

GHItaly 2017: Game-Computer Interaction in research

Maria De Marsico
Sapienza Università di Roma
Italy
demarsico@di.uniroma1.it

Laura Anna Ripamonti
Università degli Studi di Milano
Italy
laura.ripamonti@unimi.it

Davide Gadia
Università degli Studi di Milano
Italy
davide.gadia@unimi.it

Dario Maggiorini
Università degli Studi di Milano
Italy
dario.maggiorini@unimi.it

Ilaria Mariani
Politecnico di Milano
Italy
ilaria1.mariani@polimi.it

ABSTRACT

The aim of the 1st Workshop on Games-Human Interaction (GHItaly '17) was twofold. Firstly, it brought together scholars and practitioners to establish a common ground on the topic. Secondly, it proposed a meeting venue for researchers in a field still underestimated in Italy.

Author Keywords

HCI; game design; usability; biometric measures for interaction; artificial intelligence; immersive VR systems; social interaction; distributed and online systems; player experience; storytelling; gamification.

ACM Classification Keywords

• **Human-centered computing** → Human computer interaction (HCI) • **Human-centered computing** → Interaction design • **Social and professional topics** → User characteristics • **Applied computing** → Arts and humanities • **Software and its engineering** → Interactive games • **Information systems** → Massively multiplayer online games • **Computing methodologies** → Artificial intelligence

INTRODUCTION

Video games design is a fascinating field that exploits research results from many different disciplines, apparently far from each other, such as, e.g., computer science, maths, music, visual arts, psychology and neurophysiology, economy, etc. Italy has long been a “weird” country as for the video games industry development: though resulting among the first consumers in Western countries, its investments and resources devoted to games production are quite irrelevant. This situation is slowly changing, and this spurs new research at both industry and academic levels. To testify this new trend, video game design and development have recently entered curricula in the Italian public university. Actually, video games and their applications in many different contexts have long fascinated researchers from a broad group of different disciplines (moreover, video games were born in the academy [1]). Video games are intrinsically multidisciplinary artifacts, whose production requires fusing different expertise: computer science, music,

visual art, industrial design, project management, marketing, mathematics, physics, literature, storytelling, psychology, economy, etc.

To fill a well-recognized cultural gap, the 1st Workshop on Games-Human Interaction (GHItaly'17), held in Italy, aimed at bringing together scholars from the many different disciplinary areas involved, with the goal of establishing a common ground on the topic of designing and developing video games. Arising from the overlapping among the disciplines of Game Studies, Game Design and Human Computer Interaction, GHItaly Whorshop is a deliberate attempt to provoke debate, resulting a space of interdisciplinary dialogue and exchange, where different and complementary perspectives have been welcomed and encouraged. In particular, user experience is the reference point of view, which provides guidelines of paramount importance for an artifact whose purpose is to entertain and elicit fun [2, 3, 4, 5]. Discussions, exchanges of ideas, will hopefully nurture and inspire the development of new ways of researching, teaching, and working on HCI applied to the design and production of video games, in their broadest role: both entertainment and applied finalities.

GHITALY'17 CONTRIBUTIONS

The contributions collected by GHItaly'17 can be grouped into two main areas. The first one deals with issues in video game design and user experience. The second one includes papers describing more specific achievements in applied games and gamification.

The papers in the first group discuss how guidelines and techniques borrowed from very different disciplines can provide useful hints and be equally inspiring to devise robust research approaches. Such approaches aim at producing information and data, which are useful in game development to gain awareness on how both design and technical issues can affect the user experience. In particular, this group of papers tackles aspects such as the evaluation of user experience through Sentiment Analysis, Game Transfer Phenomena, peculiar features of location-based mobile

games and general mobile issues, and game experience improvement through variability and adaptation. It is possible to observe that tools borrowed from psychology research can be exploited in both the design phase - to better tune game strategies and protocols to the player's mood -, and in the evaluation phase, in order to carry out a fair investigation of players' opinions.

