Evaluation of Architectural Design
- Analysis of Perspective images, Relation of spaces, and Users’ conditions

Contents

1. Introduction
   - TextARC: Text Analysis Tool and Problem Statement
2. Theory and Interface Development
3. Computer Application
   4.1. Aesthetic aspects through visualizing the perspective images
   4.2. Relation of Spaces
   4.3. User’s Feeling
4. Conclusion

1. Introduction
   - TextARC: Text Analysis Tool and Problem Statement

If we want to understand literary works, we have to read them. This kind of reading gives us knowledge of the general outline, characters, times and the impression of the reading. This new interface, TextARC is an alternative view of a text. It shows the frequency and distribution of the words of an entire text on a single page or screen. TextARC allows viewers to quickly see relationships between words and characters at a glance through the interactive map.

(Fig. 1), even without having read the book. This special function of knowing the distribution of words in the text can support another kind of understanding. For example, it helps to reveal chapters in a text that concentrate on a specific subject. Lawyers could use such a system to search long documents for specific words or characters.

In my opinion, converting text into an interactive map like the above picture (Fig. 1), “showing” relationships of words and characters, and “filtering” the text to focus on a specific word or character can be applied to the architectural design process. The “filtering” of the text to focus on a specific word or character can correspond to “evaluating” architectural design, “showing” relationships of words and characters” can be correspond to “showing the path between spaces” and “evaluating the relation of spaces in the architectural design process”. Analyzing architectural drawings is necessary but so time-consuming work, due to the drawings having a lot of architectural symbols and information. Visualizing images, and evaluating designs focused on the specific the users or the relation of spaces are useful in the design process. Here visualizing images means another evaluation; designers can evaluate the design to fit his/her aesthetic taste through seeing perspective images.

2. Theory and Interface Development

Design can be defined as a “problem – solving process” and a “sequence of cognitive operations.” These definitions have different arguments about the design process; one is “problem formulations – solution generation with cognitive strategies”, the other is “assimilation – analysis – synthesis – evaluation – communication”.

But there are things in common with the two different arguments. First, design process is an iterative process. Second, in the design process a feedback procedure or evaluation activities are necessary to generate solutions, narrow solution space, change design goal, and add new constraints or missing ingredients.

In my opinion design tools must guarantee a kind of feedback or evaluation process and be an iterative design process for getting the natural design process with a computer application. Because designers usually repeat activities to find a solution and evaluate their solution based on major solution concept, these processes are repeated until the designer is satisfied with their designs.

In this paper I suggested a computer application that can execute the iterative process and evaluate the aesthetic aspects of design, relation of spaces and users’ feeling (condition). I categorized the evaluation elements into 2 parts: satisfying the architects aesthetic aspects and considering the user’s feelings.

To satisfy the architects aesthetic aspects, the application shows the perspective image, because we usually draw 2 dimensional drawings (often plans), although designers create in 3 dimensional space. So if you want to perceive actual created spaces, you have to imagine scenes or sketch perspectives. But even the trained designer easily cannot imagine 3 dimensional spaces very often. If the application can show the perspective of place where the designer wants to see 3D, it is very useful in design development. In considering the user’s feeling, I categorize it into 2 parts again: relation of spaces, and the user’s condition.

2 edited by Nigel Cross, Kees Dorst, Norbert Roozenburg, “Research in Design Thinking”, Proceedings of a Workshop Meeting held at the Faculty of Industrial Design Engineering Delft University of Technology, Netherlands, 1991
3. Computer Application

3.1. Aesthetic aspects through visualizing the perspective images

Designers usually draw a lot of drawings, until they figure out the satisfactory solution in their design process. The drawings consist of many sheets of paper and many kinds of drawings: plan, section, elevation, detail, and perspective. All the drawings are two dimensional except perspective sketches. Perspective sketches are useful to imagine and evaluate the created space by designer, since even the trained designer can sometimes have trouble imagining 3D space from only 2D drawings. So, designers usually use perspective images of critical area to perceive the created spaces. In my opinion, this process is a kind of analysis and evaluation of space in an aesthetic aspect. Designers change their design if the perspective image is not attractive to them, or if designs are not satisfactory to their tastes. Showing perspective images of all the parts of a plan is not an efficient method, since it is time consuming and some images are not necessary in developing their design. How can we easily select the place in the architectural drawings that we want to convert into perspective image?

Imagine that you are architect, and a client has hired you to design hospital.

First, You would draw or sketch the architectural drawings (plan).

![Fig. 1 Draw the drawings in early design stage](image)

In the early design stage, architects draw freehand sketches, which express walls, columns, stairs, and doors through simple strokes as seen in the above picture (Fig. 2). They usually note what the use of the space will be such as the emergency room, operating room, and small hall.

