KFS Journal, Vol. 20(3), 2009: 232-238

Study on Method of Expressing Surface of Furniture and Wooden Accessories during Modeling Process using Graphic Program

- Focused on 3ds MAX and V-ray -

Jae Young Lee[1], Ki Choi[†1], Won Hee Cho[2]

ABSTRACT

In designing furniture and interior accessories, a computer graphic program is normally used over the whole process of manufacturing furniture from idea stage to actual manufacturing stage. It especially play an important role in the modeling process which comes before actual manufacturing stage. in such modeling process, the most important part is expression of quality of material used and surface treatment method. Expression of material quality of wood and surface finishing just like an actual picture enable the designers to analogize the feeling of furniture and interior accessories more exactly over the whole process of actual manufacturing and such a result has positive effect on development field of furniture and accessories.

Key words: 3ds max, v-ray, wood surface, finishing techniques, furniture.

1. INTRODUCTION

Objective

Computer graphic which was introduced to design sector from the end of the 1980s has more rapidly advanced than any other field during last 30 years. In designing furniture and accessories, utilization of 3D graphic program and CAD program is especially increasing and, as a result, imagination of designers is expressed in more concrete visual images in the process of modeling.

However, among such visual expression process, the most important part is method of expressing surface material of furniture and accessories such as material quality, processing and surface finishing technique.

The most popular material used for furniture which is produced to make human lives more convenient and comfortable is wood and there are diverse materials used for methods of finishing surface of wood. But, 3D graphic programs used by many designers at present much lack data of such material quality in comparison to other fields.

In this study, we will analyze materials and surface treatment techniques mainly used for manufacturing of actual furniture and life accessories and, based on the result of analysis, present producing process of material quality needed for modeling process.

Received for publication: Feb 15, 2009 ; Reviewed: Apr 28, 2009 ; Accepted: May 15, 2009.

1) Department of Interior & Furniture Design, College of Design, Kangwon National University, Samcheok 245-711, Republic of Korea

2) Department of Living & Formative Design, College of arts and sports, Sang Ji University, Wonju 660 , Republic of Korea

†Corresponding Author: Ki Choi (E-mail: woodpeople@kangwon.ac.kr).

Though there were a lot of previous studies on expression of material quality, we think that there still is adequate necessity for study on wood and its surface treatment methods.

The eventual object is to construct and develop material database through systematic classification of diverse materials and expression techniques of surface treatment so that it can be applied to design development of furniture and life accessories of diverse materials.

Method and scope of study

In order to secure objectivity and universality of this study, we analyzed materials and surface finishing techniques used for design of furniture and accessories announced recently and, expecially, performed a brief preference survey of graphic programs used in computer graphic lessons in furniture and wooden arts departments of colleges and by designers.

As to examples of materials and surface finishing techniques used for furniture and accessories, we have collected and reviewed works of students of Chung-ang University, Sangji University and Kangwon National University majoring in furniture design and works displayed in exhibitions of nationwide associations and contests.

Lastly, we described in detail characteristics of 3D graphic program widely used and presented an alternative plan to grope for construction of a material database and new application methods.

2. THEORETICAL BACKGROUND

Outline and characteristics of 3 ds MAX and V-ray

There are various kinds of 3D graphic programs and rendering programs used and sold in the market. The result of survey showed that, among 3D programs, 3ds max of Autodesk is mostly preferred and, among rendering programs, V-ray of Chaos Software is mostly preferred.

3ds Max produced by Autodesk is a program which possesses the biggest number of users in the world. After 3ds Studio was introduced in 1990 for DOS, it was upgraded to the latest version of 3ds Max 2009 which is for Windows XP Professional and vista

3ds Max 2009 opened a new area in rendering technology by introducing new animation and mapping work flow tool which saves time and mutual operability and compatibility of 3ds Max with other industrial standard products such as Autodesk® and Maya® were greatly improved.

In the new rendering technique, there is a tool set, Reveal™ rendering, which is for repeated work flow and much faster rendering finish as well as ProMaterials™ which is library of material quality to be used for actual surface simulation. A full body can be rigged much faster and more efficiently through new bypass workflow. "Feet like Hands" is one of the character animation and mapping functions newly improved, which enhances efficiency of labor-intensive processes. Besides, mutual operability of 3ds Max with Autodesk®, Mudbox™, Maya, Autodesk®, MotionBuilder™ and other application programs was greatly reinforced in this release and bringing-in and sending-out of OBJ and Autodesk® FBX® were greatly improved.

V-ray which is developed and released by Chaos Software is a GI rendering program developed as a third party plug-in program to reinforce rendering function of 3ds Max and is getting popularity with its strong points of simple control and fast speed.

Though renderer of general scanline method which excludes various characteristics of light shows fast rendering time, it cannot express images like reality. Such method is called direct illumination.