The paper "Using User Created Game Reviews for Sentiment Analysis: A Method for Researching User Attitudes." by Strååt and Verhagen [6] demonstrates an interesting example of how users' attitudes towards a certain commercial game can be studied through Sentiment Analysis [7] applied to gamers' reviews. Sentiment analysis, also referred to as "opinion mining" [8], is not new in psychology research [9]. Psychological states have been long studied by experts through observation of verbal behavior, facial expression, and other cues revealing the attitude of a subject with respect to a specific object. At present, it is mostly carried out automatically, and exploits several tools, including natural language processing, text analysis, computational linguistics, and biometrics to systematically identify, extract, quantify, and study affective states and subjective information. In particular, the authors discuss the results obtained by Aspect Based Sentiment Analysis (ABSA) [10] applied to data gathered from user reviews regarding two video game series. ABSA implies measuring user sentiment of certain aspects of a multi-aspect entity in a dataset gathered from user comments. Examples of aspects in video games include, e.g., playability, graphics, or storyline. Aspects are represented by words or phrases that exist either explicit or implicit in the dataset. The results show that, if an aspect occurs in a review, the sentiment of that aspect will reflect the rating of the review. In other words, the relatively high frequency of an aspect is an indication that that area is the most important one for the users. It also indicates that the root cause of possibly low rated reviews is to be found within the game features that the aspect represents.

Continuing along a psychology line of research, video game playing has been associated with absorption and immersion experiences. This immersion in the gaming environment can influence the player during the game and even afterwards (in both physical and mental experiences). This is described in literature as Game Transfer Phenomena (GTP) [11]. It is possible to assume that this effect may be increased when avatars are involved, whose virtual body can share (real or desired) biological features with the player physical body. The paper by Mattiassi "Command Systems And Player-Avatar Interaction In Successful Fighting Games In Light Of Neuroscientific Theories And Models." [12] approaches the study of human-fighting game interaction by using neuroscience theories and models. The paper compares several different commercial fighting games from a neuroscientific perspective, with the aim of understanding not only how players' cognitive processes differ in slightly different games, but also which design flaws could interfere

with the players' experience. Among the conclusions drawn, the author notes that further research is needed to better adapt the motor schemes requested to the players to those devised for the avatars.

Mariani and Spallazzo in the paper "Interactive Players. LBMGs - Location Based Mobile Games from a Design Perspective" [13] study the relationships and interactions that Location Based Mobile Games (LBMGs) activate at three different levels of implication: social, technological and spatial. Classical location-based games evolve and progress via a player's location [14]. When such location can be continuously reported by personal devices like smartphones, such games, e.g., "urban gaming" or "street games", are referred to as "location-based mobile games" [15]. The analysis proposed in the paper starts from a player-centered view point. It stems from a three-year work, with a total amount of 180 students that were asked to face societal problems or taboos, and evolve them into concepts to be translated into LBMGs that challenge the common assumption of being utterly and strictly digital/mobile reliant. The aim was to study how such games can function as engaging systems able to entertain players and convey information in the meanwhile. Two main results are discussed. The first is the possibility to interpret LBMG players as "interactive agents", engaged in meaningful social, spatial and technological interactions. The second entails interesting design potentialities coming from, e.g., a thoughtful use of the surrounding spaces, contextual/situated narratives, and from configuring mobile devices as storytellers. This is possible because instead of being the "place where everything happens", the mobile device rather triggers actions that are only partially performed on the device itself. In this way the smartphone becomes also a means of urban exploration and social engagement.

