

# 3D BROWSING USING VIRTUAL REALITY

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## **ABSTRACT:**

From the time when internet came to the picture, we have known browsing the same way how it first came up. Internet has a number of websites each referenced by a URL and a set of individual web pages constitute the website. The very first browser used the URL links to access the webpage and displays it to the users in 2D format. This format is still the same even now after so many advancements in technology. The last few years has seen a steep rise in the Virtual Reality and Augmented Reality technologies and it is quickly reaching a stage where VR is no more seen as a fascinating dream and rather looks quite possible to be implemented. The concept of using VR for browsing came into the picture when JanusVR, the first proper 3D browser was released. In this paper, the main objective is to analyse the potential shortcomings of the current 2D Browsing system, introduce 3D Browsing by Janus VR, the use of oculus or similar VR devices and to give suggestions of how VR can play constructive roles in improving the browsing experience for users. Also, two case studies I had performed with my experiences in developing 3D websites are discussed. This paper would act as a baseline for readers on why 3D browsing can improve user experience and redefine the use of internet and websites.

## **1 - INTRODUCTION:**

Internet has been in the picture for about 25 years now and the first world wide web project was started in August 1991<sup>[1]</sup>. Since its invention, the number of websites existing live has always been rising up along with the number of users using internet. A little analysis on the history of the internet and the number of websites, we can infer a trend. In the year 1993, there were a total of 130 websites and on an average 108,935 users use a website. In 1998 which was the year Google was introduced, there were 2,410,067 websites were live whereas only 78 users use a website on average. Currently, in 2014, an enormous number of websites were live - 968,882,453 and only 3 users use a website on an average. Looking at these stats, the main reason for this decrease in average number of users per website is the uncontrolled increase in the number of websites that goes on live every year and the fact that the number of users does not rise as much to cope up with this. Also, a lot of past websites are no longer maintained or used. Around 75% of the websites today are no longer visited by anyone.

The above trend shows that the internet structure has somewhat stagnated and a change in the system of browsing could be a potential solution to bring in new uses for websites and improve the user experience of browsing.

## **2 - BACKGROUND:**

### **2.1 - Disadvantages of 2D browsing**

In this section, let us analyze what are the drawbacks in the existing 2D browsing system. Rather than calling it drawbacks, these can be seen as possibilities of exploring new horizons in browsing which cannot be done without making a change in the system.

Firstly, the amount of text in 2D browsing often gets too congested as there is the restriction of the space available. 2D browsers have to deal with any website only between the height and width available from the monitors in which they are viewed from. Although scrollbars are existent, they are not as convenient for normal use and stats from the Mozilla UI heat study<sup>[2]</sup> reveal that the down arrow for vertical scrolling has been used only 34% by internet users as of the data available in July 2010. This shows that any website has to showcase all their priority information in the front page with just the available width and height without using the scroll bar. Else, there is a definitive chance of the user missing out on seeing vital information if one does not scroll down.

Secondly, in the usual 2D browser, the aspect of reality gets lost totally. Agreed that most of the websites do contain information in general but some websites like real estate sites, marketing sites, estores, etc.. are some of the concepts which the users are used to using the actual physical method from the past. For example, users have been used to buying clothes from shops. Some of them hesitate using e-stores to do these kind of purchases even after making the system extremely secure. With growing demands, it is not possible to keep opening physical shops everywhere. The e-store market is surely one to grow many folds in the near future. If the e-stores are made as realistic as possible as the real stores, it will improve the comfortableness of the internet users to make their decisions to use these stores online. Reality plays a vital role in these domains.

### **2.2 - Advancements in virtual reality over the recent years**

Virtual reality is comparatively a novel concept to the industry. The first traces of virtual reality goes back to the 1950's when Morton Heilig built his prototype of the very first work of science fiction and virtual reality application called the sensorama. Many years, it had remained slow in progressing. Over the last two decades is when Virtual Reality has attained enormous advancements and presently VR has become economically feasible for commercial purchases by normal users. The cost has come down so much that VR headsets are sold along with

smartphones as freebies. And seeming a coincidence is it is the same period when internet was introduced and has grown too.

Virtual Reality applications now vary from the set of tutorials and 3D tours used in real estate companies, virtual training, driving simulators and gaming. Some really advanced software are in place to build 3D models like blender, autodesk, etc.. The usual complaints of headaches and eye strains using VR headsets have also started to decline and in the near future, with more research, VR headsets will become as smooth as normal displays.

### **2.3 - 3D Browsing**

The main aim of this literature paper is to introduce what is 3D browsing and how it can be promoted as an effective alternate to the current 2D browsing system covering up for its flaws and adding many new functionalities. 3D browsing is a concept by which the users browse the internet websites specially built using 3D models, making it more real rather than just text and links and these specially built websites will work both in 3D and 2D browsers. The difference being just that in 2D browsers the extra dimension will be lost and just the information is displayed as text as is the case with normal websites.

