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A Structured Navigation Design Method for Intranets

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Abstract

As an application of the Web technology, the intranet has quickly been emerging as a new tool for organization-wide information access and communication. The implementation of intranet is based on hypermedia whose distinguishing feature lies in the navigation through links and nodes. This paper describes a navigation design methodology for the intranet. The proposed methodology is based on the two hierarchical information structures: Metainformation Structure (MIS) and Information Structure (IS). A MIS shows the global structure of information to be put on an intranet, and an IS describes the local structure of it. These two hierarchies are used to identify various nodes and links for intranet navigation design.

Introduction

An intranet is a duplicate version of the Web that operates within an organization allowing employees to communicate and access an electronic information repository using browsers. Intranets provide organizations with various advantages (e.g., see McCune, 1996). According to O'Leary (1997), intranet growth will outpace the Internet growth by the factor of two between now and the year 2000. Intranets are an implementation of hypermedia concept capitalizing on the Web technologies and architecture (Bieber and Vitali, 1997). The heart of a hypermedia application lies in the navigation using links and nodes (Conklin, 1987). Although we have seen several navigation deign techniques such as RMDM (Isakowitz et al, 1995) and HDM (Garzotto et al, 1993), no single formal design technique is relevant for designing all of hypermedia applications (Nanard and Nanard, 1995). In the following section, issues related to the navigation design of hypermedia applications are presented. Next, a navigation design method for intranets is described using Metainformation Structure (MIS) and Information Structure (IS).

Navigation-related Issues

Navigation-related issues deal with the following questions: Where am I?, Where do I go?, and How do I get there? (Rivlin et al, 1994). According to Stotts and Furuta (1991), there are two broad kinds of hypermedia applications: hyperbase and hyperdocument applications. Hyperdocument application is related to the exploring and reading hyperdocuments for comprehension and communication. Comprehension is often described as the construction of a mental model that represents the objects and semantic relations contained in a text (van Dijk and Kintsch, 1983). There are two crucial factors that influence this process: *coherence* as positive influence (Thuring et al, 1991) and *cognitive overhead* (Conklin, 1987) as negative influence on comprehension. A document is coherent if a reader can construct a mental model that corresponds to facts and relations described in the document (Johnson-Laird, 1989). Cognitive overhead is "the additional effort and concentration necessary maintain several tasks or trails at one time" (Conklin, 1987, p. 40). In terms of hypermedia, such efforts primarily concern disorientation and navigation. (Thuring et al 1995). Disorientation occurs when readers are "lost in hyperspace" (Nielson, 1990). In this cognitive context, Thuring et al (1995) summarize a set of navigation-related issues of hypermedia, including: (1) *higher local coherence*, (2) *higher global coherence*, (3) *lower user disorientation*, and (4) *facilitation of navigation*. In addition, Bieber and Kacmar (1995) view hypermedia as a philosophy of "maximum access" (p.102) which allows the user to access and explore as much information as possible.

Local coherence can be increased by indicating semantic relations between information units and by reducing the impression of information fragmentation. Global coherence can be increased by appropriate

aggregation of information units and by providing an overview of the information space. Lower user disorientation can be achieved by guiding users between information units. Thuring et al (1995) introduce the concept of direction and distance in facilitating navigation. With respect to distance, they distinguish between *steps* and *jumps*. In this paper, a step connects between adjacent information units, and a jump between non-adjacent information units. In this method, the two structures (i.e., MIS and IS) with various links will address the navigation-related issues.

Metainformation Structure (MIS)

A MIS shows the composition of information about information to increase global coherence. In constructing a MIS, the concepts of global node, threshold node, category node, aggregate node, composite node are used at the top level of a MIS. A *global* node represents navigation domain, and a *threshold* node represents a threshold (entry point). A *category* node shows a specific category within a threshold. For example, user guide is a category within document threshold. An *aggregate* node is a class on which various subclasses "grow." Thus, an aggregate node deals with *gen-spec* structure. A *composite* node is another class on which "parts" grow. A composite node is the root of a tree structure. From the composite node, trunk, stem, stalk, branch, twig, sprig, spray, shoot, and leaf nodes grow. They are all parts of a tree. Thus, a composite node deals with *whole-part* relationship. Even though a hierarchy can show up to ninth node in this method, the actual depth can be extended, if necessary, using other names. However, it should be noted that, when extending the depth, the designer should avoid "the fragmentation characteristic of hypertext" (Marshall and Irish, 1989, p. 22) to increase the level of coherence.