Second, choose two spaces
If the designer wants to know the relation of spaces, choose 2 spaces are selected from the drawings. In Fig. 3 the ER(emergency room) and Operating Room were selected in order to get to know the relationship of the two spaces. For example “How can a patient in ER access to operating room?”
Third, show the path on the drawing and in text from one place to the other. In the previous stage, you choose the ER on the 1st floor and Operating Room on the 3rd floor. In this stage the computer application will show the path on drawings (Fig. 4) and in text (Fig. 5) from ER to Operating Room.


Fourth, click the path where you want to evaluate
If you want to see the space in perspective image, choose the part of the path on from the text or drawing.

Fifth, Show the perspective images


Sixth, evaluate the design using perspective image of the created space

Seventh, the designer decides whether he/she wants to change the design and redraw

Eighth, repeat the above procedure if necessary

In sixth step, you can analyze the perspective scene. The image presented can be satisfactory or unsatisfactory to your aesthetic taste. If the created space is not attractive to you, you can start over with the first step to change the design. The designer can repeat the procedure until he/she is satisfied with the design.

3.2. Relation of spaces

In the 3rd step of section 3.1, you can see the path from one place to the other place. The designer should ask themselves: “What relation the specific spaces have?”, “Does this path have unnatural or natural flow?” besides the simple path between two spaces. For example, look at the path from the ER to the Operating Room in Fig. 5. Designer will try to judge whether the path is natural or not.

In Fig 8 and Fig 9, the designer will discover the flow is not natural, because you have to pass a
small hall get to the operating room. What is unnatural about that? Imagine you are involved in a traffic accident and you need surgery, medical staffs must give medical care, e.g. surgery operation, to you as soon as possible. But if the medical staff has to move you from the ER to Operating Room through a crowded, small hall, the pathway between space is not allowing for an efficient, natural flow of traffic. In my opinion, designer will decide that he the design needs to be changed so that there is a natural flow.

3.3. User’s Feeling or Condition

As you know, design and art are different. Although none would deny that art and design have similar aspects. Conversely no one would deny that art and design are not the same in that the user’s feelings have to be considered in design. In architectural design considering the user’s feeling is the critical part.

In the hospital example, the designer has to seriously consider easy access for disabled persons, because patients very often use wheelchairs. In my opinion, this kind of analysis or evaluation of the user’s condition or feeling is necessary, but it is often time consuming and the designer can often overlook the user’s conditions/feelings. So, if computer application can this kind of work, it would be very useful.

In the 1st, 2nd steps of section 3.1 are same the procedure, and you choose a small hall in 1st floor and an exercise room for recovery in 4th floor, then the computer application will show the path between two places. In my opinion there will be 2 kinds of results.

"small hall in 1st floor – stairs – corridor (4th floor) – exercise room for recovery"
In case 1 (Fig. 10), the disabled person with a wheelchair would not be able to access the exercise room, because he/she cannot use stairs. So, the design should be changed, which is simple in this area. But case 2 (Fig. 11) is more complicated. The disabled person with a wheelchair appears to access the exercise room, but you have to check other things before you decide your design is reasonable: You have to check the width of the corridor, size of the elevator, width of the ramp, size of the door and so on. Since wheelchair requires more space. If a computer application could check these design elements, if then the computer application could be able figure out that the access to exercise room for recovery is impossible for a wheelchair because of the narrow width of the 4th floor corridor. The designer would then be able to change his/her design in an earlier step of the design process.

4. Conclusion

In this paper I paid attention to the iterative character of design and the evaluation stage in this iterative process. When we consider that design is a problem and solution activity with cognitive consequences, we have to do feedback or analysis of the design to get the best solution and keep with the major concept. This analyzing process (visualization of perspective images, evaluation of relation of rooms, path, and user’s condition and feeling) is necessary, but very time consuming if you did it by yourself. In my opinion, although you often try to evaluate your design, you can miss unnatural things very often.

If a computer application could check your design thoroughly, easily, and fast. It would be helpful for the designer, and this application still has the essential character, “repetitive process.” After evaluation of the design by the computer application, you could come back to your design, and modify it. You could repeat these activities until you are satisfied with your end-product.

In this paper I gave a specific example of a hospital. I believe this computer application could be used on other kinds of architecture buildings. For example in a single family residence this application would work: If the appeared path was “family room – parent’s room – living room – child room”, the computer application would recognize this relation as unnatural. The family room is a kind of public space, but you have to pass through the parent’s room (private space) to get to family room. Designers would then know that they had better change their designs.