Hindawi
Wireless Communications and Mobile Computing
Volume 2023, Article ID 9796741, 1 page
https://doi.org/10.1155/2023/9796741

Retraction

Retracted: 3D-VR Based Color Design Method for Interior Space in Iot Applications

Wireless Communications and Mobile Computing

Received 8 August 2023; Accepted 8 August 2023; Published 9 August 2023

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] M. Yang, "3D-VR Based Color Design Method for Interior Space in Iot Applications," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 2580222, 7 pages, 2022.

Hindawi
Wireless Communications and Mobile Computing
Volume 2022, Article ID 2580222, 7 pages
https://doi.org/10.1155/2022/2580222

Research Article

3D-VR Based Color Design Method for Interior Space in Iot Applications

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Received 7 July 2022; Revised 7 August 2022; Accepted 1 September 2022; Published 14 September 2022

Academic Editor: Hamurabi Gamboa Rosales

Virtual reality technology has grown in popularity as the economy and society have changed dramatically, and it is now being used in a wide range of applications. Interactive virtual technology's deployment in the field of art has a wide range of possibilities due to its interaction, immersion, and real-time capabilities. The advantages of this technology, extremely in interiors and design, are unrivalled by other technologies. Virtual reality interior design can help designers and consumers understand the influence of "what you see is what you get," while also expecting people to feel the visual concept in the 3D content of this model. The research and studies of interior decoration are conducted in this paper using visually stunning virtual reality technology, with the viewing public housing developments as the research object, creating a conceptual framework for successful research and innovation of interior design assisted by visually stunning Virtual reality (VR) technology. In this paper we applied the reliability to check the accuracy of questionnaire and descriptive statistics which summarises all the data.

1. Introduction

The aim of the study is using 3D-VR based color design method for interior space. The Digital reality's invention has obviously brought in a creative approach in the realm of architectural design, which mixes imaginative art with cutting-edge technology. It contrasts from the traditional architectural display mode of "plane, exterior, section, and 3D model." Designers can "walk into" their creative scene space at any time, inspect and analyses their design from any viewpoint, and feel changes in space, scale, external light, and even sound, leading in a more effortless project planning and design [1]. It is a modern attempt to integrate VR technology for virtual interior wandering in order to assess the impact of interiors [2]. People can utilise a dynamic and interactive approach to evaluate the digital world dwelling in a digital three-dimensional environment throughout the planning and design stage. The usage of a virtual interior system in property transactions will become a valuable tool for designers. It can be a full-scale model of a real house, and it can be used to watch the structure of the house with the use of the mouse, making it easier for the user to choose the house than the sand table model. It saves time and money as compared to the sample room. Users have a stronger feeling of actuality when they interact in a convenient and natural way [3]. These strategies make such systems more interactive between human and device technologies, and they also open up a new arena for virtual reality technology's application in the construction and real estate industry segments. This is a subject that has a lot of practical use.

The Internet of Things (IoT), often known as the Internet of Everything or the Industrial Internet, is a brand-new technological paradigm that envisions the world as a network of interconnected machines and gadgets. The Internet of Things (IoT) is garnering considerable interest from a variety of businesses and is seen as one of the most significant areas of future technology. When linked devices can interact with one another and integrate with vendor-managed inventory systems, customer support systems, business intelligence tools, and business analytics, the actual potential of the IoT for organizations may be completely realized [4].

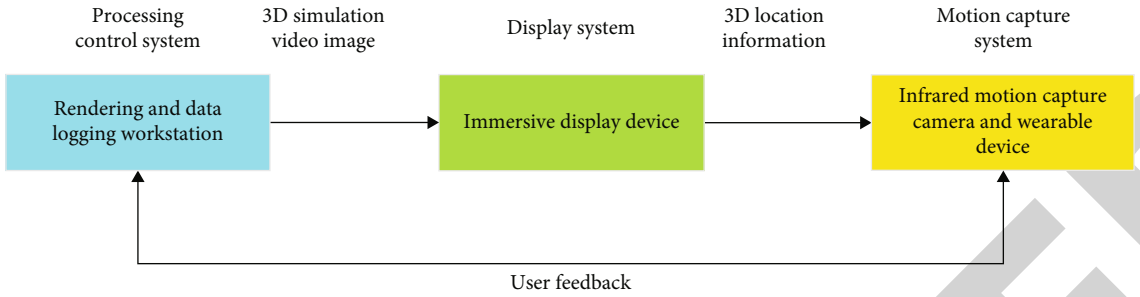

Figure 1: Processing control system and action capture system.

