Analyzing User Behavior via Gameplay Metrics

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Abstract
User-oriented research in the game industry is undergoing a change from relying on informal user-testing methods adapted directly from productivity software development to integrating modern approaches to usability- and user experience testing. Gameplay metrics analysis form one of these novel techniques, being based on instrumentation methods in HCI. Gameplay metrics are instrumentation data about the user behavior and user-game interaction, and can be collected during testing, production and the live period of the lifetime of a digital game. The use of instrumentation data is relatively new to commercial game development, offering a powerful supplement to existing user-oriented testing methods. This presentation will introduce a metrics solution and a series of case studies of games from major Danish game developer IO Interactive of EIDOS.

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Measurement, Documentation, Performance, Human Factors.

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Gameplay metrics, game metrics, user experience, user testing, computer games.

The game development industry has within the past decade established itself as a major component of the interactive entertainment industry, rivaling the movie industry in size [1]. Computer games have gone from simple text-based adventures to almost photo-realistic renditions of virtual worlds within a variety of genres, offering a wealth of entertainment opportunities to their users. Contemporaneously with this development, a requirement for user-oriented testing methodologies that take into account the unique nature of digital games has become increasingly prevalent [9,12]. Furthermore, with the increasing complexity of contemporary computer games – in terms of the amount of possible user actions and –behaviors that they afford, as well as the breath of interaction options between the user and the software/hardware – the informal testing methods traditionally utilized in the game industry, which were adopted directly from productivity software testing, have come under pressure [11,13].

Game testing can generally be divided into technical, functional and content testing, the latter two categories involving user-oriented approaches. User-oriented testing is essential to game production, because the quality of the product that a game is directly relates to the perceived user experience. Functional and content testing are therefore two areas that receives an increasing amount of attention from academic and industry environments alike [e.g. 5,6,7,8,9,11,12,15,16]. The purpose of user-oriented game testing is to see how specific components of, or the entirety of, a game is played by people. It allows game developers to evaluate whether their ideas and work provides the experience they designed for.

User-oriented game testing is normally carried out at different stages of the production cycle of digital games, which are commonly produced using agile methodologies. An organized, methodical approach to this work is vital, as this permits that issues are fixed as they arise rather than at the end of a production cycle. The requirement for improving user-oriented testing methodologies within game development, the increasing complexity of digital games, the variety of aspects of the user interaction that needs to be tested, and the requirement for methods that do not require long turn-around times, has resulted in a variety of approaches from Human-Computer Interaction (HCI) research being adapted user-oriented game testing and –research [2,7,9,11,13,14]. These include different forms of usability testing, ethnographic methods, experience testing etc. All of these have specific strengths and weaknesses, but are generally useful for capturing player feedback and subjective user experiences; and for acquiring in-depth feedback on e.g. gameplay or design problems. However, these approaches are limited in that information is often hand-coded (surveys, analysis of audio-visual recording), meaning that getting highly detailed data about user behavior is time consuming.

Gameplay metrics: Game instrumentation data
A potential source of supplementary data to accommodate this limitation is the automated collection and analysis of instrumentation data, an approach utilized within the general HCI field [e.g. 11,15], but however only recently adapted to computer game production [9,16]. Different types of instrumentation data can be recorded from player-game interaction. In game development, instrumentation data find uses within e.g. engine performance, sales across different countries or regions, project progress or user interaction with the game software, the latter category being of interest here. Within the context of user-oriented testing, instrumentation data related to player-game interaction are generally termed gameplay metrics [16,17], and serve to provide detailed quantitative information about the player (user) behavior. Gameplay metrics form objective data on the player-game interaction. Any
action the player takes while playing can potentially be measured, from low-level data such as button presses to in-game interaction data on movement, behavior etc. Examples of the use of gameplay metrics include evaluating whether players utilize the full scope of gameplay features, if all areas of a map are explored, and evaluating gameplay balance. Importantly, gameplay metrics can be utilized to discover patterns of play, i.e. if there are specific patterns in the way people play the game, and if these correspond to the ways intended. The term “metric” – as it is used here - stems from computer science, and denotes a standard unit of measure, with metrics generally being organized in systems of measurement, utilized in the evaluation and measurement of processes, events, interaction etc. [4,10]. In general, gameplay metrics can be recorded for any type of user-initiated behavior where interaction takes place in or with the virtual environment; as well as behaviors initiated by agents or systems operating in the virtual environment outside of the control of the player, e.g. autonomous agents. The analysis of user behavior via gameplay metrics act as a supplement to the established methods for user-oriented research in the game industry –research. For example, usability testing focuses on measuring the ease of operation of a game, while playability testing explores is users have a good playing experience [11]. Gameplay metrics analysis offers however insights into how the users are actually playing the games being tested.

Presentation content
In this presentation, an instrumentation-based solution to the challenge of locating methods for acquiring and analyzing detailed data about user behavior in computer games is presented. The approach has been formed in collaboration between Danish game developer IO Interactive (a subsidiary of EIDOS Entertainment), and the IT University of Copenhagen. The solution is presented via several different case studies which are covered in the presentation, based on recent major commercial games announced or published.

The case studies showcase the strength of gameplay metrics analysis, namely the ability to provide quantitative and detailed data on player behavior, as well the ability to establish large datasets and mine these in order to establish detailed patterns of user behavior in specific contexts, thereby providing a tool for not only game development and –design; but also general user-oriented research in interactive entertainment.

Conclusion & discussion
Gameplay metrics form a novel approach within game development and addresses one of the major challenges to user research, namely that of tracking and analyzing user behavior when interacting with the complex systems that contemporary computer games are. As a user-oriented approach, it complements existing methods utilized, by providing detailed and quantitative data to supplement attitudinal and semi-quantitative data from e.g. usability testing and playtesting [9,11,13].

Instrumentation data from users form an important contribution to not only user research and –testing during the development phases of game production, but also in monitoring and evaluating user (player) behavior during the extended usage, i.e. during the live periods of games, where given the right tools, data can be obtained directly from the users operating within their natural environments.

References

Figure 1: General framework for the gameplay metrics capture and analysis process at IO Interactive.