Applying Thematic Analysis to define an Awareness Interpretation for Collaborative Computer Games

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Abstract. Collaborative computer games have evolved from single-player to massively multiplayer games, usually involving collaboration to achieve team goals. As a consequence of such evolution, these players should be provided with feedback that enables them to perform collaborative tasks with other team members. The objective of this work is the analysis of current awareness interpretations in order to develop a new one that guides stakeholders while collect the needs of such games. This analysis has been conducted by means of a step-by-step Thematic Analysis of current interpretations that led us to extract the most relevant awareness elements defined in existing interpretations. This has resulted in the definition of *Gamespace Awareness*, a new interpretation based on a combination of the previously analyzed ones, which is suitable for collaborative computer games. Gamespace Awareness combines the potential awareness elements needed for collaborative computer games, making it possible to identify the awareness requirements of these games from the very beginning.

Keywords: awareness, collaborative computer games, gamespace awareness, thematic synthesis, game development

1 Introduction

Awareness is defined by [1] as "the up-to-the-moment understanding of another person's interaction within a shared workspace". It can be considered as additional information about the game the players are provided with in order to improve different aspects such as usability, user's enjoyment, the ever-more-in demand in-game socialization, etc. In other words, if the players are provided with no awareness, they may be able to play the game, but would do so in a clumsy and uncomfortable way due to the lack of information about the game environment (other players, items to interact with, social aspects and so on).

With similar needs in mind, several authors have defined their understanding of awareness by focusing on different domains that range from the design of military vehicles to groupware systems. However, none of these interpretations can be considered enough by itself to cover all the awareness needs in a modern collaborative computer

game. This constitutes the main motivation for this work: the development of a new awareness interpretation, by compiling elements from different existing ones, that helps game designers and developers to identify awareness needs of new and more successful collaborative games.

2 Using thematic synthesis to discuss and synthesize current awareness interpretations

Thematic synthesis is a technique used to bring together findings from different primary studies, helping us to create higher order concepts or meta-concepts [2]. Furthermore, according to Gough, Oliver and Thomas, Thematic Syntheses "works so well when synthesizing multiple research studies, which are often multidisciplinary and require the researcher to consider their analysis from different sides of the paradigm divide" [2]. In a nutshell, this technique consists on the systematic reading of a set of documents to obtain relevant fragments of text related to the topic being synthetized. From such fragments, relevant concepts (codes) are extracted and grouped into themes. Finally, a conceptual model linking these themes is generated as the output of the whole process (Fig. 1). A detailed description of this process can be found in [7].

Therefore, this section presents the results of applying a Thematic Synthesis to bring together and integrate existing awareness interpretations for dealing with the needs of collaborative computer games. The documents used as the input of this process were related to Collaboration Awareness, Situation Awareness, Workspace Awareness, Location Awareness, Context Awareness, Social Awareness, Activity Awareness, other awareness interpretations and awareness in games. The resulting themes obtained by performing this process can be seen in Fig. 1.

3 Gamespace Awareness

As explained at the end of the previous section, as there is no an integrated solution able to deal with the awareness requirements of collaborative computer games, a new definition of awareness based on the identified elements already defined in previous interpretations has been developed as a result of the Thematic Synthesis presented above. This new interpretation will enable game designers and developers to identify the players' awareness needs at an early stage, which could result in better games and improve players' awareness of the game context.

In order to develop this integrating interpretation, it was decided to choose one of the existing ones as the foundation of our proposal to broaden it with the results of the Thematic Synthesis. Gutwin's Workspace Awareness (WA) [1] was chosen as the core of this new definition of awareness for three reasons: firstly, it is the one that entails more awareness elements already present in current games. 18 out of the 37 identified themes (49%) have a code from WA. Secondly, WA describes awareness elements according to questions (who, what, where, etc.) which eases the identification of aware-

ness requirements and, thus, providing requirements engineers with a useful tool to develop CSCW systems. Thirdly, WA has already been applied to computer games, improving the players' collaborative performance [3]. However, some characteristics which differentiate collaborative computer games from CSCW are missing in WA, mainly those related to the emulation of the real world in the game environment [4]. These characteristics include the presence of allies, foes and neutral entities or players, as well as the real-time awareness demands of 3D immersive games (a problem that is magnified in virtual reality environments). By providing players with these awareness characteristics, they will feel they "are in the game" instead of just "playing the game" [5].