1.1. Related Research Based on Immersive Virtual Reality Technology

1.1.1. Virtual Reality's Definition. The following themes perform to the concepts of virtual reality technology. To begin, the simulated world is a computer-generated 3D stereo image that effects in real changes in response to the human visual perspective. In the case of technological performance, three-dimensional impression, such as hearing, smell, and touch, is included in addition to 3D vision. Similarly, the virtual environment may not always refer to a real-world scenario, but can similarly refer to a virtual world created by the designer [5]. Second, virtual reality technology should philosophically imitate all of the human senses, making the virtual environment envisioned by consumers increasingly genuine. Finally, the interactive virtual program's real-time and feedback designs must be ensured in the integrated component. In other words, the technology can identify natural human movements like head rotation and gestures and deliver real-time input to users' various senses, allowing humans to interact effectively with the framework and other visitors [6–8].

1.1.2. Implications of Immersive Virtual Reality. Immersive VR is a digital virtual reality in which person interacts with one another using hardware such as monitors and sensing devices, all of which are powered by biotech and computer technology [9, 10]. The technology mainframe, input equipment such as motion capture devices and various hardware equipment, output equipment such as display screens, VR system software and related technology, and so on make up the immersive VR technology engine [6, 8, 11, 12]. The interactive Virtual system is usually made up of three parts: a display system, a processing control system, and an action capturing system, categories based on the device's purpose [13]. Figure 1 shows processing control system and action capture system.

1.2. In Guanzhong, Research Was Carried on the Bright Colors of Modern Buildings

1.2.1. Architectural Characteristics of Residents in Guanzhong. The Guanzhong area's regional framework is firmly bound by 800 nautical miles of lush agriculture. This type of natural geological formation has led to creation of highly secured courtyards in Guanzhong traditional dwellings. In the Guanzhong area, a characteristic "narrow courtyard" residential buildings compound form has been constructed to achieve the objective of housing insulating and cold protection, as depicted in Figure 2, which was influenced by geography and climate [12]. The homestead is somewhat small, with a width of 9.9 meters and a depth of length that is unknown but likely greater than the breadth. It has the following properties: it makes maximum use of the available space and there is no wasted energy. Single family home layouts in Guanzhong are coupled to people's feudal traditional ideals [6]. Figure 2 Traditional dwellings in Guanzhong.

Figure 2: Traditional dwellings in Guanzhong.

Houses ascend from the courtyard level, with the gatehouse being the lowest, followed by the hall room, and the main room being the tallest. The strong hierarchy and thoughts of inferiority and superiority in Guanzhong are reflected in the interaction of house height and courtyard function.

1.3. Immersion Virtual Reality Technology in Guanzhong Residential House Interior Décor Industry and Investigations

1.3.1. Virtual Interior Scene Implementation. The virtual interior scene design includes, among other things, a wall, TV, sofa, chair, and colour temperature. In this study, the entire digital scene's coordinates system is represented in blocks and then assembled to establish a solid foundation in data style, framework presented format, and texture processing. Modeling is done in two ways: easy modeling is done with VRML, while advanced modeling is done with 3D modeling and other tools. The model is imported and suitably altered. Finally, the wrl extension is used to export

the 3D file. The modeling in Figure 3 is the result of integrating these two modeling tools [7]. Figure 4 shows modeling in combination of two modeling tools.

1.3.2. Real-Time Interior Design Element Editing. In comparison to traditional design tools, a virtual design-based tool allows for powerful technical intervention for the interior design device's real-time change editing module. The immersive VR system can be used by users to adjust the unsatisfactory spot in the interior and interact with the environment and decorating of the indoor space at any time when they use the system to observe the space [14–16]. The created virtual space will imitate natural light in real time in the virtual space [8]. As long as the immersive VR technology Program is properly designed, it is possible to mimic the user's virtual space. Figure 3 Users use immersive VR devices to edit indoor materials in real time.

Better indoor sentiment serves as an interface between several design units, the user, and the construction team, ensuring that all three parties operate effectively to secure the future of the space design. As a result, users can find the best space for them. With the advent of interactive virtual technology, designers and users now have access to online tools that allow them to communicate more efficiently and effectively [17–20]. Figure 5 Users use Oculus immersive VR helmets for participation and decision support. It enables consumers to follow the progress of interior space design and communicate more easily with designers about the current design, allowing them to directly participate in the design phase and become an intrinsic feature of effective design.

