Cognitive Load Issues in MMORPGs

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Abstract
We conducted a qualitative study to explore the effect of cognitive overloads in Maple Story, a typical Massively Multiplayer Role Playing Game (MMORPG). Our results reveal that several types of cognitive overloads emerge during the game playing. While some of these overloads pose serious problems, even to expert players, some are actually desirable in order to make the game challenging.

Keywords
Cognitive load, MMORPG, qualitative model

ACM Classification Keywords
J.4 SOCIAL AND BEHAVIORAL SCIENCES; J.m MISCELLANEOUS

Introduction
Massively Multiplayer Role Playing Games (MMORPGs) are known as networked virtual environments where multiple geographically distributed users interact with each other in real time [3]. MMORPGs provide a fictional setting where a large group of players voluntarily immerse themselves in a graphical virtual environment and interact with each other by forming a community of players [7].

Whilst playing MMORPGs, users are required to multi-task. Most significantly, players must learn to deal with the social dynamics around the game in addition to having to interact with the virtual space and game objects which are usually defined by the complicated game mechanics. This may cause cognitive overloads which can hinder the performance especially of beginner players. In this poster, we attempt to explore the kinds of cognitive overloads that exist when playing MMORPGs. We trust that in order to strive for a balance between social interaction and engagement, cognitive load issues need to be taken into consideration.

Cognitive load theory

Cognitive load theory is defined as the amount of mental energy required to process a given amount of information [1]. The major factor that contributes to cognitive load is the number of elements that need to be attended to.

Our working memory makes it difficult for us to understand and process information that is presented to us simultaneously as this creates heavy cognitive loads upon the user [5]. It is suggested that working memory has a limited capacity of 7 ± 2 chunks [2]. Working memory is the key resource in multitasking [4], hence overloading should be prevented as this affects the user's concentration resulting in tasks taking longer to complete.

There are techniques to reduce cognitive load in different contexts, including eliminating redundant information, combining visual and auditory stimulus and only presenting one representation at a time to the user [1].

Although a lot has been said concerning the handling of cognitive loads in e-learning, we speculate that in the case of MMORPGs, cognitive load issues might be manipulated differently from e-learning and other task-based applications. In MMORPGs the game might be designed intentionally to overload the player's cognitive capacities in order to increase the game challenge.

Methods

A semi controlled participant observation in which the players were required to complete a list of carefully designed tasks in Maple Story [7] was conducted. Whilst the participants were carrying out the study, the screen was video captured and observation notes were taken. After each game playing session, interviews were carried out to reveal whether the players formed any particular strategies to overcome the cognitive load they encountered. A total of 25 hours of observation data was collected.

Our analysis focused on the difficulties participants were facing when playing the game. Then the concepts of difficulties were categorised to develop a model of cognitive loads and each category was described and supported with empirical data. The relationship between the observed cognitive loads and the participants' opinions (elicited through interviews) regarding the difficulties or challenges was also identified

The mode of cognitive load in MMORPGs

Our results show that cognitive load exists in at least five different forms when playing MMORPGs (figure 1). The model indicates that players need to process the user interface to interact with the game objects. They

also have to construct either their own or other players' identities in order to interact with each other.

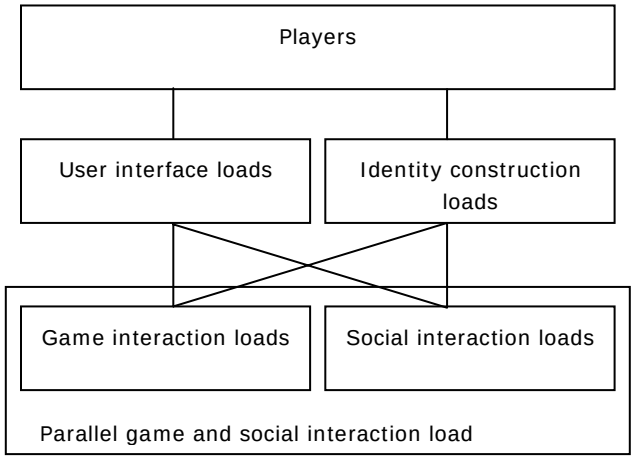

figure 1: The cognitive loads in MMORPGs

In some cases, user interface processing affects not only the game interaction but also the social interaction. For example, chatting with another player involves the interaction with the user interface (chatting window). The same goes for identity construction which might affect game interaction as well. Finally, when playing the game, players are constantly interacting with the game and other players. Thus it results in parallel game and social interaction loads. We will now discuss in detail each of these cognitive loads.

Multiple game interaction overloads

Playing Maple Story involves interacting with a large number of game objects. These include various monsters to fight and items to pick up, game props such as ropes and portals, NPCs (non-player characters), etc. It is found that these interactions, when carried out separately, cause no significant cognitive problem to the players. However, in most cases, these actions need to be performed simultaneously in order to play the game successfully and this results in what we call "multiple game interaction overloads".

Multiple social interaction overloads

Being a game played by a massive number of players at the same time and in the same virtual space, MMORPGs like Maple Story require the player to interact with other game players. There are various reasons why a player has to communicate or interact with other players. These include trading, casual chatting, fighting monsters together to improve the chance of success, etc. It is found that if a player has to interact or communicate with more than one person at the same time, "multiple social interaction overloads" occur.

Parallel game and social interaction overloads

"Parallel game and social interaction overloads" happen when the participant has to interact with both the game and other players. We believe that this is the most severe form of cognitive overload. The most typical example is when a player has to talk to other players (social interaction) and to kill monsters (game interaction) at the same time.

User interface overloads

The players also need to keep track of the information (particularly visual information) in the game user interface. This information comprises the displayed name of players, chatting window, the player's health

and magic status, the mini map, etc. We call this type of overloads “user interface overloads”.

Identity construction overloads

As players are taking on another identity when playing the game, they need to keep track of their game avatar they are interacting with. “Identity construction overloads” occur when players fail to construct and identify their own identities or others’ identities in the game.

Discussion and conclusion

Although some cognitive loads in Maple Story hinder the user’s performance, they make the game more challenging and interesting. Some of the cognitive loads are not a problem as over time the users begin to develop various strategies to cope with it. Therefore the most important question here is “how do we balance cognitive overload effects with the game challenge?” Although more studies need to be conducted to answer this question, we hypothesise that “multiple game interaction overloads” is the less severe type of overload and can be overcome rather quickly as time goes. “Multiple social interaction overloads” pose more problems as social interactions are more unpredictable during the game development phase. The most serious problem is the “parallel game and social interaction overload” and we suggest that the game should be designed in a way to minimise these parallel interactions, e.g. ensure that there are safe places with no monster on each area for players to socialise.

In future, more analysis of other MMORPGs can be carried out to refine the model by examining specifically each type of cognitive overloads to identify more sub-categories. It will also be useful if we are able to identify relationships between cognitive overloads and game engagement.

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