

Application of VR in Furniture Connection Learning for Interior Design Students

Andhika Pramalystianto^{1,*}, *Frihandhika Permana*², *Bela Ayu Safitri*¹, and *Muhammad Julfan Firnandi*¹

¹Interior Design Department, School of Design, Bina Nusantara University, Jakarta, Indonesia 11480

²Computer Science, School of Computer Science, Bina Nusantara University, Jakarta, Indonesia 11480

Abstract. This study aims to provide information about virtual reality media that can be used as information about interior learning, especially furniture joints. This project uses an experimental method to create a prototype in the form of virtual reality in which there will be several furniture connections that can be used as learning media. This study uses the main software, namely Unity, which is used as the basic software in virtual reality, as well as additional software that is used as a furniture connection modelling application. Its implementation will later use additional hardware, namely oculus. The results obtained from this study are that student's interest in the learning process using new media, is more interesting because it can create different alternative learning media than before, by using virtual reality facilities. The use of virtual reality in furniture connections provides significant benefits to students in the learning process. It removes the physical barrier of choosing a good joint to use and helps users make better decisions. As virtual reality technology continues to evolve, it is hoped that a more realistic and immersive furniture joinery learning experience will become more accessible and provide greater benefits to all involved.

1 Introduction

Wood joints are one of the most basic concepts when it comes to furniture work. Wood has its way of being made into a design of furniture which in turn has various kinds of details and various kinds of joints that unite these woods to become furniture. In wooden furniture itself, there are many variations of the types of wood joints, every carpenter has the same and even different ways to determine what connections will be used in the furniture he makes. Virtual reality (VR) or virtual reality is a technology that allows users to interact with a computer-simulated environment, an actual environment that is imitated or really an environment that only exists in imagination. Current virtual reality environments generally provide a visual experience, which is displayed on a computer screen or through a smart phone device, but some simulations include additional sensory information, such as sound through speakers or headphones.

Virtual reality (VR) is a technology that can make humans feel as if they are in another real world, where these humans will experience the unreal reality environment, even though in physical reality the humans are not there (Rebello et al, 2012:5). The process of transferring imagination is usually used with VR equipment, such as Samsung Gear VR, Google Cardboard, or even using Oculus. Computer-connected Rift. VR technology is no longer a new technology nowadays, but the development of VR does not stop, in 2016 the development of VR experienced its peak in

which year VR began to be used in various gadget *products. The emergence of VR is used as a medium for playing games, and as a video player and 360 VR panoramic photos.

Apart from being used as games, videos and photos, VR is used. VR is also often used as a simulation. The use of VR as a simulation can be found in almost all fields of entertainment, education, tourism, planning, heritage preservation, accessibility, and management. In the interior sector, there has been no research examining the use of virtual reality media as a simulation medium for interiors.

Furniture is a home appliance that includes all items such as chairs, tables, and cabinets. Furniture comes from the word movable, which means it can move. In ancient times tables, chairs and cabinets were relatively easy to move from large stones, walls, and roofs. Furniture comes from the French, furniture which means household furniture. Journal has the origin of the word furnir which means furniture or home or room furniture. Although furniture and furniture have different meanings, what is designated is the same, namely tables, chairs, cabinets and so on. In other words, furniture or furniture are all objects that are in the house and are used by the occupants to sit, lie down, or store small objects such as clothes or cups. (Haryanto, 2004)

Timber construction is part of building construction. Connections and wood connections is a basic knowledge of wood construction which is very helpful in describing the construction of wood joints and connections or how to

* Corresponding author: andhika.pramalystianto@binus.ac.id

mark (paring) when carrying out the practice of making joints and wood connections in accordance with applicable regulations.

A wood joint is two or more logs that are connected so that they become one long log or horizontally or perpendicularly in one flat plane or a two-dimensional plane. Meanwhile, the so-called wood connection is two or more logs that are connected to form one object or one construction part in one plane (two dimensions) or in one three-dimensional space. In composing a wooden construction, it generally consists of two or more rods, each of which is connected into one part so that it is sturdy. To meet the requirements for this robustness, the joints and connections must meet the following requirements:

- a. The connection must be simple and strong. Large and deep notches should be avoided, as this can result in weakness of the wood and large logs are required, which can constitute a waste.
- b. Pay attention to the properties of wood, especially the properties of shrinkage, expansion, and tension.
- c. The shape of the connection of the wooden construction relations must be resistant to the forces acting.

Timber relations are divided into 3 groups, namely:

- a. Longitudinal wood joints
- b. Connection of wood with different grain directions (angled)
- c. Wood joints in the widest direction (board joints)
Longitudinal joints are used to connect wall beams, gording and so on.

Wood ties are widely used in door, window, truss and furniture connections. While widened joints are used for floors, walls, or roofs.

