EasyChair Preprint

№ 6010

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July 4, 2021

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SUMMARY

This article aims to present, comment and discuss ethical principles that have been the subject of studies in the field of virtual reality and its application in simulations for teaching or training, having in mind the significant growth of this modality in the educational environment, academic or not. The literature points to the moral concern with virtual reality, not only because of the potential risks to mental health, risks to privacy, the possibility of increasing the level of negligence related to the real environment and dangers considering cognitive manipulation, but teach ethical principles effectively, to the extent that these tools should represent a way to learn how to deal with real-life emotional and moral challenges. The growing and undeniable importance of using virtual reality to improve the quality and safety of simulation in education and training requires answers to new ethical questions, with regard to the need for a specific code of conduct and accountability for content and its consequences, supported by codes of ethics of the entities representing and regulating professional activities related to this area.

KEY WORDS

Ethical principles, Virtual Reality, Simulation, Education, Training.

Introduction

The use of Virtual Reality (VR) as a tool in several areas of human activities, especially those related to health and engineering, has been growing rapidly and its benefits for the life quality and social well-being are unquestionable. However, in the same measure of the expansion in the use of VR, relevant ethical issues have arisen and the literature points to the moral concern about this theme, not only because of the potential risks to mental health and privacy, but also because of the possibility of psychic implications related to the real environment and cognitive performance. VR must be effectively guided by ethical principles, as these tools must represent a way of learning to deal with real emotional and moral challenges. In this sense, we present, comment and discuss ethical principles that have been the subject of studies in the field of VR and its application in simulations for teaching or training, demonstrating the relevance and topicality of the theme.

Ethics has multiple facets and each of them corresponds to a relevant aspect to be considered in the practice or implementation of the stages of a VR project for education and training, from the conceptual stage, where the prospective ethical analysis and implementation take place, until the post-production stage where the retrospective ethical analysis and implementation take place.

1 Ethics, Technology and Virtual Reality

The theoretical framework from which we understand the ethics applied to technologies exceed the philosophical content and establishes it as a relevant work tool for the exercise of technological responsible technological activities. According to the concept of Nickles (1987), ethics assumes specific methods for its practice, composed of procedures for solving problems, consisting of different stages and procedures, unlike conventional methods of research ethics, which focus only on ethics professional status of researchers, such as, for example, scientific integrity and treatment of human beings in scientific experiments (Reijers et al., 2018). In summary, the focuses of ethics in traditional research and that of ethics as a tool are essentially different.

In VR, morally inappropriate actions in the real world can be performed. Hypothetically it is possible to enable any action imaginable. Therefore, VR applications can become highly engaging and essential to education and training, among other purposes, and shape social configurations in which users interact with other human or virtual beings (Bray, 1999), or even trigger the social outbreak of behaviors morally inadequate nowadays. Ethics applied to VR must consider and resolve unusual issues or situations that may eventually result in psychological damage, such as representing scenarios of interaction with deceased relatives. It is not clear, whether this would affect, for example, the acceptance process after a loss or if it could generate feelings

such as sadness or anger (Slater at al., 2020).

The debate about the excess of violence in virtual reality games has deepened and is open to those targeting other types of media regarding the application of censorship, especially when analyzed from the perspective of the harm they can cause to children as conduct inducers unethical. What is worrying in VR, unlike other medias, is that the user is an active participant, that is, it is not just exposure to content, but the choices offered as moral indicators (Bray, 1999). However, the debate is still evolving and a close outcome is unlikely. Developers of VR applications, from the point of view of technological ethics, should reflect on their role and / or moral responsibility on how they can influence behavioral options and their consequences, particularly if we consider the applications used for education and training, especially for children and adolescents (Bray, 1999).

2 Ethics and Simulation

It is not usually a goal in computer simulations, as it is in virtual reality, to make realistic visual modeling of the systems they simulate. Some of these systems are abstract, and even for those systems that are concrete, the choice is not often made to project graphical representations of the system, but to rely only on abstract models of it. When graphical representations of concrete systems are used, they generally represent only resources that are relevant to the objectives of the simulation, and do not aspire to the realism and details desired in virtual reality (Bray, 2008).

For Smith and Lammers (2014) there are three ethical imperatives regarding simulation: physical and psychological safety of participants, preventing errors and facilitating learning or training. In general, many of the ethical issues encountered in health are also found in simulation practices. In this sense, it is important to emphasize that ethics is not a complement or adornment of the simulation, but a fundamental assumption for the good progress of the education and training process. Training is not simply technical. It is also a way to learn and practice collaboration through team training, interpersonal, interprofessional, decision-making skills and not by chance an opportunity for training in the ethics of the various profession systems.