A more technical perspective on mobile-related issues is adopted in the paper "Implementation and Evaluation of a Multiplayer Pong Game" by Begolo et al. [16]. This work exploits *Multipong*, a prototypal game for mobile devices, allowing to interact through ad-hoc communications, to explore how technical performances issues could affect the gaming experience. As for many other interactive applications, even games find their new frontiers in mobile settings. The paper tackles this interesting challenge by re-designing a classical game for the new platform. The main challenges to address in mobile design are the same identified long ago [17] and not completely solved yet, and are related to the reduced amount of resources, both in terms of computation and of space available for the interface. On the other hand, the wide availability of Wi-Fi connections makes it possible to devise new and engaging multiplayer schemes. Of course, one of the issues to consider is the need to maintain both consistency and low latency of gaming events, therefore a good strategy must be implemented for message exchange at application level. A further issue is related to energy consumption, that is a common problem in mobile world. It is to consider that mobile settings present

peculiar aspects that must be taken into consideration even for their evaluation [18], and, for games, these aspects may affect the so called “playability” [19]. The paper is completed by the report of the results of a user study carried out at the University of Padua and involved 168 subjects. The study showed that *Multipong* collects some features that users usually enjoy.

Finally, Norton et al. focus their work in the paper “Monsters of Darwin: a strategic game based on Artificial Intelligence and Genetic Algorithms” [20] on exploiting optimization techniques borrowed from Artificial Intelligence and Genetic Algorithms as tools for increasing variety in gameplay. As a matter of fact, the final goal of game design is to keep entertained the players, but this is possible by continuously providing novel and challenging contents [21]. Of course game variations must be timely, and tailored to the current game/player state. This would usually require complex and time consuming processing, but results from other fields can be exploited. The paper proposes an example of strategic card battle video game where the game contents are dynamically adapted and produced during the game sessions. This problem had been already investigated in [22] with the proposed GOLEM (Generator Of Life Embedded into MMOs)], which addresses explicitly the need to introduce more variety and unpredictability in the monsters inside Massively Multiplayer Online (MMO) games. Even in the presented paper, new monsters are continuously created. Each monster is described by a chromosome, which maps its characteristics and skills. The exploited characteristics are related to the physical aspect, to the force, and to the natural element. Genetic Algorithms and Artificial Intelligence are exploited as procedural and dynamic strategies to continuously generate novel contents and to adapt the game behavior to the players’ actions, in order to maintain the game enjoyable and fun.

The second group of papers shifts the attention towards the specific area of applied games and gamification. Widely investigated and relevant application fields are concerned, e.g., with games to enhance and facilitate rehabilitation processes [23] or to diagnose specific sensory problems in children [24], and strategies to positively affect learning processes by making them more effective and less boring through gaming [25]. The application scenarios of so-called serious games are continuously increasing [26].

An interesting case study is that presented by Gaggi and Favaro [27], whose paper “Euphoni: a system to support speech therapy” presents a voice therapy protocol to help the patient when performing exercises at home. In clinical voice therapy, the protocols typically require daily activities and to learn a target voice-production technique. The number and frequency of exercises cause a high rate of patient drop-out and poor adherence to the prescriptions [28]. The proposed protocol exploits gamification to encourage the patient to hold on. A further advantage over other approaches is the use of mobile devices, so that it is not necessary to buy new

equipment. In order to increase user engagement, the EuphoniApp does not reward the patient after each exercise, but only when the patient performs all the exercises of a day. Intermediate goals are also added, i.e. badges, which are simple set of sub-goals and reward, whose function is to keep the patient focused on the therapy and to encourage him/her. Finally, the system reminds the user to perform the exercises using a push notification system that could be customized according to the patient’s preferences.

Learning through gameplay or gamified activities happens in a variety of ways and applies both to a single person and to collaborative environments. In these cases, how Knutas et al. underline in the paper “Profile-Based Algorithm for Personalized Gamification in Computer-Supported Collaborative Learning Environments” [29], a context-aware and personalized gamification approach is needed, and it can be automatically created by using appropriate rulesets. The learners can be guided towards educational goals, like collaboration, by means of gamification, which is the application of several game elements to non-game environments. However, gamification is not a “one size fits all” solution [30], and when the goal is “learning” the task is especially delicate, since the educational process can be affected. The proposed personalization for computer-supported collaborative learning environments is obtained by synthesizing three existing design frameworks: intrinsic skill atoms [31], gamification user type hexad (to create a gamification task ruleset personalized for each user type as defined in [32]), and self-determination theory-based design heuristics (for effective gamification of education [33]). The obtained ruleset is induced into machine-format rules that can be used as a plugin algorithm for computer-supported collaborative learning environments in order to select personalized gamification tasks for specific user types and situations.

