
Exploring Quantitative Methods for Evaluating Sports Games

Veronica Zammitto

School of Interactive Arts and
Technology
Simon Fraser University
250 -13450 102 Avenue
Surrey, BC V3T 0A3 Canada
vzammitt@sfu.ca

Magy Seif El-Nasr

School of Interactive Arts and
Technology
Simon Fraser University
250 -13450 102 Avenue
Surrey, BC V3T 0A3 Canada
magy@sfu.ca

Paul Newton

Electronic Arts Canada
4330 Sanderson Way
Burnaby, BC V5G 4X1 Canada
pnewton@ea.com

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Abstract

The evaluation of Game User Experience is an emergent and important field in game and HCI research due to its direct impact on the multi-billion dollar interactive entertainment industry. Special attention has been given to the shooter genre. This paper focuses on evaluation of sports games. In particular, it presents an ongoing project that aims to assess the utility of triangulating several quantitative methods, including eye-tracking, psycho-physiological data and game telemetry. This research is an on-going collaboration between Simon Fraser University and Electronic Arts. Results of research including the triangulation of this data for the evaluation of the NBA Live 10 title and evaluation of these methods by EA's production team will be discussed.

Keywords

User research, user experience, methodology, game evaluation, usability, psycho-physiology, sport games, telemetry, eye tracking, EMG, GSR, EKG, BVP

ACM Classification Keywords

H.5.2 Information Interfaces and Presentation: User Interfaces: Evaluation/methodology; K.8.0 Personal Computing: General: Games

General Terms

CHI 2010, workshop, Brain Body Bits,
Psychophysiological User Interaction

Introduction

Developing efficient and effective evaluation strategies for measuring video game quality is an important open problem in today's game industry[3]. The field of Human Computer Interaction contributed many methods for evaluating interactive experiences, such as surveys, think aloud protocols, physiological methods. These methods are often classified into qualitative and quantitative methods. Qualitative methods use subjective information that is interpreted by an expert, for instance interviews, survey, and focus groups. Quantitative methods rely on measurable information, such as biometrics (electro encephalogram, electromyography, galvanic skin conductance, heart rate, breathing, eye tracking) or behavioral data (heat maps, time to completion of tasks). Combining quantitative and qualitative methods in a single research study has recently become more widely accepted, especially within design research [8,4,2,11].

Due to the current diversity in the game market, the use of efficient methods that can allow companies to put their games in front of thousands is becoming a necessity. Qualitative and quantitative methods, however, often require time and effort to setup and administer, thus limiting the number of players that can be tested, which, in turn, limits the utility of the results. Instead, user experience researchers within game companies, such as Microsoft Game Studios and Electronic Arts have started exploring new methods and tools for game evaluation. The term *Gameplay Metrics* [5] was coined to define a set of numerical data

collected during a play session. Depending on the game, the metrics collected differ. Most metrics involve frequency, triggered behaviors, goals, spatial and non-spatial data. Spatial metrics [6], such as heatmap have been used by game companies, including Bungie, and Square Enix to evaluate level design. For example, the heat map was used to plot the number of deaths within a game level. This allowed designers to spot places where the majority of players died, which constituted a level trap.

While some of these user experience techniques have been successfully employed to measure user behavior and game quality [6], developing efficient effective evaluation methodologies is still an open problem. Most previous research focused on first and third-person-shooters, for instance on Halo 2, Shadowrun, Gears of War, Call of Duty 3, Half-Life 2 and Tomb Raider: Underworld [6,7,10]. Sport genre games have had little attention from the academic community. Within this specific niche, we note the work of Mandryk et. al. [9] on modeling emotions based on psycho-physiological data using NHL 2003. Beyond this notable work, there is little research that explored this genre.

In this presentation, we aim to discuss a study we started in collaboration with Electronic Arts (EA). Our goal is to explore quantitative methodologies (triangulating eye-tracking, psycho-physiological data and game telemetry) specifically for sports video games. Our aim is to assess the utility of the methods for game producers and designers, efficiency of the methods, and potential ways these methods can be automated, thus producing tools for game developers.

Current Study: NBA Live 10

Our project in progress is focused on evaluating NBA Live 10 [1]. We are currently collecting and triangulating three kinds of data: (1) Eye-tracking, (2) Psycho-physiological data, and (3) game telemetry, supplied by Electronic Arts.

We first setup three experiments to evaluate all three methods separately. Then we setup a study to triangulate all data within one study. This is done in order to evaluate each method separately and integrated, thus allowing us to assess the utility of each method with Electronic Arts producers. For each experiment participants play for 15 minutes NBA Live 10 on a Xbox 360 console at EA Canada. We will also collect subjective responses through open-ended interviews, and questionnaires.

Eye tracking

Tracking user's gaze can reveal the player's focus. Eye tracking data can be used to evaluate what visual cues are identified, which ones are ignored and how much time it takes to evaluate a situation. By using eye tracking we can identify where players are attending to through measuring the points and time of fixation, patterns and gaze movements. For collecting eye tracking data we are using Eye Tech TM3.

Psycho-physiological data

We will extend previous research done on psycho-physiological data [10,9] and for this set-up we use galvanic skin response (GSR), heart rate (EKG), blood volume pulse (BVP), and electromyography (EMG). Participants are initially shown different images that illicit different emotions, then we will ask them to play NBA Live 10. Signals will be collected and time

stamped, this allows us to normalize signals based on the images stimulus, to derive emotions from when they are playing the game. The interpretation of these measurements give information on arousal and emotions, thus it's possible to conclude when people are more excited and when they may be frustrated, and associate the state with events within the game. For this experiment, we are using Thought Technology ProComp5 Infiniti with the BioGraph Infiniti Software and supported EMG, EKG, GSR and BVP sensors.

Gameplay Telemetry Data

Electronic Arts currently collects several gameplay telemetry data through event-based RPC telemetry collection system. We ran several pilot studies to identify game events to log for our purpose. After identifying data we need to collect, the current EA system was augmented to include mechanisms to report data we needed. This data included time-stamps on events such as scoring and intentional foul or stealing the ball.

Triangulation

Results from the above mentioned experiments will be assessed based on their utility through expert review with several EA teams. Our hypothesis is that each method is not specifically useful on its own. Thus, we will augment these experiments with an experiment that integrates all methods and thus triangulates the data. Results of this experiment will also be reviewed by same teams in EA and compared to other results.

Conclusion

This work is in progress and more data needs to be collected before arriving to any solid conclusion. We are aiming to answer some open questions within the game

user experience field, such as: what telemetry should we collect for sport games? Is it enough to use gameplay metrics only? If not, what psycho-physiological data need to be captured? How can we triangulate data from all these resources in a manageable manner? In an attempt to explore these questions for sports games in particular, we are conducting present exploratory studies on NBA Live 10.

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Authors Bio:

Veronica Zammitto is a PhD candidate at the School of Interactive Arts and Technology at Simon Fraser University. Her background is rooted in psychology and game studies. Her research areas are game user experience, gamer demographics and preferences.

Dr. Seif El-Nasr holds a PhD degree in Computer Science from Northwestern University and is currently an assistant Professor in the School of Interactive Arts and Technology at Simon Fraser University, where she directs the Engage Me In Interactive Experiences (EMIIE) Lab. She has directly worked and collaborated with several game companies, including Electronic Arts, Bardel Entertainment, RedHill Studios, and Radical Entertainment.

Paul Newton is a Quality Assurance Development Director for EA Sports at their Burnaby Campus in British Columbia. His current role has him overseeing the Quality of all hockey and basketball games including the popular NHL and NBA Live franchises.