When developing educational and assessment activities, it is important to determine the objectives and learning outcomes and then determine whether simulation is the appropriate method for achieving the result. For example, it is generally not appropriate to place a novice student in a high-tech simulation with many tasks. An inexperienced student needs to learn one task at a time before applying that learning to a high-tech simulation system (Smith and Lammers, 2014).

VR, as a simulation tool for real and imaginary environments, is traditionally used in applications for training in the medical sciences, education in general, arts, entertainment and in the armed forces (Burdea and Coiffet, 2003). In the areas of health sciences, VR simulation is used for anatomical studies, training of medical procedures and, more recently, it has been used as an adjunct in the psychotherapeutic treatment of anxiety spectrum disorders, such as phobias (Wiederhold and Wiederhold, 2004). In education, VR lends itself to learning from experiences of exploring virtual worlds, while in the field of arts it provides differentiated experience as it creates an engaging virtual environment. In entertainment, it is notable for the non-immersive experiences of games. The armed forces make extensive use of this resource in various military training scenarios. Finally, the use of VR simulation for training in several other professional activities has spread significantly, especially in engineering (Bray, 2008).

In view of fidelity as a significant value of VR simulation, mistaken or deficient representations of reality in computer VR simulation are morally problematic as they can result in damage. The greater these damages are, and the greater the chance of them occurring, the greater the moral responsibility of designers and manufacturers to ensure the accuracy of representations (Bray, 2008). Therefore, the moral obligation to provide an adequate level of fidelity or accuracy is inversely proportional to the degree of impact of inaccuracies in VR simulations.

"Biased" representations also fall into the category of moral problems related to computer simulation in VR. The promotion of morally inadequate values or the unjustified promotion of values to the detriment of others is biased. The “indecent” representation is an immoral act insofar as it defies the dictates of ethical behavior of the society or culture in question, since these patterns vary considerably between social groups (Brey, 1999).

In terms of actors, ethical responsibility in a virtual environment is shared by everyone involved, which are programmers, instructors, monitors, users, etc. In simulation environments, especially those built in VR, the user shares ethical responsibility to the extent that he accepts or performs morally inappropriate actions with the responsible developers / programmers, regardless of other implications. The ethically responsible posture of simulation professionals requires special attention to prevent and correct misrepresentations and, in this sense, requires clarity and assertiveness when communicating the user about ethical limits that must be respected, even by professional users.

The extent of sharing ethical responsibility has special nuances according to the purpose of the VR application. The use of VR in therapy and psychotherapy, for example, requires special consideration to the principles of informed consent and the ethics of experimenting with human beings (Bray, 2018; Wiederhold and Wiederhold, 2004), that is, individuals undergoing treatments using VR require prior clarification regarding the implications and ethical limits inherent in the procedures.

3 Methods for Practicing Ethics in Software Development Methodologies

Ethics in this scope is multifaceted and diffuse, implying analyzes of complex interpersonal, socioeconomic, institutional and environmental relationships. Going further, MPE should be useful in anticipating, predicting and identifying ethical issues within the context of project development, as a way of obtaining alignment of interests between social actors (researchers, citizens, policy makers, companies, third party organizations, etc.) to adapt to the values, needs and expectations of stakeholders.

Here we embrace Reijers et al. (2018) in the proposal of categorize methods to practice ethics in three main axes: 1) “ex ante” methods (Latin term meaning “before the fact”), implemented when starting the project, anticipating factors considered in the process decision-making process (Ernesto and Franco, 2000) and aimed at emerging technologies, which means that they are methods that aim to practice ethics in the elaborative or ideas phase, not yet materialized in the project 2) “intra” methods, intended for the design of technology itself, meaning to aim the practice of ethics during the design and testing stage of the processes and 3) “ex post” methods (Latin term meaning “after the

fact"), when the project is or has been completed, and decisions they are taken based on the results achieved (Ernesto and Franco, 2000) and apply the ethical analysis of existing technologies, which means that the methods aim to practice ethics at the stage when a completed process has resulted in concrete applications.

