

Design and Implementation of System for Exploring Subject Headings

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ABSTRACT

Subject headings are tools for subject searches in libraries. Visualization tools for subject headings are available for such public searches as NDLSH and LCSH. We report two questionnaire investigations on how to display subject headings and their relations to visualize the shape and the color of icons and the links that connect them. We created an appropriate design from among the choices that subjects chose and understood. Red was selected for broader terms, blue for narrower terms, and green for related terms. Our participants preferred a square layout to a circular layout. Based on our results, we designed a display of subject headings and implemented a prototype that explores BSH, NDLSH, and LCSH and searches through a university OPAC, the NDL Search, and the LC Online Catalog. With our methodology, a questionnaire survey was performed, and our designs are based on survey results, and a prototype was implemented. Our findings are applicable to other kinds of subject headings, classifications, and thesauruses.

Keywords

Design, implementation, subject headings, BSH, NDLSH, LCSH

INTRODUCTION

Subject headings are tools for subject searches in libraries. Visualization tools for subject headings are available for such public searches as National Diet Library Subject Headings (NDLSH) (<http://id.ndl.go.jp/auth/ndlsh/>) and Library of Congress Subject Headings (LCSH) (<http://id.loc.gov/authorities/subjects.html>). We are developing a system called Subject World, which explores various kinds of Japanese terminology, including subject headings and classification systems like Basic Subject Headings (BSH) and Nippon Decimal Classification (NDC) (Murakami, Hirata, & Kita 2002). In our initial system, we

used NT or BT to express the semantics of links with narrower and broader terms. However, since ordinary users were confused, we did a small survey with nine people about how to display subject headings and their relations (Murakami & Ueda 2004).

In this paper that extends our previous work, we conducted two investigations about how to display subject headings and relations: the icons and links connecting them. Based on our results, we re-designed the icons and links and implemented a new prototype that explores BSH, NDLSH, and LCSH, and searches through a university OPAC, the NDL Search (<http://iss.ndl.go.jp/>) and the LC Online Catalog (<http://catalog.loc.gov/>).

EXAMPLE

In two investigations, we used *Indemnity* (originally in Japanese and translated into English¹) as an example of a BSH subject heading for the following reasons: (1) we used it in our previous survey (Murakami & Ueda 2004); (2) it includes such terms as variants (UF), top terms (TT), broader terms (BT), narrower terms (NT), and related terms (RT); and (3) it is not very common (popular terms cause unexpected associations). Figure 1 shows an extract from the BSH4:

- Indemnity
- UF: National Indemnity. Loss Compensation
 - TT: Administrative Law
 - BT: Administrative Law
 - NT: Disaster Indemnity
 - RT: Land Expropriation

Figure 1. Example Subject Heading *Indemnity*

¹ All investigations were done in Japanese and translated into English for publication.

INVESTIGATION 1

Methods

Our subjects were 38 undergraduate students who attended a computer literacy lecture (males 25, females 13, average age was 19).

We showed the subjects question pairs of a sentence and display designs and asked them to select the best design for the sentence. To avoid the effect of expressions, we prepared two questionnaires, (a) and (b), whose specific language is different. Figure 2 shows an example of questionnaire (a). For the sentence “A broader term for *Indemnity* is *Administrative Law*,” we described four display design choices for the semantics of the relations: solid line, two-way arrow, down arrow, and up arrow. Questionnaire (b)’s sentence is “*Administrative Law* is a broader term for *Indemnity*.”

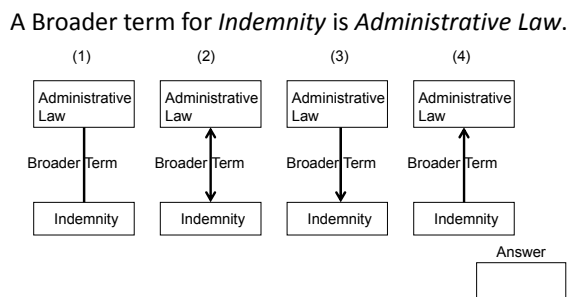


Figure 2. Q4 (a) in Investigation 1

The statements are listed below.

Q1: Instead of *National Indemnity*, use *Indemnity* for searches.

Q2: As Q1 (choices are different)

Q3: Top term for *Indemnity* is *Administrative Law*.

Q4: A broader term for *Indemnity* is *Administrative Law*.

Q5: A narrower term for *Administrative Law* is *Indemnity*.

Q6: A related term for *Indemnity* is *Land Expropriation*. A related term of *Land Expropriation* is *Indemnity*.

Q7. *Indemnity* is used as a query for OPAC, and an icon of the retrieved book is *Figure of Icon of Book*.

Q8. As Q7 (different choices)

Q9. A broader term for *Disaster Indemnity* is *Indemnity*.

Q10. *Administrative Law* is the top term.

Results and Analysis

The results are shown in Table 1. Bold letters show the maximal answers, and the underlinings show the answers chosen by more than half of the participants. For example, in Q4, the total number of answer (4) in questionnaire (a) and (b) was 29. A majority of participants chose up arrows.

