

# Applications of Virtual Reality and Augmented Reality

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## ABSTRACT

Will people feel confused when they have lost their way in a big shopping centre? Will people find it hard to understand the abstract concepts when they accept the education? Do people dream about entering the fantasy world and getting an immersive experience while playing games? Augmented Reality (AR) and Virtual Reality (VR) may help us here. A narrative research approach was taken to investigate the applications of VR and AR in these three areas: shopping, education, and game playing. Narrative research helps describe situations around the status and problems people encounter without the help of AR and VR technology. This poster presents analysis and discussion on whether the characteristics of AR and VR can help these problems.

Due to the popularity of smart mobile telephones, AR has become the most popular way to apply AR technology. Developers are willing to create many kinds of Apps and released them on App markets. This is a good start for the average person because there is no extra cost. Of course, enterprises have more advanced AR solutions, but at least, it creates a chance to popularize AR application. Both VR and AR can provide their help in the application of shopping, education and game playing. Because of AR focus on combined computer graphics and the real world, they are more usually applied to shop, work, and study. VR is suitable for immersive application scenarios. Entertainment like game playing is the most powerful area for VR. But the problems like price, safety, motion sickness and other limitation from technology stop the development of AR and VR. Today, they already can apply to many areas. Compared with devices like mobile phone and PC, a long time is still needed to solve problems, develop, and enrich the contents of VR and AR.

**Keywords:** Virtual Reality, Augmented Reality, Analysis, Narrative

## 1. INTRODUCTION

An analysis of the application of AR and VR was undertaken through narrative research. Three different areas were investigated: shopping, education, and game playing. The main aims of the research are finding the problems people will meet in these areas, analysis and discuss how AR and VR application helps solve them. AR and VR technologies are popular in the last few years (Jabil, 2018). They have a long development history (Craig, 2013; Bushey, 2017), so, they are not a new concept. Young people may be more familiar with them, however, there are still many people who have never been exposed to AR and VR technologies (Ravipati, 2016), let alone applying and distinguishing them.

AR is a reality-based interactive display environment. It uses displays, sounds, text, and effects which generated by computers to enhance users' real-world experience (Carmigniani & Furht, 2011). Most of the time, AR is a technology can assist people to realise more detail about the real environments. VR is different, computers allow users to experience virtual things and situations. However, users are willing to believe that they are real. They will believe virtual things are there, and they also will believe they have become part of the virtual environment through experiences in the VR

environment.

The poster is titled "Applications of Augmented Reality and Virtual Reality" and is authored by Yu Chen and Todd Cochran. It is structured as follows:

- Introduction:** A narrative research approach was taken to investigate the applications of Augmented Reality (AR) and Virtual Reality (VR).
- Aims and Methods:** The research aims to find the problems people face in shopping, education, and game playing. Methods include secondary research and narrative research.
- Conclusion:** AR and VR can be used in various ways to enhance user experience. AR is suitable for immersive applications, while VR is suitable for game playing. Both technologies can assist people to realize more detail about the real environments.
- Results:** A flowchart shows the research process: Introduction -> Aims and Methods -> Narrative Research -> Results -> Applications.
- Applications:** A table compares AR and VR across different areas: Shopping, Education, and Game Playing. AR is used for virtual try-on, virtual tours, and virtual museums. VR is used for virtual reality games, virtual reality training, and virtual reality education.

Details about problems people met in shopping, education and game playing became the topic of narrative research. That was triangulated through secondary research, that analysed the literature and discussed the application of AR and VR nowadays and other possible applications these technologies may achieve in future.

## 2. PRESENT, PAST, AND PROSPECTS

Virtual reality (VR) and Augmented reality (AR) technologies are one of the most popular topics nowadays in IT area. PC and smartphone are popular in the last several years, and they are

This poster appeared at the 9<sup>th</sup> annual conference of Computing and Information Technology Research and Education New Zealand (CITRENZ2018) and the 31<sup>st</sup> Annual Conference of the National Advisory Committee on Computing Qualifications, Wellington, New Zealand, on July 11-13, 2018 as part of ITx 2018.

well developed, even saturated in the market (Thomas, 2014). Comparing to these devices, commercial VR and AR are so young but have an unlimited possibility. Their development has made rapid progress, combining many new kinds of hardware, software, and sensor technology. As a kind of new device and technology, the features and special functions of AR and VR can be applied to many areas.

