

5 ASTUTE Subject Searching Functionality

5.1 Introduction

Chapter 5 describes the subject searching functionality of the ASTUTE experimental online catalog. ASTUTE was based on the FoxPro database management system, thus, this chapter begins with a brief description of FoxPro.

ASTUTE was composed of two experimental online catalogs: (1) the Blue System in which search trees controlled the system's selection of a subject searching approach in response to user queries, and (2) the Pinstripe System which chose subject searching approaches randomly in response to user queries. Thus, this chapter's discussion of ASTUTE functionality covers the functionality of both Blue and Pinstripe Systems. It also gives examples of searches in the Blue and Pinstripe Systems to illustrate functionality and system responses to user queries. The discussion occasionally refers to the search trees that control the Blue System's responses that are covered in chapter 4.

5.2 FoxPro Database Management System

The ASTUTE project team sought a relational database management system (RDBMS) to store bibliographic and authority data efficiently on the Gateway microcomputer's hard disk and feature fast retrievals and character manipulation. In relational database management systems (RDBMSs), a database is sometimes called a table. Each separate unit of database information is called a record and each entity within the record is called a field. To feature fast lookups that join two tables or databases, databases can be related to one another by a field that is common to both databases. Databases are usually indexed on this common field. The advantage of joining databases by common fields is to minimize the duplication of information in many records and databases. An example is the bibliographic main record (bib_main) database of the ASTUTE experimental online catalog. Each record in this database had a unique series number and contained information unique to individual items such

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as the author name(s), Library of Congress classification number, title, imprint, etc. The bibliographic main database was the “parent” database. ASTUTE also had a subject heading database that contained records for subject headings and a series number that joined subject headings to the main database. Since there might be more than one subject heading or subject record for each item, the relationship of the main database to the subject heading database was a one to many relationship and the subject heading database was called the “child.”

The project team sought an RDBMS that would retrieve records quickly, have window manipulation, low-level file access functions, ease of screen manipulation, and be a full-featured programming language. The primary consideration was the speed of retrieval. The many character string searches utilized by the program would make the speed of record retrieval the most important issue in the selection of the RDBMS. After considering several options, the ASTUTE project team chose the FoxPro 2.0 relational database management system. FoxPro 2.0 included many built-in functions that manipulated character strings needed to build databases and access them quickly. FoxPro could also store variable-length records of any size in a field type called a “memo” field. Built-in tools in FoxPro included access to a browse capability that was very useful in allowing users to scroll through lists and choose a topic from them. Another useful function was the ease of building screens that contained objects or buttons for the user to select. The built-in screen functions of FoxPro 2.0 also allowed users to use the keyboard or the mouse to select an objects on the screen.

5.3 Exact approach to Subject Searching

5.3.1 Background

The exact approach to subject searching is a *new* subject searching approach. This approach *facilitates browsing* for users who have entered or selected a posted subject heading in an online catalog.

The exact approach was designed in response to heavy criticism of the alphabetical approach to subject searching (Drabenstott and Vazine-Goetz, 1994, 241). Recent studies of online catalog searching have demonstrated that the alphabetical approach is no longer capable of managing large numbers of subdivided forms of subject headings because users demonstrate little perseverance when faced with large numbers of retrievals (Van Pulis and Ludy 1988; Wiberley and Daugherty 1988). Several researchers have recognized the difficulty of displaying long lists of subdivided forms of headings to users and suggested methods for reducing such lists (Holley and Killheffer

1982, 130; Cochrane 1986, 62; Markey 1984, 112–3; and Chan 1986, 355–8; Massicotte 1988, 374).

The exact approach gives users new opportunities for browsing. It anticipates the user's selection of the exact match from an alphabetical list, and thus begins with a report of the results of such matches. The report includes a summary of subdivided forms of the matched subject heading in the form of broad categories, and, if available, options for browsing related terms and other information about the matched heading. The challenge here is to convey to users the range of available opportunities in a single screen.

Implementations of the exact approach in existing online catalogs are limited in usefulness because only three broad categories can be constructed from the three different types of subject subdivisions used with subject headings, viz. topical subdivisions (\$x), period subdivisions (\$y), and geographic subdivisions (\$z). Defining new broad categories would be a huge undertaking because it could require editorial review of the thousands of subdivisions in SCM:SH. Although such a review is not within the scope of this project, the ASTUTE project team was able to expand the number of broad categories from three to four by reviewing topical subdivisions, singling out those that describe form, and assigning them a unique subfield code (\$1) in bibliographic records. (See section 3.3.4.1 for details on this effort.) Of the many broad categories that they could have created, the ASTUTE project team created the form category because of recommendations from the LC Subject Subdivisions Conference that called for the creation of form subdivisions (Conway 1992, 9).

