

## NEXT GENERATION MARKETPLACE SIMULATION USING VIRTUAL REALITY TECHNOLOGY

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### ABSTRACT

With the current boost in virtual reality technology, there has been in line development and research in vast range of application areas. One such application areas, is that the use of VR to enhance the remote shopping experience. In this research, a VR products shopping application was developed and verified. The work presents two main contributions to the established order. First of all, suitable navigation methods within the shop as a key activity of products shopping were studied.

Therefore full body tracking, using multiple sensors, were merged within the VR application allowing natural navigation within the virtual environment by a walking in place approach. While the research of this study support previous studies on important specifications for remote products shopping, it unleashes specific requirements for VR grocery shopping.

Currently, most consumers shopping can be categorized as occurring physically through brick and mortar stores, or taking place digitally, through online websites. While each of these shopping modalities have their own advantages and disadvantages, the recent rise of consumer virtual reality hardware has enabled the possibility for a new type of shopping modality that may combine the best features of these existing methods. Yet, little is known on how virtual store should be designed to optimize the customer experience.

**Keywords:** Virtual Reality, VR Shopping, Immersive User Experience.

### I. INTRODUCTION

With the recent development of advanced computing technologies and rekindled interest in virtual reality since 2012 there has been consistent development and research in a wide range of application areas. In addition to this, e-commerce has had an huge growth in the last couple of years and worldwide e-commerce retail sales is projected to more than double from 2015 through 2021. However, products which consists a significant part of the global retail market has not attained a proportional adoption on the e-commerce scenario. Traditional web and mobile products shopping applications present items only as 2D pictures and text based information, and still fall short of delivering a complete remote grocery shopping experience. Virtual Reality grocery shopping has been seen to improve the shop from home that is remote grocery shopping experience. This study presents a virtual reality grocery shopping application, delivering a complete experience of the grocery shopping activity in virtual reality. In this study, navigation in the grocery store is identified as a central activity of grocery shopping, hence it presents a walking-in-place navigation solution, with full body tracking using two Microsoft Kinect v2 sensors. In couple of past years, 3 R has become productive tool in activities such as planning, guiding and training in different fields. Google, Microsoft, SONY, HTC, and others have joined the research of 3R to develop their own 3R products and occupy the market share. Virtual reality technology is a kind of computer simulation system which can create a virtual space. It uses the computer technology to generate a simulation environment that is a multi-source information fusion, interactive three dimensional visual scene and physical behavior system simulation. The potential of VR is to reimagine reality, to personalize it – to allow customers to interact as if it were in an actual location. 2D interface for both product display and navigation: Pictures of products, Hierarchical navigation through menus. 3D skeuomorphic interface for product display and navigation. Current online shops do not offer enough of an immersive shopping experience. Provide an experience similar to shopping in an actual mall through virtual storefronts with immersive experience. Virtual Reality Replicates an environment and simulates customers

or we can say that the user's physical presence and environment to allow for user interaction and sensory experience. Use VR to create digital versions of physical stores.

This technology enables opportunities to incorporate features of electronic shopping and physical shopping. Navigation and object manipulation in immersive virtual environments. By touching the third view or we can say third dimension of the product and an environment, VR provides a more Futuristic and advanced form of visualization. Customers can handle or view any product all the way in 3 dimensional view and can be inspected from all angles with pop-up features or specification windows.

We can get the large amount of data that can be helpful for the business (e.g. how long someone looks at an item, which items they looked at prior to picking up an item, shopper behavior, etc.) In-store VR navigation Reduce the time to product engagement by ensuring users or customers can find their desired product as quickly as possible. Helpful to retailers for analysis and planogram optimization enabling the ability to adjust layouts quickly or use customer feedback to compare layout performance. Full Virtual Reality solution where shoppers buy in a digital world and have their products or groceries shipped to home. Examples of additional unique useful features: illuminated expiry for groceries, illuminated item details. In manufacturing field, Virtual reality, augmented reality and mixed reality technology can provide new ways or approaches to industrial manufacturing by developing a new environment in which virtual and physical objects can coexist and merge, providing a more immersive environment and a more naturalistic way of interacting.

## II. METHODOLOGY

Use Virtual Reality (VR) to create new shopping experiences emphasizing on greater customer satisfaction, improved performance and usability of online shops' user interfaces, provide the user with interactivity and information in an appropriate and supportive manner.

A. **Virtual Reality Headset:** A virtual reality (VR) box or we can say VR headset box, is a head mounted device that provides virtual reality environment for the user. Virtual reality (VR) boxes are vastly used with video games but they are also used in other applications like simulators and trainers. They are consists of stereoscopic head mounted display (providing separate images for each eye) or we can use a device that don't have inbuilt screen, instead at that place we can insert mobile with VR app installed in it, stereo sound, and head motion tracking sensors (which may consists gyroscopes, accelerometers, magnetometers, structured light systems etc.). Some virtual reality devices also have eye tracking sensors and gaming controllers.