3-Dimensional browsing has the following advantages over the conventional browsing system:

- No space constraint - As we saw earlier, there is no space constraint in 3D browsing because users have the liberty of moving through the browser to view different webpages and information rather than looking at the one display.
- Added reality - 3D websites tend to be more real because of the advanced and perfect 3D models built using the software available. The users tend to feel the website to be a part of their own environment and feels all the more natural.
- Attractive - 3D websites look a lot fancier than the normal websites as they have high resolution 3D models and involves the user interactively to run through them.

### **3 - EXISTING SYSTEMS:**

In this section let us look at the currently available systems for 3D websites or application platforms.

#### **3.1 - Virtual Real Estate Tours**

Over the last few years, real estate agencies make use of virtual reality by making VR tours of the homes available to them and they upload it online. This, though similar to the concept of adding video of the houses, it has a higher impact. By virtual tours, users still view the houses

online using their normal browsers, but the difference is they can move through the house back and forth using certain event logger keys. This is similar to moving in a game and usually arrow keys are used to traverse through the virtual tours.

The main concern in implementing the virtual tours is the collision node detection and handling<sup>[3]</sup>. The users can easily tend to collide with objects or the wall of the house and since no sensors are going to be used in the normal browsers, the event loggers and the directed distances need to be handled to cope for any collision and must avoid such collisions.

### **3.2 - Virtual Reality Gaming**

Gaming industry has always been one where innovation and creativity is always the need of the hour and this is where technology advancements are used then and there constantly. The trend in games has been that no game will last for a very long time and regular modifications and additions are at least needed based on the current market strategies for a game to survive. This is true even with Virtual Reality. Along with the advancements in VR, gaming giants have also started stamping their authority over the VR game markets. There are several Virtual Reality games in the industry and a lot more is to flood the market in the near future with products like the Oculus Rift releasing at economic costs.

Playstation and Xbox, the console gaming supergiants also make efficient use of these VR advancements and they have released several products like the Xbox kinect, PS Driving simulator, etc.. VR Gaming is certainly on the upward surge already and in a few years time they will start dominating the gaming arena.

### **3.3 - JanusVR Web Browser**

This is the application which realises the main aim of this paper - 3-Dimensional browsing. JanusVR (<http://www.janusvr.com/>) is a 3-dimensional virtual reality browser developed by James McCrae. It changes the traditional scenario of viewing web pages on two dimensional monitors. Virtual reality has a lot of potential in web technology in the future with the advent of Oculus Rift and similar HMDs <sup>[9]</sup>. JanusVR is built to work with Oculus Rift. In this browser, every web page is represented as a room with a door and to visit the webpage, users enter through the door rather than just clicking on it. The contents of the web page appear in three dimensions and supports the viewing with the Oculus Rift head mounted display. A defined set of syntax and semantics exists to build web pages which can be viewed in the JanusVR browser. The room to the web page can be chosen from a set of built-in templates or the user can define their own dimensions and create their own rooms. Contents like images, audio, video, text, objects, etc. can be added to the room as assets and various parameters like the speed of traversal, gravity, light, etc. can be controlled through the room by modifying room parameters.

## **4 - DEVELOPED SYSTEMS:**

The below systems were 3D websites which I have developed as part of two different groups over the last year. Both the systems use JanusVR coding libraries and can be run only in Janus VR 3D browser.

### **4.1 - Virtual Reality Museum of Consumer Technologies**

We built a virtual museum using various 3D models of past and present consumer technologies like computers, telephones, printers, etc.. The main goal of the system was to recreate the feel and use of any technology museum virtually and in the form of 3D web pages.

#### **4.1.1 - 3-Dimensional Models**

In our system, we used .obj 3D models to display various technology exhibits as it is the only format supported by JanusVR. Most of the models use mtl files to apply lighting, shadows, detailing to the objects and some of them use multiple image textures to make them more realistic. Our museum prototype has seven models distributed among three exhibit rooms. In our museum, each model was given a description which was placed on a plank next to it as is common in physical museums. In addition to including the standard factual information, we attempted to word the descriptions in such a way that the users were reminded of instances where they would have used the particular or a similar technology, thereby attempting to make them nostalgic when they see the model. When people are provided with content which triggers positive nostalgia, they tend to maintain that throughout the system <sup>[5]</sup>. The 3D models were placed in the middle of each room in order to give the user enough space to maneuver around the model without obstructing any views.

#### **4.1.2 - Audio**

Audio was used in a number places throughout the museum with the intention of enriching the user experience. Upon first entering the museum, a female synthetic voice reads a welcome message. At other points, entering a room or standing near a model triggers sound effects characteristic of the technology being viewed, such as the mechanical beeping of a modem dialing near the fax machine model or the boot up tones of an older Windows desktop. Having audio embedded acts as a tour guide to the museum and the user is more focused and informed about the exhibits <sup>[4]</sup>.

