Video Game Usage and Gameplay: Call of Duty 4 Case Study

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Resumo

A jogabilidade é um dos conceitos mais importantes a considerar quando a usabilidade em videojogos está sob análise. Este artigo apresenta um estudo com o intuito de compreender as questões de uso e de jogabilidade em videojogos num estudo de caso centrado no jogo "Call of Duty 4: Modern Warfare". 41 participantes foram organizados em três grupos distintos de experiência de jogo, jogaram o jogo e preencheram um inquérito relacionado com a sua experiência de jogo. Foram obtidas respostas relacionadas com a pertinência dos elementos cénicos, eficiência da interface e *feedback*. Os resultados apontam para a exploração de outras componentes relacionadas com a jogabilidade e que passam pelo uso de novas tecnologias e métodos para analisar estes elementos, nomeadamente a atenção visual.

Palavras-chave: *avaliação de videojogos, jogabilidade, usabilidade*

Abstract

The concept of gameplay is one of the most important aspects to consider when analyzing video game usability. This paper presents a study elaborated with the intent of understanding video game usage as well as gameplay through the use of the "Call of Duty 4: Modern Warfare" video game. 41 participants of three distinct gaming experiences played the video game and were questioned on various elements of their experience. Answers related to the importance of different game scenario elements, the efficiency of the interface and feedback were obtained. The acquired results also opened the possibility of exploring other components of gameplay as well as the use of new technologies and methods to analyze these elements, namely visual attention.

Keywords: *video game evaluation, gameplay, usability.*

1. Introduction

The concept of game usability has been and continues to be the object of study for many researchers (Clanton, 1998; Desurvire, Caplan, & Toth, 2004; Federoff, 2002; Malone, 1980; Pinelle, Wong, & Stach, 2008). One game usability aspect some of these authors agree on is the *gameplay* dimension. Understanding how players interact with video games as well as how the game environment influences their gameplay – both visually and in terms of their in-game behavior – is just one of the key aspects in understanding video game usage. Furthermore, many of the indicated researchers have presented new methodologies that can assist in the development of more *usable* and entertaining video games. In fact, if a player does not enjoy the game she/he plays, they will stop playing the game (Sweetser & Wyeth, 2005). The work reported in this paper represents a contribution for usage and gameplay centered on one of its related vectors: the relevance of architectural and scenic elements in designing the game experience.

2. Conceptual framework

2.1. Game Usability

The concept of usability, defined by ISO 9241-11, encloses three measures: efficiency, effectiveness and satisfaction. Nevertheless, these are directed towards the evaluation of products (hardware, software or services) in a specific context of use (ISO, 2009). Video games, on the other hand, are not a common product as their effectiveness, efficiency or the satisfaction they generate are not only different but also have different levels of importance because of their unique nature (Federoff, 2002). Yet, much research has been done to unite video games with usability. The association between usability and video games does, however, still result in some confusion, even in the video game community. One study (Federoff, 2002) demonstrated that even for members of a video game development team, discussing the idea of the usability of games is a complex task.

Despite these difficulties, the common tendency is to affirm that video games must be tested as well as developed taking into account proper usability issues. One of the first approaches to game usability was by the hand of Thomas Malone nearly 30 years ago (Malone, 1980). Malone proposed a set of guidelines for game designers; specifically for instructional

computer games. More recently, Chuck Clanton proposed a division of a game's usability issues into three parts: the *game interface*, the *game mechanics* and the *game play* (Clanton, 1998). Federoff (Federoff, 2002) elaborated on Clanton's three element vision of game usability. Federoff describes the game interface as both the elements that are used to control a video game (e.g. keyboard, video game controller, joystick or a mouse) as well as the visual representation of the various actions a player executes in a game. The game mechanics are described as the ways the player is able to move in the video game (e.g. walking, running) and can be divided into three parts: animation, programming and level design. Lastly, the game play refers to the challenges and problems a player must overcome to win/complete the objectives of a video game. Additionally, Federoff indicates that all three elements mentioned are dependant of the video game genre to which they are associated.

