

An evaluation of human perception of emotions in digital games built across the OCC model

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Figure 1: Different emotions expressed in digital games [1].

ABSTRACT

This paper aims to evaluate the applicability of the OCC model to represent emotions in digital games. We studied the way that emotions are interpreted and whether they are perceived with similar characteristics by different people. To do this, we used techniques of qualitative and quantitative research to get user responses and their emotional perceptions in scenes from the game FIFA 16, evaluating what emotions have been identified, and the characteristics of these emotions within the OCC model. Using qualitative research, this paper presents relevant evidence that humans perceive emotions in digital games in a similar way they do in the real world. Such evidences help to justify the use of emotions in games as it has been used in affective computing area. **Keywords:** affective computing, qualitative research, digital games, artificial intelligence, OCC Model.

1 INTRODUCTION

Imagine a scenario in which the player is controlling one or more characters within a game, such as FIFA 16¹ game from Electronic Arts. During a match, many events happen over time, and each of these events can be associated with an emotion as shown in figure 1. When we talk about events, we are considering possible and present actions in a match, such as a foul received, a converted penalty, a “boo” from the fans, a sequence of wrong passes and many other possible actions that in the real world would cause emotions to the involved agents. Thus, an important problem is just how to represent these emotions computationally.

Several researchers such as Zhang et al. [3], Bates et al. [4], Neto and Silva [5], Kshirsagar [6], among others have used the OCC model [2] to represent human emotions in different types of applications. The OCC is a model of emotion that states that the strength of a given emotion primarily depends on the events, agents, or objects in the environment of the agent exhibiting the emotion. It has been widely used in computer entertainment due

primarily to its application in psychology and related areas and the range of results outside the computing area.

While we understand the relevance of the research related to the use of the OCC model in psychology and its importance in affective computing, we believe it is important to verify if humans perceive emotions in the same way in digital games. In other words, this research aims to investigate if the way we interpret emotions in digital games is similar to the way we interpret emotions in the real world.

By “similar”, we want to verify if an event in a digital game (such as watching a player of the opposing team celebrating a goal) generates an emotion β' that is equivalent to the emotion β that would happen in a real event.

To perform this evaluation, we used a series of scenes from the game FIFA 16 and asked volunteers to make an assessment of the emotions they perceived. This evaluation sought to identify macroscopically if “from the player point of view, there are internal emotions perceived by the players during a match” and microscopically if “having perceived the emotions by players, these emotions are similar to real world emotions.”

This paper is organized as follows: Section 2 presents some theoretical background on the OCC model, affective computing and qualitative research. Section 3 details the methodology used for gathering the data with the volunteers. Finally, Section 4 discusses the results and Section 5 presents the conclusion and directions for future work.

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¹(<https://www.easports.com/br/fifa>)

2 THEORETICAL FOUNDATION

2.1 OCC Model

The OCC model [2] was proposed by Ortony, Clore and Collins (the name OCC is based on the authors surnames) as a theoretical model to represent the emergence of emotions and the conditions that trigger them.

According to Scherer [7] the model is classified as a lexical model, in other words, a model of psychological analysis of emotions, based on the structure of the semantic fields and terms related to emotion. The model is an approximation of human social behavior, in this case, a set of mental states used in the classification of how we think, recognize and understand events, agents and objects.

According to Ortony et al. [2], the particular nature of each event is determined by the way in which the triggering situation is interpreted, that is, emotions are reactions that can always be characterized as carriers of valence, whether positive or negative. The cognitive aspect of the OCC model is characterized by a central concern in explaining the role of cognition in evaluating the triggering situation, resulting or not in an effective trigger and the differentiation of emotions.

For this purpose, the authors were based essentially on semantic evidence of self-reports and the language of emotions, because they considered that the physiological and behavioral aspects are processes or events "concomitants or consequences of emotional states" [2].

According to the OCC model, the individual is located in a world composed of elements that are displayed every time, as belonging to one of three categories: Events, which are "interpretations of things that occur, considered independently of any beliefs [...] on their potential or actual causes." Objects, or "objects displayed as objects." And Agents, which are "things considered in light of their real or perceived instrumentality cause or contribute to the occurrence of events" [2].

In this way, they form three branches of emotions characterized as reactions to Events consequences, reactions to actions of agents or reactions to aspects of Objects. Related emotional states are mapped as sets and each of these sets is characterized as a type of emotion. To make the model applicable in a more general setting, the kinds of emotions are independent of cultural aspects.

Triggering conditions and differentiation of emotions are evaluated depending on how an individual interprets the implications of a situation in his personal context. The personal context is essentially formed by the representation of the goals, rules and individual attitudes. Therefore, the theory assumes the cognitive assumption that the person has mental structures of representation, evocation and manipulation of these categories of knowledge [8]. In the construction of the model, Ortony et al. [2] described 22 emotions. These emotions were distributed in a such a way that the agent perceives the world around him by consequences, actions and objects, as shown in Figure 2.

Figure 2 summarizes the OCC Model, showing the possible perceptions of an individual. From right to left, the basic branch "Aspects of Objects" is activated when there is a relation between an agent and an object, for example "John likes games." In the following basic branch, "Actions of Agents", the evaluation of the behavior is based on the moral values of who is judging, for example, "Martha reproves John because he likes games." The last basic branch, "Consequence of Events" represents the reactions of agents to events and their consequences. For example, "Martha is displeased with John because he missed her birthday party". More information about the emotions structure map can be found in the complete work from Ortony, Clore and Collins [2].