#### **4.1.3 - Image Galleries**

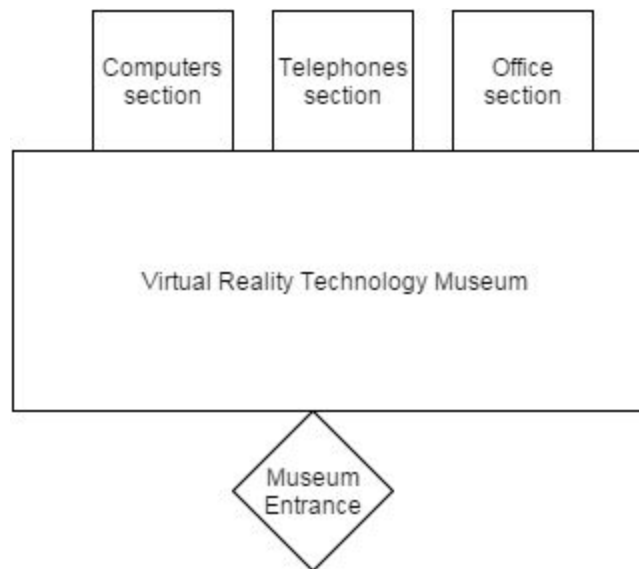
The sidewalls of each room were made to resemble a photo gallery containing displays related to the corresponding section of technology. Every image was displayed with frames in

order to make them realistic. The back wall of every room contained a general description which introduces the user to what they are about to view inside the room.

#### 4.1.4 - Virtual Reality Museum of Technology Layout

The layout of our museum is shown in figure 1. It has a total of four rooms - one for each section of technology covered (computers, telephones, and office equipment) and a main room which serves as the lobby to the museum. All the rooms in the museum have open ceilings. The main reason for this was to induce mood into the users as they step into the virtual museum. Having a sky filled with clouds generally induces memory in people <sup>[6]</sup>. The main room museum entrance is controlled by a single door which the user enters to step into the virtual museum. As they enter this room, an audio clip recorded using text-to-speech software welcomes them to the museum and guides the user of what the museum is made up of and gives directions which would help the user to traverse through the museum. A written description is also placed in the center of the room for the same purpose. The main room contains doors to the other rooms in the museums. The computers section is placed in the left, the telephones section in the middle, and the office equipment room is to the right. The user then moves ahead to view the exhibits set up in these rooms one after another.

**Figure 1: Virtual Museum Layout**



The computers section room has two 3D models - a Bondwell personal computer on the left and an Apple iMac desktop on the right. The walls show several models of personal computers which have been in use over the last three decades like the IBM machines, mainframe desktops, and the evolution of the Windows operating system over the years. As the user enters the room, they are

greeted with the audio of a Windows startup sound and when they get closer to the iMac model, the Apple startup sound is played.

The telephones exhibit contains three models - an Apple iPhone, an old cellular phone, and a cordless phone. The iPhone and the cordless phones have their trademark ringtones embedded to play when a user approaches. The walls show the evolution of mobile phones over the years and how the cellular technology has grown from large dial phones to the latest bendable smartphones. The office equipment room contains two models: a fax machine and a typewriter embedded with sounds that are usually heard when they are in use. The walls show a variety of technology generally used in offices like the copy machines, printers, and calculators.

**Figure 2: (a) Welcome Room 2D View (b) Computer Technologies Section**



#### **4.1.5 - End result**

The final product of the museum was complete with the above layout and models. The completed system was exhibited for viewers and we recorded the reviews of 7 users who went through the virtual museum tour. Surveys were conducted and users were generally satisfied with the 3D browsing experience.

#### **4.2 - Solar System - 3D informative website**

The Solar System was another group project which we did using the JanusVR. We basically wanted to recreate the Solar System using different 3D models for each planets and the sun. It would act as an interactive and informative website with all information about the solar system - in other words would act as an attractive virtual tutorial.

##### **4.2.1 - Web pages in the system**

We had a total of three web pages in our system each of which was opened by a separate door in a Janus VR room.

## Solar System

The Solar system is the main architect of the system. We built 3D models using blender for all the planets and the Sun. We restricted our design to the nine planets and the sun of the milky way galaxy. All the textures applied to the planets were provided by NASA satellite images and the planets were made in proper scaled ratios so as to make it feel as real as possible. Once the user enters the solar system page, he can move near any planet to read information about them. We used the advanced features of VR and we placed the information for each planet inside the planet. So, every planet is basically a hollow sphere with its textures present in both outer and inner surfaces.

