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Design of Digital Museum System Based on Optimised Virtual Reality Technology

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Abstract

Although China's cultural characteristics were diverse, its museum supply is limited. Traditional institutions would need help to meet the people's needs for culture dissemination, historic preservation, cultural exchange, and science and research in history's era of the internet. By utilising VR Technology in the field of furniture decorating, a new viewpoint and method for the development of a virtual museum are unveiled. Using optimum VR Technology in museum exhibition design based on the ideas of architecture, atmospheric art, light settings, coloring style, and ecological design, humans may be presented with natural and cultural heritages. The advancement of completely separate HTML text languages, QuickTime Virtual Reality innovation, Interactive Virtual Model-based Linguistic, three-dimensional (3D) applications, and data interaction systems for the exhibition has done result from an inquiry into virtual reality's history, definition, application, and present state. Ultimately, the planned work's effectiveness is analysed and compared to other related projects to maximise its efficacy. Using the Origins software, the results of this study are shown.

Keywords: Digital Museum, Virtual Reality, Interior Design, Cultural Traits, Origin Tool

1. Introduction

The virtual exhibit is a repository of photographed and digitised materials, specimens, and publications. Figure 1 depicts a digital museum system that would be completely revealed via exhibition, collection, and research activities, using photos, 3D modeling, as well as other means. There are various advantages to attending a virtual gallery rather than a physical one. Because of the growth of the internet and interactivity, museum resources may now be digitised and disseminated using new media and communication tools. Such virtual museum pieces may become available to our scientific, social, and economic models anytime. The transformation of traditional buildings into digital institutions brings up the possibility of having museum content accessible to experts as well as the public at large all over the world. A digital museum is indeed a virtual organisation in which sets of exhibition artifacts, and a wide range of participatory learning goals relevant to particular topics are placed in an immersive experience, in contrast to a typical catalogue, which also focuses on conserving, cataloguing, attempting to connectivity, as well as monitoring the use of digitised elements. In general, a virtual museum should be more engaging, intriguing, readily accessible, & visually spectacular to grab users' attention through the examination of either the most prominent features of a worldwide virtual team. A significant part of creating virtual museums is using diverse media, data, technology, and dynamic creative creations. Power infrastructure museum software's

computer programming and architecture must include more than simply a traditional library [1]. Natural and heritage groups may be able to reach a broader audience in new ways by using modern technology. Utilising computer network tools and data imaging, universities can now present their whole assets to a wide audience, surpassing the restrictions of the region. So far, the concept of "digital museums" has been limited to a data transmission perspective, primarily emphasising the socio-technical setting for the creative procedure. The approach of the digital museum has been limited to cognitive and retrieval. The approach of the digital museum has been limited to data transfer and retrieval.

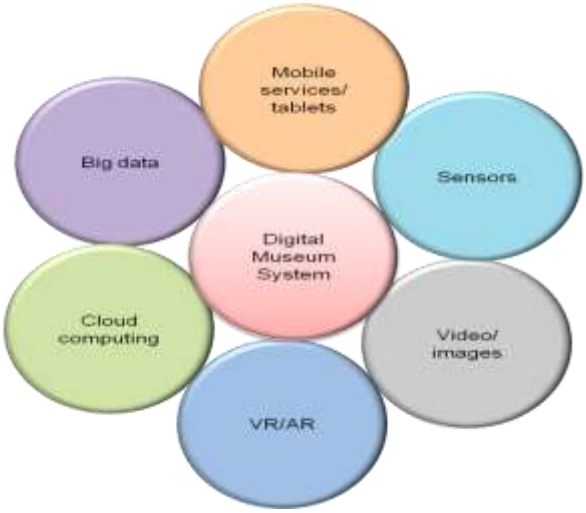

Figure 1. Digital Museum System

Modern virtual museum efforts display a wide range of cultural artifacts as well as the digital representation methods utilised to show them. Among the sampling and measurements is detecting and categorising developing kinds of graphics systems in online organisations. Inside the virtual museum, digital documents containing user engagement are ideal for "labeling" purposes [2].