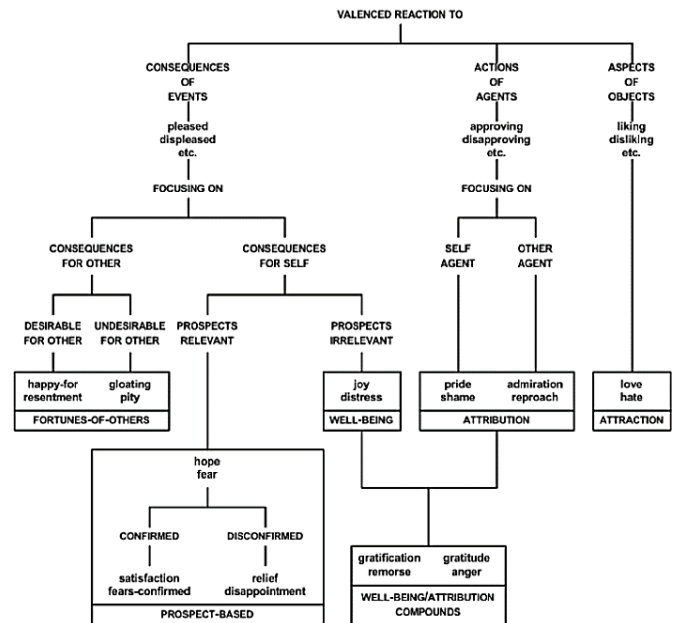


Figure 2: OCC Emotions Structure Map [2].

2.2 Affective Computing

Having understood the OCC model, it is important to identify its application within computer science. The study of computer systems and applications capable of recognizing, synthesizing or expressing emotions originated the research area, defined by Picard [9] as Affective Computing. Computer Science is made up by logical paradigms, rationality and predictability. These paradigms are, in many ways, the basis of intelligence and the focus of much research with the goal of making the machines "smart" or more like humans, in an affective point of view. However, on the other side, researchers have not yet succeeded in developing intelligent machines that are smart with people. Being smart with people, in this case, is to be able to show a compelling behavior that is expected between human beings. In other words, we want to insert human emotions into the machines, making these have actions and emotional reactions in the sense of not just simulating emotions, but having human's emotions.

Picard [9] highlights how the insertion of emotions not only and exclusively contribute to enrich the quality of interaction between machines and users, but directly impacts on the personal abilities to intelligently interpret the actions taken by the machine.

The emotional ability, especially to recognize and express emotions, is essential for natural communication between humans. The construction of NPCs in digital games is directed impacted by this. Currently, most of the developers seek a convincing behavior by simulating the extremes of the expected behavior of a human, but not its emotions.

Despite the extensive use of the OCC model in the affective computing area, for example Loyall and S. Reilly [10] Gebhard [11] Kasap et al. [12] Sales et al. [13] among others, most of the works is based on assumptions based on its use in psychology. Thus, this research is justified in the affective computing area precisely for evaluating if the OCC model is able to translate emotions into computer systems in the same way it is used to be represented in the real world.

2.3 Qualitative Research Models

The methodology used in this research, which be detailed in the next section, is based on two techniques of qualitative research: the use of questionnaires and the direct observations of scenes taking in consideration the point of view of the OCC model.

Questionnaires: Among the different techniques of data collection, the questionnaire is one of the techniques commonly used in research. The questionnaire, according to Gil [14], can be defined as an investigation technique which consists in submitting a certain number of questions in writing to users, with the objective of acquiring knowledge regarding opinions, beliefs, feelings, interests, expectations, experiences, emotions etc.

Thus, given the empirical nature of questions, the questionnaire is a technique that will be used to collect the perception of information regarding the emotions perceived by players in the game scenes.

Direct observation: Direct observation is an empirical research process, which aims to study a contemporary phenomenon in the real context in which it occurs, being particularly suitable for use when the borders between the phenomenon being studied, and the context in which it occurs is not evident. It is a particularly appropriated research methodology when we seek to understand, explore or describe events and complex contexts in which individuals are simultaneously involved. Yin [15] states that this method is suitable when we want to define research topics comprehensively, when we consider the influence of the phenomenon of occurrence within the context and when we want to support multiple sources of evidence. Yin et al. [16] also define "direct observation" based on the characteristics of the phenomenon being studied and based on a set of characteristics associated with the data collection process and their analysis strategies.

In this research, the use of direct observation aims to individually evaluate each of the game's scenes presented in order to classify them according to the OCC model as if they were scenes from the real world, that is, ignoring graphics and particular aspects of the game FIFA 16.

3 RESEARCH METHODOLOGY

The methodology used for evaluating the OCC model in this paper was divided in two parts. In the first, named methodology "A", we performed an analysis evaluating several scenes in a match, assessing and weighing each of the emotions present in each of the scenes. In the second part, named methodology "B", we conducted interviews with users about the scenes and requested them to discuss the emotions related to each scene.

3.1 Environment Setup

For the setup of both parts (A and B) it was necessary to record a match of the game FIFA 16 and then select the best moments, generating a video of 04 minutes and 52 seconds. The generated video has been broken down into 17 scenes and the evaluation performed individually in each of these scenes.

From the video, we developed a questionnaire [17] which was made available for 20 days (November 22, 2015 to December 11, 2015) being answered by 30 people that matched a selected profile. The questionnaire was developed using the *free form* of the platform google forms [18]. The form consisted in a consent statement about the research and a series of questions to evaluate

the player profile and its knowledge and previous experience with the FIFA game.

