

10.2 – Navigation of Information Spaces

Humans live in a 3D environment. It is no surprise that humans' visual perception has adapted to this environment. Ware in his book introduces depth cue theory [1]. This theory provides explanation about different mechanisms that visual system uses to perceive space from visual cues in the environment. I am going to show examples of how these principles have been used in different applications.

Occlusion is the strongest depth cue according to Ware [1]. If an object covers part of another object it seems closer to the viewer. It is also very easy to reproduce this effect in digital environment with a little cost. Cast shadows are another powerful depth cue. They provide information about the height of an object. Modern operating systems like Windows have used a combination of these two depth cues in designing their graphical interface. Figure 1 shows example of usage of these cues in Windows graphical interface. Icons are on the desktop and they also cast shadows on the desktop background. It provides the perception that they are on top of the desktop background. Open windows also can cover each other and cast shadow on each other. It helps to make the top window seem closer to the user and also attract attention to that window.

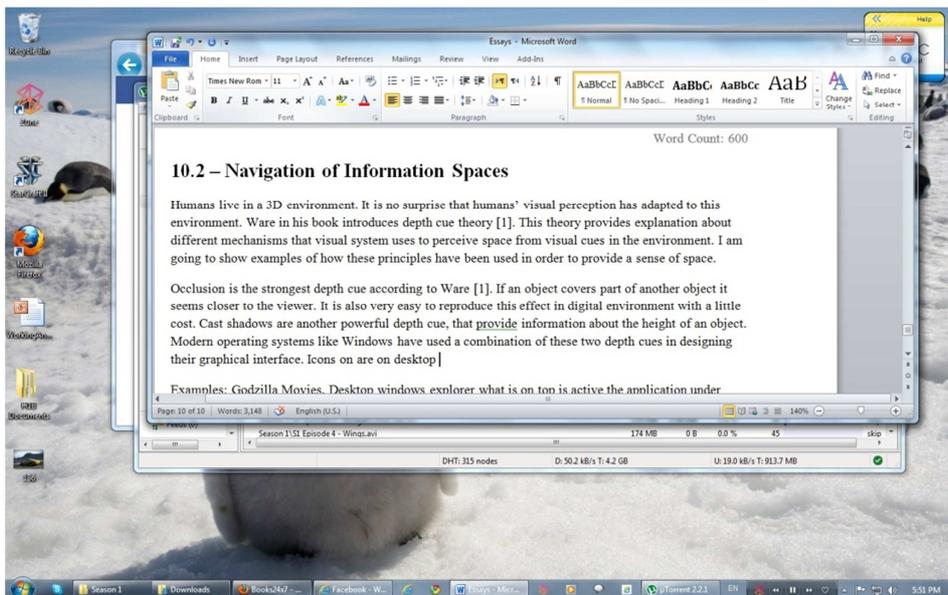


Figure 1 Windows Graphical Shell

Depth of focus is another depth cue that helps us to separate foreground objects from background objects. Objects that are not in focus become blurred. This mechanism has been used extensively in video games. It serves two purposes; first it makes the scene more realistic and similar to the real world. Second it reduces the amount of rendering and details that are required for the background objects and enables the program to allocate more resources for rendering the object in focus. Figure 2 shows an example of using this cue in Need for Speed video game. You can clearly see the car, that is in focus with a lot of details (reflection of the environment is visible on windshield and body of the car). The city in the background is blurred and gloomy in order to reduce the rendering cost and creating a realistic scene.



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Figure 2 using depth of focus cue in video games

27 Perspective cue is another depth cue that humans' visual system considers for perceiving a scene. This
28 cue is based on the facts about geometry of the scene and the view point of the viewer. Examples of this
29 cues is reduction of details in texture as the object becomes distant from the viewer or further objects look
30 smaller. Film industry has used this cue extensively in the past to produce special effects for the movies in
31 the old days. Before introduction of the computer generated animation, the film makers have to rely on
32 this technique in order to create realistic scenes. Movies like, Godzilla have to create scenes with giant
33 imaginary beast in the scene. A clever use of perspective cue and models helped directors to create scenes
34 with giant beast and people in the scene. Correct placement of camera and adjusting the size of the beast
35 in relation to the model helped them to create scenes with beast and people that looked real to viewer.

36 I provided examples of how different depth cues have been used in different visual systems. A clever use
37 of these cues will help the system to create scene with desired features and reduce the cost for creating
38 such a scene. A designer should choose the best depth cues for his application based on the application
39 requirements.

40 References

- 41 1. Ware. "Information Visualization." Chapter 8.