Virtual reality (VR) is the use of technology means to create a "virtual" world. That was a strategy that combined several data hybrids with active three-dimensional fluid scenes and activities. VR technology, in addition to its realistic features, can effectively blend sound, video, textual, animation, images, and other components and provide training material to people from all perspectives and views. VR screen replicates all anatomic sense capacities, such as taste, vision, hearing, and fragrance, and its better modelling might give users an interactive experience. Virtual reality (VR) uses computer technology to create a "virtual" world. It was a technique that combined several data fusions and participative three-dimensional dynamic landscapes and physical actions. Virtual reality technology is enthralling and fascinating, and the technique and equipment: Interaction is strong relationships with people, which may result in human interplay and device interaction; simulating is a kind of daily life that uses machine designs to imitate truth, while modelling refers to the modelled everyday world life. Virtual reality was increasingly widely used in healthcare, industrial modelling, home construction, entertainment, and daily life. A digital museum is a place that has been built atop the digital environment utilising digital technologies. It violated the geographical and metaphysical restrictions of the actual museum. It changed how information was distributed to every individual, significantly increasing audience engagement and the amount of sharing permitted for collected content. [5] Virtual reality technology has been widely used in creating online museums due to its distinct advantages. [3]

2. Related Works

Designs and implements a highly sophisticated digital museum system employing hybrid VR technologies. [2] In contrast to the current digital museum management solution, this strategy eliminates that time-consuming navigation procedure and tools to support the more diverse and genuine historical artefact data and humanises deep relationships. In explores the design work of an intelligent memorial based on artificial intelligence to start investigating this same execution of clever exhibitions in AI, [4] analyse them based on the geographical application of smart exhibitions using

web browsers, start investigating a good plan for maximising the features of innovative exhibitions, and end up making a few suggestions for smart exposition spatial arrangement. The study [5] presented the design of a digital museum narrative space based on perceptual experience, data mining, and computer vision. To complete the effective model, the suggested design makes use of the computer vision and data sensing framework. The study [6] compares the intelligent display mode of museum cultural artefacts with the conventional display mode to demonstrate the superiority of its proposed intelligent wireless sensor network. In the article [7], the authors proposed the 3D landscape modelling technology and the way of creating a digital museum environment in virtual reality are used to assess and research the overall idea of designing a VR environment based on several distinctive modelling techniques. In the research [8], the authors proposed an online platform for the construction of virtual museums with a focus on the presentation and visualisation of cultural heritage materials in online virtual museums was made. This common implementation Framework (CIF) enables users to upload large 3D models, which are then converted and optimised for web display and embedded in an HTML5 application that can range from a straightforward interactive display of the model to an entirely virtual environment like a virtual walk-through. The study [9] proposed a method for comparing and evaluating various design options for user interaction with VM systems based on user studies. The methodology has been verified using a testbed connected to a virtual machine system hosted at Cetraro's "Museum of the Bruttians and the Sea" (Italy). The research [10] suggested a collaborative filtering-based strategy for recommending museum objects that simplifies display design, enhances recommendations' effectiveness, and solves the scalability issue. The recommendation system's algorithm combines the benefits of collaborative memory filtering with smoothing processing to increase the effectiveness of recommendations and achieve the highest level of consistency. The study [11] suggested a design approach for a multi-view virtual display system of Museum Cultural Relics based on AR-VR fusion technology to realise the scientific development of the museum. The multi-view virtual display system of Museum cultural artefacts is successfully designed by optimising the system's hardware configuration structure, enhancing the system's operation effect, further optimising the multi-view virtual display algorithm, and optimising the system software performance. In the article [12], the authors used the data mining technique to examine the veracity of the cultural relic image from the digital museum. It is suggested to use data mining to reproduce photographs of cultural treasures with authenticity. This paper designs a digital museum cultural relic’ s image authenticity reproduction simulation system to address the issues of poor noise suppression, missing holes, poor reproduction quality of cultural relics, and insufficient details in conventional systems in order to realise the authentic reproduction of cultural relics images. The paper [13] creates a museum user experience model based on sensory, behavioural, cognitive, and emotional experiences; establishes a user experience design framework; conducts specific theoretical analysis and research from four aspects; uncovers specific factors affecting museum user experience; analyses the impact of each experience factor on user system design and potential design entry points; and proposes corresponding user system design strategies to direct further development.