2 Methodology

In the study of the use of interior virtual reality technology as an experimentation on furniture joints, the experimental deep interview method was used. Experimental according to Kerlinger (1986: 315) is as scientific research in which the researcher manipulates and controls one or more independent variables and makes observations of the dependent variables to find variations that appear together with the manipulation of these independent variables. Arboleda (1981: 27) defines experimental as a study in which the researcher deliberately manipulates one or more variables in a certain way so that they affect one or more of the other variables being measured. Further explained, the manipulated variable is called the independent variable and the variable whose effect will be seen is called the dependent variable. Meanwhile, Isaac and Michael (1977: 24) explain that experimental research aims to examine possible causation by applying one or more treatment conditions to one or more experimental groups and comparing the results with one or more untreated control groups. An understanding like that is given by Rakhmat (1985: 44) that the experimental method aims to examine causal relationships by manipulating one or more

variables in one or more experimental groups and comparing the results with the control group which did not experience manipulation. Meanwhile, Robert Plutchik (1988: 213) put forward a more concise definition of experimental, which is a way of setting experimental conditions to identify variables and determine the causes and effects of an event.

Study of the use of interior virtual reality technology as a means of experimentation on furniture joints through several stages, namely the planning stage of the connection concept to be used, the furniture connection modeling stage and the implementation stage. In the furniture joint design concept stage, several models of furniture joints that are often used are selected.

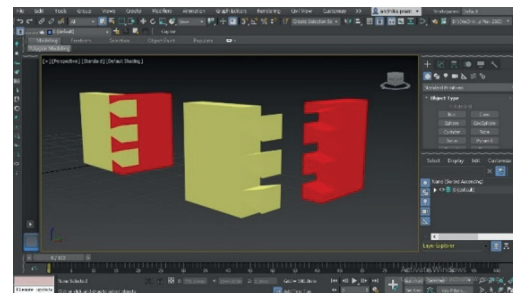


Fig. 1. Modeling of dovetail joints

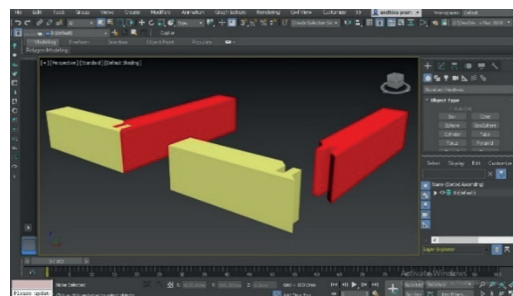


Fig. 2. Modeling of lap joints

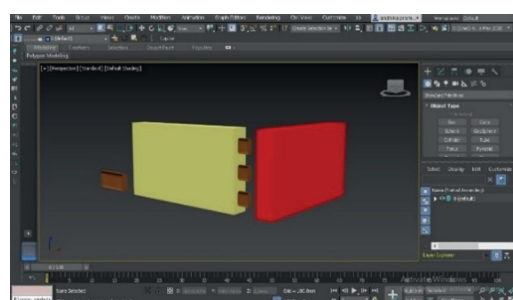


Fig. 3. are pictures of (a) dovetail joints, pocket joints, domino spline joints, lap joints. which is where the connection is often used in furniture joints.

After doing the modeling, the next step is to make experiments by making images into the virtual reality model to be used as a benchmark for evaluating the results of the research.

The process of making virtual reality using unity. Before doing the modeling in unity the model is made using the 3ds max application with the fbx file format which is used as an asset in unity. From some of the

pictures above, an analysis of the pictures is carried out by conducting interviews with ordinary people and people who have been working in the interior sector for a long time to answer some of the questions that have been made to find answers from researchers.

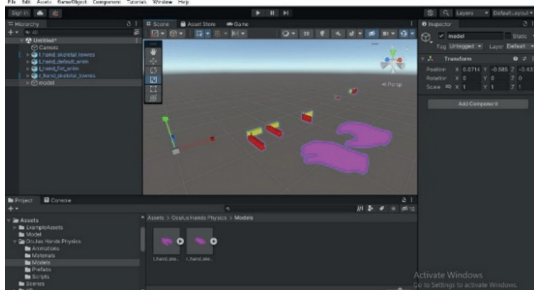


Fig. 4. Inserting assets into unity

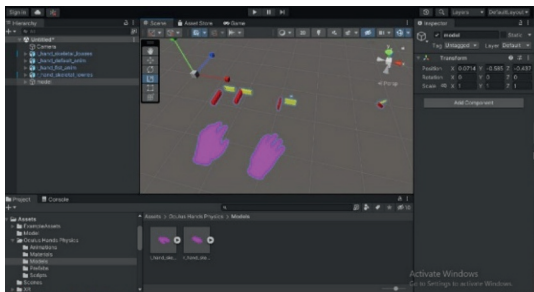


Fig. 5. Inserting assets into unity with joint models

2.1 Interview Analysis on the Use of Virtual Reality Furniture Connection

In the interview process, researchers get various answers or responses from several respondents. These answers can be used by researchers to determine the level of effectiveness of Virtual reality technology as a learning tool for furniture connections. technology as a means of learning furniture connections. Virtual reality image of this connection using Virtual reality 360. The image is expected to provide a view to respondents about Virtual reality furniture connections. The following images are used as an interview process interview process:



Fig. 6. Picture view when using a VR headset.

