



Exploration of Virtual Reality-Based Online Shopping Platform

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Abstract. The first online shopping transformed traditional shopping experience with the development of computer and network in 1984. In traditional shopping, people are able to physically interact with the products by multitude of senses: sight, hearing, taste, smell, and touch before making a purchase. In contrast, online shopping is totally different: people are restricted by the size of 2D screen and can only use the “browser to search keywords” or the “classification” to find the products of interest. Both shopping behaviors have their advantages to satisfy human beings. Therefore, the challenge of this research lies in how to create a more natural online shopping platform by incorporating online shopping and physical shopping? This research aims to use Virtual Reality (VR) device as an alternative bridge to break the boundaries between physical and virtual shopping stores. Our long term project is to create a “VR online shopping platform system”. While this research focuses on the preliminary stage to explore the simulation of VR online shopping platform, the future study will implement the system and apply it to Amazon and evaluate the possibility and feasibility.

Keywords: Online shopping · Virtual Reality

1 Introduction

Computer and internet have changed our spatial experience, and created a new space—“virtual space” (Liu 2001). To understand how human beings in the digital age experience new virtual space, researchers compare the experience between physical space and virtual world (Mitchell 1996; Liu 2001; Huang 2002). Virtual space is defined as imagination of artificial world and could serve as an alternative way to represent drawings, graphics, perspectives or nowadays animation, movie and online media (Huang 2002).

Meanwhile, the technology of Virtual Reality (VR) was invented to improve realistic experience in virtual space (Sutherland 1968) and has been widely discussed and used since 1990 (Mazuryk and Gervautz 1996). There are three main elements in VR: immersion, interaction and imagination (Burdea and Coiffet 1994). To make the VR experience approaching reality, “3D computer simulation acoustic scenes” has become an important component of VR environment (Vorländer 2007). In combination

with internet, a social network-based VR platform—Second Life (SL)—was created (Dawood et al. 2009) and used to enhance the 2D art experience in physical museums (Huang and Han 2014).

In late 20th century, Cyberspace rapidly became an alternative ‘place’ where daily human activities (such as economic, cultural, educational, and online-shopping) take place (Kalay 2006). The first online shopping system—“TV shopping” was created by Aldrich in 1979. Jane Snowball became the first TV shopping user to successfully make a purchase from TESCO website at home in 1984 (Kasana and Chaudhary 2014). In 1995, eBay and Amazon created the earliest and widely used online shopping platform (Kimberly 2007). By 2000, online shopping has been pervasive into our everyday lives. Most researchers focused on the issue of online shopping behaviors (Jarvenpaa and Todd 1997; Suelin 2010), shopping preferences (Wu 2003; Overby and Lee 2006) and shopping privacy (Hoffman et al. 1999; Miyazaki and Fernandez 2001). However, there is little emphasis on the differences in shopping environment between physical and virtual space through the perspective of “architecture space”.

2 Problem and Objective

Since 1980, with the advent of personal computer (PC), and the development of Internet, the first “online shopping” was made possible. In 1984, the first online shopping behavior—TV shopping behavior started to challenge the traditional shopping. In traditional shopping, people are able to directly interact with the products through multitude of senses: sight (ophthalmoception), hearing (audioception), taste (gustaoception), smell (olfaoception or olfactoception), and touch (tactioception) before making decisions (see Fig. 1).

On the contrary, online shopping is different: customers are restricted to the size of 2D screen and use the “browser to search keywords” or use the “classification” to find the products of interest. The number of items shown on the screen could be limited to approximately five products per page (see Fig. 1). However, users are able to quickly navigate among different shopping stores (e.g. drugstore, supermarket, shopping mall...etc.). Moreover, through internet, users could easily browse the items/stores across the world, which is not achievable in the physical world.

However, there are many limitations in current online shopping—the shopping experience, shopping environment, interface, or even the screen size are totally different from the physical shopping stores. The challenge of this research lies in the creation and simulation of online shopping from physical shopping experience. How can we create a more intuitive natural online shopping platform by incorporating the physical experiences into the virtual space?

VR has recently become a popular and inexpensive device and could be widely incorporated into multiple fields, including entertainment, health and architecture of our daily lives. Coates (1992) defined VR as an electronic simulation of environments experienced via head mounted eye goggles to enable users to interact in realistic 3D situations. This could be used as an alternative bridge to blend the boundaries between physical and online shopping stores. Our project is to create a “*VR online shopping platform system*”. Here, we present the preliminary stage: explore the possibility of VR

