

An Initial Study on Human Emotional States in Video Games

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Abstract. Nowadays, playing video games has become more than an entertainment element in our everyday life. From education, sport, marketing or clinical practice to aerospace, the video games industry has a relevant role in our society as element of entertainment, learning and social interaction. Due to that importance, the efforts to improve visual realism and games mechanics have grown considerably during last decades. However, the emotional and narrative aspect is not deeply analyzed yet, creating a knowledge gap about their usefulness on the user engagement. Aware of the importance of the emotional states of the player in the their performance when are playing, we present an experimental methodology to analyze and measure the influence of emotional states in the game performance and final user experience. This methodology will consist on the induction of different emotional states to an experimental group and, immediately after, they will play a video game. While the player is using the video game, his/her performance metrics will be extracted and saved on the computer, translating them into numerical data. This data will be used lately to look after statistical differences between the different conditions. This paper provides a complete description of the methodology used to understand how emotions are related to the performance and opinion of a group of users.

Keywords: Affective gaming, Video games, Emotion, Psychology

1 Introduction

Video games represent an industry which, on last years, have reach a similar popularity to other entertainment industries, such as cinema or literature. Video

games go further from entertainment, as it is usually considered a new art form, and a powerful technology for human being interaction. Even though their short existence (it's commonly accepted that this industry started in 1980), video games are currently a trending technology which only in 2016 [1] was used by 2.2 billion people around the world. Nowadays, they are present in almost every person's life, specially in western countries, due to its versatility and high demand from society. These products are constantly involved in more daily activities, such as learning and education [3], sports [7], clinical practice [11], training [19], marketing [14], or aerospace [22], among others.

The first decades of this industry were focused on improving the graphic quality, the mechanics, as well as the character aspect and other physical elements of the game. The development of the gaming engines, which facilitates the creation of a game (providing with a software base which reduces the time of software development and testing) [20], represented a critical point in the trend history of video games. This critical point made possible the creation of video games with a more realistic appearance.

The graphic and games mechanics improvement that video games have experienced, have usually originated a gap between the affective and social realism of game interactions, and the players [9]. However, these social and human interactions play an important role during the gaming process, to allow the generation of positive emotions that will be directly related to the activity engagement of the players [17]. This led video game companies and their associated research groups to start working on assessing how the emotions seem to be related with the player general satisfaction with the game [24]. The aim of this research field is to understand how the emotions of the player are related to the game features, and also to understand how that emotions have an impact (positive or negative) on his/her engagement and performance with it.

Here we present an experimental methodology to to measure how varied emotional states of the player affects his/her performance when playing a game, and also how this performance and emotional states are related to the user experience.

The rest of the paper has been structured as follows: Section 2 provides a description on how the emotion has been traditionally studied in video games contexts. Section 3 explains what Affective Games are, providing the theoretical context where the supporting methodology will be presented. Section 4 presentes the hypothesis which will be tested with the methodology. Section 5 describes the methodology proposed in this work for a future research related with a basic approach to an emotion research in video games. Finally, section 6 provides a final conclusion for this proposal.

2 Emotion relevance in video games

Although the main objective of video games is the entertainment, their design is carefully focused on engaging the player into the "gameplay" [4]. This design is conducted taking into account several strategies to maintain the attention of

the player. There are plenty of these strategies (focused on narrative, rewards, dynamics, cooperation vs competition, etc.), and they all have something in common: they are increasingly studied from a cognitive science perspective. These sciences (specially psychology), which were focused until recent years in analyzing the consequences of video game playing [16], are currently changing their focus to in-game variables and the behavioral impact before, during and after the play [6]. Here is where the emotion research appears to have a critical role.

As the psychological research in video games has evolved, there have appeared two different ways of taking into account the emotions in a video game context [8]:

- **Emotions as a "side effect":** the emotion is not important, as long as the individual enjoys the game. The efforts are not focused on providing any emotion, but on avoiding frustration and generating success sensations on the player.
- **Emotions as an engagement tool:** the emotion is a critical point, as it controls the player engagement with the game. This approach can also be divided in two approaches: the emotion observed as an *open loop* (it is not necessary for the computer or console to analyze the emotion) and the emotion observed as a *close loop* (the computer or console analyzes the emotions and adapts to it).

As Johnson and Whiles defend, "if a game does not generate positive emotions in the user it is unlikely to succeed" [10]. The key motivating factor for a video game player is to experience general positive emotions. There are, of course, several strategies to generate these positive emotions (depending on the person, the genre of the game, the motivation of the player, etc.), but the aim of all of them is to generate a positive emotional feedback.

Following this idea, and focusing on the close loop approach, we find a proposal which is inherited from Affective Computing [15], a discipline which develops the computer capacities of relating, arising or influencing emotions. As part of the introduction of the scientific study of emotion in the computer science world, it has also been applied to the specific video games industry on the last years. Thus, the emotion research in video games, combined with the current techniques derived from Affective Computing, arises a new discipline: Affective Games.

3 Affective Games

As a subfield within Affective Computing, Affective Games represents an effort to adapt the video games to the user's emotional state, both screening these emotions and replaying them with changes in the dynamics of the game [12]. Once the player feels an emotion, the video game retrieves this information from different extracting sources, and adapts itself to generate a positive emotion on the user.