2. Research Methodology

2.1. The Study Design. Questionnaire has been used for data collection.

2.2. The Sample Design. The study of the 50 students.

(i) Population: Population will be the student

(ii) Sampling Element: The students are the sampling elements

(iii) Sample size: Sample size will be 50 students

(iv) Sampling Technique: Probability sampling technique

Probability sampling, also known as "random sampling," is a type of sampling in which every item in the universe has an equal chance of being present in the sample. For example, in a raffle draw, individual units are drawn at random from the overall group. This is not done on purpose, but rather by a random process that limits whether unique items or additional items are preferred [21–27]. The probability sampling method will be based on the following: Systematic random sampling, stratified sampling, cluster sampling, multistage sampling, and area sampling are all examples of stratified sampling.

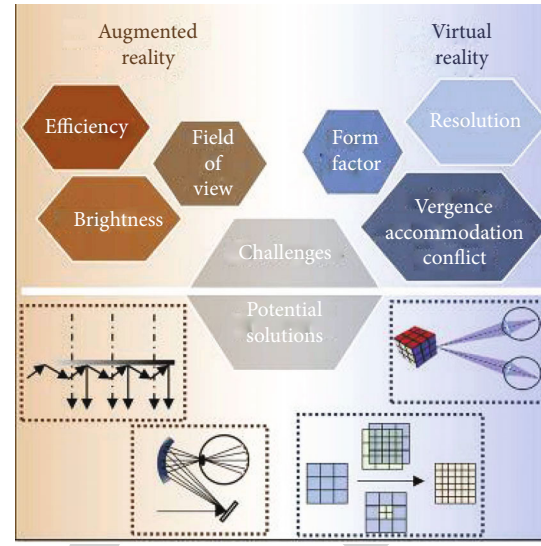

FIGURE 3: Users use immersive VR devices to edit indoor materials in real-time.

2.3. Tools for Data Collection. The standardized questionnaire will be used for data collection where 1 stands for fully effective and 5 stands for very less effective.

2.4. Tools for Data Analysis. The Reliability Test was used to ensure the data's reliability.

Descriptive Statistics has been used to find out the central tendency.

2.5. Problem. To compare the Virtual Reality-based Color Design Method and the Screen-Based Color Design Method.

3. Data Analysis

3.1. Reliability Test. The proportion of systematic variation in a scale is determined by determining the association between the scores obtained from different administrations of the scale, which can be done by determining the association between the scores obtained from different administrations of the scale. As a result, if the association in the reliability analysis is high, the scale produces consistent results and is thus reliable Table 1 shows the Reliability.

3.2. Reliability Statistics. It is considered that a reliability value greater than 0.7 is good, and it can be seen that almost all reliability methods are used here. The reliability value of the questionnaire is 0.927, which is excellent and greater than 0.7, indicating that all of the items on the questionnaire are considered reliable.

3.3. Descriptive Statistics. A descriptive statistic is a summary statistic that quantitatively describes or summarises features from a set of data, whereas descriptive statistics is the process of employing and analysing those statistics. Table 2 shows descriptive statistics and Table 3 shows the frequency and distribution items.

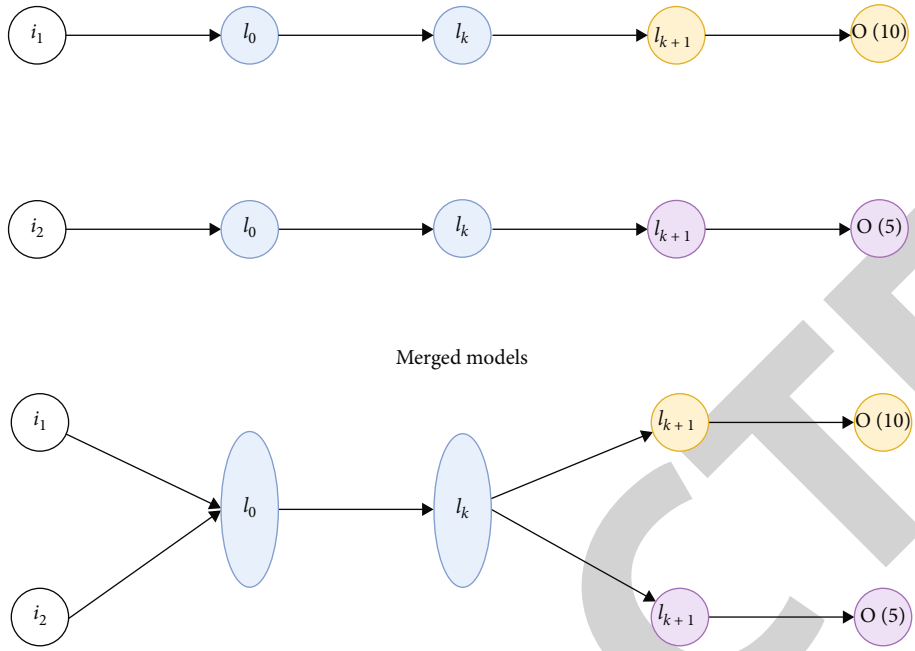

Figure 4: Modeling in combination of two modeling tools.