Overall, the maximal answers exceeded more than half of all the answers, and we believe that the choices for the statements reflected a suitable design.

		1	2	3	4
Q1	USE/UF	4	1	10	<u>23</u>
Q2	USE/UF	3	3	<u>23</u>	9
Q3	Top Term	3	1	6	<u>28</u>
Q4	Broader Term	3	3	3	<u>29</u>
Q5	Narrower Term	5	1	<u>30</u>	2
Q6	Related Term	12	<u>24</u>	1	1
Q7	Search	3	2	<u>31</u>	2
Q8	Search	4	1	4	<u>29</u>
Q9	BT and NT	2	4	9	<u>23</u>
Q10	TT Icon	2	<u>26</u>	6	3

Table 1. Results of Investigation 1

INVESTIGATION 2

Methods

The subjects were 82 undergraduate students who attended a computer literacy lecture (male 39, female 43, average age was 19).

Investigation 2 concentrates on color and layout. Questions 1-4 are shown in Figure 3-6.

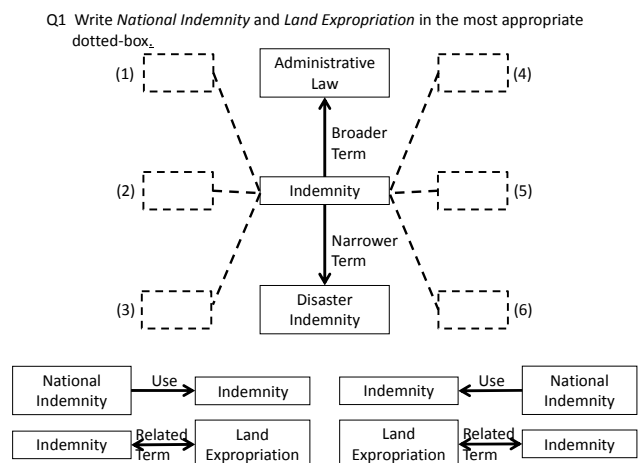


Figure 3. Q1 in Investigation 2

Q2 The term *Administrative Law*, which is a broader term for *Indemnity* is also the top term. Which do you think is best?

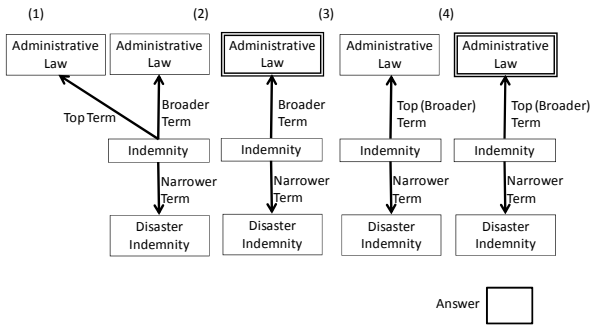


Figure 4. Q2 in Investigation 2

Q3 Write *National Indemnity* and *Land Expropriation* in dotted boxes, as in Q1, and select the best arrow color and write its number in the circles. Select color for *Administrative Law* and *Disaster Indemnity* arrows and write the number in the circles.

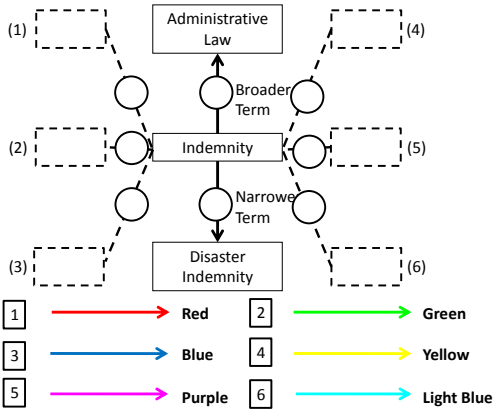


Figure 5. Q3 in Investigation 2

Q4 Choose best top-bottom-left-right layout: e.g. B1, B2, and B3 are broader terms for A, and C1, C2, and C3 as narrower terms for A, D1, D2, and D3 are left for A, and E1, E2, and E3 are right for A.

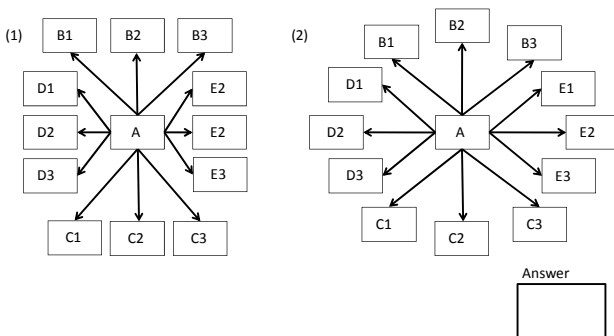


Figure 6. Q4 in Investigation 2

		1	2	3	4	5	6
Q1	USE/UF	14	20	16	5	11	13
	Related Term	2	19	5	3	33	18
Q2	Top Term	9	14	14	44		
Q3	Broader Term	48	2	5	4	1	2
	Narrower Term	10	4	36	2	5	6
	USE/UF	15	19	9	14	13	9
	Related Term	8	33	6	18	4	9
Q4	Layout	52	29				

Table 2. Results of Investigation 2

Results and Analysis

The results are shown in Table 2. UF (variants) are preferred on the left and related terms are preferred on the right in Q1. When the top and broader terms are the same, our participants chose one double-lined icon with *Top (Broader) Term* in Q2. For colors, they chose red for broader terms, blue for narrower terms, and green for related terms in Q3. A square layout was most commonly chosen in Q4.

