Information Design Elements in Videogames: A Proposed Classification

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Abstract. Some of today's videogames work with heavy cognitive loads that demand a high flow of data from the game to the user. To achieve this, games work with different visual and non-visual elements to convey information, such as heads-up display (HUD), in-game assets, subtitles and voiceovers. The choice of elements used relies not only on the game designer's choice, but also on variables including the game platform and its hardware. The aim of this study is to identify and classify different elements used in games and their relevance to the informational process. In addition, this study aims to understand the problems or solutions of such elements to reduce the noise and interference the excessive data may cause for players. This understanding may help them focus on the core activity of the game – thus improving their performance and increasing the value of the product. The classification provided is followed by a case study with the popular videogame Dota 2. By studying the game interface elements, it is possible to perceive their relevance and point out significant changes and recommendations especially considering the distinctive flow of the game and the differences in player skill level. Conclusions point, among other aspects, to the importance of information design in games, especially in helping to make complex games – or every game - more accessible and enjoyable for more players.

Keywords: Videogames · Interface · Information design

1 Introduction

Videogames are, today, part of a complex chain of electronic entertainment, being responsible for a huge impact on the industry not only in cultural but also in financial aspects. The videogames market has escalated yearly, with figures reaching US$ 83.6 billion in 2014 and projected to reach US$ 107 billion in 2017 [1].

For their considerable cultural relevance, games have also been the object of study in several different fields, ranging from computer sciences to psychology [2], design and healthcare. The field of HCI is particularly notable in this aspect, given its proximity to both computational and human aspects of games. Understanding how the user interacts with the data provided by the game might impact gaming experiences such as immersion [3].

Over the years, games have evolved and absorbed a plethora of new informational aspects in their cores. While some games stick to simple mechanics or graphics, most

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of the current market leaders [4], such as Grand Theft Auto V [5], Batman: Arkham Night [6] and The Witcher 3: Wild Hunt [7] are games with immersive plots, realistic visuals and complex gameplay mechanics that incorporate numbers and data to be analysed by the player in a fraction of a second.

Providing an acceptable amount of information without negatively affecting the gameplay experience plays a key role in helping the player achieve a state of immersion [8]. This helps them to have a game experience in which the player will focus on his/her own performance rather than dealing with unnecessary data, ultimately achieving a state of flow [9], a state of focus in which the player dedicates full attention and commitment to the game for its own challenge.

The aim of this study is to identify and classify different elements used in games and their relevance to the informational process. In addition, this study aims to understand the problems of or solutions for such elements to reduce the noise and interference the excessive data may cause for players. For that, a review of the literature on game interface elements is carried out. After that, a case study with the game Dota 2 [10] is presented to illustrate this classification. Finally, a discussion is proposed on the relevance of information design in game design.

2 Classification of Game Information Elements

Starting from the very first games made available to the wider public (e.g. Atari, from 1977, or Nintendo, from 1983), game interfaces have always relied on similar assets to convey information to gamers: most have had characters and in-game elements that describe their current status, projected on-screen displays and additional sound effects or controller vibrations.

The uses of these assets are broadly understood by gamers and are accessible to newcomers to the gaming world, since they can be easily related to other activities and can be seen in other media or applications. One considerable example is the heads-up display (HUD), which provides information without additional distractions or eye-changing movements by the user [11]. Another example is haptic feedback (i.e. the use of vibrating, reacting surfaces that provide the player with the feeling of touch or response to a surface), seen not only in game controllers but also in mobile phones, which may be configured to react to touches on the screen with vibrations [12].

From a game developer's perspective, different game elements can be seen from a variety of points of view. This paper proposes a classification of game elements in two groups: element role and element nature. While the first is about the role the elements play in the game, the second is related to how much a given element takes part in the game world – that is, whether a given element is diegetic or non-diegetic [13]. This separation into groups aims to cover game elements from two different perspectives, considering both cultural and technical aspects of game design.

These classifications are supported by descriptions of the process of immersion and gameplay experience [8, 14]. Babu [8] argues that information processing during gameplay is affected by how game elements are presented. In line with Babu [8], Fabricatore [14] describes the role of different gameplay elements in the process of game enjoyment,

pointing out their relevance in the core activity of gaming and the game learning process by the player.