The desired profile of users for this research is: (1) people who play FIFA with a frequency of at least once a week. (2) People who played at least one of the last three versions of the game, and (3) people who follow and/or perform common activities in relation to any soccer team. We selected people that fits this particular profile in order to ensure that: (1) they understood the rules of FIFA game as well as its dynamics, avoiding possible problems of understanding the issues and rules of the game; (2) the participants did use only the latest versions avoiding any problems; and (3) they had a strong connection to soccer.

With the definition of this profile, it is understood that this research adopts a cultural aspect in which the results presented here only apply to the selected profile, that is, we cannot generalize the results to persons who do not play or are not involved with digital games. However, this cannot be treated as a limitation, since this profile meets the objectives proposed in this paper.

3.2 Research Execution

The two methodologies (A and B) explained before were executed and the results triangulated as will be discussed in the next section.

For methodology "A", the authors evaluated all the scenes of the video, identifying their characteristics and classifying them in accordance with the emotions of the OCC model, as shown in Figure 5.

For methodology B, 30 users watched 17 scenes of a Fifa 16 match between two rival soccer teams of Belo Horizonte: *Atlético Mineiro x Cruzeiro*, and for each scene they filled out a questionnaire displayed in Figure 3.

We asked users to watch scene by scene with the point of view of a game character (*Victor, Atlético Mineiro's goalkeeper*) and from this character do the following actions in the questionnaire: (1) define one or more (maximum of 3) emotions that best characterized the scene, based on a annotated list of emotions from the OCC model. For example: Admiration - About a laudable act initiated by another individual, Shame - About a reprehensible act initiated by the individual himself, Pride - About a commendable act initiated by the individual etc. From the research point of view, the results of such data have a quantitative aspect, since they quantify the emotions presented scenes.

In addition to defining the emotion the users have to, for each scene, (2) explain, in free written form, the factors within the scene that made him select such emotion and (3) classify the emotion perception level using one of five possible values (None, Weak, Regular, Strong or Very Strong). From the point of view of this research, the data obtained by the explanation made by the participants in using each of the emotions have a qualitative aspect as they, in addition to be written in free text, need assessment and interpretation as will be explained in methodology "A".

When defining an emotion (1) the user had the option to select "None" if the user does not see a more evident emotion. This avoids forcing the user to select an emotion and consequently influence the result. The explanation of the emotion (2) given by the user is intended to verify if the points raised by the users were similar to the characteristics presented in the OCC model structure (Figure 2). Finally, the perception score (3) was used in order to analyze only emotions with intensity above regular, avoiding the interpretation and the shift to low intensity of emotions and little relevance. All the obtained results, keeping the anonymity of the participants, can be found in [19].

Scene 1.



0:08 / 0:26

1. Primeira emoção
Escolha dentre as emoções listadas a emoção mais evidente (Caso não perceba nenhuma marque "Nenhuma")

Justifique a escolha da emoção (Caso não perceba nenhuma deixe em branco)

4. Classificação de percepção das emoções *
Escala de percepção.

	Inexistente	Fraco	Regular	Forte	Muito forte
Primeira emoção	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Segunda emoção	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tercera emoção	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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15% concluído

Figure 3: Simplified version of the questionnaire [16].

3.3 Data Triangulation

After the data obtained from the two methods “A” and “B”, a data triangulation was performed. This triangulation aims to compare the similarity between the analysis made by the users filling out the questionnaires and the analysis performed by the authors using the OCC model. The triangulation data basically compares the results of each methodology scene by scene, thereby checking if there was some type of consistency in the selection of emotions from the questionnaires when compared with the analysis using the OCC model.

The Triangulation between the two methodologies is important considering the fact that the authors have a better knowledge on how to map the scenes to emotions using the OCC model based on their characteristics (Figure 5). So, methodology “A” can be considered as having a more significant value in comparison to methodology “B”, which is based on the feeling of the users.

4 DATA ANALYSIS

Here we present the results of the analysis of 8 of the 17 scenes. We selected four scenes from the beginning of the match (scenes 1 to 4) two from the middle (scenes 8 and 9) and two from the end (scenes 15 and 16). The choice of the scenes was based on their

relevance regarding the main events that happened in the game (in this case, 3 goals), and also trying to avoid repetitive analysis within the paper. For each of the scenes we present: (1) one short descriptive paragraph about the scene, (2) the analysis by the expert using the OCC model (methodology “A”) (3) the data obtained from users filling the questionnaires (methodology “B”) and (4) an analysis of the similarity of the data obtained in methods A and B (triangulation).

4.1 Scene 1

Scene 1 presents the player list of the two selected teams. In this scene, there is no direct action but only some events that precede the beginning of the game. A snapshot of this scene is shown in Figure 4.



Figure 4: Scene 1 – Team squad.

4.1.1 Methodology A

According to methodology “A”, in scene 1 two possible emotions were identified: “Hope”, by the prospect of winning the game, which is a desired event, or “fear” by the prospect of an unwanted event, that would be a defeat. Regardless of the emotions is evident the sense of anticipation of an event as it has an important perspective on the agent's own event result.

4.1.2 Methodology B

According to methodology “B”, the following distribution of emotions in the scene 1 were presented, and the following analysis of reasons (AR²) given by participants for their choice:

- Emotion 1: [83.33% Hope] + [16.67% Fear]
- Emotion 2: [40.00% Fear]+[60% NRI³]
- Emotion 3: [100% NRI]
- AR: In the justifications written in the questionnaires, there were words and expressions such as “defeat, victory, win, lose, run, trouncing, draw”, among others. It is evident that the reasons are based on the perspective of the desired or unwanted event in case of victory or defeat.

² AR - Analysis of reasons: The term AR will be used to represent the qualitative analysis used for justifying the choices of emotions written by the players in the questionnaires.