Much of the existing game usability issues result in the use of a common Human-Computer Interaction technique: *heuristic evaluation*. Heuristics, such as those proposed by Jakob Nielsen (Nielsen, 2005) for evaluating product interfaces and design can in fact be useful for video game development and evaluation. Furthermore, considering that a *usable* game is one that entertains and satisfies a gamer, then game heuristics must be developed to cover design aspects that guarantee satisfaction (Federoff, 2002). Other researchers have approached the game usability question on similar grounds. Pinelle et al. (Pinelle, et al., 2008) consider that video games are products that require permanent interaction and therefore, believe usability to be a significant problem in the video game industry. These authors approach game usability defining it as the degree to which a player is able to learn, control, and understand a game. Moreover, they present the argument that despite usability issues being common between both video games and other products, video games have the particularity of presenting usability questions that are not common in other products. Additionally, Desurvire et al.'s (Desurvire, et al., 2004) indicate, in their approach to game usability, that when evoking video games and playability, one cannot limit themselves to the evaluation of the usability of the game interface. They defend the need to assess other video game properties such as *gameplay*, *story*, *mechanics* and *usability*.

2.2. Game Evaluation

A unique product such as a video game requires its own specific evaluation process. A good quantity of research has been done in what concerns this issue. Some of the existing research in this area has picked up on some of the relevant techniques in usability research and

modified them to suit video game evaluation and development needs. The use of video game development or assessment heuristics is a common method proposed by many authors and researchers (Desurvire, et al., 2004; Federoff, 2002; Pinelle, et al., 2008). Federoff's (Federoff, 2002) study is based, firstly, on the analysis and comparison of game design heuristics collected through a literature review. The collected heuristics were then catalogued according to the three game usability areas defined by Clanton: *game interface*, *game mechanics* and *game play*. Secondly, heuristics were then collected through questioning and observing members of a video game development company. After refining the collected heuristics, Federoff established a final list of 40 heuristics which were categorized into the three game usability areas presented. Federoff concludes her study with a few suggestions for more formal usability procedures such as prototyping, post-mortem phases as well as expert evaluations. Desurvire et al.'s (Desurvire, et al., 2004) study introduces Heuristic Evaluation for Playability (HEP), a group of heuristics based on existing literature which focus on productivity and playtesting heuristics for video game and board game evaluation. Contrary to Claton and Federoff, these authors define four categories to classify their heursitcs: *game play*, *game mechanics*, *game story* and *game usability*. The HEP proved to be valuable in the early stages of video game design as well as useful for finding problems once they already exist. Finally, Pinelle et al. (Pinelle, et al., 2008) also present a list of heuristics that can be used to carry out video game usability inspection. Their list of heuristics was built in a three-step process. First, the authors identified video game usability problems in over 100 PC game reviews from a video game site. Second, the identified problems were categorized and thirdly; 10 usability heuristics were developed based on the problem categories as well as problem descriptions identified. The authors defend that their heuristics can play a role in the game design and development process as well as a usability inspection aid.

Even though many of the existing techniques focus on the use of heuristics, another study approaches video game evaluation on a different level. Tracking Real-Time User Experience (TRUE): a comprehensive instrumentation solution for complex systems (Kim, et al., 2008) takes video game analysis to a new level. Their study as well as their system, TRUE, is the result of an analysis of behavioral instrumentation with other HCI methods. Kim et al.'s study focuses on the possibilities of User Initiated Events (UIEs), events that are the result of a user's direct interaction with a system. One of the main values of the system is that it allows the researcher to analyze streams of data rather than just aggregated frequency counts; furthermore, the system associates a time stamp to each logged event as well as associating

contextual information to each of these. As exemplified in their work; in a racing game, the TRUE system can record information related to a car crash as well as contextual information such as the track being raced and the weather conditions at the time. A second greater value associated to the TRUE system is the fact that it collects attitudinal data; data related to participant feelings which is acquired through surveys. At the time of publication of their research (2008), the authors indicated that the system had assisted in improving over 20 games.