In fact, AR and VR are not new. An English translation of Antonin Artaud's work published in 1958 was called 'The Theater and its Double', which marked the earliest published use of the term 'virtual reality' (Bushey, 2017). In the 1990s, Nintendo company developed a console named 'Virtual Boy', which can make users experience VR games. Because of the technical limitation, this game console had a chunky display. Low-performing processors would only process simple graphics and boring games. The computer scientist Ivan Sutherland developed the first ever VR and AR head-mounted display (HMD) system in 1968 (Schmalstieg & Hollerer, 2016). Because of its weight, it had to be suspended from the ceiling and was appropriately called 'The Sword of Damocles'.

VR can provide a totally different experience to traditional display for users (Gandolfi, 2018). Computers can make a human-created environment and transfer to VR headsets. It makes people feel that they live in this virtual world. Head-tracking system of VR headsets and other motion tracking equipment can sense users' actions and operations to computers, after that, users can get the feedback (Charara, 2017).

For augmented reality, they will usually be used on portable devices like smartphone and wearable equipment. It will use camera or glasses product, computers can make the blend the virtual things and models in the real scene.

Because of these specialties of VR and AR, have a broad application prospect.

### 3. FINDINGS AND SOLUTIONS

According to narrative research, "problems" (as listed in table 1) that happen in Shopping, Education, and Game playing areas were investigated.

**Table 1. Problems that were investigated**

Areas	Problems
Shopping	<ol style="list-style-type: none"> <li>1. Customers easily lose their way in the supermarkets and large shopping malls.</li> <li>2. First time shopping in a new store, customers don't know where to start.</li> <li>3. Information labels are settled in wrong places will let customers choose wrong items.</li> <li>4. Customers need an interesting and convenient way to enjoy shopping, rather than make shopping a burden.</li> </ol>
Education	<ol style="list-style-type: none"> <li>1. Abstract concepts are hard to remember and understand</li> <li>2. The education of practice is difficult to execute because of the risk</li> <li>3. A good learning environment is hard to find</li> <li>Enterprises need to spend a lot to train employees</li> </ol>
Game Playing	<ol style="list-style-type: none"> <li>1. Traditional games like Chess, Go and Poker can help people thinking but they are a little boring because they have not enough visual impact</li> <li>2. Video games make some players indulging in and refuse to go out, it may cause them to lack sports and social activities</li> </ol>

Solutions to these problems have been identified as follows. AR Indoor navigation, commodity scanning, and AR simulator provide a kind of solution for shopping problems. In the education area, AR books add many elements like specific models, anime, videos, sounds, situation example to help students understand concepts. Contents will not only include boring words and pictures like traditional books. For game

playing, Digitally Superimposing make characters in AR games looks like in real world. Location-based AR games like Pokémon Go encourage players to walk out and make a social with other players.

The feature of VR is immersive. So, the application of VR to shopping area is virtual simulated stores. It provides a novel and interesting way for customers to enjoy shopping, stay away from crowded areas and having to wait. VR education provides a solution that creates a good learning environment, avoiding the risk of practice education because everything is virtual. Enterprise also can use VR to train their employee with high efficiency and at low cost. VR games provide a new way to make players feel excited. Now, they could enjoy the immersive game experience which only can happen in dreams before.

### 4. CONCLUSION

Although AR and VR have been commercially available, safety problems, high price, complicated using steps, motion sickness and risks limited the application of AR and VR. Development of technology can improve a part of problems. As time goes by, AR and VR content will be made and become rich. But it still needs a long time, much money and people's attention.

AR and VR have shown their possibilities, and if they continue to grow, they will change not only just these four areas but also will include in manufacturing, healthcare, entertainment, travel and so on. Like computers and smartphones, VR and AR have the potential to radically change the structure of each area. Thus will be a subject of on-going research.

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