The Design of a CAI Program for the Basic Perspective Drawing

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Abstract: Since the complexity of the steps and methods involved in the perspective drawing has caused a teaching-and-learning problem in the traditional classroom, a Computer Assisted Instruction (CAI) program was set up to help in solving it. This paper described the guidelines in setting this CAI program. A few of illustrations had also been shown how it works. By utilizing the characteristics of computer, this CAI program could lead the student to learn perspective drawing step by step. In the progress, not only the steps in drawing but also the principles are illustrated. Students have the advantages in reviewing any steps and in varying each elements of the drawing as long as he/she likes in order to depth his/her understanding. In addition, students could access this CAI program any time at any place with self-driving pace. The implications of this CAI program were also addressed.

Keywords: Computer Assisted Instruction (CAI), Perspective Drawing

1. The problem of the traditional perspective teaching

A perspective drawing is a kind of media to show the design to the world. It is a tool to draw the three-dimension objects on a two-dimension paper. Though there are some application packages, such as Alais, 3D MAX, available in the market, the concepts and skills of the basic perspective drawing still has to be taught in the classroom. Through the education and practice, a designer would cultivate his/her capability of drawing. After the class of perspective drawing, students are supposed to have ideas about the relationship between objects and space. This class would help students to have the concept of perspective drawing, to understand the principle of perspective drawing, and be acquainted with the drawing skills. Since some constraints are inherent in the available lecture tools, some teaching-and-learning problems in the traditional classroom, have occurred[1, 2, 3, 4, 5, 6]:

1.1 Because lots of consecutive lines and steps involves in a completed drawing (Figure.1, 2 and 3), teachers have to spend a lot of time on drawing and redrawing on the board, however, students still have difficulty to distinguish which one comes first and which one comes latter.

1.2 Because lots of aided lines and reference lines are needed in accomplishing a perspective drawing, with a few number of color chalks, it is a problem to tell aided lines and reference lines apart from the perspective lines by colors.

1.3 For the purpose of clearness, a drawing has to be made larger than normal size. The larger the size of a drawing the more effort is needed. In the case that errors occur, it needs lots of effort to correct them. Even correction is possible; sometimes the board would be looked messy.
2. Computer assisted instruction

Since 1960, computer assisted instruction (CAI) has been successfully implemented in several fields, e.g., mathematics[7], HIV[8]. So far, there is lack of application CAI in the field of design education. Because CAI has the advantages of individualization and interactive, and less time and space constraints, it might be adopted to solve the problems in the instruction of perspective drawing. Therefore, the aim of this study is to design a CAI for basic perspective drawing to solve the problems mentioned above.

3. Software Design

By utilizing the characteristics of computer, this software could provide easier and faster learning model. In the progress, not only the steps in drawing but also the principles are illustrated. The users could change the value and/or the location of the elements of perspective drawing to visualize the variation of the cube. For the purpose to save time in operating repeatedly, the software also provides the function of “auto drawing”; i.e., it could show the procedures step by step discretely or continuously.

The dynamic perspective drawing system (Figure 4) is programmed by Microsoft Visual Basic 6.0. The operation system is set in the Windows 98. It offers a means to help student learn easier and faster. The system has functions to vary all the elements in the perspective drawing in real-time mode to show users the various aspects of perspective drawing. The user has choices to view the variation step-by-step or automatic broadcasting.
Mouse is the only tool needed to operate in this system. The user clicks and drags the mouse to draw the perspective drawing cube just following a red dot. A "go back" button is located at the lower left corner, which give the user an opportunity to look back. An example of two-point perspective drawing was illustrated in Figure 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16. The user could use this system to learn and practice the techniques and steps which be used in real drawing.
Figure 6: A drawing example, step 2.

Figure 7: A drawing example, step 3.
Figure 8: A drawing example, step 4

Figure 9: A drawing example, step 5
Figure 10: A drawing example, step 6

Figure 11: A drawing example, step 7
Figure 12: A drawing example, step 8-9

Figure 13: A drawing example, step 10-17
Figure 14: A drawing example, step 18-21

Figure 15: A drawing example, step 22-27
After finishing the example, the user can click the button "modify / move" located at the middle bottom of the window to view the variation of drawing (Figure 17). Then the user can select one of the elements: "P.L.", "tip point", "length", "angle", "S.P.", "GL", and "H.L.". After a desired element is selected, the user uses mouse to click and drag the red dot to view the corresponding variation of a drawing in real-time (Figure 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, and 31).
Figure 18: Move the element of "P.L." (I)

Figure 19: Move the element of "P.L." (II)

Figure 20: Move the element of "tip point" (I)

Figure 21: Move the element of "tip point" (II)

Figure 22: Move the element of "length" (I)

Figure 23: Move the element of "length" (II)

Figure 24: Move the element of "angle" (I)

Figure 25: Move the element of "angle" (II)
4. Conclusion

All above is the application of computer assistant teaching in perspective drawing. After the computer assisted instruction program was setup, the students could control the pace of learning and studying by themselves, understand the principle of perspective drawing step by step, have the chance to practice, repeat and review the teaching contents, have the advantage in reviewing any steps, and vary each element of the drawing as long as they like in order to depth their understanding. By adopting this CAI program, teachers might be easier to illustrate the drawing principles in the class. Students might access this CAI program any time at any place with self-driving pace. While this CAI is broadcasting, students could follow it step by step to draw their own drawings on paper. By this way, students might not miss any lines and steps, and they could tell aided lines and reference lines apart from the perspective lines. Consequently, they would learn the concepts and skills of the basic perspective drawing.
In the future, we will attempt to add the three-point perspective drawing or the shade drawing into the CAI program, in order to provide users with better concept and skill in perspective drawing.

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