³ NRI - No relevant intensity: The term NRI will be used in this paper to quantify the responses of users who have intensity under “regular”, i.e. emotions classified in events such as “missing” or “weak.”

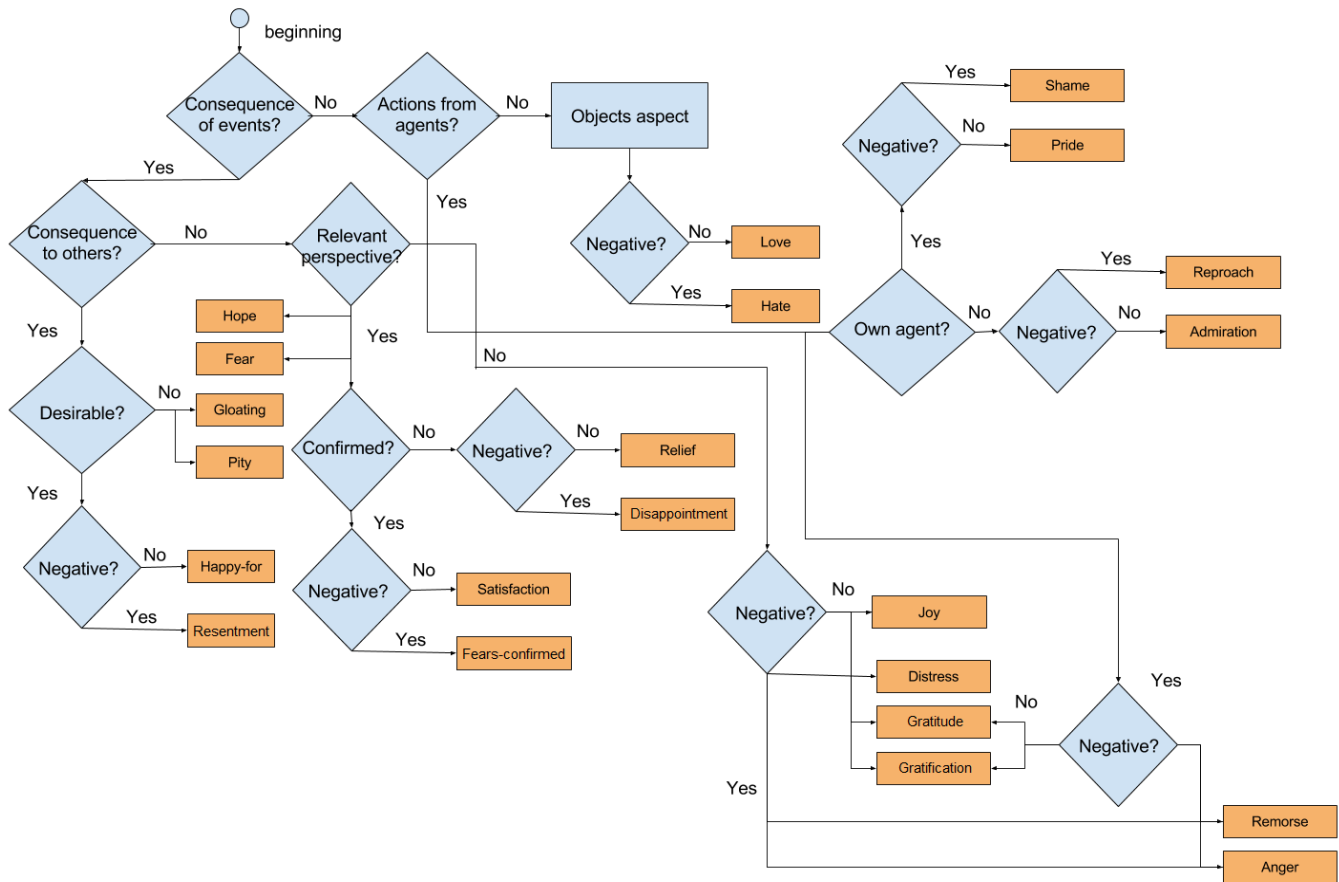


Figure 5: OCC model mapped.

4.1.3 Triangulation

As mentioned, the triangulation is performed comparing the data obtained by the two methodologies. For this scene, according to method "B", in 83.33% of the cases, the most evident emotion was [Hope]. This is in accordance with the map of the OCC model emotions (Figure 5) used by methodology "A", which points emotions [Hope] and [Fear] as the two more likely, once the scene introduces the match and observers can forecast the possible results of the game: win, lose or draw.

According to the "B" methodology, in 54.5% of the cases, the second more evident emotion was [Fear], wherein 40% of the sampling subgroup considered it with relevant intensity for the experiment (WRI⁴) following in accordance with the analysis of the OCC model emotions map used by methodology "A" stating emotion [Fear] as one of the two most likely emotions due again to the scene's characteristics in creating a prospect of the final result: victory, defeat or draw.

4.2 Scene 2

Scene 2 starts with the kick-off by *Atlético Mineiro*, and terminates with a play by the same team. After a few ball touches, there is the first shot on goal. Unfortunately, this attack happens with little chance of goal conversion, being easily handled by the

goalkeeper of the other team, *Cruzeiro*. *Atlético Mineiro* players were all behind the line of defense, preventing any attempt to recover from a possible failure of the goalkeeper.

4.2.1 Methodology A

Since this is not a good play by *Atlético Mineiro*, without major actions that would end up in goal, no emotions are expected with enough intensity to be highlighted in the scene. More specifically, as in the previous scene, two possible emotions (fear and hope) were expected, but with a much lower intensity, as discussed by Picard [9] with regards to the emotions decay curve. Moreover, in a scenario where the first emotion is not clear, a second or third will not be clear as well.