3. Study methodology

The methodology carried out to comprehend the manner in which video games are played involved the elaboration of a case study where participants played a video game. 41 participants of three distinct gaming experiences – inexperienced, casual and hardcore – completed a two 5 minute task study playing a First-person shooter game. These tasks were followed by a questionnaire to collect both quantitative and qualitative data related to their game experience. Bearing in mind that video game playing experience varies from player to player, participants with different aptitudes for playing games were selected and further divided into the three indicated groups. The questionnaire participants were required to fill out covered several aspects of their participation. The questionnaire consisted of 4 categories: the first inquired on the influence of game elements such as “buildings”, “balconies”, “stairs” or “windows” (or others eventually suggested by the participants) over participant eye movement and choices in “avatar” movement; the second focused on the efficiency and placement of game interface elements such as the “ammunition”, the “time”, “team points” and the “map”; the third inquired on the game feedback and asked the participants to discuss the efficiency of “weapons”, “vehicles”, “building” and “avatar” feedback. The fourth category was of open answer nature and asked participants to explore their thoughts on issues such as the “luminosity of the maps”, the “number” and “diversity of buildings”, the “possibility of exploring”, among others.

4. Empirical study

The empirical study consisted in participants playing the First-Person shooter video game “Call of Duty 4: Modern Warfare”. The study was divided into two 5 minute tasks. The first task consisted in the participants playing the multiplayer game mode “Free-for-All” in which

every player plays for her/himself. The second task, played with the "Domination" game mode, consists in two teams with the players having to capture and dominate the flags placed on the map. The second part of the study was dedicated to the questionnaire.

4.1. "Call of Duty 4: Modern Warfare"

"Call of Duty 4: Modern Warfare" ("CoD4") is a First-person shooter (FPS) video game, released in November of 2007. This game was chosen for various reasons. The main reason is that favored the choice of "CoD4" was the large amount of modes and maps available allowing a more accurate selection of a game environment that best suited the study objectives.

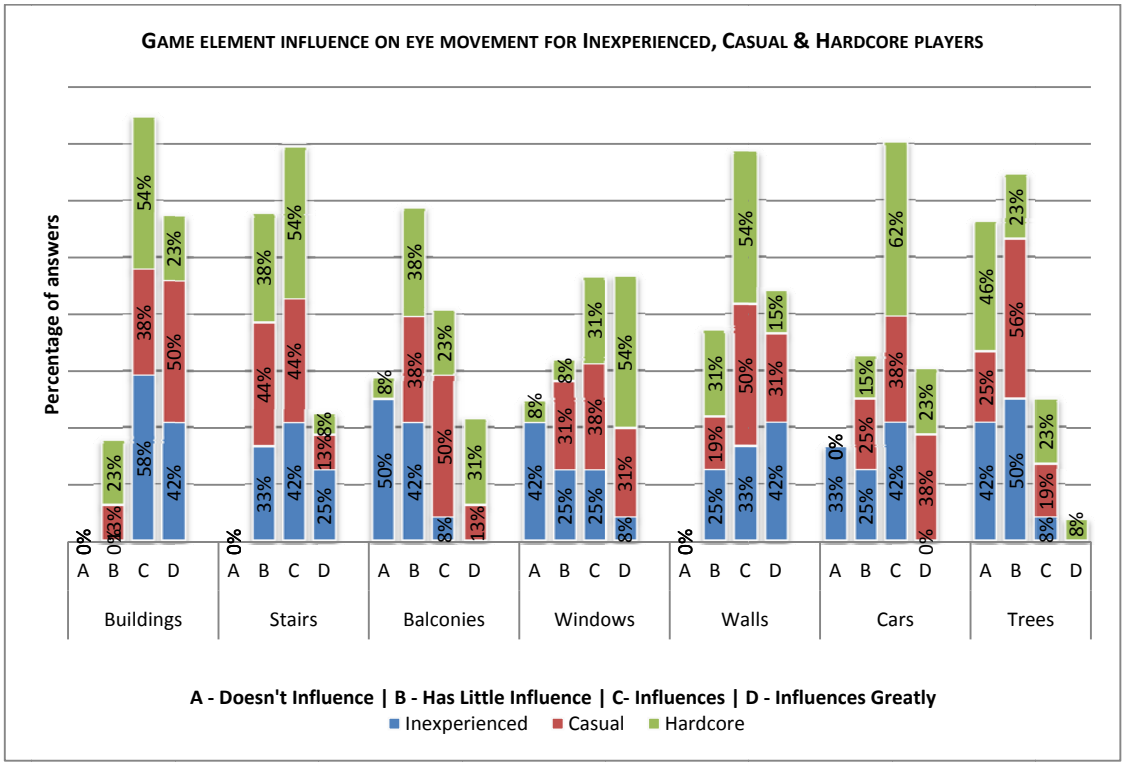
4.2. Participant selection and categorization

