

GHItaly19: Research Perspectives on Game Human Interaction

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ABSTRACT

This is a short introduction to the papers presented at the 3rd Workshop on Games-Human Interaction - GHItaly19, that was held in connection with CHIItaly 2019. This series of workshops focuses on the multifaceted issues related to the design and development of human-game interfaces. This entails multidisciplinary competences and skills, and the final quality of the User eXperience depends on how consistently and smartly they are exploited. As a matter of fact, users' engagement and satisfaction rely on the wise design and skilled evaluation of the produced (multidimensional) artifacts. This gains even more critical importance since the application of video games has long overcome the borders of amusement, to spur new possibilities for, e.g., continuous healthcare and education.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI); Interaction paradigms; Interaction design; Interaction design process and methods; Visualization**; • **Social and professional topics** → **User characteristics**; • **Computing methodologies** → **Machine learning; Computer graphics**; • **Applied computing** → **Arts and humanities**; • **Software and its engineering** → **Interactive games**.

KEYWORDS

HCI; Game design; Usability; Brain Computer Interface; Adaptation; Affective computing; Machine Learning; Procedural Content Generation; Social interaction; Interaction Design; Information visualization; Player experience; Storytelling; Gamification

1 INTRODUCTION

Playing has a fundamental role for animal development. Puppies learn adults' actions by imitation, that in many cases works through playing with peers. As for human childhood, the attractiveness of games extends for an even longer time [16], and also spans adult life. This especially holds in our digital era, where technology multiplies and extends the possibilities to design a huge variety of different categories of games. Increasingly sophisticated electronic devices, the possibility of online sharing and communication, and finally virtual, augmented and mixed reality represent a set of advanced building blocks for game design and development. At the same time, playing is not synonym for pure amusement anymore. It finds a growing number of different applications. As a consequence, the design and development of video games can be considered as a fascinating and multifaceted research field, that embeds the results from both science and humanities regarding several technological, cognitive, and social aspects. Topics from many computer science areas are involved, from computer graphics to software engineering and usability evaluation. But also physics, psychology and neurophysiology, industrial design, and, on the other side, literature, history, economy, visual arts, semiotics, etc., provide useful elements for an effective game design. On one side, video games represent, now more than ever, a growing industrial field, as clearly testified by the increasing revenues and the impact on the job market. On the other side, the deeper and deeper effect on different aspects of people's everyday life calls for a true research commitment. Gaming scope has gone well beyond the original boundaries of enjoyment to extend to novel targets, from learning to rehabilitation and promotion of cultural heritage [6][8]. Unfortunately, just due to the variety of involved knowledge and skill, the field still presents a high fragmentation.

In its first two editions [5][7], the GHItaly workshop aimed at constituting a bridge among the many different disciplinary

areas involved, trying to decrease the still existing cultural gaps and to establish a common ground and a crossroads for related research. Since the workshop series continues as a space of interdisciplinary dialogue and exchange, also the third edition has encouraged and welcomed the presence of different and complementary perspectives. Some papers dealt with User eXperience and preferences: the analysis of the users' attitudes is a necessary condition to increase the quality of artifacts whose purpose is both to entertain and elicit fun [3][9][13][19], and also to support serious activities, e.g., education. The emerging ideas can inspire new ways of researching, teaching, and working on the design and development of video games, in their broadest role: both entertainment and applied goals.

2 SUMMARY OF PAPERS PRESENTED AT GHITALY19

GHItaly19 included contributions that can be divided into two broad groups. The papers in the first group deal with game design issues. The papers in the second group focus on both static and dynamic analysis of player's preferences.

The paper "Analysis of Advertising in E-Sports Broadcasts" by Kareinen, et al. [12] proposes to develop a new strategy for advertisement in e-sports broadcasts. It uses game data, to increase the audience interest. The video game Counter-Strike represents the case-study. In Global Offensive (CSGO), two teams of five players try to reach 16 round wins to achieve a map win. The "commentators" discuss the actions of the previous round in a "freetime" at the beginning of every round. The proposal is in a preliminary stage and develops a new analytic tool for commentators that uses the Game State Integration of CSGO. In this way, their analysis is better supported in order to provide a new advertising element for more attractive broadcasts. Viewers get information in the form of game statistics. At the same time, the display shows a possible new spot for advertising the sponsors of the broadcast in the place of the more traditional static advertising. Unfortunately, a survey carried out with some volunteers revealed that, though the new strategy was appreciated, the new kind of advertisement was not better remembered than the traditional static one.

