that the players knew their special strengths before moving on to the third scenario. During this scenario, players also had the opportunity to observe how their avatars' moods and emotions fluctuated in the proximity of each other, and what effects these fluctuations had on their action potential.

Figure 7: Window for authoring manifestations.

Scenario: Player-authored foes

In the third scenario, one of the players was asked to cast a curse on one of the other players. The curse was chosen by the player in the test, and could be a curse of confusion, guilt, sadness, distress, shame, anger or fear. The player with the cursed avatar would then author a compound manifestation – a powerful foe representing the emotion of the curse. Players got very loose instructions on authoring – they were asked to create something from real-life or fantasy, abstract or concrete. Figure 7 shows a player's authoring of a manifestation of anger. Players could name them, describe them, specify a message to all players online upon its instantiation (spawn message), specify what the manifestation says, rename the spells that manifestation casts (spells increasing the emotion it represents in its targets), and pick AAs. In this authoring interface, players could choose freely from the complete range of 48 AAs.

Once the manifestation was instantiated, the group's task was to figure out how to neutralize it by using spells and AAs – both on the manifestation and on each other's avatars. If time allowed each player in the test created a compound manifestation that the group then cooperatively dealt with. In total, 22 manifestations were made. The players neutralized the majority of these, but in a few cases, they were forced to give up since the time ran out for the test, and in one case, the players did not agree about neutralizing the manifestation in the first place.

In the third scenario, the AAs were mainly used in three ways. Firstly, players used them as authorial building blocks when creating their compound manifestations. Secondly, they used them in order to manipulate the mood of each other's avatars when they attempted to neutralize the manifestations. Thirdly, they were used to diminish values of the emotion nodes of the opposing manifestations. Players used different strategies for

neutralizing the manifestations. Table 2 shows examples of how players described they dealt with the hostile manifestations, when asked about it in the post-test survey.

Did you, or any of those you played with, create a manifestation? If so, please describe it	How did you deal with the manifestation that was created?
My "Goblin of Doom" was the innermost uninvented goblin that housed all my humiliation and shame. poor thing he should have been smaller but since he was in disguise he came out rather large.	I tried to heal him and counteract the others who tried to squash my humiliation with odd feelings of their own. I did pretty good and managed to spawn a few mini-goblins of shame to help my cause. But in the end they all perished due to some do-gooders.
Yes, two of us did. It's a big boss creature that's the result of a curse. It looks like a normal monster, but is much bigger and stronger. It has a weakness against an emotion like its smaller counterparts. When you create the manifestation, you get to name it, its lines and spells, and even decide what interactive actions it will have.	We countered it with its emotional weakness and tried to drain its energy. One of us constantly hugged and complimented it, which it didn't like since it was an abomination of agony.
Yes, a bunch of them. Dont know what to describe thou... It was fun and interesting to see how emotions breaks the wall to reality and puts your thoughts into work about what is going on. The manifestations was different feelings for example terror and shame.	The horror one we hold its hand and used aggression on it, shame was taken care of with spine of confidence and brute force attacks.
I created an IRS agent filled with fear and terror. It went about to intimidate and scare people but we managed to calm it by "holding its hand"	As above, we held its hand

Table 2: Survey responses.

If one of the members in the group was able to cast a spell directly affecting the emotion the manifestation represented they did so, because they knew this to be the quickest way. When this strategy was used AAs was used sparingly, mostly on the other party members in order to change their mood to serve the needs of the group. If no one in the group had the spell that hit the weak-spot of the manifestation, players opted for either minimizing the manifestations' mental resistance (health) or the emotion it represented (its 'reason to live'). When players ran out of mental energy, they selected one of the avatars in the group to target with positive AAs. An avatar in the jubilant mood space generates energy quickly and can give energy to the other avatars. If all avatars were in positive moods, no one could cast harmful spells on the manifestation. Players then cast negative AAs on each other to rectify this. In some sessions, the avatars that had angry sentiments towards each other were placed close to each other. Their increasing annoyance could then be channeled towards the manifestation. Players also used AAs directly on the manifestations, experimenting with what AAs could diminish the emotion it represented. Not all sessions showed any particular strategy. Some groups did not communicate enough to form a common strategy, and in some groups, players pursued different goals. For example, in an interesting session, one player created a manifestation of Shame, which he protected from any attempts to decrease it. By doing so, he sided with the manifestation while the other two players continued trying to neutralize the manifestation.

