THE COMPARISON OF ANIMATION, VIRTUAL REALITY, AND SCENARIO SCRIPTING IN THE DESIGN PROCESS

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Abstract. Evolved from freehand sketches, physical models to computerized drafting, modeling, animations, and virtual reality, different media are used to communicate to designers or users with different conceptual levels. This study investigates the similarities and variances among computing techniques, interacting principles, and their applications. Different computerized media in the design process are also adopted to explore related phenomenon by using these three media in the renew project of old Hsinchu, Taiwan. Finally, similarity and variance among these computerized media are discussed. This study not only provides insight into the fundamental characteristics of the three computerized media discussed herein, but also enables designers to adopt different media in the design stages.

1. Introduction

Design media is a fundamental tool, which can incubate concrete ideas from ambiguous concepts. Evolved from freehand sketches, physical models to computerized drafting, modeling (Dave, 2000), animations (Woo, et al., 1999), and virtual reality (Chiu, 1999; Klercker, 1999; Emdanat, 1999), different media are used to communicate to designers or users with different conceptual levels during the design process. Extensively employed in design process, physical models help designers in managing forms and spaces more precisely and more freely (Millon, 1994; Liu, 1996).

Computerized drafting, models, animations, and VR have gradually replaced conventional media, freehand sketches and physical models. Diversely used in the design process, computerized media allow designers to
handle more divergent levels of space than conventional media do. The rapid emergence of computers in design process has ushered in efforts to the visual impact of this media, particularly (Rahman, 1992). He also emphasized the use of computerized media: modeling and animations. Moreover, based on Rahman’s study, Bai and Liu (1998) applied a new design media—virtual reality, to the design process. In doing so, they proposed an evaluation process to examine the visual impact of this new media in the design process. That same investigation pointed towards the facilitative role of the computerized media in enhancing topical comprehension, concept realization, and development of ideas.

Computer technology fosters the growth of emerging media. A new computerized media, scenario scripting (Sasada, 2000; Jozen, 2000), markedly enhances computer animations and, in doing so, positively impacts design processes. For the three latest media, i.e., computerized animation, virtual reality, and scenario scripting, the following question arises: What role does visual impact play in different design phases of these media. Moreover, what is the origin of such an impact? Furthermore, what are the similarities and variances of computing techniques, principles of interaction, and practical applications among these computerized media?

2. Problem and Objective

This study investigates the similarities and variances among computing techniques, interacting principles, and their applications in the above three media. Different computerized media in the design process are also adopted to explore related phenomenon by using these three media in a real project—a renewal planning project of the old district of Hsinchu City. Finally, similarity and variance among these computerized media are discussed. This study also examines the visual impact of these three computerized media in the design process.

3. Analysis Among Three Computerized Media

Gradually, computerized-media intervene in various architectural design stages. Diversity of computerized-media will have some differences in digital technology and making processes. In this stage, we will analysis and compare three media—animation, virtual reality, and scenario scripting, in terms of computer technology and making processes.

Animation:
A software, 3DMAX, can construct a building or space in computerized-world, and assign proper materials and lighting on all object in the scene. After
building a complete space, we set up a camera with a moving path for making a dynamic movie in 3DMAX. Finally, an animation was combined by this dynamic movie and background music in Adobe Premiere5.5. (Please refer making process in figure 1 and comparisons in table 1.)

**Virtual Reality:**
As similar as animation, after building a complete space, using the software, Nemo, which can import 3DMAX file and modify it, make a model-based virtual reality (not image-based VR). In this kind of VR, users and designers can move their viewpoint as their will to enjoy the computerized-world. (Please refer making process in figure 1 and comparisons in table 1.)

**Scenario Scripting:**
Before making animation, we defined characters (e.g. high-tech engineers) and their properties in the scene. They live in Hsinchu, and activate in the city. Scenario Scripting was combined by defined characters who follow the script, and animations made by 3DMAX.