The research fields in information systems seem to have produced and use more widely established methods for the practice of ethics, such as the ETHICS method (Effective Technical and Human Implementation of Computer-based Systems), developed by Professor Enid Munford at Manchester University, which consists of a participatory method for assisted design of information systems and the VSD (Value Sensitive Design) method, theoretically grounded so that the entire technology design process takes into account human values in a systematic way and established principles (Reijers et al., 2018). The presence of different methods of evaluation and practice of ethics are incentives for several authors to discuss the general need to practice ethics and the criteria for designing methods to do so (Brey, 2012a), and how ethical analyzes can contribute for the overall success of information and communication technology projects (Stapleton, 2008; Markus and Mentzer, 2014).

Even recognizing the importance of the exercise of ethics in software development projects, in its various phases, the inclusion of methods to apply ethics in the theoretical construct and in the implementation of software development methodologies is not clearly established. Software design decisions often depend on more than one ethical issue, possibly conflicting where the appropriate ethical choice is not always clear cut (Thomson and Schmoldt, 2001) and as a rule in the construction of an Ethical Project two main problems are identified: first, how to offer a way for professionals integrate ethics in their work and, second, the inclusion of ethical values in the design of projects without sufficient theoretical support (Reijers et al., 2018).

The evident difficulty of including ethics as a work tool in software development projects and their methodologies, especially those aimed at VR, is in itself a primary ethical issue. The relevance of solving this question grows as society, more and more intensively, uses technological solutions based on more interactive, intelligent and autonomous computer systems. The future social and cultural implications of the above raise unprecedented ethical questions that deserve answers.

4 Codes of Ethics, Ethicist and Virtual Reality Project

The professional codes of ethics as a rule present recommendations or norms of behavior towards clients, interlocutors, society and professional improvement, they are synthetic and explain in detail each paradigm established for the proper exercise of professional activity. It does not discuss, its function, philosophical and moral questions about how each professional activity and derivatives, influence society, economy, environment, sustainability of the planet and much less address issues related to aspects of human existence. Qualified reflections and speeches in the field of ethics require consistent knowledge and even specific training in this area.

In work activities carried out as a team, as in the case of software developers, the presence of the ethics specialist, the ethicist, whose knowledge provides guidelines for the ethically responsible development of products and services, is a differential element. This professional presents, guides and discusses the relevant ethical aspects to develop projects, even in the earliest or ex-ante phases. From this context, the ethicist is justified as an effective member of development teams, in all phases, especially those based on VR.

5 Technological ethics or Technoethics

Especially in the last decades, the emergence of the internet of things and what is known as artificial intelligence, has exacerbated the perception of the importance of ethics as an element to be considered in the design, development and monitoring of products and services, constituting a decision tool business and market positioning. On the other hand, questions about the real purpose of technology or what are the criteria to limit or prohibit the development of some technology foster academic debate about how ethics contributes to the construction of the future of society.

Regardless the philosophical current on duty, the use of ethical principles in the development of technologies, current or emerging, has the objective of promoting moral parameters to adequate social and interpersonal relationships, within the greater context of sustainability and environmental preservation. Increasingly rapid technological advances, influencing various segments of society, demand methodologies to use ethics appropriately to the dynamics of growth and technological transformation in progress.

Technoetics manages uncertainties resulting from the insufficiency of conventional responses to new technical-scientific situations that emerge in direct measurement of the increase in socially transformative technological advances and justifies answers to questions, such as if the "quantum" of ethical responsibility is equally assigned to each actor of the transformation process.

When dealing with the undesirable side effects of new technologies and their social and cultural implications, technoetics is discussed by actors other than conventional technicians and philosophers, assuming an environment of debate with a wide spectrum of actors and a deliberative character on the topics at hand. From the point of view of technoetic practice, interdisciplinarity is one of the central elements in the theoretical construct of any methodological application. The use of methodological frameworks used for the study of social phenomena, such as Professor Michel Thiollent's action-research, can be a safe path.

6 Challenges

Understanding ethics in its various dimensions and the details of its application in technologies, especially those aimed at teaching and training in the VR environment, reveals the need for systematized methodologies for this purpose. However, it is possible to verify the absence of a dominant or consensus method and this is the first challenge, to determine from which parameters we can develop and qualify a method to use ethics in all phases of a technological project. This is particularly important in an VR teaching or training environment, since in this environment ethical parameters can be transfigured, which poses the challenge of establishing whether ethical conduct can or should be flexible in an environment of socially impacting technological changes.

What is certain is that there is a demand for solutions capable of implementing the exercise of ethics in real time within the processes of evaluation and monitoring technologies and in all phases of new technologies development processes. Philosophical discussions in this regard are open and, regardless the domain of the bias, a consensus is desirable.

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