DESIGN

Based on our investigations results, we designed the display of terms and relations as follows (Figure 7):

- (1) Broader terms are located up, and red up arrows are associated with *Broader*².
- (2) Narrower terms are located down, and blue down arrows are associated with *Narrower*.
- (3) Related terms are located to the right, and green two-way arrows are associated with *Related*.

Below are our optional designs. Some subject headings do not need them.

- (4) Used for or Variant term is located on the left, and yellow right arrows are associated with *Use*.
- (5) When broader and top terms are the same, the frame of the icon is double-lined and the associated character of the link becomes *Top (Broader)*.

² In investigation we used *Broader Term* (in Japanese), which is composed of only three Japanese letters. However, since English 12 letters including a space, we cut *term* for LCSH visualization. *Narrower*, *related*, *top (broader)* are used likewise.

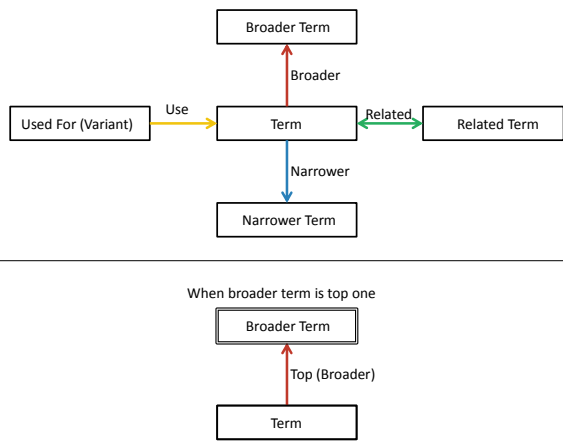


Figure 7. Design

IMPLEMENTATION

We implemented a system prototype to explore subject headings that has the following functions:

- (1) The keyword search facility enables users to find subject headings (BSH, NDLSH, and LCSH) by inputting keyword and selecting the type of subject headings.
- (2) The selective search facility enables users to explore subject headings by selecting icons of subject headings and their types.
- (3) View facility enables users to display and organize the icons of subject headings in various ways: a spring model, move, square/circle layout, enlarging, etc.
- (4) The search catalog facility enables users to search online catalogs (a university OPAC, NDL Search, and LCSH Online Catalog) by selecting icons and catalog type.

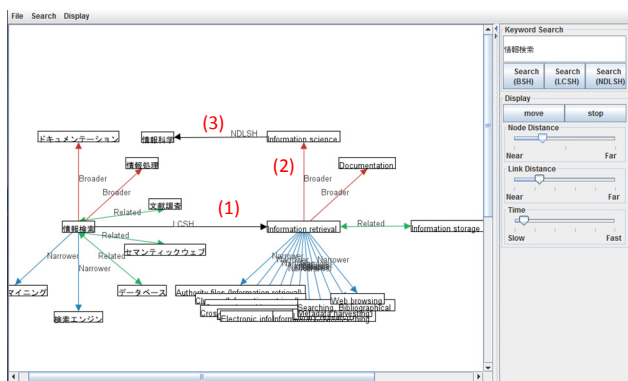


Figure 8. Prototype

Figure 8 shows an example screen of exploring *information retrieval* (NDLSH in Japanese) to *information retrieval* (LCSH) (1), *information retrieval* (LCSH) to *information science* (LCSH) (2), and *information science* (LCSH) to *information science* (NDLSH in Japanese) (3). We applied

a circle layout as a display. It is very useful for users to explore different subject headings in different languages to search for terms and books in unfamiliar languages and cultures.

DISCUSSION

Much research exists on subject headings or OPAC design (e.g. Bates 1986), most of them is concerned with structure, terminology, or user interfaces without visualizing subject headings. Many systems visualize subject headings whose design processes are unknown. To the best of our knowledge, no previous work used questionnaires to investigate how to display subject headings for visualizing subject headings. IFLA has published guidelines for displaying subject headings (IFLA 2005, Jahns 2012), and their “display” denotes which terms should be displayed and indented.

The difference between our current and previous prototypes (Murakami, Hirata & Kita 2002) is design and the type of subject headings, system facilities, and catalogs to be retrieved.

With our methodology, a questionnaire survey was performed, and our designs are based on survey results, and a prototype was implemented. Our findings are applicable to other kinds of subject headings, classifications, and thesauruses.

SUMMARY

We reported two questionnaire investigations about how to display subject headings and relations for visualization: shape and layout of icons and the shapes and the colors of the links connecting them. Based on our results, we designed icons and links, and implemented a new prototype that explores BSH, NDLSH, and LCSH, and searches through a university OPAC, NDL Search, and LC Online Catalog.

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