Table 1. Preference of 3d modeling program and rendering program (Question investigation target Chung-ang, Sangji and Kangwon National University)

3d modeling program	program name	3ds max	Maya	Rhino	Alias
	Preference (100%)	83 (83%)	5 (5%)	12 (12%)	0 (0%)
rendering program	program name	V-ray	Maxwell	final render	Lightscape
	Preference (100%)	95 (95%)	0 (0%)	0 (0%)	5 (5%)

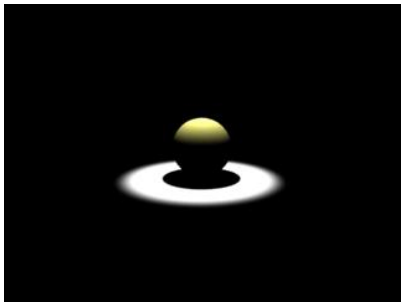

Fig.1. Direct illumination image.

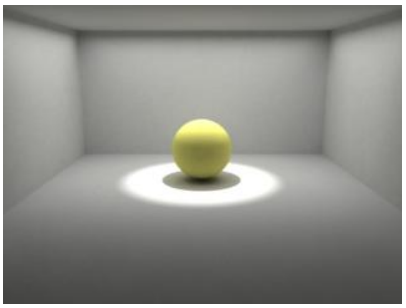

Fig.2. Global illumination image.

3. OPTIMUM STUDY

Study examples on material quality of wood surface

Among materials used for furniture and life accessories, wood is most frequently used and, among wood, special trees such as ebony, Garing or zelkova are the major species used, and, other than that, plywood made of white birch is more frequently used.

As to material source of such various kinds of wood, though there are some materials in the material/map browser of 3ds Max itself as shown in <fig. 3.>, the reality is that it is far insufficient in quantity and quality. Required material images can be acquired from 2-d graphic program such as photoshop.

In case of material quality expression, though material source is important, how to map such material is also one of the important matters. Drag type mapping method in 3ds Max can not get a good rendering image how good the material source used is and, in order to solve such a problem, proper use of UVW mapping of madifier list is important. As shown in figure 6, the best image can e created through a mapping form adequate for the shape and material source and Gizmo. <Fig.4>

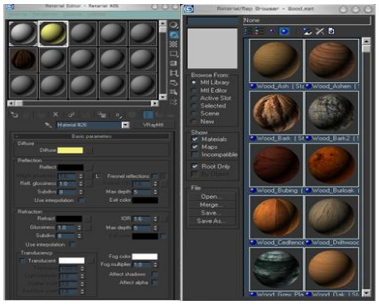

Fig.3. material/map browser for 3ds Max.

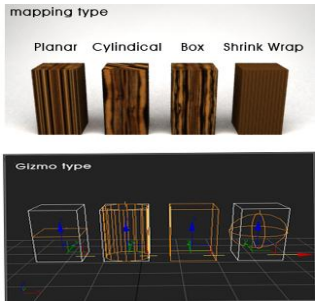

Fig.4. Mapping form and Gizmo through UVW mapping.

In case more than 2 material sources have to be applied which is difficult to be expressed through UVW mapping, polygons are detach <Fig.5>, on each of which each of different material sources is applied. Such a method is used to map plywood made of zelkova. Though this method has a weak point that it takes longer time than the method mentioned above, the completed image may look more efficient <Fig.6>.

Though there are other mapping methods than those mentioned above, two methods mentioned above are thought to be most adequate for furniture and accessories, and a better output image may be acquired if two methods are used in appropriate combination.

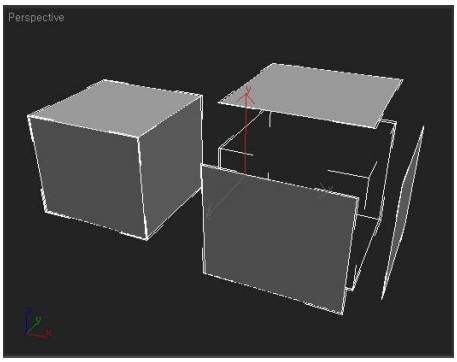

Fig. 5. Work process of detach polygon.

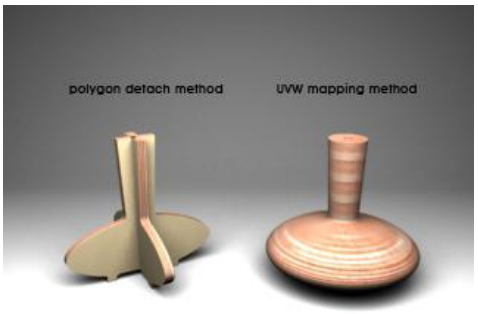

Fig. 6. white birch Plywood image to which UVW mapping method and polygon detach method are applied.

