SURVEYING GAMES WITH A COMBINED MODEL OF IMMERSION AND FLOW

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ABSTRACT

Detecting flow in games is key for successful adaptation processes. Until now, the method of choice to measure flow in games, is the usage of questionnaires. Because of the shortcomings of this method, the ultimate goal is, to establish an alternative measuring method through correlations of physiological sensor data. Beforehand the enhancement of the theoretical model of flow with the more fine-grained model of immersion is introduced. A unified flow/immersion model is proposed to allow a more detailed mapping of flow depth. In conclusion a way to evaluate the unified model is presented and a perspective towards preliminary test runs and future data recordings is given.

KEYWORDS

Flow, Immersion, Measurement

1. INTRODUCTION

Digital game based learning concepts should enable the player to fully immerse into a fictional world and story. All learning objectives should be integrated and not abstracted from real life, making the game feel like an entertainment title, but implicitly allowing to accomplish learning objectives with high learning motivation, resulting in better and sustainable learning outcome (Deci&Ryan, 1985; Krapp, 2009).

The ability to measure flow (Atorf et al., 2016), would provide a valuable input to adaptation processes, that try to improve the attractiveness of the game, regarding its potential of reaching a positive intrinsic motivational effect. Questionnaires, the standard method of flow evaluation until now (Nordin et al., 2014), only provide the means to answer whether a flow state is reached or not. A more fine-grained analysis of player experience would enable earlier adaptation and thus improving the quality of the game.

The method explained in this paper expands upon the flow model (Csikszentmihalyi, 1991), by adding Cairns' definition of immersion (Cairns et al., 2006). Cairns establishes immersion as a three-level construct, which is assumed as precondition for reaching the state of maximized intrinsic motivation (Figure 1). It is proposed that a clear relationship between both immersion and flow can be established and linked into one unified model, thus improving the ability to detect flow and its precursors.

If the thesis of the combined model is correct, the incorporated immersion questionnaires will tend towards total immersion during identified phases of flow.

2. CONSIDERING A COMBINED MODEL OF FLOW AND IMMERSION

Cairns' three levels of immersion are elicited by the immersion questionnaire, published by Cheng (Cheng, 2015). While flow is considered the psychology of optimal experience, immersion is known as the psychology of sub-optimal experience (Cairns et al., 2006). As such, these concepts appear to be linked by definition. However, the exact nature of this link is still unclear. Georgiou et al. define flow as part of the most extreme state of immersion, which puts it into the total immersion category of Cairns' model (Georgiou, 2017).

Existing methods used to elicit flow, focus on questionnaires. These questionnaires are based on the definition of immersion employed in these studies. Csikszentmihalyi described flow as the optimal experience of an action (Csikszentmihalyi, 1991), as a state of extreme focus on an activity. Flow is achieved, when the individual becomes engrossed in the activity to a point, where their surroundings no longer appear relevant. Csikszentmihalyi considers this the optimal experience, the optimal way to enjoy an action. He links this with the idea of an autotelic personality, a personality that performs actions for the enjoyment derived by the action itself, instead of external gains. This is special because it means that enjoyment can even be derived from work and other taxing activities. It is achieved when a balance between challenge and skill of the subject is struck.

The problem when defining immersion is, that immersion is used to refer to two different things known as spatial immersion and emotional immersion. The definition of spatial immersion is synonymous with the definition of presence. As such, it refers to the psychological sense of perceiving a virtual reality as real while being physically located in another (Zhang, 2017). The model proposed in this paper concerns itself with emotional and engagement-based immersion. This type of immersion deals with the intensity of user engagement with a task. Cairns defines engagement-based immersion in their series of papers (Cairns et al., 2006) (Jenett, 2008) as a three-level construct.

The first level is called engagement. It is automatically achieved when the subject interacts with a task. As such, its entrance barrier is "time". The second level, engrossment, is achieved when the subject becomes emotionally involved in the activity. It is synonymous with the feeling of the controls becoming invisible. The highest stage of immersion is referred to as "total immersion". In this state, the subject is completely cut off from reality and experiences both spatial real world dissociation as well as a loss of a sense of time.

Based on this definition, Cairns developed a questionnaire to measure immersion. They define five main factors: Cognitive involvement, real world dissociation, challenge, emotional involvement and control. Many of these factors overlap with flow. The main difference between flow and immersion is that immersion may be a sub-optimal experience. Cheng improved upon Cairns' model of immersion by adding dimensions to the three layers (Cheng, 2015). Engagement is broken into Attraction, Time Investment and Usability.

Engrossment, the second level of Cairns' immersion levels can be broken down into emotional attachment of the user to the task and decreased perceptions of time and spatial surroundings. The final level of Cairns' immersion model, "total immersion", has two components: The first refers to the loss of spatial awareness, and is identified by Cheng as "presence", the feeling of physically being present in a virtual reality. The second term is given by Cheng as "empathy", the state in which the player relates to their avatar on an emotional level and shares the character's emotions.

Georgiou et al. notice that term and define it as synonymous with "flow" (Georgiou, 2017). This fits well with Cairns' definition of immersion as the "psychology sub-optimal experience" (Cairns et al., 2006), while flow is referred to by Csikszentmihalyi as the "psychology of optimal experience" (Csikszentmihalyi, 1991). This would make "flow" the highest state in Cairns' multi-level immersion model.

