CHAPTER 4

DESIGN

This chapter discusses the design process of the thesis. Section 4.1 looks at the good user interface design principles. Section 4.2 investigates hierarchical tree structure. Section 4.3 summarizes the discussion of the design topic.

4.1 USER INTERFACE DESIGN PRINCIPLES

User appreciates good user interfaces. Usually, users will judge an application and a web site by its user interface first. This is as what the old adage says "most people judge book by its cover". Poor user interface design is always said to be the main reason of why many applications and web sites are never used [Shneiderman, 1998].

Graphical user interface (GUI) relies on windows, iconic representation of entities, pull-down or pop-up menus, and pointing devices. GUI normally have the following characteristics:

Table 4.1 GUI Characteristics

Characteristic	Description
Windows	Multiple windows allow different information to be displayed simultaneously on the user's screen
Icons	Icons represent different types of information. On some systems, icons represent files; on others, icons represents processes
Menus	Commands are selected from a menu rather than typed in a command language

Pointing	A pointing device such as a mouse is used for selecting choice from a menu or indicating items of interest in a window
Graphics	Graphical elements can be mixed with text on the same display

Source: Sommerville, Ian. Software Engineering 5th Edition. Addison Wesley, 1996.

For an application or a web site to be usable, several user interface design principles [SCO, 1996] need to be followed. They are as the following:

- **Keep the user interface consistent**

Consistency is important both among applications and within a single application. It also applies to the user interface design. Consistency helps the user transfer familiar skills to new situations. The user can apply the knowledge learned from one application to another application, reducing the amount of learning and subsequent recall. Consistency within applications facilitates exploration of new functions. Consistency among applications increases the user's sense of mastery.

- **Keep Interfaces Natural**

The designers can extend the concepts of giving the user control and using real-world metaphors to arrange the application so that tasks flow naturally. Users need to be able to anticipate the natural progression of each task; through this anticipation, they are able to complete tasks more quickly. Each screen object needs to have a distinct appearance that the user can easily recognize and quickly understand. At the same time, the style of the interface needs to graphically unify these elements and ensure a consistent and attractive appearance at any screen resolution.

- **Make Navigation Easy**

Make navigation easy by providing a straightforward presentation of the overall work area and the mechanisms for moving through it. Moving easily and quickly within the work area gives the user a sense of mastery over the application. For example, scrollbars are an effective way to indicate the position of the current view in relation to an area as a whole. In addition to providing positional feedback, scrollbars allow the user to move through the area.

- **Use Real-World Metaphors**

A good user interface allows the user to transfer skills from real-world experiences. For example, pushbuttons push, and scales slide. This makes it easier for the user to infer how to use an application. When designing a new component or user interface, the designer need to consider how a similar real-world control performs to incorporate the metaphor into the new component. Real-world metaphors can extend to groups of components as well, especially when making a computer-based user interface to replace a mechanical user interface. In this thesis case, the metaphor most suitable is the book's table of contents.

- **Allow Direct Manipulation**

Users need to be able to directly manipulate elements of the user interface and their applications. For example, the user needs to be able to directly scroll text with a scrollbar, rather than using a keyboard-driven command. Direct manipulation simulates the real world where the user employs tools to perform tasks on physical objects [Shneiderman, 1998]. Users control applications by directly manipulating graphical components similar to real-world controls,

rather than entering a command on a command line. Direct manipulation reduces the amount of information the user needs to memorize. Direct manipulation connects an action to an observable response from a component. Using direct manipulation, the user gets an immediate visible result from each action. The direct manipulation model is an object-action model. That is, the user first select an object or group of objects, then perform an action on the selected objects. An object-action model allows the user to see what elements will be acted on before performing an action. It also allows multiple actions to be performed successively on the selected elements.

If the user interface design principles above are followed, the users would not do the following as what Neilsen [1999] found in his extensive usability studies. He discovers that:

- People have very little patience for poorly designed WWW sites. As one user put it: "the more well-organized a page is, the more faith I will have in the information."
- Users do not want to scroll: information that is not on the top screen when a page comes up is only read by very interested users.
- Users do not want to read: reading speeds are more than 25% slower from computer screens than from paper.

4.2 USER INTERFACE STRUCTURE

This section researches a suitable user interface structure for content-rich web site as the emphasis. Hierarchical tree structure as a user interface to represent and visualize a web site's contents is studied.

Hierarchical Tree Structure

Although some people is not typically think hierarchically, however, the information hierarchy is the primary navigation system. Usually, from the main page to the destination pages that house the actual content, the main options on each page are taken directly from the hierarchy [Rosenfeld and Morville, 1997].

Organization structure plays an intangible yet very important role in the design of web sites. While human being interact with organization structures every day, they seldom think about them. For instance, movies are linear in their physical structure. Viewers experience them frame by frame from beginning to end. However, the plots of the movie may be non-linear, employing flashbacks and parallel subplots. Another example is map. Maps have a spatial structure. Items are placed according to physical proximity and this is actually hierarchical in nature.

The structure of information defines the primary ways in which users can navigate. Major organization structures that apply to web sites and intranet architectures is the hierarchy tree structure [Conger and Mason, 1998]. Thus, the emphasis of this thesis is only on the hierarchy tree model.

Hierarchy Tree: A Top-down Approach

The foundation of almost all good information architectures is a well-designed hierarchy [Conger and Mason, 1998]. The mutually exclusive subdivisions and parent-child relationships of hierarchies are simple and familiar. Human being has organized information into hierarchies since the beginning of time. The family trees are hierarchical. The division of life on Earth into kingdoms and classes and species is hierarchical. Organization charts are usually hierarchical. Authors divide books into chapters into sections into paragraphs into sentences

into words into letters. Hierarchy is ubiquitous in people' lives and informs their understanding of the world in a profound and meaningful way. Because of this pervasiveness of hierarchy, users can easily and quickly understand web sites that use hierarchical organizations models. They are able to develop a mental model of the site's structure and their location within that structure. This provides context that helps users feel comfortable. See Figure 4.1 for an example of a simple hierarchical tree model.
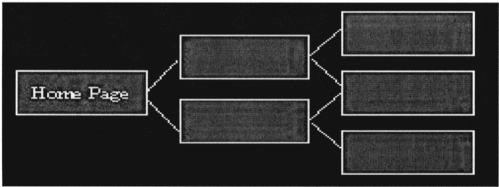

Figure 4.1 A Hierarchical Tree Structure In A Web Site

Because hierarchies provide a simple and familiar way to organize information, they are usually a good place to start the information architecture process. The top-down approach allows the designer to quickly get a handle on the scope of the web site without going through an extensive content inventory process. The designer then can begin identifying the major content areas and exploring possible organization schemes that will provide access to that content.

4.3 SUMMARY

From the study made in this chapter, it is clear that hierarchical tree structure is a very useful representation method for a web site. It is widely used and not only for web sites but also in many human interests such as family tree, organization chart and animal kingdom.

Based on these facts and the familiarity of humans with such structure, the next chapter discusses the implementation part of the hierarchy tree structure for the CRIVE interface.