Chapter 4
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, such as flow short scale or game experience questionnaire. Because of the shortcomings of these methods, the theoretical model of flow is enhanced by the concept of immersion to propose a unified flow/immersion model. In combination with this more fine-grained model of immersion, player experience may be measured in a more detailed fashion. The enhancement of the theoretical model and the altered experiment procedure are presented. In conclusion, a perspective towards performing the experiment and future data recordings is given.

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 a better and sustainable learning outcome (Deci & Ryan, 1985; Krapp, Schiefele, & Schreyer, 2009).

The ability to measure flow (Atorf, Hensler, & Kannegieser, 2016), would provide a valuable input to adaptation processes that try to improve the attractiveness of the game, especially regarding its po-
tential of reaching a positive intrinsic motivational effect. Questionnaires, the standard method of flow evaluation until now (Nordin, Denisova, & Cairns, 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, thus improving the quality of the game.

The method explained in this paper expands upon the flow model (Csikszentmihalyi, 1991) by adding the definition of immersion by Cairns, Cox, Berthouze, Jennett and Dhoparee (2006). Cairns et al. (2006) establish immersion as a three-level construct, which is assumed as precondition for reaching the state of maximized intrinsic motivation. Figure 1 shows this hierarchical model and its three levels. 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.

In addition to testing our combined model, the proposed experiment records physiological measurements of players during gameplay. Current methods to measure flow and immersion rely on questionnaires and as such lack objectivity and the capability to measure these states in real time. Using physiological measurements, our goal is to create a system that can measure flow and immersion automatically.

BACKGROUND

The three levels of immersion by Cairns et al. (2006) are elicited by the immersion questionnaire, published by Cheng, She and Annetta (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 and Kyza (2017) define flow as part of the most extreme state of immersion, which puts it into the total immersion category of Cairns’ model.

Existing methods used to elicit flow focus on questionnaires. These questionnaires are based on the definition of immersion employed in these studies. Csikszentmihalyi (1991) described flow as the optimal experience of an action, as a state of extreme focus on an activity. Flow is achieved when the individual becomes engrossed in the activity to a point, at which their surroundings no longer appear relevant. Csikszentmihalyi (1991) 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 assertion is made based on the theory of intrinsic and extrinsic motivation, which divides motivations for actions into those motivated by external gains, such as money or rewards, and internal motivation. In this context, the idea of intrinsic motivation and an autotelic personality 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 concept of flow was later mapped to games in the form of the GameFlow questionnaire (Sweetser & Wyeth, 2005). Games are useful for researching flow, as they are not played due to extrinsic motivation, but rather due to intrinsic motivation, for the enjoyment of the game itself. This makes it possible to reach the flow state when playing games. The GameFlow questionnaire was later further adapted by Fu, Su and Yu (2009) into the EGameFlow questionnaire for use with Serious Games.