The picture above provides information in the form of furniture design visualization to students. The picture can explain the real conditions of a furniture in the room

Lighting, furniture in the room can be clearly seen by students later. in the room can be clearly seen by students later. Details of a furniture connection can also be clearly visible with the picture below.



Fig. 7. Detail view furniture joint

From the shape, color, material, and texture of the furniture joints that will later be applied to unfinished or imagined furniture, it will look real. furniture that is not yet finished or still in the form of imagination will also look real. Virtual reality images that are shown to students also have differences in terms of image quality and comfort level. by users when using Virtual reality technology.

3 Interview conclusion points

The following points related to the question of using virtual reality are used as a medium for simulating furniture connections:

- The addition of aesthetics in virtual reality joints can add an interesting impression for students to choose with the form of virtual reality.
- connections can create an atmosphere to influence the interest of students The advantage of virtual reality.
- connection itself is that it can make the interest of students more willing to try and recognize the use of furniture joints.

4 Conclusion

Based on the results of the analysis of Virtual reality media, furniture connections are still rarely used as simulation media but with a Virtual reality interior display can attract students to use it. Virtual reality can increase attractiveness in simulation facilities because in terms of motor and emotion Virtual reality can express the experience of Virtual reality users. In terms of time and cost, Virtual reality can be more easily used as a simulation media and Virtual reality furniture simulation media is effectively used as a simulation media in the future.

Analysis of the preferences of users of Virtual reality connection media as a means of simulating furniture

connections resulted in the conclusion that the main aspect that affects the use of Virtual reality media furniture connections as a means of simulation is with good images and looks realistic and by using a simple device can make students interested when they first use the virtual reality media furniture connection.

By analyzing the factors needed by designers such as in interior design elements, it must be clearly depicted about the texture of the lines, shapes, and materials used, that way the immersion factor in Virtual Reality can be formed because the object-forming factors will make Virtual Reality users unconsciously think they are in the real world. With the existence of virtual reality that can be formed by Virtual Reality, it is certainly an advantage as a furniture connection simulation media compared to other connection simulation media.

Based on the analysis of Virtual reality media used as a means of simulating furniture connections, it can be concluded that respondents say that virtual reality connection displays have attracted interest from respondents, however, interior Virtual reality media used as a means of simulating furniture connections is still considered expensive media because virtual reality connections are rarely used as simulation media. The proper use of virtual reality devices also affects.

The limitation of this research is this research focuses on the use of virtual reality methods to design and test joints in furniture. This research will not discuss aspects of furniture design but will focus on virtual reality methods used for furniture joints. The selection of the types of furniture studied is limited such as, for example, chairs, cabinets tables, or bookshelves. These types of furniture were chosen because they have joints that are important in structure and strength. Interactive User Experience: Virtual reality methods allow users to interactively explore and interact with the resulting furniture designs. Users can experience first-hand the look and features of the joint, providing immediate feedback to the designer. This can improve the designer's understanding of user preferences and needs, resulting in a more customized design.

Skill and Knowledge Development: This research can assist in the development of skills and knowledge in the field of furniture design and virtual reality technology. In the face of technological developments and increasingly complex design demands, this research can provide new insights and broaden the understanding of virtual reality applications in furniture design.

Improved Design Efficiency: Virtual reality methods allow designers to interactively design and test furniture joints in a realistic virtual environment. As such, the design process can become more efficient as it allows for early identification and potential rectification of errors or flaws in joints before physical production takes place.

Reduced Environmental Impact: By using virtual reality methods, the number of physical prototypes created in the design stage can be reduced. This can reduce the use of materials and energy required for prototype production and reduce the waste generated. Thus, this research can make a positive contribution towards reducing the environmental impact of the furniture industry.

These benefits can lead to improvements in the furniture design process, production efficiency, user experience, and reduced environmental impact. By utilizing the potential of virtual reality methods, this research can make a positive contribution to the furniture industry.

Future research can be Improved Simulation Accuracy: The development of more advanced virtual reality technologies can lead to more accurate and realistic simulations. In this research, the focus could be on developing more precise simulation algorithms and techniques to predict the performance of furniture joints, including strength, stability, and movement.

Use of Mixed Reality Methods: In addition to using virtual reality environments, research can also consider the application of mixed reality methods. This combines virtual and physical elements in the design and testing of furniture joints. Thus, users can experience actual physical joints while viewing relevant virtual elements.

Collaborative Platform Development: Research can lead to the development of a collaborative platform that allows designers, manufacturers, and users to interact and contribute to the furniture joint design process using virtual reality methods. This platform can facilitate the exchange of ideas, feedback, and collaboration in the development of better furniture joints.

Overall, it can be concluded that Virtual reality media furniture connections have attracted the attention of students to use, but virtual reality media providers furniture connections still seem expensive and there are still many students who do not understand the use of Virtual reality. As for user behavior, there must be further socialization because virtual reality media users of furniture connections are very low in number because users still do not know in depth about Virtual reality furniture connections and consider other simulation media to be more affordable than virtual reality interior simulation media.

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