Within a related context, the paper “A dialogue-based software architecture for gamified discrimination tests” by Origlia et al. [34] discusses the development of a software architecture designed to present discrimination tests to pre-school children in the form of gamified tasks. Such tasks are customized on the basis of the child's performance. The ability to discriminate linguistic sounds is associated to the correct acquisition and production of the same sounds. As a matter of fact, an alteration of the same ability is recognized as a cause of speech and language disorders [35]. For this reason, a timely and reliable evaluation of the phonetic discrimination ability is important in order to individuate at-risk subjects, allowing clinicians and caregivers to operate in focused and specific ways. Due to the fact that an effective diagnosis should be done at a pre-school age, the use of games or gamified approaches is of paramount usefulness, since it helps in engaging the child and delaying boredom. The test is modeled as a dialogue between the child and a group of virtual characters controlled by a single artificial intelligence agent. In order to increase the reliability of the analysis,

instead of providing pre-scripted tests, the authors propose an approach in which the test is dynamically generated.

In a completely different perspective, approaches relying on game-based methodologies can be exploited also to foster the culture of participation in design activities. Of course, this is an issue of transversal interest for the many application fields involved. Fogli et al. address this specific topic in their paper “Sustaining Cultures of Participation by Fostering Computational Thinking Skills through Game-Play” [36]. The authors discuss a possible way to foster the learning of Computational Thinking skills through gameplay, exploiting tangible user interfaces and virtual reality. The aim is to promote participatory design strategies, where the communication between users and designers is bi-directional. User-centered design, popular since the introduction of the term by Norman and Draper in [37], generally stems from pure user observation, and therefore can be considered as a mostly one-way process. Participatory design rather actively involves the final user in the design process [38], and therefore adds further value to the user participation. As a matter of fact, these two approaches are deemed to be successful to design systems that really fit with users' work practice, needs, and also individual preferences. The paper develops along the line of game-based learning. Being a general paradigm, it has also been exploited for Computational Thinking [39]. The paper proposes an approach to this aim that combines Game-Play Learning with Tangible User Interfaces and Virtual Reality. The presented proposal treats tangible user interfaces and physical object manipulation as fundamental tools to make user activities more engaging, especially for young learners.

Serious games for cultural heritage have long raised as one of the most active lines in game-based design [40]. In their paper “Establishing a theoretical background for a museum-centric entertainment system” [41] Origlia et al. advocate for the need of a novel methodological approach to the design of games for museums. The aim to pursue is promoting the value of cultural experience in itself, against the plethora of technological instalments that often risk averting the attention from the intrinsic value of objects in exhibitions. In this perspective, digital games are meant to be part of a continuing emotional experience, which is co-designed by game designers and museum experts.

CONCLUSION

Video game design is a technically and culturally rich field that involves issues from different other research fields, among which interface design, neuro computing and psychological research. This makes it fascinating for both researchers and practitioners, and finally for users, especially if and when they appreciate its results. Therefore, it can spur different investigations with its rich set of interconnected facets. These investigations can tackle either general aspects, like design strategies, game aspects like playability and engagement, and user evaluation, as well as specific

application contexts. Albeit their diversity, each contribution challenged the idea that games are artifact aimed at producing mere fun and just-in-time amusement. This workshop aimed at setting up a common venue for researchers in the different areas involved. This summary provides a glance at the interesting discussed topics, and sets them within a unified framework.

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