The number of individuals that volunteered to participate in the case study was 41. The participants' ages ranged between 18 and 45 and belonged to the University of Aveiro community. No restrictions were placed in terms of gender. Upon volunteering, participants were asked their *gaming experience* and were categorized into one of three groups: *inexperienced* gamers, *casual* gamers and *hardcore* gamers. The criteria used to categorize the players were based on the number of weekly hours dedicated to playing video games, criteria similar to that specified by Barreiro Jr., a division according to amount of time played and attitude towards games (Barreiro Jr., 2008). The final distribution resulted in 12 inexperienced, 16 casual and 13 hardcore players. Furthermore, the use of three distinct groups of players is a result of the interest in understanding how different gaming experiences influences game usage and gameplay. Studies have shown that different gaming experiences result in different manners of visualizing video games (Castel, Pratt, & Drummond, 2005; Green & Bavelier, 2003). Consequently, these differences also result in different approaches to gameplay.

5. Results & discussion

The acquired results from the questionnaires indicate divergences among answers from the three distinct gaming experience groups. The number of times in which a majority number of players from each of the three groups shared a similar answer was reduced.

Graph 1 shows the influence of game elements vs. players' visual attention while playing. As can be seen, on no occasion did a majority of the participants of all three groups share a similar opinion. Nonetheless, the "building" element was indicated by 58% and 54% of inexperienced and hardcore players, respectively, as having *influenced* their eye movement. Additionally, 50% of casual players and 54% of hardcore players indicated that "walls" in the game scenario *influenced* the location to which they looked. Finally, a third moment in which the majority of two experience groups shared a similar opinion is related to the "trees" element; where 50% of inexperienced and 56% of casual players stated that the element had *little influence* on their eye movement.