Figure 3: (a) Solar system view (b) Earth planet closer view

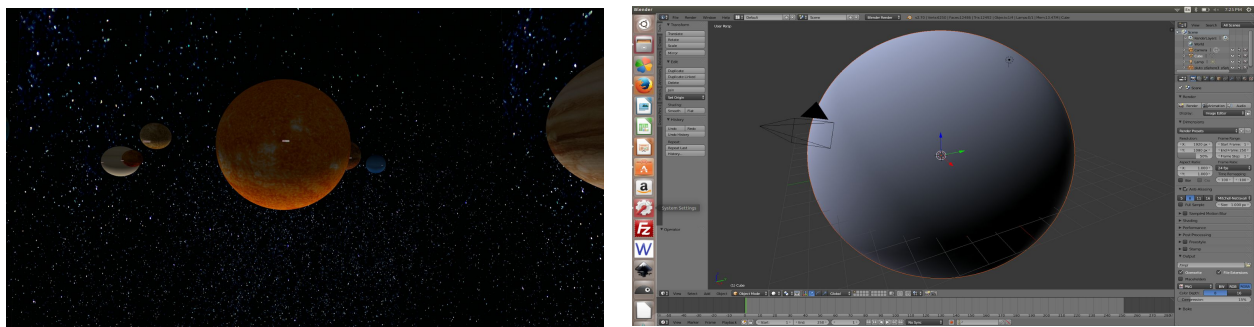


Figure 4: (a) Earth inside planet view (b) Earth description inside room



## Google Page Room

This page was made to demonstrate that 2D websites can also be loaded into the JanusVR browser and normal browsing of the current websites can still continue. This is very important because not all sites can be rebuilt to be accessible in 3D. The 3D browser should be able to display the normal existing websites too and should be interactive.

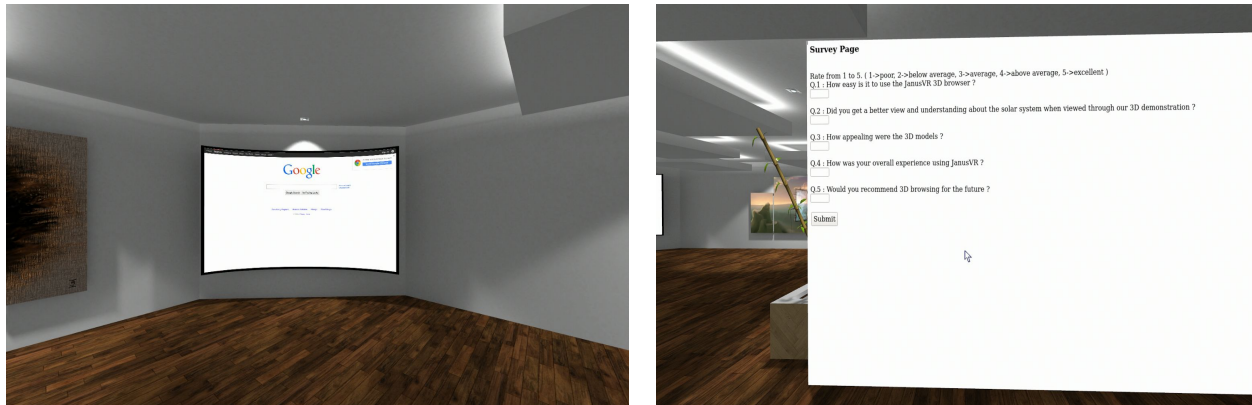
## Survey Page

Finally once the user completes the tour of the solar system, he is directed to enter the survey page room which contains a set of questions for the user to evaluate based on their experience traversing the website. This was created to ensure that backend processing also works



without any issues from the 3D browser. The survey results were stored into a remote database server for future references.

**Figure 5: (a) Google Page (b) Survey Page**



#### **4.2.2 - End Result**

The virtual solar system project was very well received and the users who took the tour felt that the models looked very realistic and they felt that they were truly floating in the space. The Oculus support from JanusVR makes the case even more compelling and the system looks highly realistic.

### **5 - FUTURE OF 3D BROWSING**

JanusVR is just a pilot product and it has been in the scene only for less than 5 years. With further advancements in VR, 3-Dimensional browsing will eventually evolve as a plausible alternative to the current browsing system. There is a huge scope for improvement in the systems we developed and the JanusVR in general. In a few years, with the ongoing research, the flaws in the application will be corrected and 3D websites will be implemented realistically..

### **6 - CONCLUSION**

This paper was written to gather information regarding what is 3D browsing and why is it suddenly coming up in the tech world. The paper discussed the various advantages and disadvantages of the concept and analyzed the various systems currently available for implementing Virtual Reality to web and technology in general. Through the sample systems developed, there is enough evidence to proof that 3D websites are possible to be developed and they have the potential to improve the user browsing experience overall.

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