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Augmented reality practices in health services: Literature review

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ABSTRACT

Augmented reality (AR) is a version of virtual reality (VR) technology, and digital three-dimensional interfaces and virtual objects appear before us as a dynamic and innovative technology allowing simultaneous interaction with the real world. Today, we encounter wearable technologies as the widespread use of augmented reality technologies. Along with the rapid proliferation of mobile devices and wireless network technologies, innovative technologies such as augmented reality (AR) and virtual reality (VR) have also become useable in each domain. The development of health technologies also in the same pace brings along the opportunities for using such technologies in the domain of health. In the present study, literature review on AR practices used in the domain of health was made, and the data was analyzed.

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1. Introduction

Milgram and Kishino (1994) had defined augmented reality as “the environment of reality in which the products of digital media are being used instead of the objects of the real world”. Augmented reality (AR) is a version of virtual reality (VR) technology, and digital three-dimensional interfaces and virtual objects appear before us as a dynamic and innovative technology allowing simultaneous interaction with the real world (Azuma, 1997; Sommerauer and Müller, 2014). When the definitions in literature are reviewed, augmented reality may be defined as real worlds that are enriched with the use of virtual objects. According to this, augmented reality is an environment that consists of real and virtual objects formed by virtual objects placed in the real-world environment with

experiential purposes. Today, we encounter wearable technologies as the widespread use of augmented reality technologies. In this manner, the co-occurrence of virtual objects and real beings ensures the increase of sense of reality in the users of augmented reality (Bokyung, 2008). Along with the rapid proliferation of mobile devices and wireless network technologies, innovative technologies such as augmented reality (AR) and virtual reality (VR) have also become useable in each domain. The development of health technologies also in the same pace brings along the opportunities for using such technologies in the domain of health.

When AR practices’ usage area in the domain of health is considered, they are being used in order to easily determine the point of interference in surgical operations, and in order to minimize the risk of infection by making smaller cuts on the patient. In the domain of neurosurgery, it was observed that it

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is being used for accessing the area of tumor, decreasing the size of cut, or displaying three dimensionally the construct of veins in brain in cases of aneurysm. And in the domain of physiotherapy and rehabilitation, it is encountered that it is being used both on adults and children with the purpose of having the patients perform the given movements in a correct manner along with the creation of the perception of reality. Lastly, the domain that is frequently encountered is education. In medical education, especially in the domain of anatomy, it is observed that AR practices are being used, and thus that it is very useful in cases where training on cadaver cannot be made, or where the students want to study a subject again. In addition, we are also observing that it started to be used on the education of health habits such as getting the children adopting the habit of brushing their teeth.

1.1. The purpose of the research

The purpose of the present study is to determine AR practices' usage area in the domain of health. For this purpose, an extensive literature review was performed. Moreover, it is being considered to also reveal information on the states of the researchers performing such researches, the change of researches as per years, and the magazines where they were published. Along with the determination of the subjects on which it was concentrated the most in this field, it was intended to reveal the results that will shed light on the future researches.

2. Method

For an extensive literature review, EDS search engine, enabling access to all the subscribed databases from a single access point by the provider service of "EBSCO Discovery Services", was directly accessed through the website of the Library and Documentation Directorate of University of Bezmialem Foundation. The key words of "augmented reality" and "healthcare" were written in the search section, and in the content providers section, Complementary Index, Scopus®, IEEE Xplore Digital Library, Newspaper Source Plus, Academic Search Complete, Science Citation Index, Regional Business News, Business Source Complete, MasterFILE Complete, Networked Digital Library of Theses & Dissertations, MEDLINE, MEDLINE Complete, General OneFile, Supplemental Index, Directory of Open Access Journals, ScienceDirect, Social Sciences Citation Index, Newswires, CINAHL Complete, arXiv, ERIC, Library & Information Science Source, Library, Information Science & Technology Abstracts, Food Science Source, Journals@OVID, Arts & Humanities Citation Index, Teacher Reference Center, DergiPark, China Science & Technology Journal Database, Emerald Insight, National Database of ULAKBİM (Turkish Academic Network and Information Center), Dentistry & Oral Sciences Source, eBook Academic Collection Trial, JSTOR Journals, GreenFILE, Research Starters, Books at JSTOR, Dynamed, Bibliotheksverbund Bayern, eBook Index, Google Scholar, and ProQuest Dissertation and Thesis database were selected.

The conformity to key words of the listed articles was examined again, and 46 publications in total were obtained. Each of the reviewed publications were listed with the used of MS Excel program in the direction of the intended objectives, and the obtained data was analyzed.

3. Findings

The distribution of the authors as per the states is listed as seen in Graph 1. According to the analysis performed, it is being observed that most of the researches on AR practices used in health services are originating from USA [16,19,22,42,44,45,]. And then Canada is following USA in terms of researches performed on the same [18,20,24,43].