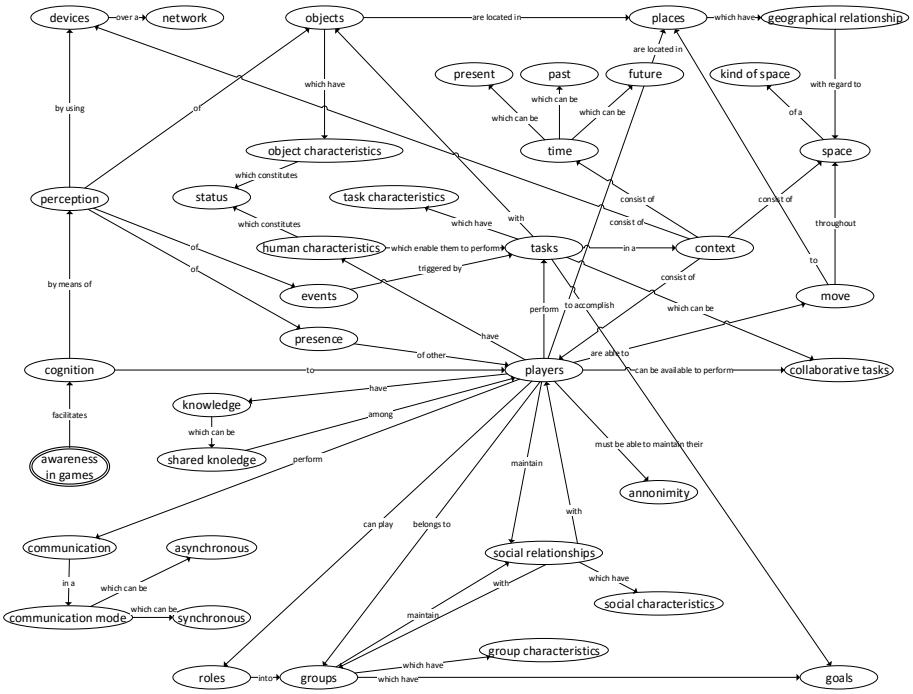

Fig. 1. Directed graph of themes

Table 1. Elements of the Gamespace Awareness Interpretation

Concern		Category	Element	Specific questions
Time	Present	Who	Presence	Is anyone in the gamespace?
			Identity	Who is playing? Who does this avatar belong to? Who is available to colaborate with?
			Authorship	Who is doing that?
		What	Task	What are they doing? What is the difficulty of this task?
			Intention	What goal is that task part of?
			Object	What object are they working on? What object can I work with?
			Status	What are the players / avatars status? What are their feelings? What is the objects' status?

Concern		Category	Element	Specific questions
			Abilities	What are the avatars' abilities? What are the they able to do with such abilities?
			Knowledge	What do the players know? What knowledge can they share?
			Perception	What are the players perceiving? What can they perceive? (looking, touching, hearing…)
		Where	Location	Where are the players / avatars playing? Is it a physical or virtual location?
			Gaze	Where are the players looking at?
			Reach	Where can the avatars reach?
			Position	Where is an object? How near is it?
			Mobility	Where are they able to move?
		How	Device	How do I use a certain device to interact?
	Past	How	Task history	How did that task happen?
			Object history	How did this object come to be in this state?
		When	Event history	When did that event happen? How often? Is there any network delay?
		Who	Presence history	Who was here and when?
		Where	Location history	Where has a player / avatar been?
			Position history	Where has an object been?
		What	Task history	What has a player / avatar been doing?
	Future	When	Next event	When will the next event happen? How often?
		Who	Next participant	Who will be the next participant?
		Where	Next location	Where will a player / avatar be?
			Next position	Where will an object be?
		What	Next task	What will it happen next?
			Next status	What will the players / avatar next status be? What will the next status of the object be?
			Next abilities	What will the avatar' abilities have? What will the avatars be able to do with such abilities?
			Next knowledge	What will I know?
Social & Group Dynamics		Who	Members	Who are the members of my group? Has anybody left the group?
			Other members	Who are the members of the other groups?
		What	Belonging	What group do I belong to?
			Role	What are my privileges within my group?
			Others' roles	What are the privileges of my group's members?
			Alliance	What is my relationship with others? (ally, neutral, foe…)
			Exposed information	What do the others know about me?
			Structure	Is there any structure within my group? How is it?
			Group goal	What are the goals of my group?
		How	Inner communication	How should I communicate with each group member?
			Outer communication	How can I communicate with others?