Cavicchini and Mariani, in their paper "Hybrid board game: Possibilities and implications from an interaction design perspective" [14], deal with interaction design. They investigate the combination of digital and analog media in the context of IoT (Internet of Things). The case study is represented by boardgames. The authors consider that an object-based system such as a tabletop represents an effective support

for smart interactions. The progressive prototype development suggests a series of guidelines and best practices, but also leaves open problems concerning the hybridisation of digital means in an analog play experience. A hybrid board game could simplify the playing experience by entrusting data to the game system itself. The players are not forced to elaborate and remember the information necessary to set up a gaming strategy, so that their enjoyment can be increased via a lower effort. The developed prototype relies on the strategy of "putting knowledge" in the world [15]. Among the problems underlined by the experiments, it is worth underlining a series of implications able to reduce the feasibility of designing hybrid artefacts. Establishing share and exchange of data between different electronic components, each with very specific tasks, might lead to problems concerning the efficiency, noise and latency of the communication.

The paper "A.T.L.A.S.: Automatic Terrain and Labels Assembling Software" by De Francesco et al. [4] presents a tool for the automatic creation of complex imaginary worlds, that make up the basis for video games. Game designers or game writers can testify that making an imaginary world "credible" and convincing for the player, requires it to be "consistent". In other words, no aspect should be perceived as "weird" or "out-of-place". The proposed tool is methodologically different from other imaginary world generators proposed in the Procedural Content Generation (PCG) field [18]. It was developed as one of the components of a more complex story-driven approach to the generation of video games: in fact, A.T.L.A.S. smoothly integrates its output with that of GHOST [11]. The latter tool semi-automatically produces the main narrative structure of a story and its characters. This provides a solid backbone to be filled by the game/level designer. A.T.L.A.S. follows a top-down approach to generate the features of the imaginary worlds. It moves from the general/outer level (i.e., the generation of the Earth's crust) to the particular/local (roads, villages, specific buildings and locations). The generation process is divided into two phases. The first phase creates the orography of the environment, according to elements of *physical geography*, that can be controlled by the game/level designer. The second phase follows *political geography* principles, and adds points of interest to the map (i.e., cities, villages, roads, etc.). Most of them can be imported directly from a structure for a story produced by GHOST.

In the second group, the paper "A BCI-based Assessment of a Player's State of Mind for Game Adaptation" by Carofoglio, et al. [2] discusses how a passive Brain Computer Interface (BCI) can be used to enhance the gaming experience through

adaptation by assessing the state of player's mind. The authors assume that both cognitive and emotional factors drive the process of playing videogames [20]. Therefore, they focus on the efficient recognition and classification of states of the players during gameplay, including boredom, flow and stress. Features extracted from EEG signals should allow state classification. The authors performed an experiment collecting data from 35 subjects playing at a horror video game, for a total of 240 EEG signals recordings. The horror video game presented specific features and mechanics causing emotional impact on the player, e.g., the use of a measure of "mental health", an adaptive use of rendering effects and sounds, the behaviour of Non-Player Characters (NPCs). At the end, the players had to answer to a questionnaire to assess their perceived emotions, engagement, and the appropriateness of their skills with respect to the game challenges. The answers of the questionnaire allowed the interpretation of the physiological data, and the annotation of the collected data. Results showed that the emotional states extracted by BCI are coherent with the self-evaluated measures. In particular, the level of engagement was mainly coherent with experimental conditions.