![Diagram](image.png)

*Figure 1. Processing of making animation, VR, and scenario scripting.*

| TABLE 1. Comparison of components among three media. |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 3D Model | Texture | Lighting | Music | Characters | Scripting |
| Animation | ✓ | ✓ | ✓ | ✓ | ✗ |
| Virtual Reality | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ |
| Scenario Scripting | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
4. Methodological Steps

4.1. EXPERIMENT SAMPLES

In order to realize the capabilities of the three media mentioned above to be used in the design processes including architectural design and urban design, we first took the same urban scene to be the test data: a linear block of the Chung-Cheng road in the city Hsinchu, Taiwan. The animation, virtual reality (Nemo software), and a piece of scenario scripting were created (Figure 2, 3, 4). Please note that the three media were carefully dealt with so that the subjects of the experiment could be provided within the same experimental conditions.

Figure 2. Two test images from animation techniques.
4.2. SUBJECTS AND THE EXPERIMENT

Twenty subjects were included in this experiment. We invited ten designers and ten non-designers to be the two groups of subjects. Each subject was asked to fill out a questionnaire based on what the subject saw the three kinds of media. In the questionnaire, we asked subjects the effectiveness of the use of the three media in the following stages of design processes: local environment analysis, design concept developments, design alternatives, design evaluation, final design decision and final review (Rahman, 1992).

Also, after asking the twenty subjects the use of media in various stages of design, the subjects were then asked to compare the four kinds of characteristics of each media, based on their previous experience and what they currently see. Each subject could report unable to compare, if they could not be able to tell the differences between all these variables.
4.3. RESULTS AND DISCUSSION

When all the grades that the subjects marked for the experiment are acquired, the data was examined by statistical processes. First, the three media are cross-analyzed by the six stages. It shows that VR could be effective mostly in all stages (Table 2), whereas the scenario scripting is not easy to realize in the beginning but the most understandable in the final review process. And, the animation could fairly used in all phases of design as shown in Table 2a and 2b.

TABLE 2a: The relationship between the 6 design stages and the three media

<table>
<thead>
<tr>
<th></th>
<th>Animation</th>
<th>Virtual Reality</th>
<th>Scenario Scripting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Environment Analysis</td>
<td>3.4</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>Design Concept Development</td>
<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
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<tr>
<td>Design Alternatives</td>
<td>3.4</td>
<td>4.5</td>
<td>4.6</td>
</tr>
<tr>
<td>Design Evaluation</td>
<td>4.1</td>
<td>4.1</td>
<td>3.8</td>
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<tr>
<td>Final Design Decision</td>
<td>4.7</td>
<td>4.7</td>
<td>3.8</td>
</tr>
<tr>
<td>Final Review</td>
<td>4.2</td>
<td>4.2</td>
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</table>

With respect to the comparison of the 4 characteristics and the six stages, the data illustrated that the characteristics of design presentation is more and more important from the beginning to the end of the process; whereas the realizing the environment is truly in the opposite way. And, special handling and interaction with the media are both equally needed throughout all phases of design. Please see Table 3a and 3b for details.
When this study compares the four characteristics of the three media during the design processes, we found out the following phenomena. First, animation is similar to scenario scripting among the four characteristics, but is different from virtual reality (shown in table 4a). VR techniques are good at “Interactive with media” and “special handing”. On the other hand, animation and scenario scripting are very good at “design presentation”. Therefore, the scenario scripting presentation is suitable for the end of the design process. Details are provided in Table 4a and 4b.

TABLE 4a. The relationship between the 3 media and the 4 kinds of characteristics
TABLE 4a. The statistics of the 3 media and the 4 kinds of characteristics

<table>
<thead>
<tr>
<th></th>
<th>Interactive with media</th>
<th>Special handing</th>
<th>Realizing the environment</th>
<th>Design presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animation</td>
<td>2.5</td>
<td>3.4</td>
<td>3.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Virtual reality</td>
<td>4.9</td>
<td>4.3</td>
<td>4.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Scenario scripting</td>
<td>2.5</td>
<td>3.8</td>
<td>4</td>
<td>4.5</td>
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</table>

5. Conclusion and Future Study

This study also examines the visual impact of these three computerized media in the design process. In computerized animation, although other designers can realize the spatial concept in design, users cannot fully comprehend the concept. On the other hand, other media such as virtual reality and scenario scripting enable users to more directly comprehend what the designer's presentation.

Future studies should more closely examine how these three media impact the design process. This study not only provides further insight into the fundamental characteristics of the three computerized media discussed herein, but also enables designers to adopt different media in the design stages. Both designers and users can more fully understand design-related concepts.
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