A Framework to Adapt Gamification in Learning Environments

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Abstract. Many learning environments are quickly deserted by the learners, even if they are efficient. Gamification appears as a recent game-based learning approach to enhance the learners' motivation. The difficulty with this approach is that people have various expectations from games, and react differently face to specific game mechanics. In order to adapt the game mechanics of the developed game elements, we propose a player model complementary to existing learner models. This model aims to predict to which game mechanics the user is responsive, and is used to adapt the gamified features of the system.

Keywords: Gamification, Adaptation, Motivation, Player Model.

1 Introduction

Technology-enhanced learning systems are becoming more and more efficient, especially by taking into account the learning goals of the activity and the knowledge model of the learners. However learning activities are not always motivating for the learners and do not prevent them from taking off. Simultaneously, research in the field of game-based learning aims at making the learning activities funnier and more engaging for the users by proposing two main approaches: learning games and gamification. Learning games refer to the use of games for learning purposes; gamification relies only on game design elements [1]. Turning the learning environment into a serious game requires a complete redesign, which could be very expensive and time consuming. In this paper, we are interested in gamification in order to integrate gaming features in already existing learning environments.

People do not have the same emotional responses to game mechanics (e.g. some are highly responsive to competition, whereas others are not). This paper aims to propose a model and a process to raise motivation for learning environments that are not intrinsically motivating, by gamifying them in a strongly adaptive way.

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2 Adaptation of Gamification with a Player Model

How to take into account the player types diversity? Adding gaming features for all the existing player types would entail a high risk of overloading the user interface with too many buttons. So far, a common approach to fulfill the player's expectations with gamification is to use the game elements that generally work the most (e.g. points, badges, leaderboards). But learners are usually not engaged with all these elements. Therefore, this diversity among learners-players requires a radical change in game mechanics for a game to be strongly adaptive. Thus we decide to select the game elements according to a player-types model. For instance, the players interested in socializing will be provided with a "share" button to post on social networks, and the players interested in competition will be provided with a leaderboard [2].

The role of the adaptation engine is to find the most relevant gaming feature for a user, according to the player model. The gaming features are represented by a vector based on the classification of Ferro *et al.* [3] with values between 0 and 1. For instance, the leaderboard vector could be [*dominant 1, objectivist 0.4, humanist 0.2, inquisitive 0, creative 0*]. The users are represented in the same way. Indeed, users are generally interested in more than one game mechanic. When gaming features have been designed, the values for their player types vector are set according to the game mechanics they implement. Unlike the game mechanics vector, the player types vector is dynamic: it changes according to the user's interactions with the system.

3 Conclusion

Most existing game adaptations focus on adjusting the difficulty level of the game, while gamification requires real changes among game mechanics to support motivation. We argue that, in the context of gamified learning environments, the difficulty has to be handled by the learner model, and the gamification system should focus on adapting the game mechanics. Accordingly, we propose a gamification layer composed of gaming features, a player model, and an adaptation engine for selecting the features for the users.

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