

Schola Ludus, Serious Games, and Measurement of Interestingness

Andrej Ferko, Zuzana Černeková, Jana Dadová,
Viktor Major, Daniela Onáčilová, Elena Šikudová,
Rastislav Švarba, Miroslava Valíková, Ivana
Varhaníková, Martin Vataha, Martin Vesel

Faculty of Mathematics, Physics, and Informatics
Comenius University
Mlynska dolina
Bratislava, Slovakia
ferko@sccg.sk

Elena Dušková

DCGI FELK CVUT
Faculty of Electrical Engineering
Czech Technical University
Praha 2, Karlovo náměstí 13
Prague, Czech Republic
dusko@fel.cvut.cz

Abstract— We propose a novel engagement measurement (established originally in virtual museum theory) for serious games. The key idea is to measure the user input in terms of time spent. The output is given by the recorded user behavior. We discuss the implications for edutainment, e-learning, and serious games.

Keywords-serious games; virtual museum; quality measure

I. INTRODUCTION

The key open problem both in education and virtual heritage is how to measure the interestingness. A significant part of the problem is how to define interestingness.

II. BACKGROUND

Andrew Glassner [11] introduced a promising concept of story space – a chronotope for multiple versions of given (interactive) story. Interactive storytelling should innovate computer games [11], [4]. Each game session record offers a particular story – how the user played and what was his/her engagement. A method for measuring the engagement is described in [2]. A modification of the method for a virtual museum was designed and implemented by Rastislav Švarba [26]. We present this approach as a suitable solution for non-disturbing and implicit user voting for interestingness of virtual museum parts. The observed user engagement was increased by a serious game. We discuss the implications for edutainment, e-learning, and serious games. Our method in this paper is to transfer the relevant theoretic knowledge from interactive storytelling and virtual museums into the edutainment, especially for using serious games. We can do this, because a single session of game playing or a virtual museum visit are stories, microstories within virtual space. In other words, their structures are identical.

There is a vivid research of digital and interactive storytelling, including European project Inscape [12] or MIT Media Lab Center for Future Storytelling. Visionary books by Glassner [11] and Crawford [4] advocate (immersive) interactive storytelling, which should overcome the popularity

of computer games. The final evaluation of a story can be easily measured by the feedback from the target group - virtual museum visitors, e-tourists. The double theoretic framework for audience engagement combines rhetorics and the theory of appraisal [2]. E.g. in virtual museums the engagement is measured by the total number of visitors, divided by number of repeated visits, and multiplied by the average time spent at the webpage [2].

Virtual time is a specific resource for presentation and interaction. We dealt with its control in linear story case and static virtual museum, as well. (Seemingly, virtual time for a static exhibit has no meaning. However, the virtual time is added by immersion and interaction, when the subjective time of a virtual tourist starts to play a role.) Perception, emotion and cognition are supported by semiotic systems, conveying meanings of input perceived, even the intangible heritage can be conveyed [23] and Web 3D technologies offer a well-established easy-to-use technology [25].

Time is an attribute of matter and a way of its existence, expressing continuation, existence, and sequence of changes. The ontology of time attributes is analyzed and standardized within CIDOC CRM, an ISO standard [5]. In total, there are 84 entities, having 141 properties. Timing is an important tool for controlling of presentations of dynamic audiovisual objects like animation, music, film, and game. Historically, the first vision of virtual time after [22] can be found in J. L. Borges. His vision in the Garden of Forking Paths describes multiple times – branching, parallel and even crossing each other. Our case is much simpler, we deal with the linear (story)time. Even in this simplest case we have to distinguish two structures: event structure and discourse structure. Event structure in linear chronology is given by canonic ordering of events [21]. They can be presented in 1. canonical passage or 2. backward passage. There are three more possibilities 3. flashback, 4. flashforward and 5. embedded passage. We preserve the canonic ordering of events. On the other hand, the user can change the settings using his or her own navigation. This way two past times are created (an event past in canonic ordering, and another event past in the sequence of user options). In other words, the past of events and the past of discourse may

differ. From this point of view a virtual museum visitor creates his or her own version of the presentation [2].

III. RESULTS

There are three basic kinds of virtual museums – visualization, activization, and hermeneutic ones. Serious games are employed in activization ones. We experimented with multiple modalities of interface [1], [7], [9], [14], [27], evaluation of images and videos [3], [24], virtual museum presentations [6], [10], [16], [17], [18], [20], [19]. Explicitly with games we dealt in [8], [13], [15], [28], [29]. Currently we study the best and the worst views, interactive video, and procedural animations of virtual population.

Our particular and ongoing experiences were reevaluated in [26]. The virtual museum Virtuálne Brhlovce consists from a merged 3D model, interactive footprint, and spheric panoramas. The options of a virtual tourist are recorded and the time measurements are used to derive „the most interesting“ path. We observed, that including a serious game there, increased the activization of virtual tourists. The results achieved will be presented at the conference in detail.

We can conclude, that each serious game offers and consumes virtual time and that measuring the structure of time consumption we can use as a non-disturbing and very practical tool for authoring of Schola Ludus approach in digital storytelling, edutainment, and web communication.