The proposed interpretation of awareness (see Table 1), namely Gamespace Awareness (GA), extends WA by also adding social & group dynamics elements to the awareness elements related to time (present, past and future). This special category was added to those already defined in WA because some of the newly identified elements do not have a direct relation to when the user is aware of them, but they are related to social relationships among players. Since WA is intended for online communication and cooperation scenarios, there are also awareness elements not present in WA, which differentiates GA from other interpretations. This new approach includes some ideas from

other interpretations such as future elements (not considered by WA) from Situation and Activity Awareness, social elements from Context, Social and Collaborative Virtual Environment Awareness and communication elements from Collaboration Awareness. All the awareness elements and the specific questions used in GA to describe them have been adapted to games, applying the rules described above, so that they can be directly used by game designers and developers. Thus, Gamespace Awareness has been defined as an awareness interpretation for gathering all the awareness information required by users of collaborative computer games (e.g. with whom to collaborate, their past, current and future actions or social structures, as mentioned in Section 2). However, GA can also be used to identify awareness requirements in non-collaborative games (e.g. the player's own status, the items in the game stage to interact with or the zones where the player's avatar can move to). Besides, GA should not be confused with the in-game awareness concept described in [4], which is aimed at differentiating what a player is currently doing in the virtual world or what a player is currently doing in the physical world (real-world awareness).

Note that in the previous table, there are certain elements that focus on making players aware of either other players or their avatars (or both). For instance, in certain games players must be aware of the real-world status of their collaborators (online, offline, busy, away, etc), but in other games, they need to be aware of the other players' avatar status (healthy, damaged, dead, etc). Moreover, GA aims at identifying what awareness information the player may need, but not whether such information should be presented in a diegetic or non-diegetic way [6].

4 Conclusions and on-going work

In order to find out whether current awareness interpretations are suitable for specifying the awareness needs of collaborative computer games, a Thematic Synthesis of such interpretations was performed, which allowed us to identify the key concepts (themes) for collaborative computer games. This analysis comprised several of the most well-known awareness interpretations, such as Collaboration Awareness, Situation Awareness, Workspace Awareness, Location Awareness, Context Awareness, Social Awareness and Activity Awareness. Other more-domain-specific interpretations were also analyzed in order to gather information about awareness elements for more specific domains. This analysis concluded that none of these interpretations were expressive enough for contemporary games, which require a wide range of awareness elements. As computer games are becoming more and more social, any awareness interpretation involving them must take into account the social and group characteristics that the players must be aware of. To solve the lack of expressiveness of current awareness interpretations when dealing with collaborative computer games, a new awareness interpretation, Gamespace Awareness (GA), was developed by extending Workspace Awareness (WA) with other awareness elements extracted from other interpretations, with a significant number of elements related to social and group dynamics. WA was chosen as the basis for GA because of its suitability for groupware (collaborative computer games being a specific type of groupware), the considerable number of elements shared

with other interpretations, and its ease of use thanks to its awareness elements being identified by a set of questions. GA can therefore be used to identify the awareness requirements of modern computer games during the first stages of their development.

Currently, we are creating a framework based on GA to help game designers to identify the awareness requirements of a game depending on its genre and its players' expertise. To do that, we are conducting a survey[1] in order to gather the opinion of professional game developers about the suitability of the different GA elements to 8 major game genres. Therefore, our goal is to develop an awareness framework created for / by the game development community.

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[1] http://bit.ly/Gamespace