Figure 5: Users use Oculus immersive VR helmets for participation and decision support.

Table 1: Reliability table.

Cronbach's alpha	No. of items
0.927	10

As per the above table no. 2, we observed that the average mean is approximately 4. After the test, the test persons had to complete a questionnaire.

Similar to the augmented reality experiment for both methods ten statements had to be answered on a scale from is not right (-2), rather not (-1), do not know (0), is right rather (1), and to is right (2). Table 1 gives the asked statements for each working method together with the answered average result. The lower with plus and minus marked values represent the standard deviation of the upper average value in the table cell [20]. In addition the significance level alpha from a two-sample Student's t-test and a column to indicate an advantage for the screen-based compared to the VRglasses-based method is given.

The following list sums the comments to the questionnaires ordered according to their occurrence. The threshold was that at least two test persons wrote the statements analogously.

(1) A more familiar mouse interaction would be good for the screen-based method. (6 test persons)

(2) The low resolution of the VR glasses irritates. (5 test persons)

(3) The orientation is easier with the VR glasses. The VR glasses are very intuitively in terms of navigation. (4 test persons)

(4) The X-box controller interaction in VR is not stomach-careful; on the other hand the head moving is good. (4 test persons)

(5) Very good space perception with VR better than the screen. (3 test persons)

(6) It is fun. (3 test persons)

(7) Currently no device can reproduce colour, contrast, and brightness realistically. (3 test persons)

(8) There are too many different menus and switches in the screen-based method. (2 test persons)

(9) The speed shall be limited with the VR based interaction method to prevent sickness. (2 test persons)

(10) There were too few colours to choose from in the model. (2 test persons)

(11) A functionality to lighten or darken the VR colours would be nice. (2 test persons)

Table 2: Descriptive statistics table.

Statement	Screen-based method	VR-glasses-based method	Significance level alpha	Advantage for	Mean	Std. deviation
You have applied this working method often already.	−0.714 + /−2.204	−1.929 + /−0.267	0.00138	Screen	3.26	.948
You can imagine the whole room and the colour design.	0.5 + 1 − 0.855	1.357 + 1 − − 0.745	0.00111	VR-glasses	3.45	1.236
You felt sick/uncomfortable (VR-simulator-effect) during your design experience.	−1.538 + /−0.877	0.571 + / −L453	0.00131	*Screen*	*3.65*	.369
This working method is practical for the architectural design process.	0.857 + /−0.864	0.643 + /−0.929	0.53283	Screen	3.26	.152
This tool/interaction concept is easy to use.	0.429 + 1 − 0.938	1.071 + 1 − − 0.997	0.15627	VR-glasses	3.25	.220
You trust the colour visualisation and quality of this tool.	−0.071 + /−1.141	0.143 + /−1.231	0.55148	VR-glasses	3.45	1.336
You feel limited through the means of the tool.	0 + /−1.301	−0.857 + /−0.663	0.06073	VR-glasses	3.26	.354
You could compare different alternatives.	1.571 + / −0.852	1.5 + /−0.65	0.77527	Screen	3.88	.411
The working method is efficient.	0.857 + 1 − 0.949	0.786 + /−1.122	0.85555	Screen	3.44	1.336
You trust the tool and this working method.	0.714 + 1 − 0.469	0.643 + /−1.008	0.77527	Screen	3.66	1.366

Table 3: Frequency and distribution table of items.

Total 10 items	Frequency	Percent
Valid		
Not right (-2)	4	8.0
Rather not (-1)	5	10.0
Do not know (0)	14	28.0
Is right rather (1)	27	54.0
To is right (2).	50	100.0
Total	65	100.0

(12) The screen-based method is familiar. (2 test persons)

3.4. Frequencies of the Questionnaire. Figure 6 presents the 3D-VR based color design method in the terms of interior space. Out of all 50 respondents, 8% of respondents are negative, 10% of respondents are not rather, 28% of respondents do not know about the color design method, and 54% are right [24–27].