2.1 Problem Statement

The following elements are heavily emphasised in studies on the connection between modern technology and museums in Chinese-language literature: First, a focus on how new technologies can be used in museums. Second, a focus on digital museums' communication channels. The third topic is a discussion of museums' educational role in a virtual setting. However, more research needs to be done to investigate the extent to which factors affect the evolution of the digital museum. The research question, "What influences the development of the digital museum in China?" has been put forth.

2.2 Proposed Methodology

The Origins program provides a visual representation of the findings of the study. Figure 2 shows the proposed methodology.

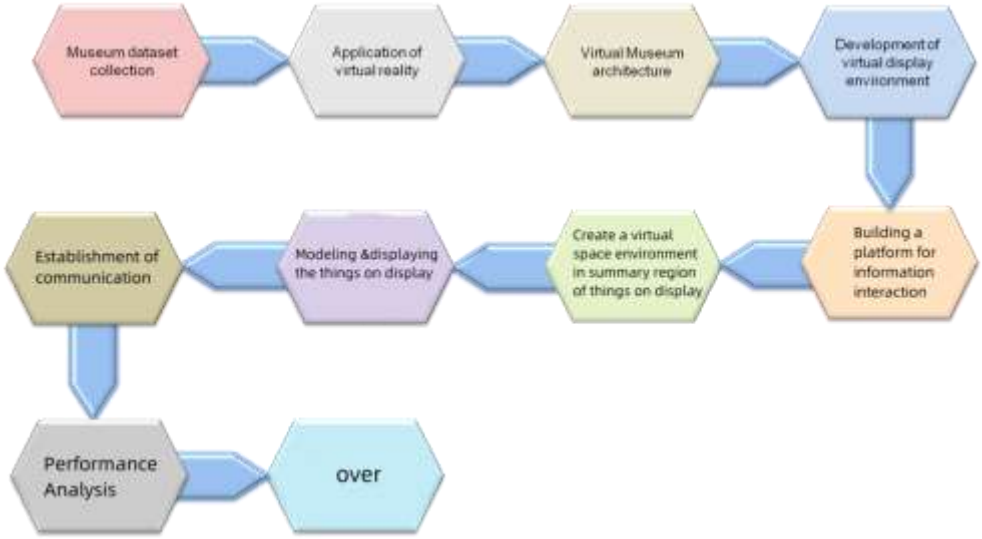

Figure 2. Proposed Methodology

2.2.1 Dataset

The statistics identified in the study were obtained during a five-month public research project between March 23rd May, and 30th, 2017. The study looked at the acceptability and use of mobile technology, including Augmented Reality (AR), Virtual Reality (VR), Projection Shows, Interacting 2D (i2D), and Interface 3D (i3D), Mobile Installations, or any unexpected highly controlled within the odd region. This data was collected in 22 sites in 15 cities, encompassing Chinese national and community institutions, producing 806 types of information. There have been 36 different digital systems found in all [14].

2.2.2 Application of Virtual Reality

Since the early 1990s, VR technology has piqued the curiosity of researchers from a variety of fields, and it has been used or extended inside the business sector. The technology is unusual because it generates a digital space in which a computer makes a three-dimensional digital representation of the digitised picture and a virtual world. All of them provide users with an authentic experience in this sort of environment, which is known as Immersion. Virtual reality differs from Computer-aided design prototypes and traditional three-dimensional visuals in several ways. It's an open fluid GUI world where people can monitor and manipulate, rather than a set cosmos; this style of the protagonist also is known as Interactive elements. Virtual reality is both a presenting media as well as a kind of design. The author's thoughts are represented in the form of a picture. VR Technology can transform a writer's concept into a virtual object and environment, usually built using traditional sand design. Creativity, the 3rd interactive virtual personality mentioned above, dramatically improves the efficacy or effect of designing in creating a suitable setting utilising electronic platforms. Due to the prominent three properties listed above, Virtualization Technology can be used in some settings to lower the cost of production and drawbacks, all while giving a completely new user experience as well as a significant financial benefit.