These elements also influence the experience of immersion, a relevant outcome of gameplay [15]. This is because, in addition to presenting the game challenges and world elements in a playable way, they are also presented in a coherent manner that enhances the occurrence of phenomena like "flow" [9] and "spatial presence" [16], which is the perception of being "inside" the game world. Figure 1 shows the proposed classification of game elements. The two types of elements proposed are described below.

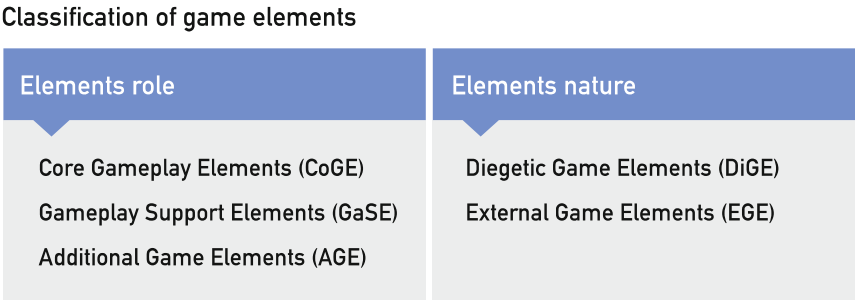

Fig. 1. Classification of game elements proposed in this study

2.1 Element Role

From plot devices to world descriptions and gameplay mechanics, the gaming activity is often focused on receiving and analysing information and then making decisions before repeating the process as new challenges appear [14]. For a clear understanding of what these different informational elements are, it is possible to classify them not only by their design or function, but also by the role they play in the game. They are classified into three types: core gameplay elements, gameplay support elements and additional game elements. The element Role is based on the previously mentioned works [8, 13, 14], focusing on how relevant that element is to their role. The proposed classification synthesises these different works into a simplified structure to be easily compared to the next one, based on how the element is integrated into the game. Thus, a given element can be classified according to its role:

- **Core Gameplay Elements (CoGE):** These elements are related to the game world and the core activities of the game (i.e. the main objectives and activities performed by the player, such as running and jumping in an action or platform game). These include 3D models, characters, sound effects, landscape, items and some HUD elements such as health bars or countdown timers, when relevant. Without the CoGE, the game can be rendered unplayable, since the user will not have access to essential information regarding his performance and feedback for his actions.
- **Gameplay Support Elements (GaSE):** While the core gameplay elements are essential for the game activity, the support elements help the player by organising and highlighting relevant information when necessary, or by manipulating the game

world to convey additional experiences to the gamer, exceeding the gameplay mechanics. Objective highlights, additional character animations (i.e. "taunts" and "idle cycles") and on-screen notifications of player performance can be considered GaSE, depending on the game.

- **Additional Game Elements (AGE):** More than performing the core activity of the game, the user also interacts with various game elements that are related not to a game world, a plot or the game mechanics, but the game itself. Depending on the game, genre and platform, elements such as interfaces and menus, performance records, stats graphs and social media tools can be described as AGE. [17] describes the effort made by the developers of League of Legends [18] to improve player experience outside the core gameplay action, focusing on several cross-media elements (i.e. crafting and streaming systems) to enhance engagement. This is an example of AGE being used within a game.

The above descriptions of elements are related to their relevance to the core gameplay activity; that is, they do not refer to the nature of the element from an information design perspective. Hence, it is possible to classify these elements regardless of their presentation. In other words, both a 3D model and a sound effect can be classified as GaSE, for example. While this may prove useful from a developer's perspective, this classification can be complemented by another one, which covers the nature of these elements.

2.2 Element Nature Classification

Classifying the game elements by their nature – that is, pointing out if a given element is an in-game asset or a HUD projection, for example - is also a useful method of analysing and understanding the effects of information transmission in-game. It is worth noting that most of these are visual elements and, while the use of sound effects must be considered an efficient substitute for some visual assets, some gameplay conditions restrict their use. This is the case with quiet environments, mobile gaming (e.g. playing a mobile game during a commuter trip) and hearing-impaired users (although accessibility factors pose a larger field of study and must be thoroughly considered during game development) [19]. The same applies to more complex input methods (e.g. Microsoft Kinect and the Nintendo 3DS accelerometers), which may not be available at all times during gameplay.

