

A review of augmented reality in educational applications

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Abstract

In education, augmented reality (AR) provides a better user experience due to its features of displaying 3D virtual information and interaction. Thus, many scholars have been attracted to developing this technology in their research. However, there are different types of AR technology represented in the educational environment. Therefore, the impact of using this technology in research may differ from one type to another. This paper provides an overview of AR technology in the educational environment. It investigates articles from three journals over three years (2017-2019). The paper is structured around three aims: first, to identify the type of AR used in each reviewed article; second, to extract the benefits of using AR technology, according to each type; and third, to specify the learning subject regarding each AR type. The review's significant findings showed that "user satisfaction" is the most frequently mentioned positive impact of integrating AR in education. It is also mentioned in all AR types.

Keywords

Augmented reality, AR, Educational applications.

1. Introduction

Augmented reality (AR) is a technology in which the real world is augmented by computer-generated content like text, images, and videos [1]. It has three main characteristics: combination of the real world and virtual elements, interaction with the user in real-time, and being registered in a 3D space [2]. Moreover, it offers freedom and new experiences to the users by allowing them to move a 3D virtual image and view it from any point just as with a real object [1-3]. Therefore, AR technology has been adopted in various research areas, such as e-commerce, travel, marketing, and education.

In the education sector, the use of AR technology produces rich learning experiences, enhances skills and knowledge, and improves collaborative learning [4]. This has encouraged researchers to integrate this technology into fields like biology, chemistry, mathematics, medicine, history, engineering etc. [5]. They examine the potential of AR technology and its effectiveness on the learning experience, or they make a comparison with other traditional learning methods.

However, researchers have used different types of AR to achieve their goals. According to Yuen et al. [1], there are five types of AR applications: discovery-based learning (DBL), object modeling (OM), AR books, game-based learning (GBL), and skills training. Thus, learning effects may differ according to each type. Furthermore, each type could be used more in some specific disciplines than in others.

The objective of this review paper is to present an overview of previous studies that have integrated AR technology for learning purposes. It covers three journals and a period of three years (2017-2019). The paper aims to assign the benefits of using AR technology regarding its type. Furthermore, it explores the learning subject for each reviewed study to find out which learning subjects are most used for each AR type. The literature review questions are as follows:

RQ1: What type of AR application is used in the reviewed paper?

RQ2: What are the benefits of AR according to each type?

RQ3: What learning subjects are commonly used for each AR type?

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