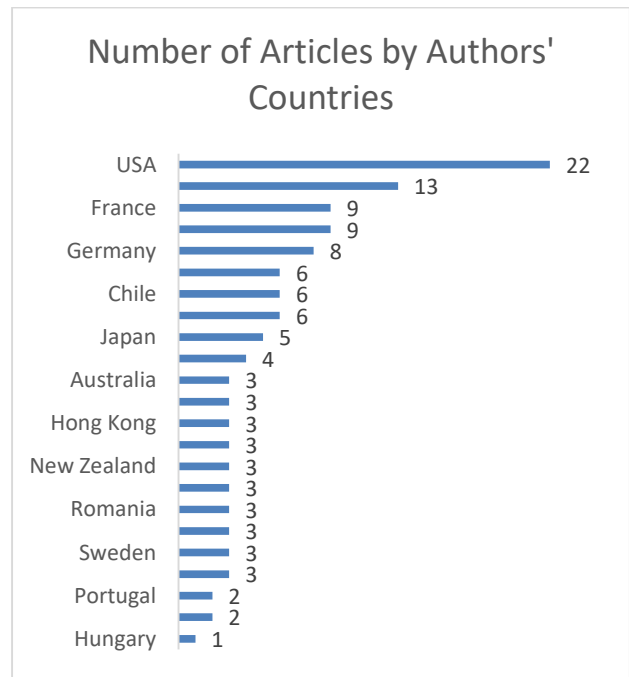


Figure 1. Distribution as per states of AR studies performed in the domain of health

And when the research methods used in the studies were examined, it was observed that literature review [8,9,10,13,14,19,33,34,36,40], compilation and AR practices applied on surgical operations were published at a high degree [17,18,20,24,26,35,44]. (Graph 2)



Figure 2. Methods used in the publications on AR practices used in the domain of health

When the fields of application of AR, used in trainings provided in the domain of health, were examined, it is being observed by Graph 3 that it was used the most in the medical education [5,7,8,11,14,22,36,40,43].

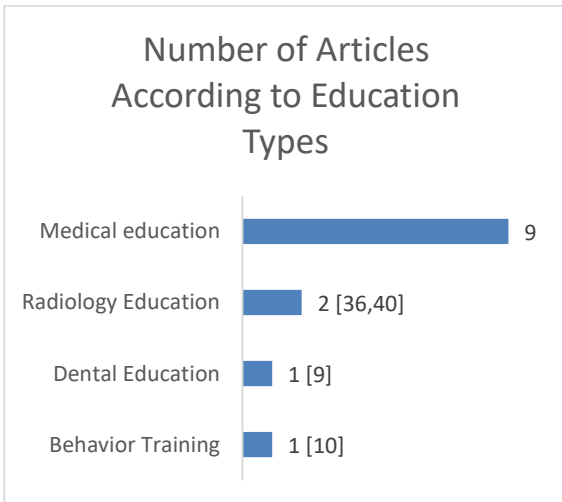


Figure 3. Types of health education provided by AR practices

When articles on AR practices used in surgical sciences were examined, it was observed that the highest number of publications was on the domain of General Surgery as clinical domain [13,17,20,44].

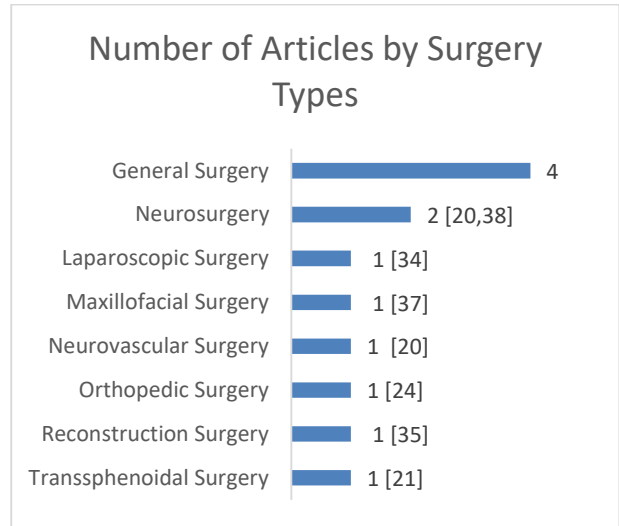


Figure 4. Use of AR practices in surgical branches

And when the key words of the publications were analyzed, it is being observed by Graph 5 that the most frequently used key word was “Augmented Reality” [5,7,8,9,11,13, 14,15,16,17,19,20,21,22,23,26,27,29,31,33,34,35,37,38,39,41, 42,44,45,46], and the second one was “Virtual Reality” [8,9,13, 14,16,25,27,37,41].