4.2.2 Methodology B

According to the "B" methodology, the following emotions in scene 2 were present, and the following AR was given by participants for their choice:

- Emotion 1: [76,67% NRI] + [10,00% Hope] + [10,00% Fear] + [3,33% Angry]
- Emotion 2: [96,66% NRI] + [3,33% Fear]
- Emotion 3: [100% NRI]
- AR: In the justifications submitted in the questionnaires, there were words and expressions such as "emotionless, bad shot, bad, lonely, and greedy". It is evident that the reasons are based on the perspective that any event, negative or

⁴ WRI - With relevant intensity: The term represent responses of users who have intensity above "weak", i.e. emotions classified in events such as "Regular", "strong" or "Very Strong".

positive could have occurred in the scene, thus featuring no significant emotion.

4.2.3 Triangulation methodologies

Analyzing the results from both methodologies, we can see that, according to methodology “B”, at 76.67% of the instances, there was not an evident first emotion (information entered as NRI). This is in accordance with the map of model OCC emotions used by the methodology “A”, which pointed out that because the scene does not present an action with clear objective, no emotion is perceived in the scene.

From the remaining percentage (23.33%), 10.00% were assigned to the hope emotion and 10% have been attributed to the emotion fear, being in accordance with the trail left by emotions in the last scene as raised in the “A” methodology. The rest (3.33%) didn’t show NRI for the experiment.

According to the methodology “B”, in 96.6% of the sample cases there was NRI for a second emotion, in accordance with shown by the methodology “A”, about second and third emotions are unlikely when the first also aren’t. This result follows in accordance with the analysis of the OCC model emotions map used by the methodology “A” that showed that no emotion was probable for both the second and the third emotion.

4.3 Scene 3

The scene 3 (figure 6) starts with the opposing team's attack leaving the defense area. Atletico's team seems to be lost on the game and has difficulty to approach to try to get the ball, the opponent attempts a first cross that beats at the defense and back to the player, who crosses again and the Cruzeiro's player hit a first-time shot and make the goal with the ball going too close to the goalkeeper who fails to defend. The Cruzeiro's players celebrate with the crowd with clenched fists and hug each other.



Figure 6: Scene 3 – The first goal of Cruzeiro [1]

4.3.1 Methodology A

According to the map of the OCC model, we can make two separate analyzes. At the first, clearly something bad happened: a goal of the opposing team on the goalkeeper's fault, this action is characterized in [Anguish] because it is a relevant event occurring with the agent itself. However, an interpretation of a second point of view is possible, that is the opponent (third agent) started a reprehensible act (opponents goal) on a desirable event (goal in favor and victory), in this case, such an emotion is characterized as anger over the opponent. Due to the high intensity of the fact (opponent's goal), second and third emotions are unlikely since the high intensity on the first annuls the perception of others.

4.3.2 Methodology B

According to the Methodology “B”, the following emotions distributions were presented at the scene 3, and the following AR as the interviewee's choice:

- Emotion 1: [56,67% Angry] + [43,33% Anguish]
- Emotion 2: [90,00 % NRI] + [6,67% Anguish] + [3,33% Angry]
- Emotion 3: [100% NRI]
- AR: In the justifications submitted in the questionnaires, there were present words and expressions such as: "Goal, goalkeeper failed, failed defense." It is evident that the justifications are based on the prospect of a negative event that occurred (opponent's goal) at the same time can be characterized as anguishing from agent's point of view, or anger about the third agent who carried out the reprehensible act.

4.3.3 Triangulation methodologies

By the data obtained in the analysis of the two methods “A” and “B” according to “B” methodology in 56.67% of cases sampling the first over this emotion was the anger of excitement, followed closely by anguish - 43.33% - and complies with the analysis of the OCC model emotions map used by the methodology “A” which pointed out that due the scene have different negative interpretations (on itself or on others) both emotions would be possible to be presented in the scene.

According to the methodology “B” in 90.00% of the sampled cases there was NRI for the second emotion, as showed at methodology “A” of second and third emotions are unlikely when the first is extremely intense. This result follows in accordance with the analysis of the OCC emotion model map used by the methodology “A”.

4.4 Scene 4

The scene 4 begins in the same way to the scene 3 with an opposing team's attack. The opponent makes a good thrust, however messes up on the last touch and cannot finish. The Atletico's defender who puts the ball forward and returns it to Cruzeiro team prevents finalization. Despite failing to convert, Cruzeiro get too close to finalizing and convert a second goal.

4.4.1 Methodology A

According to the map of the OCC model, it is seen at this point that a third agent was able to perform an action; this action was clearly an unwelcome event for the player, featuring as a relief emotion, since the action didn't take place. However, there was also the participation of a team's own agent who managed to avoid the goal kick, awakening a sense of gratitude, since it has performed a commendable act (avoid kick) on a desirable event (prevent the goal). As the excitement of the previous scene was a negative emotion, it is likely that more negative emotions (or less positive) as relief protruded on less negative emotions (or more positive) as gratitude.

4.4.2 Methodology B

According to the “B” methodology, the following emotions distributions on the scene 4 were presented, and the following AR as given by participants for their choice:

- Emotion 1: [50,00% Relief] + [40,00% Gratitude] + [10,00% Fear]
- Emotion 2: [100,00 % NRI]
- Emotion3: [100% NRI]
- AR: In the justifications submitted in the questionnaires, there were present words and expressions such as "Defender, narrowly avoided the shot, marking". It is evident that the justifications are based on the prospect of a negative event

that could have occurred (opponent's goal), but it was avoided by the team defender in a commendable act.