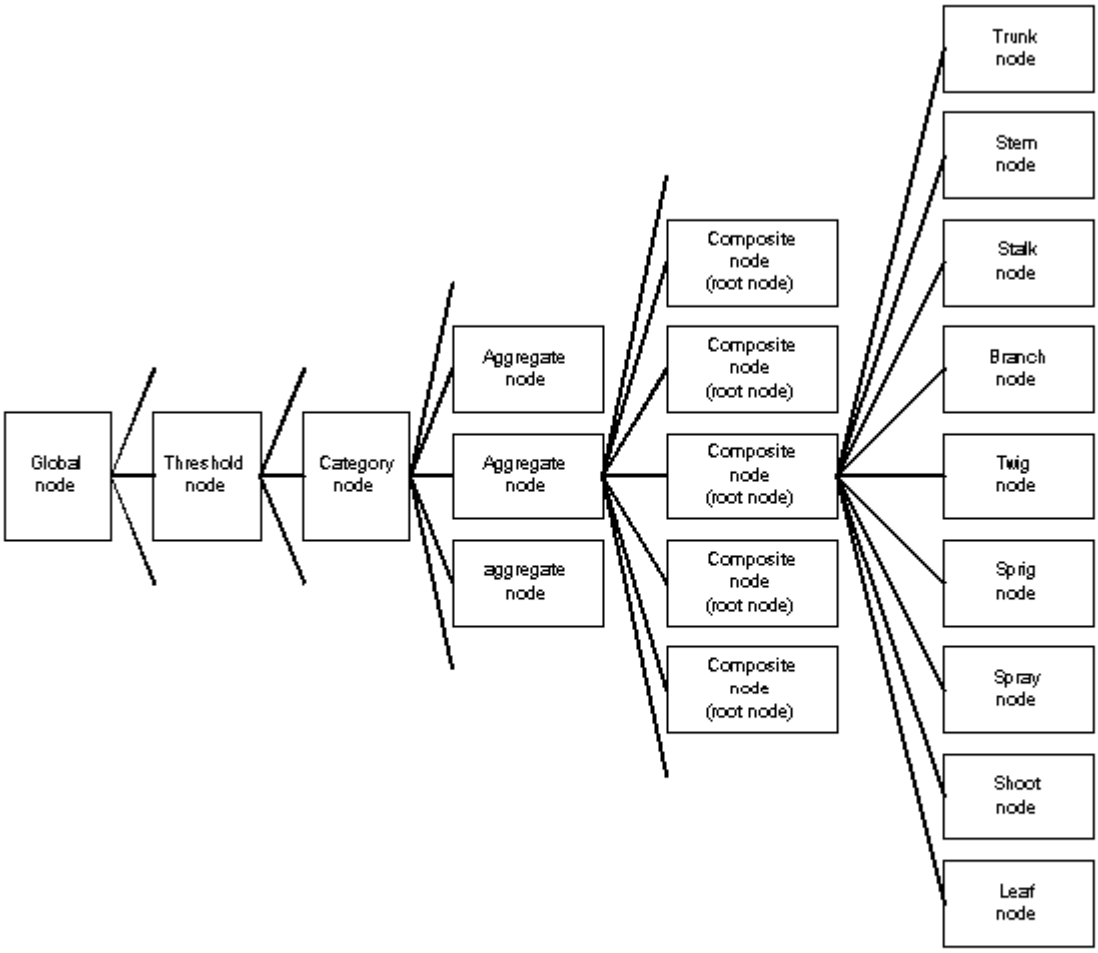

Figure 1. Basic elements of metainformation structure (MIS). A composite node is a root node, and the top most node is called global node

Figure 1 graphically shows the basic elements of a MIS. An example of a MIS for a user guide is shown in Figure 2. As can be seen, the MIS starts with a navigation domain node (a navigation domain node is a node that represents a navigational context within an organization where an intranet is implemented. There will be many navigation domains in an organization such as Headquarters, Europe Branch, Asia Branch, etc.). Within a navigation domain, there may be several thresholds (entry points) such as Document and Business Units. In a document threshold, there may be various document categories such as user guide, training manual, etc. This process continues until the leaf node. The node names provide the designer with useful guides to constructing MISs and corresponding ISs. They also becomes a basis for user interface design for the intranet. Figure 2 shows the step link type and its instance links which are used to traverse adjacent nodes. Figure 3 shows another link type called jump link type which is used for "jumping" between non-adjacent nodes in the hierarchy.