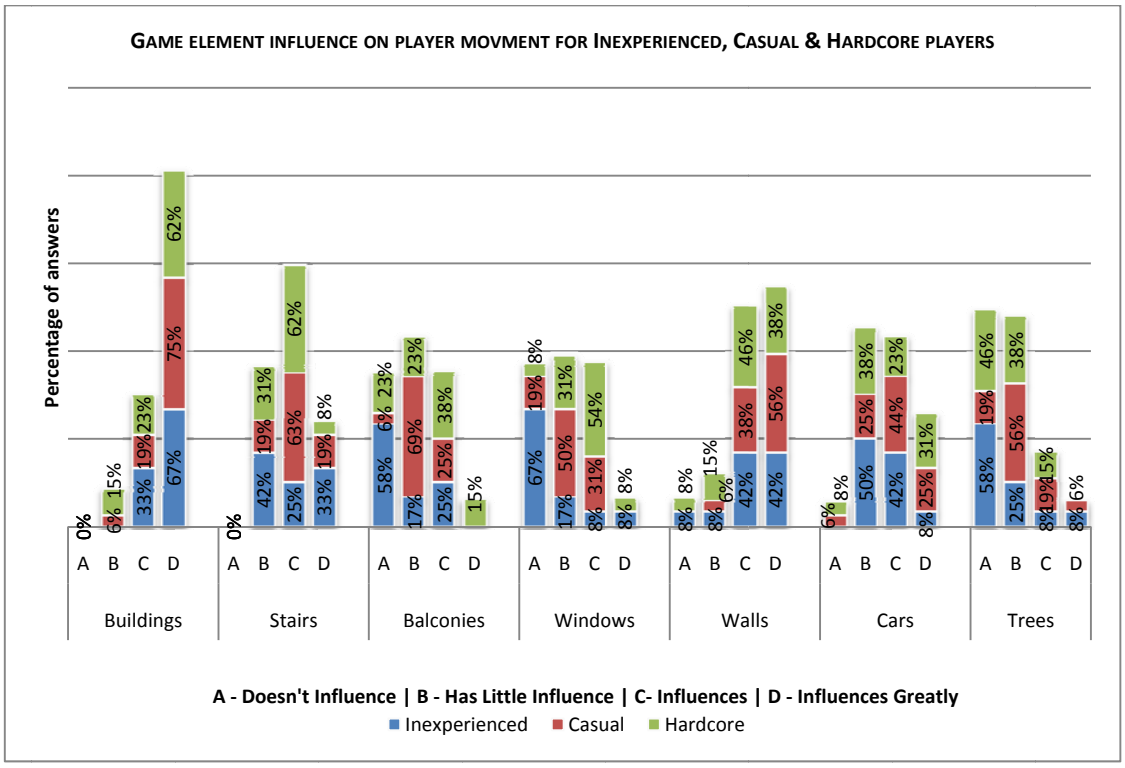


Graph 1 - Game element influence on Inexperienced, Casual and Hardcore players' eye movements

Worth mentioning is the "stairs" element which received the most divided answers: in terms of the hardcore players, despite 54% having indicated the element as *influential*, 38% indicated that it had *little influence* on eye movement. As for the casual players, 44% answered that "stairs" *influenced* eye movement while the same number indicated that it had *little influence*. Finally, the inexperienced players' answers resulted in a dispersion of percentages: 33% indicated that the "stairs" element had *little influence*, 42% indicated that it *influence* whereas 25% answered that it *influenced greatly*. With a similar scattering of answers was the "windows" element. Here, hardcore players distributed their responses

among the positive options, *influenced* and *influenced greatly*. Casual and inexperienced players, however, were more divergent. 31%, 38% and 31% of casual players indicated that "windows" had *little influence*, *influenced* and *influenced greatly* their eye movements, whereas 42%, 25% and 25% of inexperienced players answered that "windows" *did not influence*, *had little influence* and *influenced* their eye movements. The acquired results indicate that "buildings" are an element that captures the attention of the participants, namely inexperienced and hardcore players. However, the remaining elements are not indicated as of value by the inexperienced gamers, an idea that does not occur with casual or hardcore players. Hardcore players' answers indicate that these pay attention to elements of greater dimension (e.g.: "buildings") and also to elements of smaller dimension (e.g.: "stairs", "windows"), equally important in their game strategy as they allow access to other areas and that can be used in a *camping* strategy.

Graph 2 represents the influence of the game elements over the players' choices in movement. The graph demonstrates that on one occasion, the majority (67% of inexperienced, 75% of casual and 62% of hardcore players) of all three groups indicated that "buildings" *influence greatly* their choices in movement. These could indicate a tendency for players of all groups to consider "buildings" as places where action occurs as well as places that can be explored.



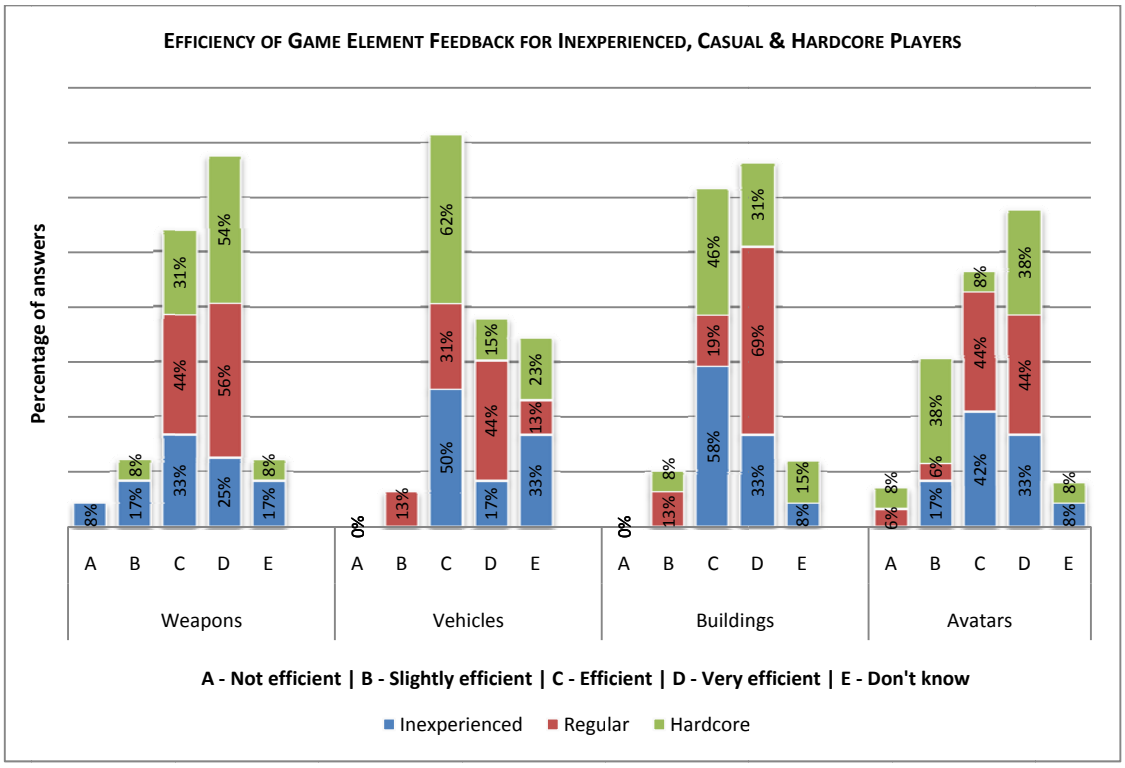
Graph 2 - Game element influence on Inexperienced, Casual and Hardcore players' in-game movements