2.2.3 Virtual Museum Architecture

Museum virtual boasts a glass as a complimentary transfer between physical and virtual settings during the design stage. Because the museum'smuseum's location could be more suitable, it is in a unique situation regarding slow transfer and addressing the public's desire for art. Consequently, this same casting floor plan within the presentation would be predicated just on the presence of a tangible inner surface that would use a virtual learning environment to encapsulate the actual condition throughout olden history. It is not a replica and will create a new kind of showcase with such fantasy, predicated just on the crossroads of society, heritage, backstory, landforms, social science, and programming skills, and that will not be an identical replica. Using independent Digital Reality technologies such as HTML text introductory, QuickTime Virtuality, and Virtual Reality Modelling Language, as well as integrating other files to create an actuality and interaction impact in various scenarios. Simultaneously, provide spectators with a seamless experience from the outset, including

in Figure 3, by gathering data, purchasing tickets over the web, and experiencing the digital reality in a real-world museum setting to develop an engaging art environment.

Figure 3. Designing Image in a Framework

2.2.4 Development of a Virtual Display Environment

To accomplish a suitable architecture of virtual display space in terms of style choices, we first must investigate the overall perspective plus comprehend the viewers' habits. Derived from research to viewers from expertise issuing, capacity to reserve seats available, going to visit the monument and artefacts in the art gallery, and ultimately, the communication among numerous viewers, the framework of the simulated display must be focused on 3 virtualisation worlds, namely HTML, QuickTime Virtual Reality, and Virtual Reality Model-based Language, based on the research to tourists from expertise issuance, ability to reserve reserved seats, going to visit this same exhibition and artefacts on the exhibition. Ultimately, the interplay among various audiences, study to visitors from expertise issuing ability.

2.2.5 Building a Platform for Information Interaction

Constructing an informative interaction is straightforward compared to other virtual reality technology. Using existing HTML & associated software like Adobe, create an interactive or ASP reactive database depending on the interactive experience. Users can quickly query about the appropriate organisation or obtain seats by adding images, videos, and actions and finding similarities.

2.2.6 Create a Virtual Space Environment in the Summary Region of Things on Display

As customers journey downstream through history, people enjoy engaging within and feeling the majesty of a display area via the senses of sight, music, and feel. One of the most essential aspects of the presentation is the overview section, which transitions from one area to the other. Virtual reality and media content, such as graphics, automatic monitoring methods, massive screen projectors, ultra-thin TV displays, and capacitive panels, are used in the large display to provide a technology that allows people to experience a real-world environment. For example, we rarely picture the prehistoric

period. Still, we may use multi-tools such as 3DMAX / MAYA to simulate the out-from of the dinosaur age based on literary and archaeological data. Instead, to create the outside environment extra fascinating, we might include related images and movies. An interesting technique is to use assistive technology like headgear display to limit seeing and hearing, reconstructing creature models and using the Virtual Reality immersion method to improve a sense of being in this period. Viewers, especially children, could enjoy a self-induced self-journey that captures the attention of your interest in the study.

2.2.7 Modelling and Displaying the Things on Display

When we get to the display space, researchers could use three-dimensional components like sound, illumination, and electronics to represent the personalities and faces of the products on showcase. Because real things are frequently hard to view correctly, we can project things on such a display using media, keeping those authentic goods from being seen from different angles and rotations. Concurrently, the function of things on display or procedures is done by utilising key contact activities and varying media measurements, including sound, movement, text, etc. Integrating virtualised digital museum this strategy enables historical museums to display items next to visitors. The virtual exhibit concept adds another level to a user experience, enabling visitors to engage with it instead of simply staring at it. The tactile sight has the potential to provide a new way of showing museums' architecture and a more precise answer, enabling individuals to build much more efficient & engaging materials habits.