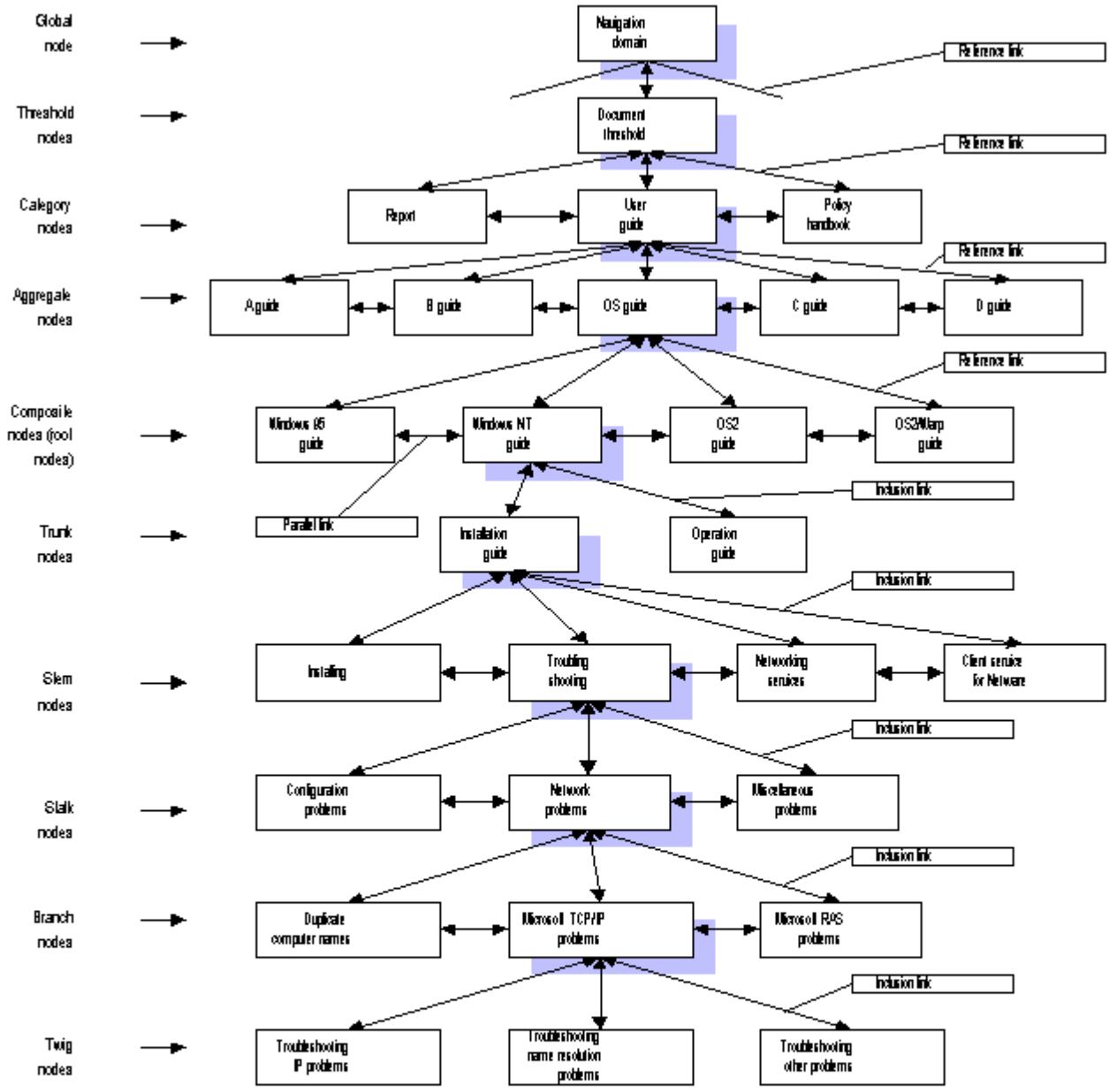

Figure 2. Step link type. It shows links of the step link type. Reference link shows links for the structural relationships "is a threshold of," "is composed of," "is a category of," and "is a." Inclusion link shows "is part of" relationship. Parallel link shows spatial or temporal relationship.