The paper "Towards a model to meet players' preferences in games" by Bellini [1] presents a different approach to the adaptation of a game to players' attitude. The author analyzes the approaches based on Procedural Content Generation via Machine Learning (PCGML) [21]. PCGML represents a new paradigm for the self-driven creation of new contents. With respect to Procedural Content Generation, the quality of the created content is generally higher. It is achieved by integrating automatic creation techniques with Machine Learning models. The latter models are trained on existing content. PCGML has been applied to create video game contents (e.g., levels structure, story progression), but not yet to generate the complete video games. The author applies Machine Learning for the recognition of a player's attitudes, and proposes a PCGML model able to adapt a game to players' preferences. The game content is procedurally customized according to the single player's profile and to a Player Model built during an in-game opaque survey. This entails that, during playing, the model records the player's path, made up by each chosen action, and updates the player's profile accordingly. At each new level, the algorithm picks a subsequent level according to a probabilistic distribution, that takes into account what is more likely to be interesting for the player, following the current Player Model.

The last paper presented at the workshop is "Faster is Better: The Speed of Player Character Growth affects Enjoyment and Perceived Competence" by Guardini et al. [10]. It presents an interesting study on the perceived competence

and enjoyment of video game players, based on the Self-Determination Theory (SDT). SDT turned out to be a highly successful tool for the investigations on video games under several perspectives. It predicts that people tend to be proactive and engaged in activities that can satisfy three specific intrinsic needs: the need for competence (the human innate desire to grow one's own abilities), the need for autonomy (the human innate desire to be the causal agent of one's own life), the need for relatedness (the human innate need for meaningful interactions with peers) [17]. In the paper, the authors test the SDT predictions by manipulating the amount of reward given to the player within Torchlight II commercial video game, in opposition to applied games and gamified application used in previous studies. The collected data include game metrics, video recordings, and self-reported feedback. The analysis was carried out on information from two groups of video game players that participated in a 60-minutes play session. The control group played the standard version of the game, while the experimental group played a version of the game that provided five times the amount of rewards. Results showed that the speed of player character growth affected the participants' perceived competence and their enjoyment of the game, although the game metrics indicated that the two gameplay sessions were almost identical.

3 CONCLUSION

Video games are still almost universally considered as pure amusement artifacts, and assigned a secondary role in both editorial, artistic and scientific worlds. However, a growing number of studies and experiences demonstrate that video game design and development is a technically and culturally rich and challenging area. It is continuously expanding to "serious" applications like healthcare and education. In this context, it exploits the results from several different research fields. In a complementary way, it can contribute to the research in neighboring areas. The works presented at GHIItaly19, as well as those in the previous workshop editions, clearly demonstrate the interest and relevance of this fascinating field for both researchers and practitioners. The results obtained include new approaches, techniques, and interdisciplinary exchanges characterizing game design and development. However, they are significant to the extent that they can support an improved and more engaging User eXperience. It is important to achieve this goal whether the players are people playing for fun or for more serious reasons, since it is the final expected outcome of any technical as well as theoretical investigation. However, as already observed in the previous editions, the complexity implicit in

video game design and implementation can stimulate different investigations on several game aspects. These include, e.g., design strategies and techniques, playability and engagement, and user evaluation, as well as specific application contexts. Applied games extend their target from education to cultural heritage to healthcare. Albeit their diversity, each contribution presented at the GHIItaly19 workshop underlines that games are artifacts by far more complex and cross-disciplinary than generally deemed. Moreover, the experience lived by the player has deep implications for their fruition, whatever is the category they belong to, and especially if their goal is not pure amusement. As a consequence, they can no longer be classified as only “simple” software applications. A more frequent, intense and fruitful exchange of ideas, experiences and results among the different disciplines involved should take place, as we hope this will happen in the next future.