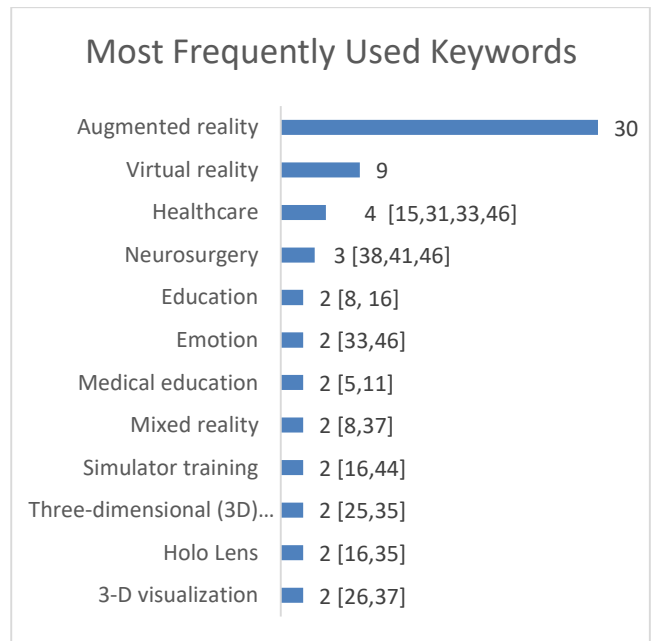


Figure 5. The most frequently used key words

And when number of articles was examined as per years, the highest leap had occurred in 2018 by 20 articles as seen on Graph 6.

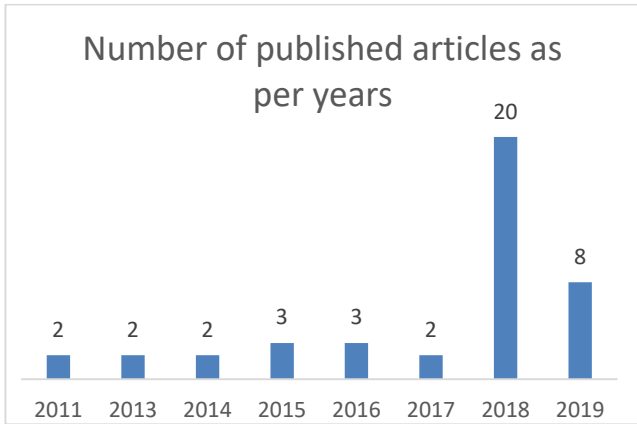


Figure 6. Number of published articles as per years

The following results were obtained by the analysis of journals on which the articles were published

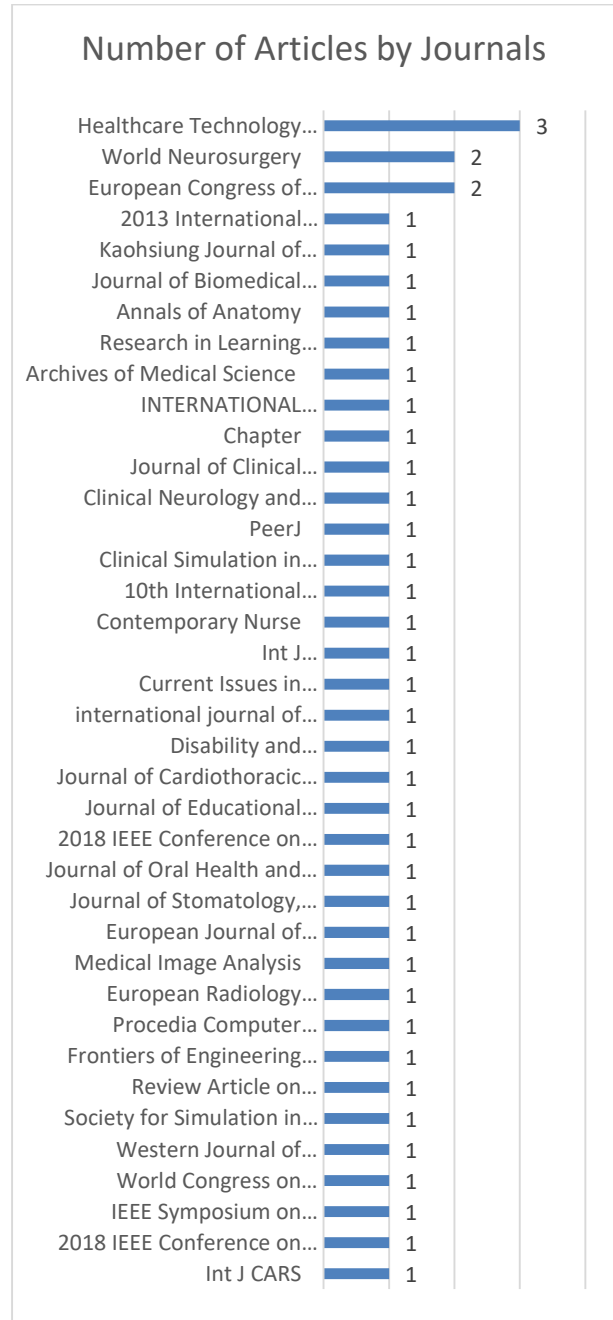


Figure 7. Number of articles by journals

4. Conclusions

According to the obtained results, we observe that AG practices had significantly increased as of year 2018. It will not be incorrect to say that ease of access to the referred services along with the development of AR systems had caused that increase. And along with the increase of malpractice actions in the whole world, it is a reality that the use of practices, that will minimize human error, will increase. It is being anticipated

that this technology will be increasingly used both in the domain of clinics and in the domain of education.

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