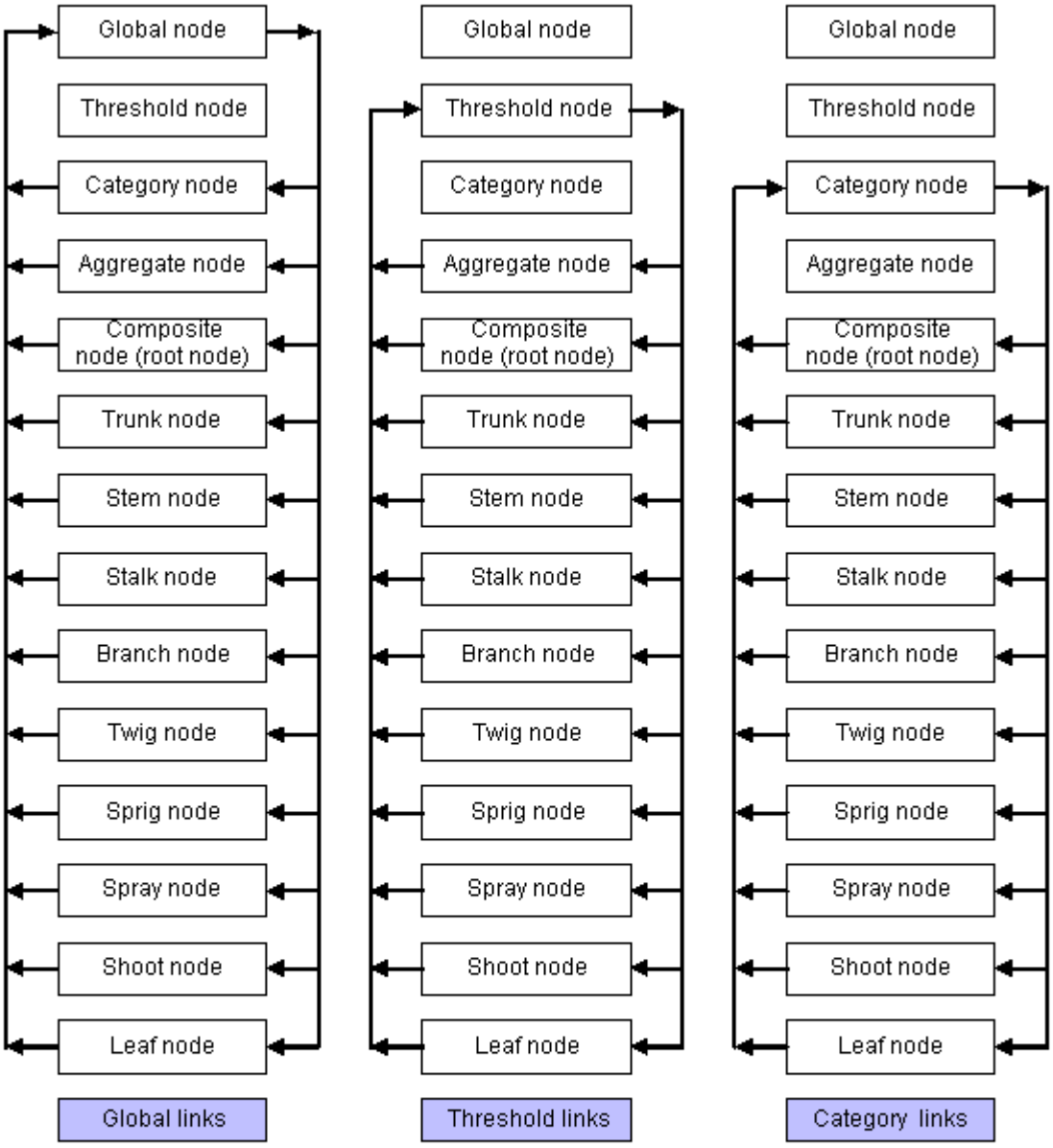

Figure 3. Jump link type. Links in the jump link type are used for jump between non-immediate nodes. This figure shows only three links of the jump link type (global, threshold, category links). In this methodology, total of 12 links are possible, but not limited to, for the jump link type.