With that in mind, this classification focuses on how much a given element takes part in the game world or, on the other hand, how much an element is detached from the context and presents itself with the sole purpose of providing information to the user. Therefore, these elements can be divided into diegetic game elements and external game elements, according to previous descriptions by Babu [8] and Saunders and Novak [13], who describe the effects of diegetics in games and point out its relevance in making the game more understandable for the player.

Saunders and Novak [13] work with two additional categories, not diegetic or non-diegetic, called Meta and Spatial. Meta category refers to elements that belong in the game world not as actual assets, but rather as projections based on the visual style of diegetic elements. Spatial, on the other hand, focuses on non-diegetic elements projected

within the 3D game world (such as an exclamation mark above a character's head). The classification proposed here does not consider these types of asset as belonging to different categories, but rather as a non-diegetic, "external", game element.

- **Diegetic Game Elements ("DiGE"):** Diegetic game elements are contained within the game world as an actual part of it. Given that a character is sentient and able to observe the environment, they would be able to perceive DiGE elements, which may include characters, scenery assets and particle effects (such as "auras" or damage and debris). Essentially, every DiGE is a part of the game world and, from a broader view, it can be said that the whole game world could fall into this category. From this point of view, it can be affirmed that the whole game world describes information to be decrypted and analysed by the player.
- **External Game Elements ("EGE"):** Non-diegetic game elements take part in the game action and convey relevant information to the player, being related to the core gameplay or support activities (as seen with the CoGE and GaSE). Unlike DiGE, though, EGE are elements not visible inside the game world from a character's perspective. Examples include projections on the HUD (heads-up display), such as health bars and objective indications, but also special in-game effects that are not diegetic, such as character highlights (when selected or active) and number overlays (e.g. an enemy's loot indication when it is defeated).

2.3 Considerations About the Game Element Classification

As previously stated, classifications and definitions in the videogame context require a subjective approach to the theme, since games vary greatly in their presentations, themes and mechanics. Therefore, the developer must consider that recommendations should not be taken as completely wrong or right, and should take each project into consideration when making decisions.

While it is feasible to include special effects, graphics and audio (e.g. character voiceover or adaptive soundtrack with music matching the calm or intense moments of the match), from the users' perspective these effects may make the game very complex and therefore increase the users' challenge to both understand the game and carry out their decision-making process. By balancing diegetic and non-diegetic elements according to the flow of the game, developers can create a more interesting game world, with noticeable landmarks and effects that pose real consequences in the game. These all can happen simultaneously with the information that the player needs without compromising his/her performance. It's worth pointing out that diegetic elements are considered less distracting during the game activity [8].

Also, depending on the game's genre or characteristics adopted for a project, some data used by the player can be hidden during gameplay and presented only between matches or at specific moments. This can also be considered an exercise to evaluate if the game is offering unnecessary feedback (such as excessive data or unused figures) or cluttering the game screen with excessive noise, allowing the developer to focus on more important assets.

The next topic presents a case study with a popular game in which these elements can be seen in action and then analysed for their relevance in gameplay.

3 Case Study: Dota 2

In order to illustrate how the elements are applied in games and in addition to demonstrate the classification described above, a case study is presented with the popular videogame Dota 2. This game has been chosen because it includes a considerable variety of game elements that fall under all the categories mentioned. In addition, it is currently one of the most popular games on the PC platform – with a player base reaching peaks of over a million active players simultaneously and a monthly average of around 500,000 players [20]. The game, known for its intense competitive community, relies on a number of different gameplay elements and strategies that prove it a success after many years [21].

DotA 2 is a Multiplayer Online Battle Arena (MOBA) game which puts teams of 5 players competing for supremacy in a fixed-layout arena. Players take control of "heroes", characters with specific sets of skills that require different gameplay strategies to win, who fight their way past enemies (both human and computer-controlled), grow stronger by purchasing magical items and winning battles, and finally strike the enemy base to destroy a particular trophy-like structure that will grant them victory in the match.

Dota's complex strategies and gameplay aspects require the user to analyse an outstanding amount of data, ranging from the hero's health to complex game stats (e.g. the amount of gold collected by the team per minute, the number of enemy kills by the opposing team or skills that 'stack', requiring the player to succeed in launching a particular attack against their enemies). In order to do so, Dota 2 makes use of all types of interface elements, from diegetic graphics and effects to short audio notifications.