4.4.3 Triangulation methodologies

By the data obtained in the analysis of the two methodologies "A" and "B" according to Methodology "B" 90.00% of the sample of cases the most commonly found emotions were the emotions of relief and gratitude, both due to the interpretation of the agent's point of view of praise that failure realization of a negative fact or praise the agent that avoided it. A point not provided, however that doesn't invalidate the analysis of the Methodology "A" was the appearance of 10% of the fear emotion, present probably because a sequence of negative emotions culminating in a negative event (possible loss).

According to the methodology "B", at 100.00% of the sample cases there were NRI for a second and a third emotion excitement in accordance with the methodology "A", that second and third emotions are unlikely when the first is extremely intense. This result follows in accordance with the analysis of the OCC emotion model map used by the methodology "A".

4.5 Scene 8

The scene 8 (figure 7) begins with a cross from Cruzeiro. The Atletico's player who was marking the Cruzeiro's player leaves its position, so the Cruzeiro's player was free to head in the corner between the goalkeeper and the crossbar. The player who makes the goal celebrates with debauchery with some Cruzeiro's players.



Figure 7: Scene 8 - The second goal of Cruzeiro [1]

4.5.1 Methodology A

According to the map of the OCC model, it is seen at this point that a third agent of the opposing team had the opportunity and completed the realization of an action. This action was clearly an unwelcome event for the player, featuring as an [Anguish] emotion since something bad happened. However, there was also again the participation of a team's own agent, who left his mark position, leaving the Cruzeiro's player free to finish, awakening a sense of shared anger between the agent who executed the goal and the agent who left the marking.

As the excitement of the previous scene was a negative emotion, it is likely that more negative emotions appear (or less positive) like fear, disappointment, disgust, not because of the event itself (opponent's goal) but due to the possibility of defeat.

4.5.2 Methodology B

According to the "B" methodology, the following emotions distributions on the scene 8 were presented, and the following AR as given by participants for their choice:

- Emotion 1: [40,00% Anguish] + [43,33% Angry] + [13,33% Fear] + [3,33% Disappointment]
- Emotion 2: [73,33 % NRI] + [13,33% Anguish] + [6,66% Disappointment] + [6,66% Angry]
- Emotion 3: [100% NRI]
- AR: In the justifications submitted in the questionnaires, there were present words and expressions such as "Goal, defender failure, defense, error, marking, again." It is evident that the justifications are based on the prospect of a negative event that occurred (opponent's goal), and the defender fails marking the opponent.

4.5.3 Triangulation methodologies

By the data obtained from analysis of two methodologies "A" and "B", according to the methodology "B" in 83.33% of the sample cases most present emotions were anxiety and anger, two due to interpretation of the agent from its point of view of penalizing a third by the realization of a negative fact or penalize the agent that did not prevent the achievement. A predicted point of methodology "A" was the appearance of other emotions concomitant with the main emotions, due to the fact that at the same time that specific events occur, macro events are concretize (end of the game and consequently defeat).

According to the methodology "B", in 73.33% of the sample there were NRI for the second emotion and 100% of NRI for a third emotion in accordance with methodology "A" of this negative event (opponent's goal) accumulate in a greater negative event (the match defeat), causing that other emotions such as anxiety, disappointment and anger appear. This result follows in accordance with the analysis of the OCC emotion model map used by the methodology "A".

4.6 Scene 9

In the scene 9 with quick ball touch, the Atletico's player can complete the kick towards the goal. However, the player makes a long range shooting instead of passes it to a better-positioned player, besides the kick be finalized with little chance of goal due to the height of it.

4.6.1 Methodology A

According to the map of the OCC model, it is seen in this moment that an agent of the Atletico's team with the opportunity to realize the achievement of a positive action for the team (one goal). This action is clearly a desired event by the player in seeking to reverse the unfavorable score of the game, however as the action is relatively weak, with little possibility of conversion, at this time it is unlikely the perception of some relevant emotion.

As the development of the match is accompanied by negative emotions due to unfavorable score, it is likely that more negative emotions (or less positive) as anxiety, anger, fear, disappointment, disgust appear not because of the event itself (failure goal kick) but due to the possibility of defeat.

4.6.2 Methodology B

According to the "B" methodology, the following emotions distributions on the scene 9 were presented, and the following AR as given by participants for their choice:

- Emotion 1: [96,66% NRI] + [3,33% Anguish]
- Emotion 2: [100,00 % NRI]
- Emotion 3: [100% NRI]
- AR: In the justifications submitted in the questionnaires, there were present words and expressions such as "defeat, second half, replacement." It is evident that the justifications are based on the change of perspective of a larger event (the match), not the event itself held (goal).

4.6.3 Triangulation methodologies

By the data obtained from analysis of two methodologies "A" and "B", according to the methodology "B", in 96.66% of the samples cases there was not a first more evident emotion entered as NRI, following the analysis in accordance with the map of model OCC used by methodology "A" which pointed that the fact of the scene doesn't present an action with the objective of a possible outcome, no emotion would be likely in the scene. The rest (3.33%) were appointed on the [Anguish] emotion, which was an emotion already present in decline in other scenes.

According to methodology "B", in 100% of the sample cases there was NRI for a second and a third emotions; this occurs because these are unlikely when first also are not likely either. This result follows in accordance with the analysis of the OCC model emotions map used by the methodology "A" which showed that no emotion was probable for both the second and the third emotion.