Study examples of surface finishing techniques

After mapping of material has been done in the methods explained up to now, the next work is surface finish. In actual production process too, after a shape is made by cutting material, finishing should be performed using surface finishing material when the technique used is coating or painting technique. At present the finishing material mostly used for wooden furniture and wooden accessories is lacquer which is a composite material and, only recently, natural high glossy paint of acrylic ingredient and natural paint of natural ingredient (lacquer) are more frequently used <Fig. 7>.

Fig.7 Furniture and accessories finished using various surface finishing materials

In order to express feelings of such surface finishing, changes have to be given to the object

made from material source through a number of processes. First of all, as one of the factors to classify finishing materials, gloss can be considered and, in case of high glossy material, mirror like image can be created by the glossiness. Also, chemical ingredient and lacquer too have different glossiness depending on the types.

Such glossiness of material is expressed by applying reflection value to the object in material/map browser of V-ray. The value is adjusted using colors, a brighter color having a higher reflection degree. In V-ray, fresnel reflections is also used, where more natural and realistic reflection can be expressed by adjusting the angle of object surface <Fig.8>.

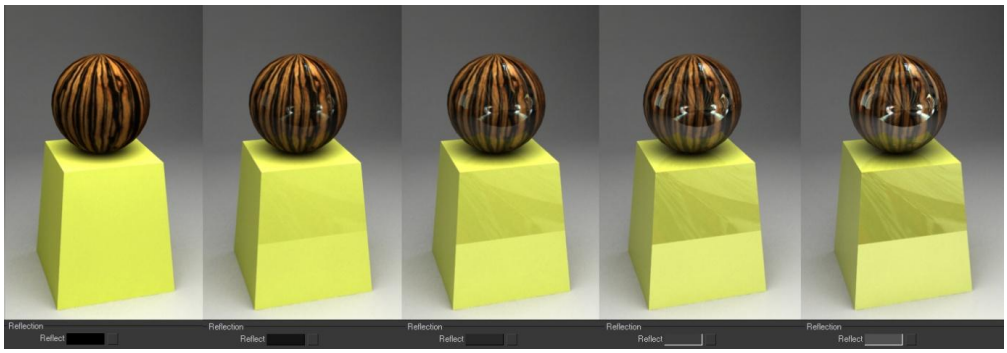

Fig.8. Change in reflection achieved by color change.

Feeling of high glossy or lacquer can be created by adjusting the glossiness of the material source made through such change of reflection. Also, when feeling of dull finish without gloss is required, in some cases, the reflection function may not be used, but dull finish feeling can be also created by adjusting Glossiness among reflection functions <Fig.9>. The number of light for such expression can be adjusted through Subdivs.

Refract has the function to adjust transparency, which can be used a little to create a good result. The refraction value used at this time may be determined through test or IOR which is an official document of refraction values globally recognized may be used as well.

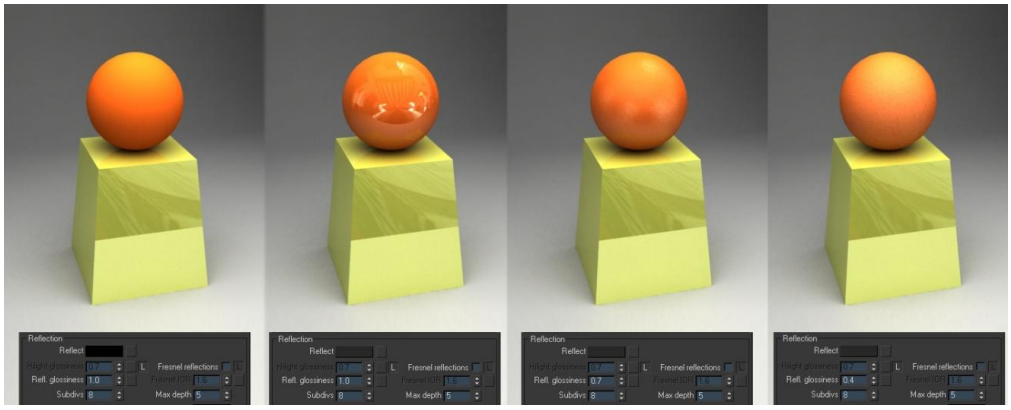

Fig.9. Change of image following use of Glossiness.

Another important point when making material using material/map browser of V-ray is to designate material type, which is adjustable in BRDF. 3ds Max has three types of BRDF, phong, blinn and ward and, in case of general wood, working with two types excluding phong can have feeling of wood in either reflection or refraction of light <Fig.10>.