3.1 The Game Screen Layout

During gameplay, the player faces a screen divided into three areas. The top area is taken by the HUD, which displays the game's current situation (game time, team score and the team's heroes' situation) and AGE controls such as chat windows and the pause menu. Using the classification previously presented, the upper HUD can be described as AGE-EGE.

The lower area contains information about the player's hero, the game map, items and some core elements including skills and their cooldown timer (i.e. the time required to use a skill again, one of the core aspects of gameplay). While these elements are external to the game world from a graphic point of view, they are connected to the game's core activity, being an essential part of gameplay. Thus, the lower HUD can be clearly described as CoGE-EGE.

Most of the screen is taken up by the main game area, where the Dota world is presented to the player. Using a top-down perspective, this is where most of the game takes place – where the player will click and move his hero around, attack his foes and follow the flow of the game. Despite being a realistic representation of the game world,

including the use of a fog-of-war (i.e. an effect that hides foes and items that can't be seen by the hero, despite their being visible to the game's camera), the game screen makes use of HUD-like elements and non-diegetic effects and particles. In other words, the game screen offers mostly CoGE, although they are presented in both DiGE and EGE.

3.2 DiGE vs EGE in-Game

Two examples with different characters can illustrate the difference between DiGE and EGE in-game: in the first one, the hero ("Pudge") casts an aura of rotten air that affects Pudge and the nearby foes. It can be observed that the effect fits into the game world in an effectively diegetic way, since the aura is, in fact, a cloud of rotten air surrounding the character, and its area of effect is determined by the shape and spread of that cloud. The second example is a spell cast by "Silencer". The spell, like Pudge's, affects the foes after being cast, but instead of creating a particle effect around the characters, it projects a skull right above the affected foes. Comparing the two effects, it is possible to see that both are related to the core gameplay (CoGE), though the former is part of the game world from a diegetic point of view (DiGE) while the latter presents the spell's effect using a HUD projection, thus being an EGE.

While the difference between these elements might seem clear, it must be understood that the games get more complex over time. In Dota 2, the later parts of the game usually involve intense battles between multiple players who, by that point, will have powerful spells and items that unleash the most diverse on-screen effects.

During these parts of the game, both diegetic and non-diegetic elements overlap each other, since different players are casting different spells and effects. As previously mentioned, the game makes use of different elements, including audio notifications, to keep the informational load acceptable for the player. This solution is well aligned with the recommendations previously mentioned, especially in balancing diegetic and non-diegetic elements. There is room for fine-tuning in terms of HUD elements, in order to make some information highlighted according to the in-game events, for example. On the other hand, Dota 2 relies heavily on community interaction and, for that reason, the game presents many EGE-AGE elements that may make the player stray from the core gameplay. This may affect some of the effects of engagement and immersion [15] that the game could provide, and therefore these elements could also be reviewed according to the game design strategy adopted by the developers, which may be focusing on external features and engagement strategies, as seen in similar games [17].

4 Final Remarks

Analysing the game interface is an efficient way of identifying many of the effects of gaming on players. These interfaces are in many ways similar to other computer applications, so recommendations that apply to improving user experiences with a computer might be applicable to games.

Also, by categorising game elements as related to the core gameplay (CoGE), support elements (GaSE) and non-gameplay or additional elements (AGE), the developers can evaluate if the game interface is displaying unnecessary information, giving them the possibility to lighten the cognitive load on the player. Describing each interface element and then removing or hiding the excesses is one possible way to use these classifications.

While many games focus heavily on their core gameplay, it is the developer's duty to analyse and hone elements that are not related to gameplay itself. Depending on the nature of the project, this might have an effect on creating an immersive experience for the player – keeping in mind that immersion can be either related to the challenges of the game or to the world it presents via various stimuli [22].

The classification proposed here, thus, allows developers to have a quick, easy look at how graphic elements behave according to their role within the game. This quick-reference is important in quick iteration scenarios, where designers have to point out design changes in short times. By grouping role and nature of interface elements this task is simplified, and the use of short names may help in quick documentation processes.

Also, by studying games from a technical point of view the field of Game Studies also grows in importance, and while people less familiar with games might consider that they are merely simple entertainment, society in general is slowly improving their perception of the countless possibilities that games offer in providing fantastic, engaging experiences to gamers.

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