However, on no other occasion did the majority of inexperienced players indicate another element as *influencing* or *influencing greatly* their movement choices suggesting that, when playing, their choices are based on random "balconies" decisions and without a planned strategy. In fact, for 4 of the 7 elements presented, the majority of the inexperienced players indicated that these elements had *little* or *no influence* at all: 58%, 67% and 58% indicated that "balconies", "windows" and "trees" *did not influence* their movements whereas 50% answered that "cars" had little influence over their choices in movement. This does not occur for casual players where their answers, including some majorities, suggest a more pondered strategy. 63% and 56% indicated that "stairs" and "walls" *influenced* and *influenced greatly* their movements, whereas 69% and 50% indicated "balconies" and "windows" as having *little influence*. For hardcore players, two elements ("cars" and "trees") were indicated as having *little* or *no influence* over their movement. This answer contrasts with what was verified in the previous question, namely for the "cars" element, which was said to have *influence* over eye movement. Even so, this indication suggests that, despite these elements not being used by hardcore players in their game strategy as places or objects to move towards to, hardcore players do consider them as elements where enemies could be located; therefore, they consider that these *influence* the place to where they look on the screen.

In what concerns the second grouping of questions related to the game interface elements (icons), the consensus among the players of the three groups is more visible than in the previous grouping. The most significant result related to the efficiency of the interface was that 93% of all the players combined indicated that the "map" element was either *efficient* or *very efficient*. Equally positive were the results for the "game events" and "ammunition" icons, essentially centralized however on the *efficient* answer. Contrasting with these answers were those acquired for the remaining three elements: "points", "time" and "utilities". For each, there was a distribution of answers between the positive (*efficient*) and negative (*slightly efficient*) answers. For the "points" icon, a combined percentage of 38% answered that it was *slightly efficient* whereas 50% indicated it was *efficient*. In what concerns the "time" icon, the percentages were 29% and 52% for *slightly efficient* and *efficient*, respectively. Finally, 33% answered that the "utilities" icon was slightly *efficient* while 55% indicated it was *efficient*. In terms of the efficiency of the localization of these elements; all three groups indicated that the "game events", "points" and "utilities" icons were *efficiently* placed on the game interface, with overall percentages of 61%, 69% and 66%, respectively. When questioned about the "game map" icon's placement, only inexperienced and casual gamers agreed with significant

majority. However, and as occurred with the "game map" efficiency, hardcore players distributed their answers among the *efficient* and *very efficient* options. Despite either option being positive (one more than the other) the fact that hardcore players' answers did not result in a significant majority for either of these options could possibly be a result of past experiences with similar games and personal preferences. If such is the case, players who chose the answer *efficient* could be those who prefer maps placed on the right side of the screen. Even though they have this personal preference, their gameplay isn't conditioned by the placement of the map and for that reason, they still might consider that a localization different from their favorite is still acceptable.