ACKNOWLEDGMENT

This work in part funded Slovak Ministry of Education, project VEGA SPINKLAR-3D No. 1/1106/11.

REFERENCES

- [1] Behal, D. Technológia streamingu pre virtuálne múzeum. MSc. thesis. Bratislava: FMFI UK, 2008.
- [2] Cameron, F. – Kenderdine, S. eds. Theorizing Digital Cultural Heritage. ISBN 0-262-03353-4. Cambridge: MIT Press, 2007.
- [3] Cernekova, Z. et al. “Information theory-based shot cut/fade detection and video summarization.” *IEEE Transactions on Circuits and Systems for Video Technology*, 2006, vol. 16, no.1, pp. 82-91.
- [4] Crawford, C. On Interactive Storytelling. ISBN 0-321-27890-9. Berkeley: New Riders, 2005.
- [5] Crofts, N. et al. eds. Definition of the CIDOC Conceptual Reference Model. [online] At http://cidoc.ics.forth.gr/official_release_cidoc.html, June 2005. (August 15, 2010.)
- [6] Csidey, A. Virtuálne Interiéry a Image-Based Rendering. MSc. Thesis. [online] <http://csatosz.szm.com/>. (August 15, 2010.) Bratislava: FMFI UK 2010.
- [7] Dadova, J. „Skybox as Info Billboard.” [online] <http://www.cg.tuwien.ac.at/hostings/cescg/CESCG-2009/papers/BratislavaC-Dadova-Jana.pdf> (August 15, 2011.) Vienna: CESCG, 2008.
- [8] Duskova, E. *Virtuálna Kremnica: Virtual city presentation*. MSc. thesis. [online] <<http://kremnica.duskova.sk/>> (August 15, 2011.) Bratislava: FMFI UK, 2009.
- [9] Fekiacova-Valikova, M. Múzeum bratislavských múzeí. Bc. thesis. Bratislava: FMFI UK 2007.
- [10] Ferko, A. et al. “Národný program virtualizácie múzeí.” Banská Stiavnica: DMZ, 2009.
- [11] Glassner, A. Interactive Storytelling. ISBN 1-56881-221-3. Natick: AK Peters, 2004.
- [12] Inscape community and repository. [online] www.inscapers.com. (August 15, 2011.)
- [13] Kuchynarova, M. Hra pre virtuálne múzeum v prostredí COLLADA. MSc. thesis. Bratislava: FMFI UK, 2010.
- [14] Lacko J. - Ferko A. Techniques Of Reconstruction Of 3d Scenes. pp. 431-437. Bratislava: Aplimat, 2009.
- [15] Ludvikova, M. Virtuálne Múzeum zbraní. MSc. thesis. Bratislava: FMFI UK, 2011.
- [16] Major, V. Virtuálne Múzeum hodín. Bc. thesis. [online] www.bratislava.sk. (August 15, 2011.) Bratislava: FMFI UK, 2009.
- [17] Mrva, M. - Ferko, A. “Považské múzeum 3D online.” *Pamiatky a múzeá*, No. 3 (2007), pp. 30-33.
- [18] Onacilova, D. Tutoriály. Urbánne rekonštrukcie v počítačovej grafike. MSc. thesis. [online] <http://www.sprite.edi.fmph.uniba.sk/~dankao/> (August 15, 2011.)
- [19] Portal Považské múzeum Žilina. [online] www.pmza.sk (August 15, 2011.)
- [20] Patoprsta, E. et al. Level-of-detail Stories for Virtual Museum. *Computational Aesthetics*. Poster. London: Eurographics, 2010.
- [21] Qvortrup, L. ed. Virtual Interaction: Interaction in Virtual Inhabited 3D Worlds. ISBN 1-85233-331-6. London: Springer, 2001.
- [22] Qvortrup, L. ed. Virtual Space: Spatiality in Virtual Inhabited 3D Worlds. ISBN 1-85233-516-5. London: Springer, 2002.
- [23] Rizvic, S. - Sadzak, A. “Digital Storytelling - Representation of Bosnian Intangible Heritage in the Virtual Sarajevo Project.” *VAST 2008*. Braga, Portugal, 2008.
- [24] Sikudova, E. et al. “Extracting semantic information from art images.” In *Proceedings of the International Conference on Computer Vision and Graphics*. vol. 32. New York: Springer, 2006, pp. 394-399.
- [25] Šperka, M. „Web3D and New Forms of HCI.” [online] http://newmedia.yeditepe.edu.tr/pdfs/isimd_04/24.pdf (August 15, 2010.)
- [26] Švarba, R. 2011. Virtuálne Brhlovce. MSc. Thesis. [online] <http://brhlovce.ra100.net> (August 15, 2011.) Bratislava: FMFI UK, 2011.
- [27] Tencer, L. HCI with Visualization... MSc. thesis. Bratislava: FMFI UK, 2009.
- [28] Varhanikova, I. *Virtuálne Bánovce nad Bebravou*. MSc. thesis. Bratislava: FMFI UK, 2009.
- [29] Vesel, M. *Serious Games*. MSc. thesis. Bratislava: FMFI UK, 2010.