2.2.8 Establishment of a Communication System

Visitors would've had various ideas and sentiments after visiting the exhibit. As a consequence, the location or system of communication is required. A Telecommunications Industry's display was split into two categories to fulfil guests' communication needs: "travel" and "dialogue." Two buildings with white and transparent sides that mimic two people chatting make up its "Speaking" area. An identical amazing tunnel connects the two buildings, providing all of us with a fantastic spot to contact individuals worldwide. After the trip, guests can put information such as mail, URL, emotion, and other items inside the lighting display and constructions to engage with these other visitors. In this type of presentation, its value of diversity and intensity could be stressed. Visitors could communicate directly on top or on a computer display via sight, videos, stationary pictures, or rich literacy.

3. Simulation Results

In this section, we analyse the performance of the proposed system based on various education parameters and compare the model with existing approaches. The traditional model includes the feature model technique [15], machine learning [16], and semantic analysis.

3.1 Interaction Ratio

While analysing the link between several or even more factors, interplay can occur since the concurrent impact of 2 factors on a third is not cumulative. The existence of interaction can have a significant impact on how mathematical techniques are interpreted. When two factors of interest intersect, the link between these interacting variables and a third "dependent variable" relies on the quantity of all the other interaction parameters. This makes it harder to forecast the consequences of altering a variable's value, especially if the variables it interacts with are hard to measure or manage. Figure 5 depicts the interaction ratio for existing and proposed techniques.

When compared to the existing work (feature model technique [15], machine learning [16], and semantic analysis [17]), the proposed methods have a more excellent interaction ratio. In a "digital museum system", the interaction ratio can achieve the most significant output from existing works.

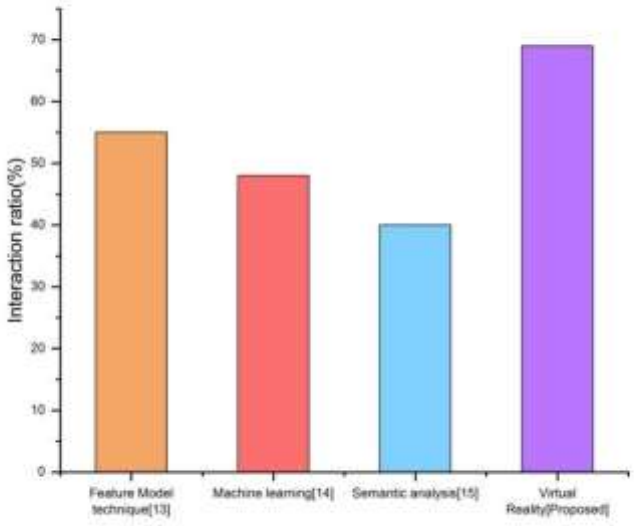

Figure 5. Comparison of Interaction Ratio (%) for the Existing and Proposed Technique

3.2 Implementation Cost

Installing or managing Change that results throughout Completed Measures results in Implementation Costs, the total or a portion of the actual overall costs to construct and implement Measures. Costs associated with implementation. Figure 6 explains the implementation cost of comparative analysis for the existing and proposed methods.

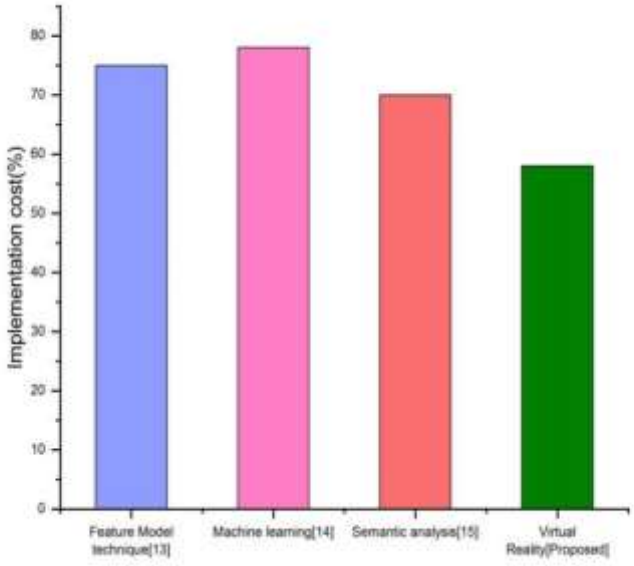

Figure 6. Comparison of Implementation Cost (%) for the Existing and Proposed Technique

When compared to the existing works (feature model technique [15], machine learning [16], and semantic analysis [17]), the proposed methods have a low implementation cost.