In terms of the game feedback, the only element not indicated by the majority of the three groups was the "vehicles" element. However, inexperienced and hardcore players indicated having perceived feedback from "vehicles" when having interacted with them. This occurrence could be related to several factors such as the distance at which the interaction took place or the type of feedback the players were expecting. The remaining elements – "weapons", "buildings" and "avatars" – received significant average percentage values: 84% for "weapons", 83% for "buildings", and 92% for "avatars". Graph 3 represents the efficiency of the four referred elements.



Graph 3 – Efficiency of game element feeback for Inexperienced, Casual and Hardcore players

As can be seen, the majority of all the players from each of the groups answered that these were *efficient* or *very efficient*, with exception to the "vehicles" element that received some "*don't know"* responses. Additionally, 20% of all the players (from all three groups) indicated that "avatars" feedback was only slightly efficient, a significant result.

The final grouping of questions was, as mentioned, of open nature and focused on several of the other issues of the "CoD4" video game. For each of the items presented in the questionnaire – "luminosity of the maps", "number of buildings", "diversity of buildings", "possibility of exploring maps", "quantity of places to hide" and "diversity of obstacles" – many similar answers were received from players, even from distinct gaming experience groups.

Regarding the "luminosity of the maps", some players believed that the illumination was too dark whereas others enjoyed the balance between exterior and interior illumination. Furthermore, some of the players indicated that the luminosity of the maps conveyed a true sense of war.

In what concerns the "number" and "diversity of buildings", the received answers tended towards the idea that the number of buildings was excessive. Nonetheless, in terms of building diversity, while inexperienced and casual players said either that it was sufficient or exaggerated, hardcore players indicated their approval in terms of the diversity.

In terms of the possibility of "exploring maps", players of all three groups either answered that the possibility was vast or limited. In fact, it is believed that both options are acceptable and correct. If on one hand the maps contain various streets and paths that can be explored, on the other hand, many of the buildings in the game environment are static/passive and can't be explore.

Now considering the "quantity of places to hide", the majority of all the players indicated that in fact the maps were rich in this aspect. Furthermore, it was the greater part of the hardcore players that indicated the positivity in this aspect. Considering that hardcore players are more active and rational in terms of their game strategy, the number of hiding places is one of their concerns. An insufficient number of places to hide from enemies can affect their game strategy plans while playing, leaving them more vulnerable to attacks from enemies.

Finally, in terms of the "diversity of obstacles", inexperienced and casual players offered fewer opinions than what occurred with hardcore players. Inexperienced and casual players

mentioned that many of the obstacles were static and could not be interacted upon. Others indicated that the number of items was positive, mentioning, in addition, that it created a *war-zone* atmosphere. As verified in the previous item with hardcore players, the amount of obstacles can also be analyzed in terms of a player's game strategy. Those with a planned strategy will often enjoy a good quantity of obstacles as they serve as both protection and places to hide. However, those with no strategy might feel that the obstacles are an obstruction in their gameplay.

6. Conclusions & future work

Using the FPS video game "Call of Duty 4: Modern Warfare" along with the use of a questionnaire, the acquired results show that different gaming experiences result in different approaches and strategies in gameplay: hardcore players have a more rational, pondered and strategized gameplay, and confer distinct importance to different game scenario elements; an idea that contrasts with inexperienced players' random and non-pondered gameplay. Additionally, other game elements such as the game's interface and the feedback generate a greater consensus. Nonetheless, it must be said that an analysis of gameplay is much denser than the one presented as it encloses other elements and variables not presented in this paper. Brown & Cairn's (Brown & Cairns, 2004) research resulted in the identification of three levels of game involvement, one which is strongly connected to *presence*. Presence, in turn, is tightly coupled with *presential context*, even if the context is entirely a virtual one. This leads to the need of highly optimized contexts, in particular, the virtual representation of the game universe, namely the architectural and scenic structures. Future work would certainly take into consideration the use of other techniques and instruments, such as an eye tracker, towards a more in depth analysis of the various gameplay and *user experience* components. Furthermore, an analysis of the possible relationship between interface and game scenario design along with video game enjoyment is another possibility.

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