4.7 Scene 15

In this scene occurs two good finishes in favor of Atletico's team. In the first, the Atletico's player comes face to face with the Cruzeiro's goalkeeper who can defend but grants rebound. In a failure of the Cruzeiro's defender while trying to retrieve the ball, it passes the ball for a second Atletico's player, guaranteeing a new possibility of finalizations; it in turn passes to confuse the mark and again the first player kicks towards goal, passing very close to the goalpost and without the possibility of goalkeeper defense, but the Atletico's team doesn't scored.

4.7.1 Methodology A

According to the map of the OCC model, it is seen at this point the possibility of positive action for the team (a goal); this action is clearly a desired event by the player seeking to reverse the unfavorable score of the match and the action takes place with great possibility of goal, generating emotions such as joy, since a good finalization is good giving hope to the possibility of changing the score.

At the same time, as the goal was not converted, emotions like disappointment may occur by no confirmation of the desired event and, due to the unfavorable score, it is probable that more negative (or less positive) emotions such as fear become more present over the match time.

4.7.2 Methodology B

According to the "B" methodology, the following emotions distributions on the scene 15 were presented, and the following AR as given by participants for their choice:

- Emotion 1: [43,33% Joy] + [23,33% Fear] + [20,00% Disappointment] + [13,33% Hope]
- Emotion 2: [80,00 % NRI] + [20,00% Fear]
- Emotion 3: [100,00% NRI]
- AR: In the justifications submitted in the questionnaires, there were present words and expressions such as "Goal, almost, well, kick, defender failure". It is evident that the justifications are based on the change of perspective of a greater event (the match) from the conversion goal on goal kick.

4.7.3 Triangulation methodologies

By the data obtained in the analysis of the two methodologies "A" and "B" according to methodology "B", in 43.33% of the sample cases the joy emotion was present, being justified by the possibility of conversion into goal, action of the two kicks of the player. Due to the achievement of an expressive attack, the emotion hope appeared in 13.33% cases, as pointed out by the analysis of the OCC model emotions map used by the

methodology "A", which pointed out that due to the scene present actions that aimed a possible result (goal), positive emotions related to events could occur. The rest (43.33%) were expressed in emotions fear and disappointment are emotions present in the context of the match and the possibility of defeat, not the event itself.

According to the methodology "B" in 80% of the sample cases there was NRI for second emotions, and in 100% of cases to third emotions. That happens because they are less probable, when the first emotions are more probable. In the remaining 20%, the second emotion was fear, which again goes in the context of a chance of defeat the match. This result follows in accordance with the analysis of the OCC model emotions map used by the methodology "A" that pointed out how positive emotions were probable from positive events.

4.8 Scene 16

In the scene 16, Cruzeiro's player make a long pass to a second player from Cruzeiro, which was marked for two and can finalize the kick and score a goal. After the goal, the player celebrates with the other team players and the crowd celebrates.



Figure 8: Scene 16 - The third goal of Cruzeiro [1]

4.8.1 Methodology A

According to the map of the OCC model, is seen at that time an agent of the Cruzeiro team with the possibility to achieve the realization of a negative action (a goal) against Atletico. This action is clearly an unwelcome event by players who seeks to reverse the unfavorable score of the match and the action takes place with the conversion of the goal. If it were at another time of the match (as occurred in the scenes 3 and 8) emotions would be mostly related to the event.

However the team is already losing the match with a score 2-0 at 90:00 of regulation play. Changing the score to 3-0 culminates in fear confirmed, i.e., confirming the perspective of an unwanted event (defeat). At the same time, as the event was converted (the goal), negative emotions like disappointment, anger and anxiety may occur.

4.8.2 Methodology B

According to the "B" methodology, the following emotions distributions on the scene 16 were presented, and the following AR as given by participants for their choice:

- Emotion 1: [76,67% Fear-Confirmed] + [23,33% Disappointment]
- Emotion 2: [100,00 % NRI]
- Emotion 3: [100,00% NRI]
- AR: In the justifications submitted in the questionnaires, there were present words and expressions such as "Defeat,

played badly, failure, terrible." It is evident that the justifications are based on the conclusion of a major event (the match) and another goal at 90:00 minutes prevents any possibility of victory or even a draw.

4.8.3 Triangulation methodologies

By the data obtained in the analysis of the two methodologies "A" and "B" according to methodology "B" in 76.67% of the sample cases the fear-confirmed emotion was present, being justified by the conclusion of the match (with negative score) with the last goal scored by the opposing team preventing any reaction at that time. The emotion disappointment came up with a total of 23.33%, evidencing not the action itself (the goal), but the match conclusion with an unfavorable score as pointed out by the analysis of the OCC model emotions map used by the methodology "A" which pointed out that due to scene to present a new negative, culminated in fear confirmed emotion about a greater negative event (defeat).

According to the methodology "B", in 100% of the sample cases there was NRI for second and third emotions; this occurs due to these emotions are less probable when the first emotion are more intense as occurred in this case. That result follows in accordance with the analysis of the OCC model emotions map used by the methodology "A" that pointed out how the emotions of a macro event conclusion (defeat) minimize micro events of emotions (opponent's goal).

5 CONCLUSION

Some conclusions can be raised based on the evidences presented here and they can be considered advances in the fields of affective computing, artificial intelligence and digital games. Our study revealed that the way humans interpret events in games and interactive systems, associate these events and express them with words follows a line of reasoning similar to the one applied in the OCC model. In general, in all the 8 scenes in which we applied the two methodologies, both presented a similar behavior, pointing to the same emotions, that is, humans were able to identify emotions in the scenes in the same way the OCC model is able to map them.