3.3 System Efficiency

The proportion of the quantity of available power given out by the system ("outcome power") to an entire quantity of electricity taken in ("intake power") and the value of hard work power as a percentage of the total power input, is used to determine the power system efficiency or equipment that converts energy. Figure 7 represents the system efficiency of the control group and study group for existing and proposed methods.

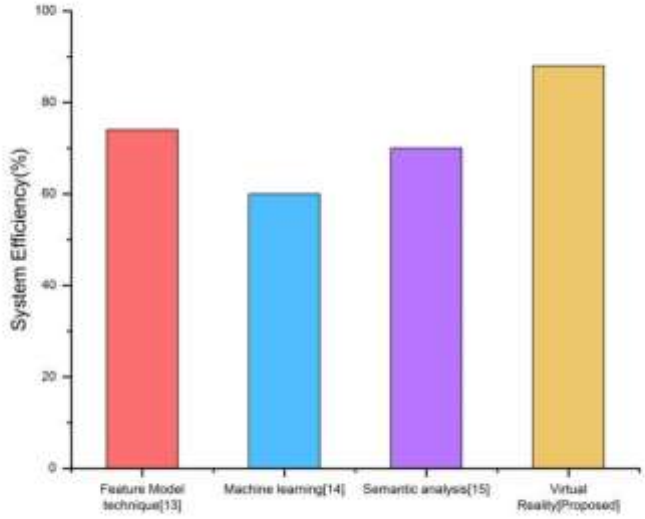

Figure 7. Comparison of System Efficiency for the Existing and Proposed Technique

When compared to current works (such as those in the fields of feature model technique [15], machine learning [16], and semantic analysis [17]), the suggested approaches have a higher level of system efficiency. When the suggested virtual reality approach has a score of 88 per cent, the feature model technique has a score of 74 per cent, the machine learning technique has a score of 60 per cent, the semantic analysis has a score of 70 per cent, and the feature model technique has a score of 60 per cent.

4. Discussion

In the feature model technique [15], inadequate information increases the likelihood of a classifier, which increases the danger of a classifier. When the number of possibilities is huge, computation time becomes essential. In machine learning technique [16], Among its significant drawbacks are the expense and time attack batches necessary to create modelling techniques. Additionally, standard models perform badly when applied to complicated substances, rendering them inaccurate for predicting the characteristics of an array of substances. In semantic analysis (SA) [17], a large amount of memory is required for semantic analysis matrices. Despite significant advances in electronic storage mediums, decreased sparseness due to extensive data remains a more severe concern. SA works well enough for important papers because just a few context vectors are utilised to characterise every content. Nevertheless, the vast amount of data necessitates more storage capacity and computing time, limiting SA's effectiveness.

5. Conclusion

The virtual museum system based on VR technology comprises the museum'smuseum's museum database and relevant information resources, enhancing the collision detection method employed in the network. Users can obtain extra information through the connection between inside and outside virtual reality technology to trade various sorts of materials & conserve area, which would be created inside the monument's exhibition space can considerably extend the data capacity. Its size does not restrict data storage in a museum, and geometrical series are used to extend the outflow. At some

moment, the online world offers greater freedom than the virtual environment regarding the patient's viewpoint, path, and materials, so augmented reality allows people to experience a genuine mental makeup that they didn't even know existed. VR in museum design modifies the barren, cold, or inactive aspect of actual displays, resulting in a much more human-looking event space. The application of virtual reality technology to furnishings design improves human presence area and makes a living more contemporary and more colourful.

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