Towards Emotionally Adapted Games based on User Controlled Emotion Knobs

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ABSTRACT

The paper presents an approach to a gaming personalization system to systematically facilitate or avoid user-selected emotions during gameplay with control knobs that regulate the emotional impact of the game. Underlying the framework is a Psychological Customization system that entails personalization of the way of presenting information (user interface, visual layouts, modalities, narrative and temporal structures and other factors) per user or user group to create desired transient psychological effects and states (such as emotion, attention, involvement, presence, persuasion and learning).

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Keywords

Games, emotional regulation, personalization, psychological customization

INTRODUCTION

Emotions as part of user experience also in gameplay are biologically based action dispositions that play an important role in the determination of behavior (e.g., Lang, 1995). Most theorists endorse the view that emotions comprise three components: subjective feeling, expressive behavior, and physiological arousal; others add motivational state or action tendency and/or cognitive processing (Scherer, 1993). A dimensional theory of emotion holds that all emotions can be located in a two-dimensional space, as coordinates of valence and arousal (or bodily activation; e.g., Lang, 1995; Larsen & Diener, 1992). The valence dimension reflects the degree to which an affective experience is negative (unpleasant) or positive (pleasant). The arousal dimension indicates the level of activation associated with the emotional experience, and ranges from very excited or energized at one extreme to very calm or sleepy at the other.

How then to link emotions in games and basic elements of games? One obvious answer is to look at the narrative structure in games, like character and event structures that may lead to different types of emotions. Outside narrative elements of a game, also the factors related to the presentation of the actual events the game and the form factors of the game, such as visual representations of the gaming events, amount and pace of image motion, audio effects and background music, and the level of interactivity offered to the player, are important from the point of view of emotion. To relate the narrative and presentational elements of a game to emotion the concept of an emotionally adapted gaming template is needed. A basic approach to an element to be adapted inside a game is a psychologically validated template that is embedded inside the game to create a particular psychological effect. (Saari et al, 2004)

The possibilities for manipulating different elements of per layer of technology are presented in Table 1.

Table 1. Technological possibilities of Psychological Customization in emotionally adapted gaming. Adapted from Saari et al, 2004

Layer of Technology	**Emotionally Adapted Gaming Templates**
1. Physical	-PC and mobile device covers: colours and shapes that facilitate desired emotions
2. Code	-The user interface elements (background color, forms, shapes, directions of navigation buttons etc.) may be varied

	in real-time per page per user to create various emotions and ease of perceptual processing
-*Windows-type user interface* -*Mouse, pen, speech,*	-audio channel may be used to create emotional effects (using audio input/output sound, varying pitch, tone, background music, audio effects etc.) -the interaction modalities may be adapted to suit the nature of the task
3. Content **A. Substance** - *Multimedia content created by authors or generated by game algorhithms*	-The genre of the game or type of game should be taken into account (first person shooter, simulation game, level playing game, other) -The role of the user in the story can be varied to create emotional reactions -Adding subliminal extra content to create desired emotion while playing
B. Form **Modality** -*Multimedia modalities*	-Modality may be matched to cognitive style or pre-existing mood of the receiver to create ease of processing -Background music, audio effects or ringing tones may be used as a separate modality to facilitate desired emotions and moods
Visual presentation	-Emotionally evaluated and positioned layout designs and templates for (colors, shapes and textures) may be utilized per type of user segment
Structure -linear/non-linear -temporal	-Using emotionally evaluated and positioned narrative templates for creating emotionally engaging story structures and varying sub-elements of the narrative and form within the template to create different emotional emphasis of the events unfolding (related to substance of content) -Using different temporal resolutions, such as fast or slow pace of events that may influence arousal

USER CONTROLLED EMOTIONAL REGULATION

It is hypothesized that the notion of user controlling his or her emotional levels when gaming is at least sometimes feasible. By controlling emotional levels we preliminarily mean influencing i) the valence dimension of emotional experience, i.e. whether an experience is pleasant or unpleasant and ii) varying the arousal dimension of emotional experience, i.e. whether an experience creates high arousal or is calming. There are also neutral valence and neutral arousal states. One may think of the dimension of user selected emotional regulation from the points of view of facilitating or avoiding certain types of experiences and provide some examples. These are briefly summarized in Table 2.

Based on Table 2 there are the following three main patterns for emotional regulation that may be the most feasible. First, there are the transient basic emotional effects of games that are

dependent of the phase of the game or some specific events. These are emotions such as happiness, satisfaction, sadness, dissatisfaction, anger, aggression, fear and anxiousness. These emotions are the basis of narrative experiences, i.e. being afraid of the enemy in a shooting game, feeling aggression and wishing to destroy the enemy and feeling satisfaction, even happiness, when the enemy has been destroyed. Emotional regulation systems in these instances most naturally may focus on manipulating the event structures, such as characters, their roles, events that take place and other features of the narrative gaming experience. One may wish to amplify these emotional contrasts in a time line to make for very emotionally engaging stories, or more dramatic stories. Second, there are possibilities for emotional management, especially in the case of managing arousal, alertness and excitation. Also, one may wish to manage negative emotions, such as sadness, dissatisfaction, disappointment, anger, aggression, fear and anxiousness. Third, there are possibilities related to the avoidance of certain types of emotions that are typically indicative of a poor gaming experience. Inactivity, idleness, passivity, tiredness, boredom, dullness, helplessness as well as a totally neutral experience may be indicating that there is some fundamental problem in the user-game interaction. (Saari et al, in press)

Table 2. A dimensional approach to emotionally regulated gaming. Adapted from Saari et al, in press.