B. **Virtual Reality Controller:** Controllers for the VR project are a key part of the overall customer/user experience, especially for Virtual Reality (VR) applications. Virtual reality controllers merged with the Virtua reality headset to capture natural hand movements in order to control objects in the virtual world, thus allowing the user to interact with the virtual surrounding environment. Foremost to the functionality of controller devices are the sensors that senses the location and movement of the user respective to the images displayed on the mobile screen or headset screen and the real time communications between these devices.

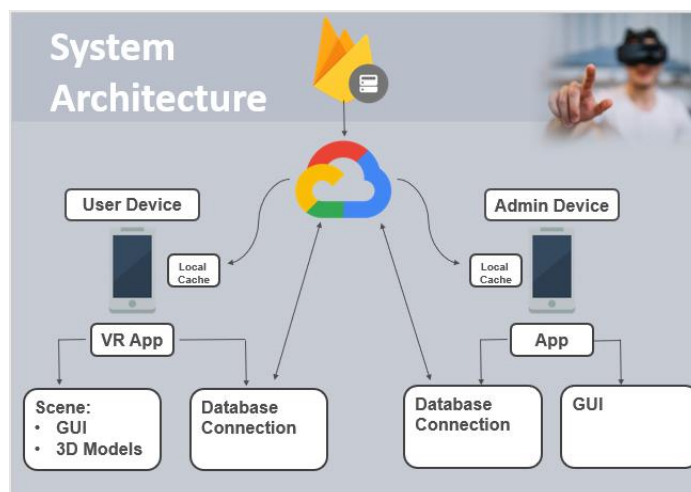


Fig 1: System Architecture

**A. Frame 1(Login frame):**

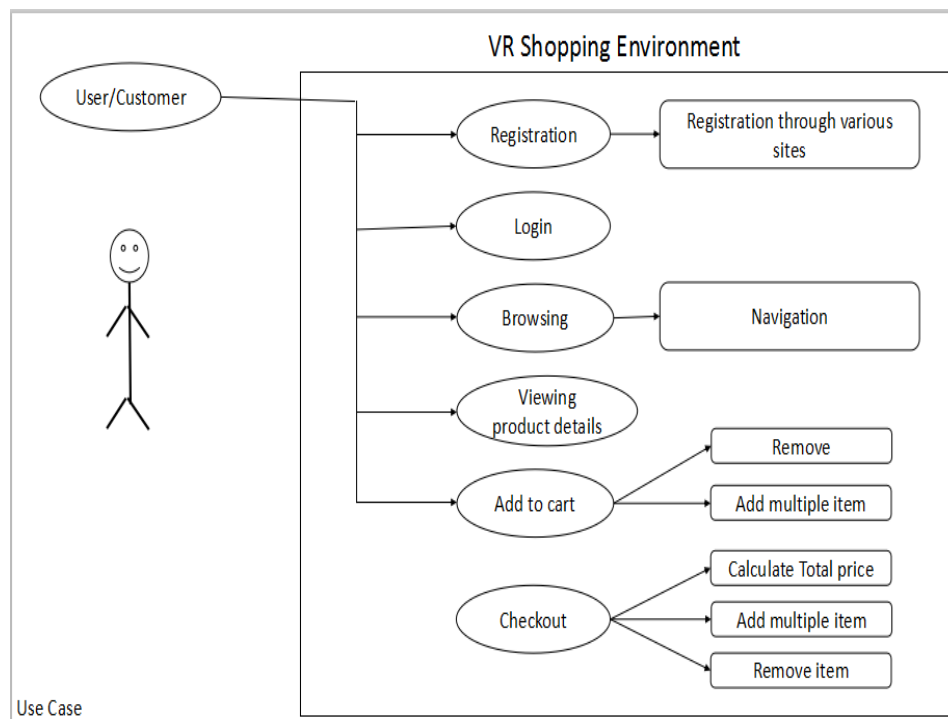
1. **Login Button:** The user will have to enter the username and password and log into the system.
2. **Sign up/Register button:** If user is the new user, he/she need to go to the sign up page using sign up button and register himself/herself and then can login into the system.
3. **VR environment button:** Upon clicking on this, user will enter into VR Shopping Environment.