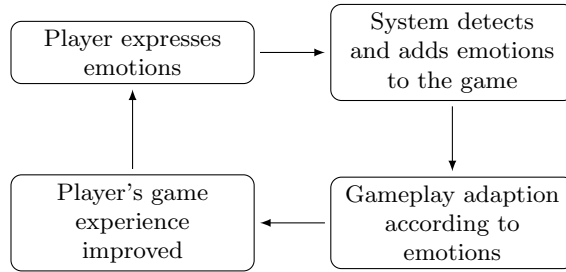


Fig. 1. Typical affective game feedback loop, as appeared in [12]

Figure 1 summarizes the loop followed by the Affective Games dynamics. When the user express an emotion, the system automatically detects and processes that emotion, adapting the gaming experience to that emotions. This shall always represent an improvement for the user experience, once the game adjusts its content to the detected emotional state.

Recently, most of the research on Affective Games has been focused on two main blocks:

- **The extraction of the user information**, normally using physiological measurements, external (i.e. body position, button pressure) and internal (i.e. number of enemies defeated in the game) behavioral measurements.
- **The design of the game**, which includes the adaptation of the game to the user emotions.

These fields, which are normally combined with the User Experience research (UX), concentrates most of the research currently published [12]. Furthermore, most of the research has been concentrated on a physiological perspective to obtain emotional feedback from the user [13], while the behavioral patterns of the user related to the gameplay (the intern measurement) have been briefly studied. Moreover, there are just few studies assessing how the different emotional states influence the performance of the player [18]. This basic gap in emotional research applied to video games must be fulfilled in order to understand exactly how emotions, performance and user experience are related.

Therefore, as a way to understand how emotions are related with the game performance, this research proposal aims to test how different emotional states impact on the player performance playing a game, also analyzing how the emotional state and performance inside the game is related with the gaming user experience.

4 Objectives

The aim of this research is to analyze the influence of emotional states in the game performance and final user experience. To do so, different emotional states will be induced to the experimental group across a first phase of the experiment.

Immediately after that, they will play a video game where several variables related to their performance will be measured using in-game indirect indicators [12]. Finally, a final UX test will be applied to them.

The main hypothesis are presented below.

H1. The users with a positive emotional state (happiness) will need less time to end the game.

H2. The users with a negative emotional state (sadness, fear or anger) will need more time to end the game.

H3. The users with an angry emotional state will show the most aggressive behaviors inside the game, defeating more enemies.

H4. The users will report higher levels of interest on the video game with positive valence emotional states.

5 Proposed methodology

The sample for the experiment will be extracted from a university student population, from the Universidad Autónoma de Madrid. The sample will be divided in five groups, each of the first four assigned to a different experimental condition, in this case related to an emotion (happiness, sadness, anger and fear) and one assigned to a control condition (no emotional induction will be applied to them).

As a first part of the experiment, an emotional induction will be conducted with each user. The induction of emotions using videos has been reported to be the most effective method in prior research [5, 23]. Thus, and following this methodology, the groups will be asked to have a look for a 5 minutes long video depending on the emotional state objective. Every video will be related with the group objective emotion, and will be extracted from previous research [21]. These films are presented on table 1.

Table 1. Films used as emotional inductors

Emotion	Film	Description of the scene
Happiness	<i>Life is beautiful</i>	In a prisoner's camp, a father (Roberto Benigni) and a boy talk to the mother using a loud speaker, reaching the whole camp.
Anger	<i>Schindler's List</i>	A concentration camp commander randomly shoots prisoners from his balcony.
Sadness	<i>City of Angels</i>	Maggie (Meg Ryan) dies in Seth's (Nicolas Cage) arms.
Fear	<i>The Blair Witch Project</i>	Final scene in which the characters are apparently killed

Once they have stated the video, they will fulfill a questionnaire related to their current emotional state (as a way to measure if the emotional induction was effective). The questionnaire chosen will be the Analogical Emotional Scale (AES), which has been previously used as a fast psychological tool to measure emotional states [2].

Immediately after, the user will play the video game chosen for this research. In this study, the video game will be “*Infinite Mario Bros*”, an open source game based on the classical saga “*Super Mario*”, which has the same 2D design and mechanics than his formal counterpart. The players will play the same level of the game, in order to avoid possible biases. The game itself will include several measurement features, such as:

- Time used to end the level.
- Times defeated until the end of the level.
- Number of enemies killed.
- Number of bricks destroyed.
- Frequency of use of each button.

While the player is using the video game, his/her performance metrics will be extracted and saved on the computer, translating them into numerical data. This task will be performed modifying the source code of the video game (in this case, an open code) to obtain this metrics. The data obtained will be used lately to look after statistical differences between the different conditions.

Finally, and once ended the video game level, the users will answer again to the AES questionnaire, in order to check if the emotional state is still present on the person. This test will be applied along with some User Experience questions, where they will be questioned about their performance, their sensations about the video game and about their general opinion about it.

6 Conclusion

The field of Affective Gaming rises as a promising application of cognitive sciences to the video game industry. To ensure the impact of emotions in the video game industry, this research has been designed as a first basic approaching to this new discipline. The main contribution of this empirical study is getting a better understanding of how emotions are related to the performance and opinion of a group of users. Also, this will open different research questions, once the outcomes are finally prepared, in relation with the impact of different emotions on the user behavior, and also how the specific game will relate to that results.

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