Dimensions	**Low arousal**	**Neutral arousal**	**High arousal**
Positive valence	***Relaxation, calmness***	***Happiness, satisfaction***	***Energetic, peppy, joyfulness, enthusiasim***
	+Relaxation and concentration games with peaceful atmosphere or so	+When reaching a goal in a game this is elementary and can be motivating to play the game further	+Important in many games , related to success in the game or one´s gaming skills, a motivating factor to play further
	+Short break in an adventure game, after having achieved a goal, a "break to breathe" and experience some reward	-Perhaps not feasible	+Can indicate a successful gaming session
	-In an aggressive game perhaps should be avoided		-Perhaps not feasible
Neutral valence	***Inactivity, idleness, passivity***	***Totally neutral experience***	***Arousal, alertness, excitation***
	+Perhaps not feasible, unless the goal of the game is too passivate the person	+Not very feasible	+In many games the gaming challenge and events could lead to this
	-Perhaps should be avoided in most games	-Not very feasible	+One could also maximize arousal in driving games, adventures or violent games if one wishes
			-Avoiding too much arousal in some instances, i.e. managing arousal, for instance for children

Negative valence	***Tiredness, boredom, dullness, helplessness***	***Sadness, dissatisfaction, disappointment***	***Anger, aggression, fear, anxiousness***
	+Perhaps not feasible	+These are basic parts of experience in many games, for instance, when not succeeding to reach a goal or so	+In many games this is a basic part of experience in the game +One could also maximize aggression in a game
	-Perhaps should be avoided in most games as these may be indicators of poor gaming skills vs. the challenge of the game, a boring game or some other fundamentally distracting factors to the gaming experience	-In special circumstances one may wish to avoid these, such as the case for children playing -Also, these may be indicative of poor gaming skills vs. the challenge of the game	-Totally avoiding or controlling aggression in a game, for instance for children or those wishing to have a less aggressive gaming experience

Based on Table 2 regards possible clusters of emotional regulation in games we state that the possibilities of emotional gaming relate mainly to i) controlling the intensity of different emotions in the dimensional model of emotional experience (valence-arousal) and ii) eliminating, if possible, some emotions altogether from the game. Out of these the first approach may be more relevant, as it may be that eliminating basic emotions in gaming experiences may be overly difficult, unless one really focuses on creating an overly happy game or an overly aggressive and negative game. However, the elimination or minimization of certain emotions may be feasible in the case of indicated overly poor gaming experience in which the game may adapt its behavior to advice and help the user. It should be noted that events in games may change quickly and produce complex situations and hence complex emotions that may change rapidly. Consequently, one should better integrate these approaches into the genre or type of the game, such as driving simulator, first person shooter, sports game such as golf, or an adventure game, or a level-playing game for children. (see Saari et al, in press)

SYSTEM ARCHITECTURE FOR EMOTIONAL REGULATION SYSTEMS IN GAMES

A basic concept for emotionally adapted games is Mind-Based technology design that takes into account individual differences in processing information in order to be able to offer a particular user a particular type of experience, such as a desired emotion or mood. This type of system design approach may be of practical use, as it is known that individual differences in processing various types of information may produce sometimes quite large variance in the intensity or type of psychological effects, such as depth of learning, positive emotion, persuasion, presence, social presence and other types of psychological states and effects (Saari, 2001; Saari, 2002; Saari, 2003a; Saari, 2003b; Saari, 2004; Saari et al, 2004).

Psychological Customization is one possible operationalization of Mind-Based Technologies in

system design. It can be applied to various areas of HCI, such as Augmentation Systems (augmented and contextualized financial news), Notification Systems (alerts that mobilize a suitable amount of attention per task or context of use), Affective Computing (emotionally adapted games), Collaborative Filtering (group-focused information presentation), Persuasive Technology (advertising for persuasion, e-commerce persuasion), Computer Mediated Social Interaction Systems (collaborative work, social content creation templates) and Messaging Systems (emotionally adapted mobile multimedia messaging and email). (Saari and Turpeinen, 2004a; Turpeinen and Saari, 2004)

It can be hypothesized that the selection and manipulation of substance of information takes place through the technologies of the various application areas of Psychological Customization. Underlying the application areas is a basic technology layer for customizing design. This implies that within some limits one may automatically vary the form of information per a certain category of substance of information. The design space for Psychological Customization is formed in the interaction of a particular application area and the possibilities of the technical implementation of automated design variation. Initially, Psychological Customization includes modeling of individuals, groups, and communities to create psychological profiles and other profiles based on which customization may be conducted. In addition, a database of design rules is needed to define the desired cognitive and emotional effects for different types of profiles. Once these components are in place, content management technologies can be extended to cover variations of form and substance of information based on psychological profiles and design rules to create the desired psychological effects. (Saari and Turpeinen, 2004a)

Based on the Psychological Customization basic system design described above, we now present a possible system design for including emotional regulation into a gaming engine, in Figure 2.