**B. Frame 2(VR Environment):**

1. Navigate into the VR Shopping Environment using Bluetooth VR controllers.
2. Move the controller colloidal on the item/product which he wants to buy or want to check the details of it.
3. Details of the item/product will get popup in 2D manner.
4. The selected item/product will get pop into the air and will roam around itself in 360 degree to give the attention to details of the product.
5. User will use add to cart button to add the item which he/she wishes to buy.

**C. Frame 3(Checkout and Bill window):**

1. User will use the checkout button to proceed to the billing window.
2. After checking out, the list of all the selected items will be displayed on the screen.
3. User will have add and remove button on the selected item list to add multiple similar items in the cart and also to remove/delete the selected item from the cart.
4. After this, upon pressing the proceed button, system will generate the bill for the selected items and option for online payment and home delivery will be displayed.



**Fig 2:** Use Case Diagram

**III. MODELING AND ANALYSIS**

The current ways to shop are e-commerce sites like amazon, flipkart, snapdeal etc. and conventional brick and mortar shops. We do not get 3D effect of products while shopping from these websites and also we cannot get the effect of shopping physically in mall or shops. To overcome these drawbacks this project will enable various ways to shop from home using Virtual Reality Technology and will give 3D skeuomorphic interface for product display and navigation. It will provide an immersive shopping experience along with an experience similar to shopping in an actual mall through virtual stores. Following are some screenshots of the project:

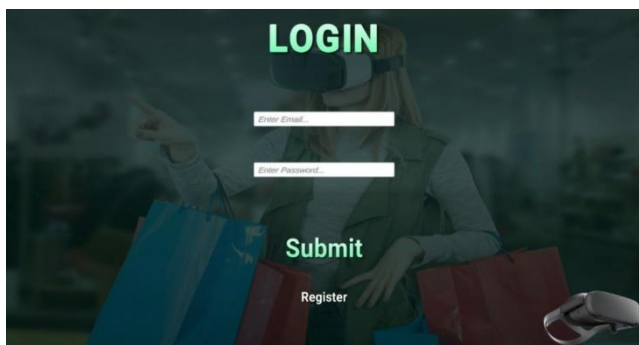


Figure 3: Login Page

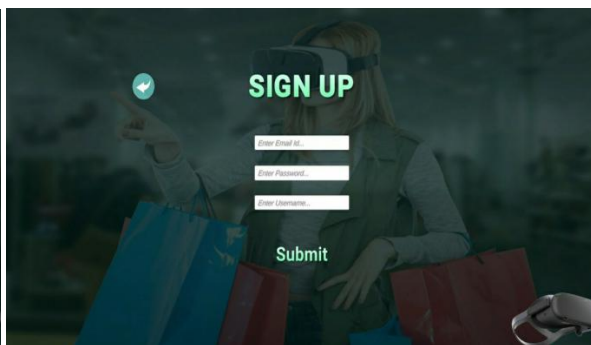


Figure 4: Sign Up Page



Figure 5: VR Environment

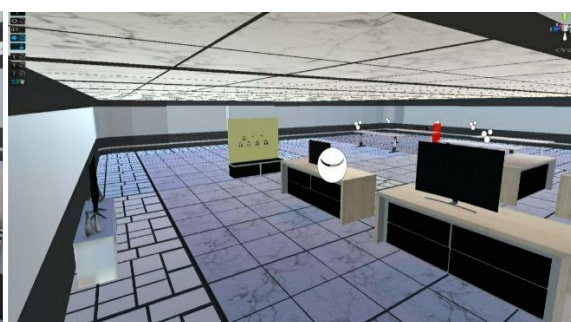


Figure 6: VR Environment



Figure 7: Cart

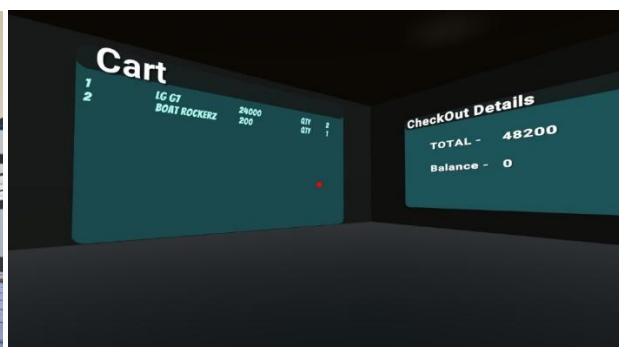


Figure 8: Bill

#### IV. CONCLUSION

Virtual reality has seen an explosion of interest among marketers as it enables to overcome constraints of current e-commerce and has a potential to test diverse scenarios, which will be unfeasible.

The exploration in this research requires an interdisciplinary approach combining aspects of computer science, design, human computer interaction and marketing.

Successful implementation of this project will enable a new way to understand UI/UX design and development for VR shopping and provide practical implication for multidisciplinary fields.

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