DISCUSSION

In the first two scenarios of the test of the software prototype, players approached the AAs as rules of the game. They explored them by use, and tried to work out their effects on their co-players' avatars and on autonomous entities in the virtual environment. It can be compared to exploring the given laws of nature and society in real life. In the third scenario however, they found themselves in a situation where they were enabled to use AA's as a mechanic – creating an entity which the group of players then could interact with.

As noted above, in the first scenario, the pattern of the players who had the role of being the new one was to pick among the positive social actions. The other two players chose among both negative and positive AAs. The count of events in the log-files of the 25 avatars for the first scenario shows, for example, that a favored negative AA was to `misunderstand on purpose.' The roles given by the role-playing setting seemed useful for creating a situation where players perceived it as allowed to use negative social actions on each other. The scenarios showed that the patterns of selections of AAs differed depending on the three main contexts: whether players were exploring the functionality, whether they were in a social role-play situation or if they were in a combat situation were emotions were used as a functional element.

The interface of the prototype in the tests made it necessary to have the game master to guide players for explaining the effects of affective actions, since the feedback from the system was divided in different windows and in text messages that were not always noticed by the players. For future iterations, it would be desirable to have a more clear feedback from the system – it would be easier for players to explore the effects of their actions.

In the social role-playing situation, players could choose between actions that in real life are more or less direct. Gillies et al. (2008) have distinguished between *primary* and *secondary behavior* for virtual characters. Primary behavior consists of the major actions of avatars and secondary behavior is more peripheral to the action but may be vital to making characters seem alive. An action such as 'look at with dismay' would be a more secondary behavior than for example 'insult.' In social situations, play situations in the tests seemed to find it awkward to perform such secondary behaviors unless it was sanctioned by their dramatic roles. For future work in this area, I believe that it is most meaningful to create autonomous secondary behavior for avatars, while both types are needed for the NPC behavior. However, it can be useful to have an off-switch for the autonomous behavior of an avatar, or the possibility for players to choose a level of autonomy. Based on the selections of AAs that players have chosen in the tests, I believe that when players who are not experts in role-play are in new social contexts, they might want to tune down the autonomy for increased control. By doing that, they would decide on what level of social risk to take in displaying the autonomous reactions of their avatar to those around them.

In combat situations the social norms in using AAs were completely ignored, instead they were used as metaphorical actions in the game play when the authored manifestations were defeated. I speculate that this approach might have given players an interesting perspective on how rules and mechanics may relate to each other. One player wrote (see Table 2) that it was `fun and interesting to see how emotions break the wall to reality and puts your thoughts into work about what is going on.'

When working with experimental game prototyping in a research context (Eladhari and Ollila 2010) the possibility space can sometimes seem overwhelming. Each layer of design – the initial game design, its iterations in development, and the design of the play tests – bring the results further away from easy repeatability. A large or complex design may run the risk of generating results that, while relevant to the specific game, might not be applicable broadly. The method demonstrated in this paper – the use of the vertical slice – is by no means an ultimate solution to these challenges, but may offer a way to approach larger and more complex designs. It is possible to select those features that, in

tests with players, prove to hold some innovation, or to offer knowledge that may be applied in future games.

CONCLUSION

This paper described the feature Affective Actions (AAs) that lets characters in the prototype multiplayer game world Pataphysic Institute affect each other's emotional states. Special focus was set on the iterative process of designing the AA feature, describing the play-tests that informed the design. The feature was used as a vertical slice into the whole of a large design with many features. By exploring this slice in the design space, it was possible to see how a specific set of game mechanics could give rise to certain dynamics or patterns when played. It was found that players chose different combinations of AAs depending on context – whether they were exploring the system, whether they were in a context of role playing, or whether they used the feature in a combat situation. The tests indicate that for future development it is promising to (for avatars) mainly focus on developing autonomous behavior that mimic secondary, more indirect, social behavior, and to also provide players with the means to control the level of autonomy to fit their preferences which may change depending on the context.

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ENDNOTES

1 The values were decided when tuning the design of the test. Higher values in the sentiment nodes rendered avatars to be in extreme moods in proximity of each other, limiting the action potential of the players. The avatars of player 2 and 3 would be furious with each other, and player one would be in bliss. Lower values (or none) did not represent the relations clearly. The values used were an acceptable middle ground for the scenarios given that the mood fluctuations also are determined by the avatars' personality trait nodes.

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