The process of a typical gaming engine is depicted on the left-hand side of the diagram. The engine continuously monitors user input, which is typically collected using a keyboard, a joystick, or other game controllers. This input data is then processed and transferred to the layer that handles the game's internal logical state, and the user input may influence the game state. After the logical state of the game is defined the system alters the actions of the synthetic agents in the game world. For example, these include the actions of computer-controlled non-player characters. The complexity of this AI layer varies greatly depending on the game. Based on the game state and the determined actions of the synthetic agents, the physics engine determines the kinetic movements of different objects within the world. Finally, the game world is synthesized for the player by rendering the graphical elements and producing and controlling the audio elements within the game. (see Saari et al, in press)

The proposed emotional regulation can be implemented as a middleware system that runs parallel to the actual game engine. The input processing layer of the game engine can receive a

data flow of captured and pre-processed sensor data. The real-time signal processing may consist of different forms of amplifying, filtering and feature selection on the biofeedback signals. This data flow may directly influence the state of the game world, or it can be used by the emotional regulation sub-module of the emotion feedback engine. This module consists of the rules of emotional balancing for different player profile types and gamer-related explicitly set preferences controlled by the "emotion knob". In addition, it contains a collection of design rules for narrative constructions and game object presentation within the game world. The emotional regulation module also receives input from the game engine's logical layer to make selections related to desired emotional balance and narrative structures within the game. (see Saari et al, in press)

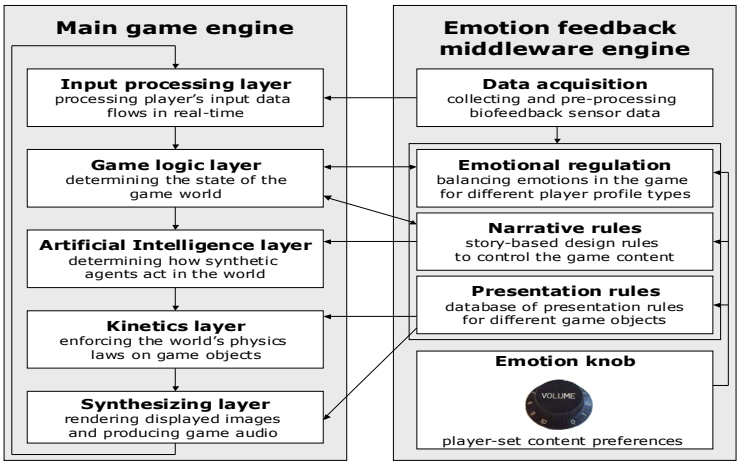

Figure 2. Emotion feedback middleware engine for games. Adapted from Saari et al, in press.

The outputs of emotional regulation engine may then be applied to various different levels of the actions of the game engine: i) the logical state of the world may be re-directed, ii) the actions of the synthetic agents may be controlled, iii) the kinetics of the game may be altered and iv) the rendering of the game world may be changed. First two options are more related to high-level and story-related structures of the game, whereas the last two are more directly related to the selection of presentation of objects within the virtual environment. (see Saari et al, in press)

CONCLUSION

It should be noted that to build a smoothly functioning Psychological Customization system one should do much more research and gain more evidence of the systematic relationships of user profiles, information forms and psychological effects than what is currently reported in scientific experiments with available methods of acquiring such complex information. Specifically, the

feasibility of an "Emotion Knob" for regulating one´s gaming experience needs to be studied. It may be that dialing the Emotion Knob to high arousal already creates a psychological suggestion that will make the experience more intensive, or conversely it may even lead to disappointment if the experienced arousal level is lower than expected. Consequently, clear and conclusive hypothesis, best practices for design or other low-level and explicit recommendation on how exactly to build and best use a Psychological Customization system in gaming is beyond the scope of this conceptual paper.

Some remarks can be made, however. First, our approach does not imply that we somehow flatten the gaming experience and make good, exciting games "non-games". There are specific circumstances within which the approach presented here may be feasible and this is open to further empirical studies within which games are still seen as creating rewarding gameplay experiences. Second, the relationship of flow and emotional states needs to be clarified. It has been suggested that a flow-state can explain and predict gaming behavior, but the empiric evidence of this is still a bit thin. However, the component of flow experience may be also studied when making further experiments on our approach. Third, the emotion knob may work differently in different genres of games. For instance, turning the knob to high arousal in a driving game may create more difficult situations (obstacles, more aggressive behavior of computer controlled cars) for the driver within levels of the game. Turning the knob to less arousal in a violent first person shooter may cut down on showing blood and guts and other graphic violence involved in many of these genres of games but still enable the user to complete the missions. The feasibility and optimal uses of our approach in different types of games for emotional regulation is still subject to further empirical studies.

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