

Gamification and Serious Games

Papagiannakis George^{1,2,3}

¹ Foundation for Research and Technology - Hellas, Greece
papagian@ics.forth.gr

² University of Crete, Computer Science Department, Greece
papagian@csd.uoc.gr

³ ovidVR SA, Greece
george.papagiannakis@ovidvr.com

Synonyms

Simulations; Interactive Learning Events; Game-based Learning; Mixed Reality Serious Games ;

Definition

A *Video game* is a mental contest, played with a computer according to certain rules for amusement, recreation, or winning a stake [Zyda 2005].

A *Digital Game* refers to a multitude of types and genres of games, played on different platforms using digital technologies such as computers, consoles, handheld, and mobile devices [DGEI2013]. The concept of digital games embraces this technological diversity. In contrast with terms such as ‘video games’ or ‘computer games’, it does not refer to a particular device on which a digital game can be played. The common factor is that digital games are fundamentally produced, distributed and exhibited using digital technologies.

Gamification has been defined as the use of game design elements in non-game contexts and activities [Deterding2011] which often aim to change attitudes and behaviors [Prandi et al 2015]. Using game-based mechanics, aesthetics and game thinking to engage people, motivate action, solve problems and promote learning [Kapp2013] [Kapp2015]. i.e. employing awards, ranks during missions or leaderboards to encourage active engagement during an activity e.g. health fitness tracking or e-learning during an online course. Thus, gamification uses parts of games but is not a complete game.

Serious Games are full-fledged games created for transferring knowledge [Ritterfeld et al 2009], teaching skills and raising awareness concerning certain topics for non-entertainment purposes [Deterding2011]). Essentially is a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or

corporate training, education, health, public policy, and strategic communication objectives [Zyda2005].

Introduction

The appeal of *Mixed Reality* (MR) digital games arouses interest among researchers and education specialists who since their recent proliferation, they have been trying to introduce their motivating potential in learning contexts. Previous work in this field has been focusing on whether digital games can, via novel Presence (feeling of ‘being and doing there’ in a virtual or augmented world) and MR gamification (dynamics, mechanics, components) support and foster future learning and teaching, to address a wide variety and variation of educational contexts. The final aim is to provide informal, non-formal as well as formal learning for their end users.

This article aims to highlight their main conceptual differences and key indicative applications and challenges across the mixed reality and learning aims.

Related ecosystem definitions and key application areas

The concept of ‘*Presence*’ refers to the phenomenon of behaving and feeling as if we are in the virtual world created by computer displays [Sanchez-Vives2005]. “Presence is an incredibly powerful sensation, and it’s unique to VR; there’s no way to create it in any other medium. Most people find it to be kind of magical” It is not the same as ‘Immersion’, where the user is simply surrounded by digital screens [Abrash2014]. Presence is a key term that next-generation of serious-games will need to take into careful consideration to be successful.

Mixed Reality (MR) has been defined as a continuum of technologies that include both Virtual Reality (VR) (fully substitute reality with a virtual 3D world) as well as Augmented Reality (AR) (supplements reality by blending virtual and real elements with the use of special displays) [Azuma2001].

Simulation is a realistic, controlled-risk environment, where learners can practice behaviors and experience the impacts of decisions. Simulations are designed to be realistic representations of real-world environments, events and processes whereas games on the other hand may or may not reflect the reality. Hence Simulation + Gamification = Game [Kapp2013].

Digital Games for Empowerment and Inclusion (DGEI) are Digital games for non-leisure purposes used in specific contexts so that they can empower individuals, and communities in ways that lead to social inclusion [Misuraca 2012].

Interactive Learning Events (ILEs) is a term used to include games, gamification and simulation [Kapp2013].

Informal learning: Learning without the intention to learn, and without actual planning of learning activities. Sometimes also referred to as experiential or accidental learning

Formal learning: Learning as an intended and planned activity taking place in an organizational context

Non-formal learning: Learning as a result of planned general activities in which participants can learn both intentionally and unintentionally [Misuraca 2012], [Centeno 2013].

Mixed Reality Serious Games and Gamification (MRSG) is used about any kind of Serious game, Simulation or Gamified process for learning in Mixed Reality featuring Presence, Natural Interaction and the suite of the novel MR technologies MR gesture-based and game-based learning [Zikas et al 2016].

Indicative non-entertainment themes of Serious games and gamification include multitude areas from general education and training [Magenat-Thalmann et al 2009] to Cultural Heritage [Anderson et al 2011], [Kateros et al 2014], [Ioannides et al 2017] Health and surgical training [de Ribaupierre et al 2014], [Trahanias et al 2017] and Inclusive well-being [Brooks et al 2014].

Challenges

One of the main challenges for the next-generation of gamified simulations and serious games, involves answering the key research question on *how allow the learners and teachers to experience the feeling of 'Presence' under a novel MR educational learning framework*, in both Virtual Reality (VR) as well as Augmented Reality (AR) formal, non-formal and informal learning environments. The former (VR) allows for the unique feeling of 'being there' and 'doing there' in the virtual world, that will be transforming the overall game-based learning experience, via latest innovations as well as recent progress in low-cost h/w Head Mounted Displays (HMDs). The latter (AR) blends real and virtual elements so that the 3D virtual element is registered accurately in the real world and interacted freely by the learner via various mobile displays, including smart glasses, natural, gesture-based interaction (mobile RGB and RGB-D), MR virtual characters [Magenat-Thalmann et al 2009], [Jung et al 2011] and gamified learning processes [Sawyer 2002] [Misuraca 2012], [Centeno 2013].

Another main challenge for serious-games and gamification, involves user-performance metrics, characterization of the player's activity and better integration of assessment and user analytics in games [Belloti et al 2013]. "[Serious games] will not grow as an industry unless the learning experience is definable, quantifiable and measurable.

Assessment is the future of serious games” [Ritterfeld et al 2009]. In MR, this challenge requires significant future research but it can be aided by the fact that the end-user position, orientation, gaze, gestures and actions can be fully tracked and recorded in VR/AR.

Conclusion

In this work we have provided clear definitions and latest bibliographical references for the terms Serious Games, Gamification, Simulations, Digital games and related terminology suitable for Mixed Reality continuum. Moreover, we have provided key future challenges that their application in the Mixed Reality Continuum poses.

Cross References

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