Information Structure (IS)

A MIS is for the global structure of a hypermedia application. A MIS increases the level of global coherence because it shows aggregation of information units as well as an overview of an information

space. In user-interface design, the individual node names of a MIS will be organized as indexes and menus. Next step is to elaborate local structures of given nodes using the concept of IS. An IS deals with individual classes, subclasses, and their instances within the end nodes (e.g., "troubleshooting IP problems" in Figure 2) identified in the corresponding MIS. An end node is the node located at the bottom of a MIS, which can be any node under the threshold node depending on the MIS. To construct an IS, various attributes are used. There are two generic attribute types: standard and custom attributes. *Standard* attributes include intrinsic attribute (e.g., name), associate attribute (which has multiple values), and conditional attribute (e.g., "rank" which is the basis of subclassing). The intrinsic attributes are combined into a composite attribute called "overview." A similar but different concept is used in Isakowitz et al (1995). *Custom* attribute consists of multimedia attributes (except for text) such as photo, video clip, and animation, and occasionally "search" attribute. The search attribute is a special custom attribute for a class such as a large group people, a possible threshold, which requires a search procedure to find a specific person. All identified classes, subclasses, objects, and attributes are again organized by a hierarchical structure which becomes an IS. Figure 4 shows an IS with its step link type for a part of the graduate handbook of an information systems department.