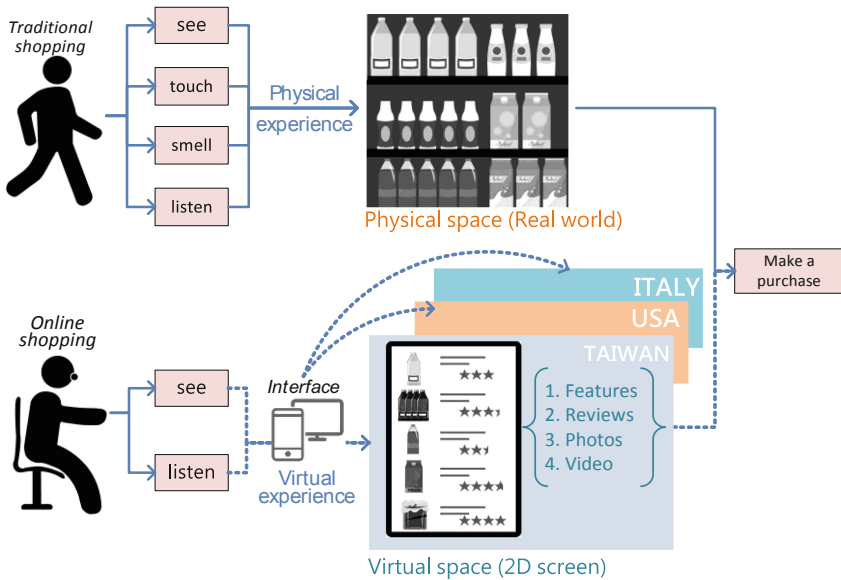


Fig. 1. Comparison between traditional shopping and online shopping

online shopping platform. The objective of this research is to create a “scenario of VR online shopping platform” according to the experience of online shopping, physical shopping and playing PS4 VR games.

3 Methodology and Steps

The project of “VR online shopping platform” has two stages: “the exploration of VR online shopping” and “VR online shopping platform”. Since this is an ongoing project, the research we only discuss the first stage—“the exploration of VR online shopping”. There are two steps for the methodology:

Step 1. Discussion of Shopping Experience and VR Manipulation.

In order to understand the advantages of online shopping, we designed a sequence of experiments to discuss the user’s shopping experience. The experiments include: questionnaire, observation and interview.

Step 2. Scenario of VR Online Shopping

We created a scenario to demonstrate the concept based on the results of Step 1.

4 Discussion of Shopping Experience and VR Manipulation

Our experiments recruit ten people, between age of 20–40, with over one year of online shopping experience, as our subjects. The experiments included “questionnaire”, “observation” and “interview”.

4.1 Shopping Experience

Environment. We chose Amazon, Pinkoi, PChome Taiwan and Books.com as our test model to evaluate online shopping interfaces to understand how users chose to shop online and their preference. Most subjects prefer the platforms with simple, clear description, and interactive display, such as Amazon and Pinkoi. They believed that too much decorations and advertisements would disturb the shopping experience. As to the display styles, the results are not consistent: 50% subjects prefer the single product display, the other 50% subjects prefer scenario product display.

On the other side, since the VR environment is not restricted to the 2D screen, people can navigate the virtual environment in 360 degrees as reality. We interview the same subjects to understand the preference of three future online shopping concepts (Fig. 2).



Fig. 2. Concept of VR environment

90% of the subjects prefer the miniature scene as the future online shopping environment. The best thing is that users can quickly take a glance of the whole category in one shot because of the enhancement of the viewport. Also, the users are able to navigate between different stores around the world.




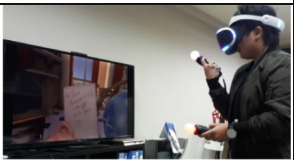

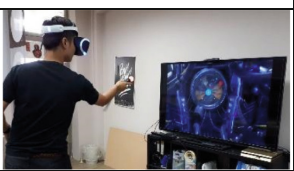




Shopping Process. As in the traditional shopping space, users need to follow the paths and the category signs to find the products. There is usually one kind of categories to display products in one day. Nevertheless, same as online shopping, the users are able to quickly switch the filter to find the products by “key words”, “multiple categories”, “price” or “review”. Regarding the filter priority, we found users set “price” most frequently, and followed by “brand” and “review”. Every user agreed that the filter option augmented the efficiency of online shopping.

Final Decision, Assistant and Shopping with Friends. It was not possible to physically test the products, thus, most users relied on the “review of the products” (especially the numbers of stars), “comparison of products” and “online-assistant” to make the final decision before purchasing. As to the shopping assistant, the users would like to shop alone but only when they needed. For the shopping list, most users do not prefer to share the shopping list to the public, but they were happy to shop with specific friends or family. Nevertheless, some subjects prefer shopping with friends or family but some are not.

4.2 VR Manipulation

To explore the possibility of VR manipulation, we study the most immersive game—“*Batman: Arkham VR*” through PS4 VR device. We chose ten subjects (same as previous experiments) to navigate the VR world. By wearing the VR headset, every user is able to completely immersive into the virtual world. The users are able to interact with the 360-degree display scene around themselves based on the system—“6DoF (six degrees of freedom)” which plots your head in terms of your X, Y and Z axis to measure head movements forward and backwards, side to side. In the VR game “*Batman: Arkham VR*”, the users can naturally and smoothly make the actual poses interacting with the virtual environment as well as in reality: such as “hold and drag a box”, “hold and flip the postcard” and “pick up/drop off and push” or “see and turn the head” (see Table 1.).