Besides, various feelings may be expressed through setting of light and render scene of V-ray. More effective and realistic image can be created if various methods explained up to now are properly used and, as shown in <Fig. 11>, a good result can be acquired through images like an actual picture in the stage before actual production of furniture and accessories.

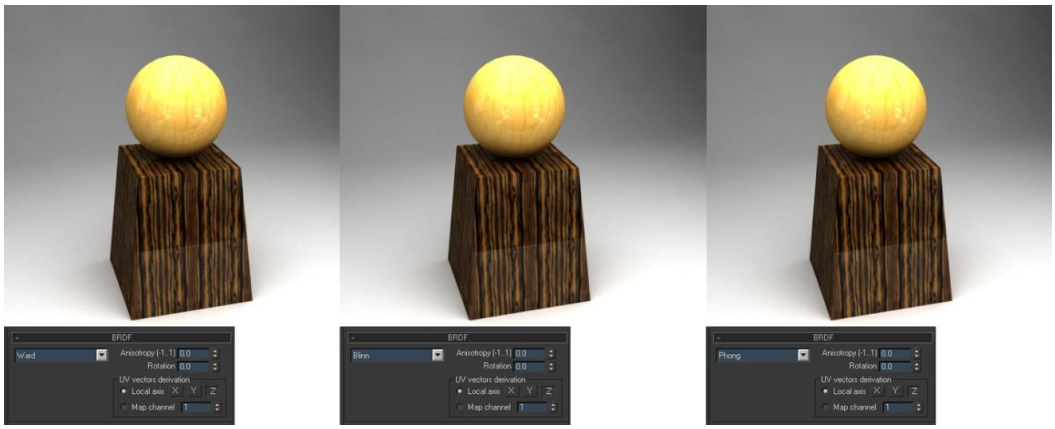

Fig.10. Image change according to BRDF.

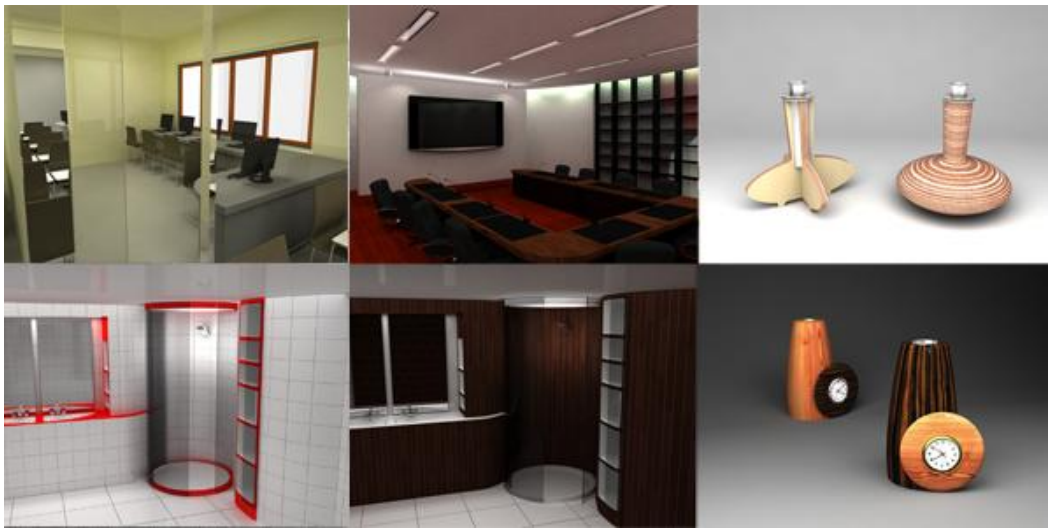

Fig.11. Modeling image acquired through 3ds Max and V-ray.

4. CONCLUSION

Passing through the process of this study, we would like to conclude the importance of mapping in 3-d modeling process as follows: First, the scope of idea generation can be expanded as the feeling can be confirmed before actual production through rendering of images like actual pictures while, in the past, the designer performed the work relying only on imagination based on his experience of producing furniture and accessories from the process of sketching the idea to actual production. Second, the most adequate material can be selected before actual production through applying diverse material sources like actual pictures in the process of material selection. Third, the time loss of repeated rendering process can be reduced by constructing material database.

Various quality of material and expression methods of finishing techniques presented in this study are thought to be adequate. We believe that further study of more diverse material may be needed in the future. Construction of database for mapping sources of diverse material quality may indefinitely expand formative expression of furniture and accessories.

5. REFERENCES

LeeSeungyeop. 2006. V-ray for 3-d graphic designers . Information Publishing Group. 14pp.
Kim Yeonggi. Kim Yundong. Power of V-ray. Youngjin. 27pp. 245pp.
Choi Kee. 2007. Korea Furniture Society. 19(4): 252.
www.autodesk.co.kr
www.chaosgroup.com
www.vrayrender.com