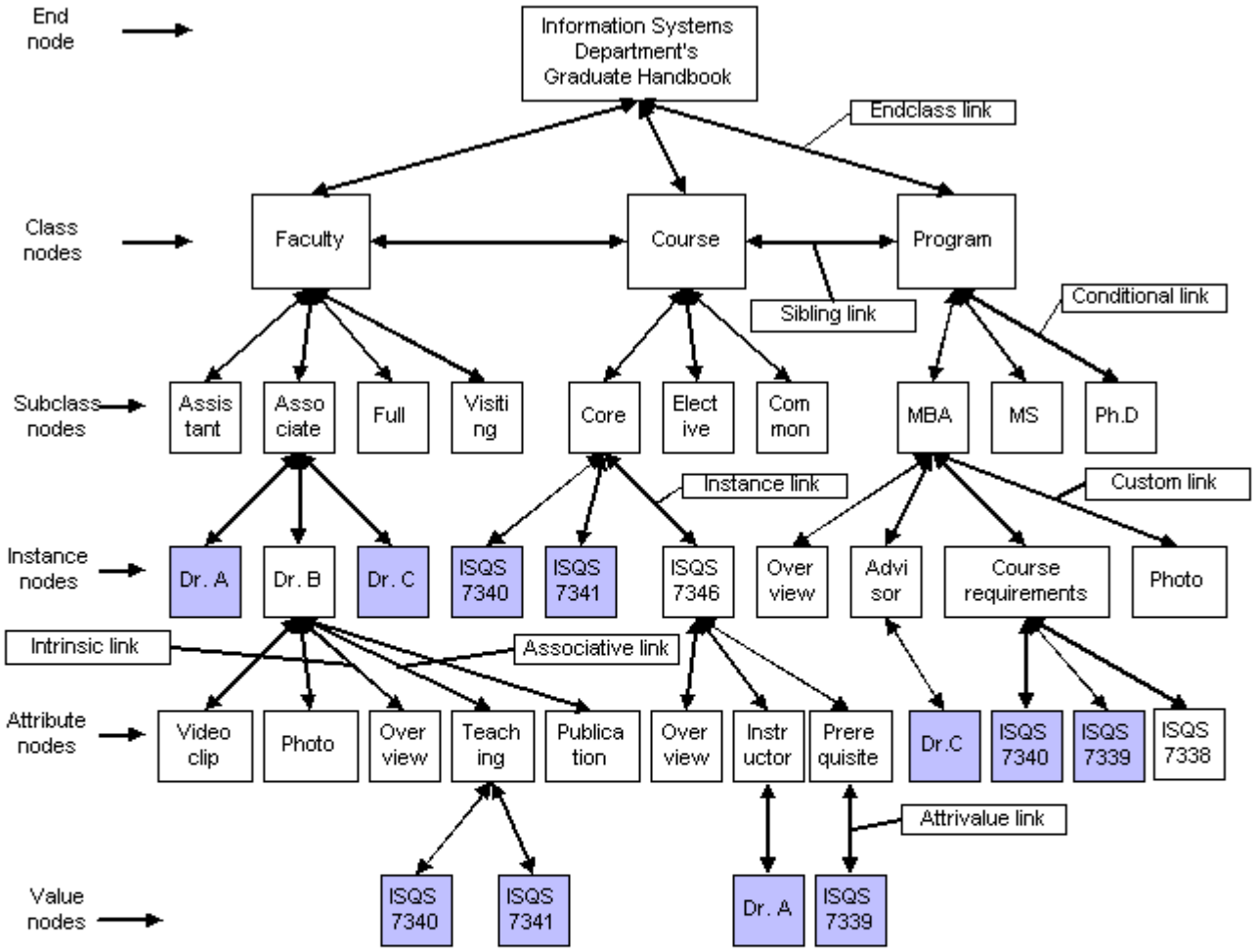

Figure 4. Step link type. This link type shows eight links of the step link Again, the individual nodes should be arranged on the basis of spatial temporal inclusion when establishing sibling links. If there are more tha subclass, then there will be more than one conditional link.

Figure 4 also shows several hidden links called cross links. The shaded objects occur more than twice. These imply that there are cross links between occurrences of the same object. For example, Dr. A is an associate professor and an instructor. If a user is navigating the object of ISQS 7346, he may need information about the instructor. The information may be obtained if there is a link between Dr. A under the Instructor and the same Dr. A under the Associate. This connection represents a cross link which is not shown in the Figure 4 explicitly. Figure 5 shows jump link type within the context of the IS. Like the jump type link of a MIS, this IS jump type link is used to facilitate navigation between non-adjacent nodes.

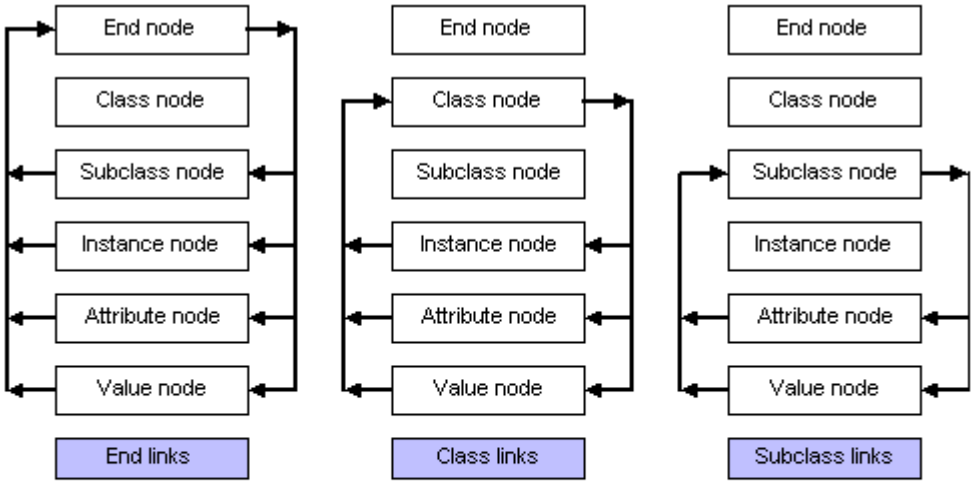

Figure 5. Jump link type. Links in the jump link type are used for jump between non-immediate nodes. This figure shows only three links of the jump link type (end, class, subclass links). In this methodology, the total number of jump link type depends on the number of subclasses.

Conclusion

This paper is a part of a complete intranet design methodology which is under progress. Although this method focuses on intranets, it can be used for other Internet applications. Those applications will be implemented using Hypertext Markup Language (HTML) in a TCP/IP environment. This navigation design method at least addresses, if not provide solutions to, most of the issues pointed out by Thuring et al (1995). It also provides useful structures for organizing information. Unlike other methods, this method is simple but powerful in that it is based on two logical information structures. It also is the first navigation design method which aims specifically at intranet navigation design.

"References are available upon request from the author"