Table 1. Controller in VR world

Action	Description	Controller	Demonstration
Hold + and drag	The user pressed the button and drag the mortuary cabinet.		
Hold + flip	The user pressed the button and pick up a postcard and flip to the back.		
Hold + throw out	The user pressed the button and throw out the darts.		
Release + touch/push	The user touched the vial from the table		
See + turn head	The user is turning head to browse the environment around him in virtual world.		

5 Scenario of VR Online Shopping

5.1 Features of VR Online Shopping Platform

Based on the result of our study, the “VR online shopping platform” includes the following features:

1. Environment: Since most users preferred simple interface without frame or decorations, we built the glass-like display as the interface in 3D environment. Also, we started with a miniature viewport to make the users easily filter the stores, features, prices around the world.
2. Interaction: In virtual reality, users could naturally use hands grab a product and simply rotate the product smoothly in order to see the detail of the products.
3. Shopping assistant: We use the voice control avatar to be the shopping assistant (like Siri on iPhone). The assistant will be available whenever requested.
4. Social network: The system is connected to social network and the users can send the requests to other individuals to shop together.

5.2 Scenario Demonstration

We built a scenario to demonstrate the possibility of VR online shopping platform based on the features included above. The scenario demonstration is as below:

Emily wanted to buy a pair of headphones, so she wore the VR headset and hold two controllers to get into the VR online shopping. First, she started at the home spot with multiple shopping ports (by category). She turned left her head and call “Amy” to wake up the assistant and commended by saying “find headphones” (Fig. 3A). The environment switched to the headphone show room. Emily started to go shopping in the 360-degree display scene. She used her hand to grab a highly-rated headphone—‘Urbanear’ (Fig. 3B), the related floating descriptions were displayed and attached to the product (Fig. 3C). Since she was still undecided and wanted to review all other high-rated headphones, she pressed the four-stars icon to pull out all four-stars headphone (Fig. 3D). Finally, she decided her favorite headphone and she easily put it into the shopping cart. Emily would like to shop around the clothes, so she swiped out to go back to home spot (Fig. 3E). She selected the brand—‘Uniqlo’ (see Fig. 3F), the environment changed to the Uniqlo store. Then she wiped left to browse the clothes. Suddenly a banner showed up—“her best friend Yumi requested to join her shopping” (Fig. 3G). Emily responded “yes” to accept the request (Fig. 3H). Finally, Emily was shopping together with Yumi (Fig. 3I).

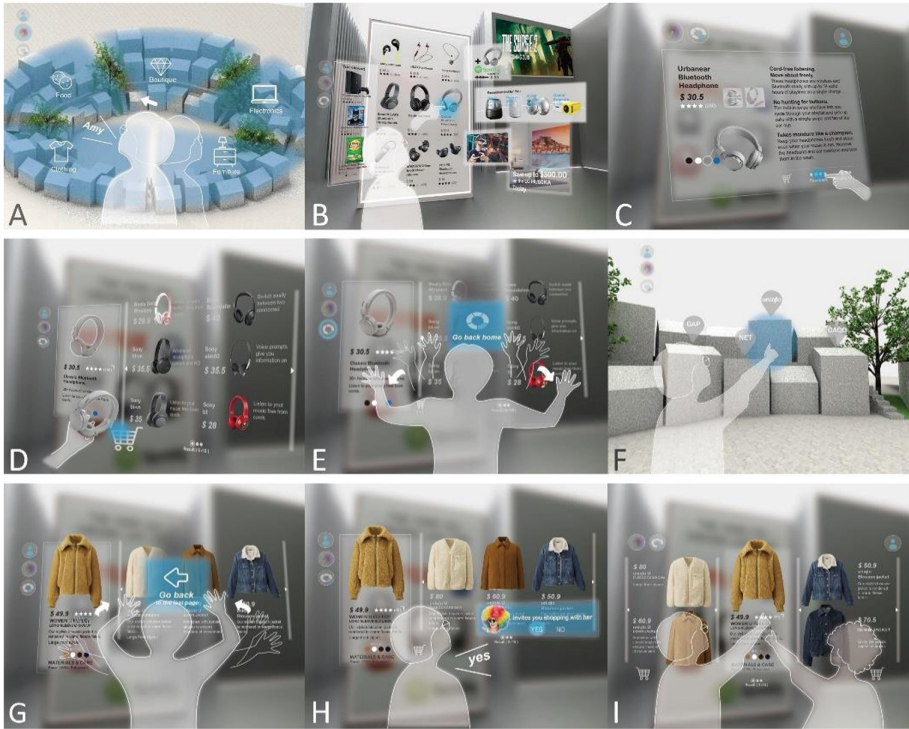


Fig. 3. Scenario demonstration

6 Concluding Remark

Through the scenario, we expect the users to smoothly, conveniently and appropriately shop at the VR, and even better than physical experience. Simulating a realistic shopping mall that people might get used to could be easier. Our research incorporates virtual reality and challenge to provide a more natural and intuitive shopping place for human by creating a VR online shopping platform. VR world is not limited by the restrictions in the real world, such as the gravity, size and style. Our research is still an undergoing project with multiple ideas yet to be tested in a real VR online shopping system. Our future study will apply the system to Amazon and evaluate the possibility and feasibility.

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