At the base of the proposed model, Cairns' multi-level immersion model is employed. Additionally, Cheng's model is used to extend the multi-level immersion model. Csikszentmihalyi's flow model of optimal experience comes into play as part of the highest level of Cairns' immersion model, "total immersion": it depicts an increase in flow among the diagonal through eight sub states. Given this diagonal increase, the lower levels of immersion, engagement and engrossment resemble the lower to medium flow levels in the bottom left to center area of the model, while total immersion resembles the highest flow level in the upper right corner (Figure 2).

Looking at the components of flow and immersion, a large overlap can be seen. Challenge and control are a part of both flow and immersion. Real world dissociation is also found as part of both immersion and flow, both as temporal dissociation and spatial dissociation (when interacting with virtual environments). The flow state's concentration aspect is synonymous with the most extreme version of immersion' cognitive involvement.

Contrary to immersion, flow does not identify emotional involvement. Arousal is defined as the strength of emotional experience. Strength of emotional experience can be mapped directly to challenge. Mapping valence to skill is more difficult. Such a mapping would require identifying an emotional component to skill. Such an approach would be to introduce the concept of dominance, an emotional dimension related to a person's sense of feeling control (Mäntylä, 2016). Measuring such an emotional dimension, would prove to an interesting field of research by itself and therefore it is not evaluated here.

Flow is also strengthened by direct feedback from the interaction, which is not required in order to become immersed in an activity. This can be explained with flow being an extreme version of immersion. As thus, our model proposal can be summed up as a unification of flow and immersion, which treats flow as the most extreme state of immersion (Figure 2).

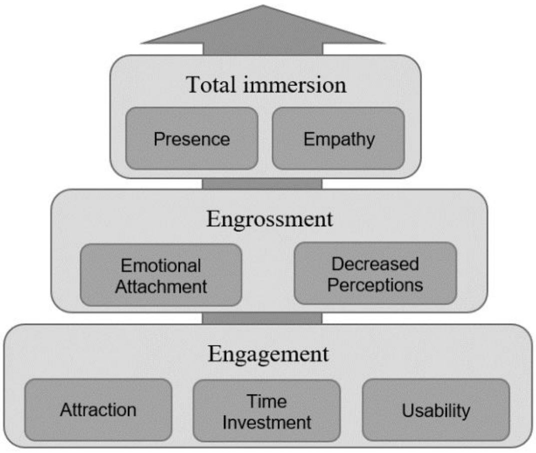

Figure 1. Cairns' 3-level Immersion Model

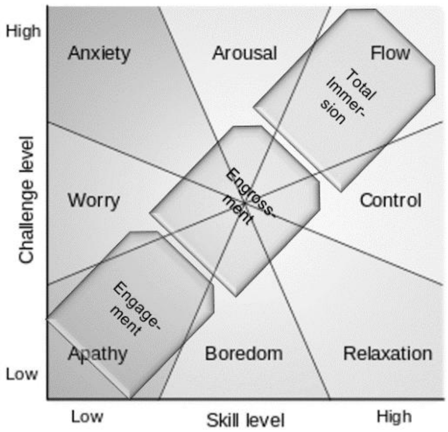

Figure 2. Combined 8-channel Flow/Immersion

3. CONCEPT OF MEASURING FLOW AND IMMERSION

In the procedure of evaluating our proposal, 40 randomly selected people go through a gaming phase and an assessment phase. Test runs showed, that 30 minutes were enough time to reach a relatively high state of immersion; accordingly, the gaming phase was set to 30 minutes of game play. The game can be selected freely; this choice was made in order to make it easier for test subjects to reach high states of immersion. During the gaming phase, game play and player footage are recorded. During the following assessment phase, the player watches the previously recorded gaming session and answers flow and immersion questionnaires periodically. These questionnaires elicit the player's flow state at the specified time in the video recording.

The questionnaires are shown multiple times, in a three level hierarchical fashion, throughout the footage evaluation in differing time intervals. The first level of questionnaires is measuring which level of immersion the player is currently in. It is based on Cheng's immersion questionnaire (Cheng, 2015), which adds multiple dimensions to Cairns' definition of immersion (Cairns et al., 2006) and presented every three minutes.

The second level of questionnaires measures flow, based on the Flow Short Scale questionnaire (Rheinberg, 2003) and is presented every six minutes. The final level of questionnaires is presented at the end of the game footage playback. It is based on the Game Experience questionnaire (IJsselsteijn et al., 2013) and entails a complete elicitation of flow, immersion and related experiences. The questionnaires were rewritten into past tense for consistency, additionally; some points were rewritten for clarity. As it was unclear to participants, they were also altered to reflect which span of time they referred to.

This way, the theory that flow is an extreme version of immersion can be tested by comparing phases of immersion, identified in the first and third level (Immersion/Game experience questionnaire) to corresponding phases of flow, identified in the second and third level (Flow Short Scale/Game experience questionnaire).

4. CONCLUSION AND PERSPECTIVE

The work in progress presented, proposes a unified model of flow and immersion. The model will be verified by data elicited by flow and immersion questionnaires in the context of serious games. If the model is proven, a qualitative evaluation and steps towards an adaption process are enabled.

The procedure is composed of a gaming phase and an assessment phase, the former to record player and gameplay footage, the later to identify phases of flow and immersion. It is an attempt to find proof, that flow and immersion are linked in the multi-level immersion model by Cheng (Cheng, 2015). It will be performed at Fraunhofer IOSB in the near future, as soon as preliminary tests are completed.

Furthermore, the approach will enable experiments towards establishing a method for measuring player flow/immersion levels automatically through physiological measurements. These experiments will be about, whether physiological parameters correlate during identified phases of flow or immersion, allowing a less intrusive, less biased and more automated analysis of player experience, during the activity under test.

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