3.5. Evaluation. The direct evaluation produced the following tendential statements. The list enumerates only the significant statements, which reached a significance level alpha smaller than 0.05 computed in a two-sample Student's *t*-test:

(1) the participants had not applied the VR glasses method yet

(2) The test persons could imagine the room and VIRTUAL AND AUGMENTED REALITY the colour design significantly better with the VR glasses

(3) The VR simulator effect (indisposition or feeling of sickness) clearly appeared with the VR glasses

4. Result and Discussion

Most people experienced the so-called "VR simulator-effect". It manifests itself in indisposition and a feeling of sickness. The effect is known and appears when the optically perceived movements do not match the physical signals of the human senses. Among others, the reason may be:

(i) A too low frame rate of the VR glasses

(ii) A too high latency or time delay between head movement and visual image update or

(iii) An artificial optically perceived movement without the matching physical senses

The used X-box controller interaction method for changing position corresponds to such an artificial movement e.g. by free virtual movements and smooth rotations. It is possible to reduce the effect by moving the virtual person slowly. If the user would change position close along a surface, maybe by "sneaking on the floor" or "moving close along walls" or even by "running through virtual walls" the perceived movement appears to be fast again and the VR simulator effect is back [28] In recent VR computer games, the player teleports in the virtual world from location to location in order to neutralise the effect. At the fixed locations, the user has all degrees of freedoms for the head movement [6]. Another option for a VR control is to make the artificial movements like virtual rotations or jumping to appear extra artificial [5]. This happens through sudden hard cuts of the actually smooth movements. Thus, the user can distinguish these transaction types easily from real head

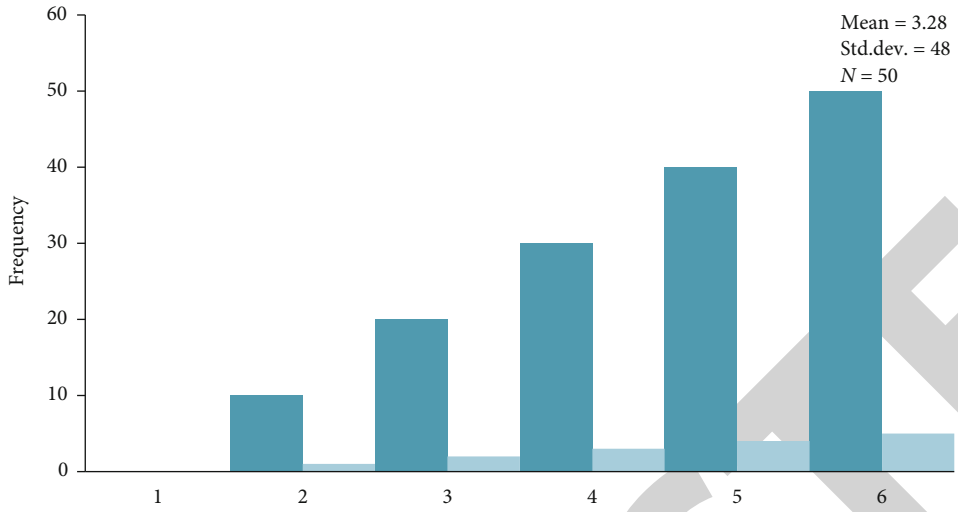

Figure 6: Graphical presentation of frequency and distribution of items.

movements. Instead, the tested prototype used smooth movements, sidelong movements, height movements, and rotations. With reference to the applied VR control, the critic is that sometimes, less is even more. Furthermore, the participants found the VR interaction method easier than the screen-based one. In the VR environment the test persons used only the preset colour drag-and-drop tool together with the movement control. Besides there were also several pie menus as well as colour scales, brightness scales, saturation scales, and daytime scales available. However, the test persons could not use these, because of a lack of training [22]. Hence this reduced method seemed more suitable. In contrast, all functionality of the menu, icons, control groups, and colour widgets were visible in the screen mode. Probably because of that, the screen-based method seemed more complicated. Promising results are that the VR glasses communicated the virtual space and the colour design better than the screen and an improved orientation in the virtual reality with glasses.

5. Conclusion

The propositional research and analysis of interior design can be conducted by immersive 3D visualization, in order to carefully figure out the deficiencies and problems in the interior space decoration design process and make timely modification and optimization. With the improvement of people's aesthetics and the demand for innovation of indoor space emotional design, the evaluative experiment and analysis of interior decoration design can be conducted by immersive virtual reality technology, in order to effectively figure out the deficiencies and problems in the interior space decoration design process and make timely modification and optimization. As a result, this paper conducts the reliability and descriptive statistics V (v inhabitants' interior space design with immersive VR technology, with positive findings.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The author declares that she has no conflicts of interest.

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