

## Preface

Augmented reality is an interactive technology which makes it possible to combine virtual and real, instead of creating a completely virtual world, and to view such combination in the same medium. Although the ideas on augmented reality has an historical background, its technological development is relatively new. We see that augmented reality applications have been developed in the recent years for wearable technologies and especially for mobile technologies rather than for desktop/laptop computers. Strengthening of mobile technologies with various sensors and hardware and ease of producing mobile application software have led to rapid widespread use of mobile devices in all segments of society. With such spread of mobile technologies, augmented reality applications are downloaded and used by everyone and such applications are even developed without any need to advanced software knowledge.

Augmented reality is one of the popular subjects frequently studied in the field of educational technologies in the recent years. Augmented reality applications have been used intensively in educational environments with their interactive, interesting and entertaining elements. Augmented reality applications enrich the physical world through various three-dimensional interactions and a number of studies show that these applications have positive effects on learners in different aspects. However, we see that only a limited number of studies examine the use of augmented reality in open education. Augmented reality may be used in open and distance learning where learners and instructors are distant to one another. However, there are not many studies, especially books and projects, dealing with this issue. Therefore, this book has been prepared to fill that gap in this field: it aims to provide suggestions to learners, academics, software developers and institutions' managers with respect to use of augmented reality (especially mobile augmented reality applications) in educational environments (especially in the scope of open education). The book consists of 16 chapters and authors analyze the possibility to use many augmented reality components from smart glasses to mobile applications. A brief summary of the subjects handled in each chapter and the significance of these chapters are given below.

Chapter 1 discusses the positive and negative aspects of possible outcomes from the public use of smart glasses which are frequently used in augmented reality applications. It analyzes the social aspect of smart glasses which is one of the most well-known and widely used wearable technologies. It aims to determine how the consumers interpret and evaluate the potential opportunities and threats associated with public use of smart glasses. As there are fewer studies in this field, the authors aim to fill that gap in the literature.

Chapter 2 addresses to developers of augmented reality software, introducing educational applications of augmented reality and provides information on development processes of such applications. In Chapter 2, it was presented the various limitations and advantages of augmented reality revealed by some empirical studies in the literature. In addition, it was given information about augmented real-

ity development tools/programs, add-on packages and presented development stages for an exemplary augmented reality book page. The use of the Unity and Vuforia was explained as the development tools.

Chapter 3 intends to advance a sociocultural perspective to frame the integration of augmented reality technology for the learning of mathematics. It is discussed the design of an application already produced with this technology. The purpose of the application is to promote the development of spatial ability while also reviewing the visualization of some calculus topics at college. Patricia Salinas Martinez contends the benefits of focusing in the graphical representation to approach mathematics knowledge, especially because digital devices are part of the modern culture.

Chapter 4 is devoted to analyze a high school class of 23 students invited to use Augmented Reality and Virtual Reality tools to create their own study material. They are about 16-year-old attending Instituto Tecnico Tecnologico “Eustachio Divini” in San Severino Marche, Italy. The basic idea of the trial is to create a short printed document augmented with the technologies of Augmented Reality and Virtual Reality. The experience is evaluated using tests and direct observation. The aim is to observe the impact of augmented mobile learning and to demonstrate that Augmented Reality and Virtual Reality study material may represent a new communication object adequate to teach future students.

In Chapter 5, educational use of augmented reality on mobile devices is explained. Throughout the content of the chapter, readers are informed about how augmented reality applications changed people’s teaching and learning styles. Besides, it presents the history, application platforms, educational use, advantages and disadvantages of augmented reality. Additionally, detailed information on mobile augmented reality is analyzed through in-depth literature search.

Chapter 6 focuses on technologies, tools, programs, operating systems, a number of standards as well as some parts of web infrastructure standards for use in mobile augmented reality applications and then discusses the current state, issues, and direction of the development and the use of these apps. The aim of Chapter 6 is to provide information on that can be used by developers of mobile augmented reality applications for learning and to assist educators and instructional designers in developing mobile augmented reality apps for learning by using augmented reality development tools that provide them to create custom mobile augmented reality applications without programming skills.

Chapter 7 gives an answer by presenting mobile learning ecosystem and mobile augmented reality definitions derived from a Delphi study carried out in 2016 in Turkey. The results and discussions present a “good fit” framework for a viable mobile learning ecosystem.

Chapter 8 introduces an augmented reality based intelligent mobile application to support courses of Computer Education. In the study, it was aimed to provide an alternative way of improving M-Learning experiences by employing both augmented reality and artificial intelligence based approaches in a common environment.

In Chapter 9, the potential of combining making, gaming and education is demonstrated by evaluating an implemented math-game prototype in a school by pupils aged 12-13. The aim of the virtual reality game is to solve math exercises with increasing difficulty. The pupils were motivated and excited by immersing into the virtual world of the game to solve exercises and advance in the game. The results of the evaluation were very positive and showed the high motivational potential of combining making and game-based learning and its usage in schools as educational instrument.

Chapter 10 deals with various aspects of mobile augmented reality and its potential in education. This chapter covers a comprehensive literature search and provides detailed information on mobile augmented reality application examples.

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Chapter 11 deals with design and development of artificial intelligence based “intelligent Augmented Reality based M-Learning application” and its effects on the English language skills of engineering students.

Chapter 12 explores the use of interactive 3D game environments in design visualization in Building Information Modeling (BIM) by adopting various available software packages and APIs. Virtual reality will allow the prospective customer to enter and explore a structure before it is constructed. This can be achieved by making use of a powerful game engine, in this case, Unity3D. In Chapter 12, the authors describe ways to pivot Unity’s functions towards the benefit of civil engineering.

Chapter 13 integrates “flipped learning” and augmented reality approaches and brings a new dimension to use of augmented reality in education and distance education. In this context, it provides some information especially on the augmented reality hardware and software.

In Chapter 14, authors discuss literature and research supporting the augmented reality, affordances in K-12 Education. The purpose of this chapter is to articulate the affordances of using augmented reality in K-12 classrooms. This is thematic review of the literature to understand what themes are developing from the publish literature. This chapter begins with a definition of augmented reality. This is followed by the unpacking of four trends in how augmented reality can support teaching and learning. These affordances are that augmented reality supports; authentic learning, contextualized learning, student-centered learning and enables students to better visualize subject content. Finally, the projected future path of augmented reality is revealed to show where augmented reality may benefit future students.

Chapter 15 emphasizes the importance of mobile augmented reality in “online nursing education” and follows an interesting and quite different approach. It presents proposals to use mobile augmented reality applications in “online nursing education” to increase the quality of nurses and to provide a better education service.

Chapter 16 provides first general information about video games and video gaming sector and then explains the details of design, development and marketing of such games. This chapter categorizes the concept of video game systematically and explains each category and type of games in details. Also, it aims to create awareness among researchers on video game development process.

This book consists 16 chapters and has been prepared with contributions by many authors from various countries. 28 authors, mostly from Turkey, and from the USA, Germany, Mexico, Italy, Austria and India put a great effort and time to create this book. The book not only handles the augmented reality mobile applications used in education and open education but also provides, in connection with the augmented reality, a detailed analysis of the virtual reality applications, video games, wearable technologies, smart glasses and artificial intelligence based applications. This book serves as a reference book to academics, educators, managers, software application developers and students who study on augmented reality and make research on this field. It aims to provide available academic information on augmented reality and contribute to this field by filling the gap in education.

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