This result was somewhat expected, since the OCC model was developed as a lexical model, that is, a model of psychological analysis of human emotions based on the structure of semantic fields and terms associated with emotions. Here we present the study of the OCC model applied to games, raising evidences that the psychological model, even inside games, has a behavior similar to the behavior of the model outside the environment of games, from the perspective of the players.

It is important to mention that the behavior of the model of emotions in a game is similar but not equal to the behavior of humans in the real world. This can be explained by two reasons: (1) the graphical and computational limitations that inhibit the game from being 100% similar to a human, whether physically or intellectually and (2) interaction and immersion failures that separate the game from the real world.

It is also important to mention how the choice of profiles can directly interfere in the results. In this paper, we used as profile only people with a high degree of involvement with soccer, games and, in special, people involved with both of them. The choice of people indifferent to these topics could result in individuals with limited emotions or even without emotions inside the game. The results obtained by applying methodology "B" on players who attended the profile show that they were capable of perceiving aspects of emotions in the game scenes.

The analysis of the answers indicated a significant agreement between the individuals (a larger group of individuals tended to the same emotions) in some specific moments, but in other

moments they presented a lower agreement. As discussed, several factors influenced in the lower agreement, but we identified as the most important factor the intensity of the events. We were able to observe that in events with higher intensity (such as goals) the emotions were very centralized, while, on the other hand, in events with lower intensity, the emotions were very broad. This result can be explained by the different perspectives that allow different analysis of the events, with a wide range of emotions and intensities, making the analysis for the OCC model harder (but not impossible).

An important fact about the OCC model that must be mentioned is that the use of all the 22 possible emotions is not mandatory. In games, different from the real world, this happens because we have a lack of events that are capable of arousing the less common emotions. In general, the events are associated with the most basic emotions, such as happiness, fear, rage, hope, etc. However, when looking for different types of games, not only FIFA, it is possible to find emotions that are more complex.

5.1 Future work

For future work, we have identified some points and open questions in which incited the researchers involved in the development of this paper. During the tests, users were placed in contact with scenes of the game, however it's interesting to understand if there is a greater perception of emotions playing the game and not just watching. The answer to this question can be achieved using a close approach to the methodology adopted in this paper, however necessitating adjustments in the way of identifying the user-perceived emotions.

A second issue concerns the possibility intensifying the level of emotions perceived by the user, in order to verify if it would be possible to increase the level of perception of emotions with internal modifications of the game, such as inserting new audio components as the real noise of the crowd, or even using favorite player Team.

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REFERENCES

- [1] E. Arts, *FIFA 16*. 2015.
- [2] A. Ortony, G. L. Clore, e A. Collins, *The Cognitive Structure of Emotions*. Cambridge University Press, 1988.
- [3] H. L. Zhang, Z. Shen, X. Tao, C. Miao, B. Li, Y. Cai, e others, "Emotional agent in serious game (DINO)", in *Proceedings of The 8th International Conference on Autonomous Agents and Multiagent Systems-Volume 2*, 2009, p. 1385–1386.
- [4] J. Bates, "The role of emotion in believable agents", *Commun. ACM*, vol. 37, n° 7, p. 122–125, 1994.
- [5] A. F. B. Neto e F. S. C. Da Silva, "On the construction of synthetic characters with personality and emotion", in *Advances in Artificial Intelligence-SBIA 2010*, Springer, 2010, p. 102–111.
- [6] S. Kshirsagar, "A multilayer personality model", in *Proceedings of the 2nd international symposium on Smart graphics*, 2002, p. 107–115.
- [7] K. R. Scherer, "Psychological models of emotion", *Neuropsychol. Emot.*, vol. 137, n° 3, p. 137–162, 2000.

- [8] J. McCarthy e P. J. Hayes, “Some philosophical problems from the standpoint of artificial intelligence”, *Read. Artif. Intell.*, p. 431–450, 1969.
- [9] R. W. Picard, “Affective computing”, *MIT Press Camb. MA*, vol. 167, p. 170, 1997.
- [10] J. B. A. B. Loyall e S. Reilly, “An Architecture for Action, Emotion, and Social Behavior”, 1992.
- [11] P. Gebhard, “ALMA: a layered model of affect”, in *Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems*, 2005, p. 29–36.
- [12] Z. Kasap, M. Ben Moussa, P. Chaudhuri, e N. Magnenat-Thalman, “Making them remember—emotional virtual characters with memory”, *Comput. Graph. Appl. IEEE*, vol. 29, nº 2, p. 20–29, 2009.
- [13] R. Sales, E. Clua, D. de Oliveira, e A. Paes, “An Artificial Emotional Agent-Based Architecture for Games Simulation”, in *Entertainment Computing–ICEC 2013*, Springer, 2013, p. 156–159.
- [14] A. C. Gil, “Métodos e técnicas de pesquisa social”, in *Métodos e técnicas de pesquisa social*, Atlas, 2010.
- [15] R. K. Yin, *Applications of case study research*. Sage, 2011.
- [16] R. Yin, L. Bickman, e D. Rog, “Handbook of applied social research methods”, *Editor. Bickman Rog DJ Lope Publ. Lond.*, 1997.
- [17] “Questionário pesquisa qualitativa de emoções FIFA”, *Google Docs*. [Online]. Available at: <https://goo.gl/ErPfA0>.
- [18] Google, *Google Form*. Google.
- [19] “Análise dos dados pesquisa qualitativa de emoções FIFA”, *Google Docs*. [Online]. Available at: <https://goo.gl/nG0JZX>.