REFERENCES

- [1] Mattia Bellini. 2019. Towards a model to meet players’ preferences in games. In *CEUR Workshop Proceedings - Proceedings of GHIItaly19 - 3rd International Workshop on Games-Human Interaction*.
- [2] Valeria Carofiglio, Berardina Nadja De Carolis, and Francesca D’Errico. 2019. A BCI-based Assessment of a Player’s State of Mind for Game Adaptation. In *CEUR Workshop Proceedings - Proceedings of GHIItaly19 - 3rd International Workshop on Games-Human Interaction*.
- [3] Mihaly Csikszentmihalyi and Jeanne Nakamura. 1979. The concept of flow. *Play and learning* (1979), 257–274.
- [4] Alessandro De Francesco, Laura Anna Ripamonti, Davide Gadia, and Dario Maggiorini. 2019. A.T.L.A.S.: Automatic Terrain and Labels Assembling Software. In *CEUR Workshop Proceedings - Proceedings of GHIItaly19 - 3rd International Workshop on Games-Human Interaction*.
- [5] Maria De Marsico, Laura Anna Ripamonti, Davide Gadia, Dario Maggiorini, and Ilaria Mariani (Eds.). 2017. *CEUR Workshop Proceedings 1956 - Proceedings of GHIItaly 2017 - 1st International Workshop on Games-Human Interaction*.
- [6] Maria De Marsico, Laura Anna Ripamonti, Davide Gadia, Dario Maggiorini, and Ilaria Mariani. 2017. GHIItaly 2017: Game-Computer Interaction in Research. In *CEUR Workshop Proceedings 1956 - Proceedings of GHIItaly 2017 - 1st International Workshop on Games-Human Interaction*.
- [7] Maria De Marsico, Laura Anna Ripamonti, Davide Gadia, Dario Maggiorini, and Ilaria Mariani (Eds.). 2018. *CEUR Workshop Proceedings 2246 - Proceedings of GHIItaly18 - 2nd International Workshop on Games-Human Interaction*.
- [8] Maria De Marsico, Laura Anna Ripamonti, Davide Gadia, Dario Maggiorini, and Ilaria Mariani. 2018. GHIItaly18: Game-Human Interaction in Research. In *CEUR Workshop Proceedings 2246 - Proceedings of GHIItaly18 - 2nd International Workshop on Games-Human Interaction*.
- [9] Tracy Fullerton. 2018. *Game design workshop: a playcentric approach to creating innovative games (Fourth Edition)*. CRC press.
- [10] Pietro Guardini, Dalila De Simone, and Rossana Actis-Grosso. 2019. Faster is Better: The Speed of Player Character Growth affects Enjoyment and Perceived Competence. In *CEUR Workshop Proceedings - Proceedings of GHIItaly19 - 3rd International Workshop on Games-Human Interaction*.
- [11] Andrea Guarneri, Laura Anna Ripamonti, Francesco Tissoni, Marco Trubian, Dario Maggiorini, and Davide Gadia. 2017. GHOST: A GHOST Story-writer. In *Proceedings of the 12th Biannual Conference on Italian SIGCHI Chapter (CHIItaly ’17)*. ACM, 24:1–24:9.
- [12] Kalle Kareinen, Antti Knutas, and Jussi Kasurinen. 2019. Analysis of Advertising in E-Sports Broadcasts. In *CEUR Workshop Proceedings - Proceedings of GHIItaly19 - 3rd International Workshop on Games-Human Interaction*.
- [13] Raph Koster. 2013. *Theory of fun for game design*. O’Reilly Media, Inc.
- [14] Ilaria Mariani and Saverio Cavicchini. 2019. Hybrid board game: Possibilities and implications from an interaction design perspective. In *CEUR Workshop Proceedings - Proceedings of GHIItaly19 - 3rd International Workshop on Games-Human Interaction*.
- [15] Don Norman. 2013. *The design of everyday things: Revised and expanded edition*. Basic books.
- [16] Anthony D Pellegrini and Peter K Smith. 2005. *The nature of play: Great apes and humans*. Guilford Press.
- [17] Scott Rigby and Richard M. Ryan. 2011. *Glued to games: How video games draw us in and hold us spellbound*. Praeger/ABC-CLIO.
- [18] Noor Shaker, Julian Togelius, and Mark J. Nelson. 2016. *Procedural Content Generation in Games: A Textbook and an Overview of Current Research*. Springer.
- [19] Lee Sheldon. 2004. *Character Development and Storytelling for Games*. Thomson Course Technology PTR.
- [20] Tan Eduard Sioe-Hao. 2008. Entertainment is Emotion: The Functional Architecture of the Entertainment Experience. *Media Psychology* 11, 1 (2008), 28–51.
- [21] Adam Summerville, Sam Snodgrass, Matthew Guzdial, Christoffer Holmgård, Amy K. Hoover, Aaron Isaksen Isaksen, Andy Nealen, and Julian Togelius. 2018. Procedural Content Generation via Machine Learning (PCGML). *IEEE Transactions on Games* 10, 3 (2018), 257–270.