5.3.2 Generating Entries for the Exact Approach Database

In the ASTUTE experimental online catalog, computer programs generated normalized forms of subject headings in bibliographic records. They also generated normalized forms of *see* references for the subject headings used in bibliographic records. The programs added normalized forms of subject headings and *see* references into the exact_approach database. When users entered their query, ASTUTE searched the exact_approach database to find a match. Normalized forms of subject headings and *see* references were generated by manipulating headings and references in the following ways:

- Converting upper to lower case.
- Eliminating punctuation (i.e., commas, parentheses, apostrophes, hyphens, semicolons, periods, slashes, subfield codes).
- Eliminating stopwords (i.e., the, of, and, or, in, etc., for, to).

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- Eliminating qualifiers.
- Normalizing word order by alphabetizing words in subject headings.
- Double posting subject headings bearing hyphenated words (without hyphens and as single run-on words) and bearing apostrophes (with and without trailing “apostrophe-s”).

Examples of normalized forms of subject headings are listed below adjacent the authorized form from which they were generated:

Subject heading	Normalized form
Afro-American children	afro american children, afroamerican children
Astronomy, Prehistoric	astronomy prehistoric
Ball's Bluff, Battle of, 1861	1861 balls battle bluff, 1861 ball battle bluff
Computers \$x Acronyms	acronyms computers
Expert systems (Computer Science)	computer expert science systems, expert systems

Table 5.1 lists fields and subfields of USMARC bibliographic and subject authority records that contributed subject headings to ASTUTE's exact approach database. Since the exact approach was limited to user queries for subjects generally, fields and subfields for personal names as subjects did not contribute to the exact approach database.

Table 5.1. Fields/Subfields in Exact Search Approach Database

USMARC Field Name	Format Type	Tag	Subfields
Subject (corporate body)	bibliographic	610	abndcxyztps
Subject (meeting name)	bibliographic	611	andcktxyz
Subject (uniform title)	bibliographic	630	apsdxyztnk
Subject (topical)	bibliographic	650	axyz
Subject (geographic)	bibliographic	651	axyz
See reference (topical)	authority	450	axyz
See reference (geographic)	authority	451	axyz

5.3.3 Responding to User Queries with the Exact Approach

The exact approach was limited to the Blue System. This system responded with the exact approach to user queries for subjects generally that matched normalized forms of subject headings from bibliographic records and/or *see* references from subject authority records. The exact approach offered users many options to further the

subject search. Table 5.2 lists these options in six option boxes numbered 5.2.1 to 5.2.6. The wording of options in Table 5.2 generally corresponds to the wording on ASTUTE screens. Searchers pursued options by positioning the cursor over highlighted text using key combinations, e.g., directional and “Enter” keys, <Tab> and <Enter> keys, or moving and clicking the mouse. ASTUTE did not require users to explicitly type in option names. For example, users pursued backward and forward browsing options using a mouse to manipulate a scroll bar.

The Blue System responded to user queries that matched a normalized form(s) of subject heading or *see* reference with the “Exact approach main menu” (options 5.2.2, Table 5.2). When the Blue System found more than one matching subject heading and/or *see* reference, it presented users with an intermediary screen bearing matched heading(s) and/or reference(s) and prompted them to choose a listed term (options 5.2.1, Table 5.2). User selection of a listed term resulted in the exact approach main menu (options 5.2.2, Table 5.2).

Table 5.2. Exact Search Approach Options

Intermediary term selection options 5.2.1:	
[Intermediary matched terms list]	
Choose listed heading	==> Options 5.2.2
Main menu display options 5.2.2:	
[Exact approach main menu]	
Display general works	==> Options 5.2.3
Display narrower terms	==> Options 5.2.4
Display broader terms	==> Options 5.2.4
Display notes on this subject	==> Options 5.2.5
Display specialized subtopics	==> Options 5.2.6
Display specific places	==> Options 5.2.6
Display various time periods	==> Options 5.2.6
Display forms of publication	==> Options 5.2.6
Go to previous screen	==> Options 5.2.2*
Expand search	==> Search trees
Start over	==> Switch systems
Bibliographic Record Display Options 5.2.3:	
[Bibliographic record display]	
Display next record	==> Options 5.2.3
Display previous record	==> Options 5.2.3

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Display second page of record	==> Options 5.2.3
Exit record display	==> Options 5.2.2
Related Terms Display 5.2.4:	
[Broader or narrower terms display]	
Browse backward or forward	==> Manipulate scroll bar
Search for selected term	==> Options 5.2.2
Go back	==> Options 5.2.2
Scope Note Display Options 5.2.5:	
[Scope note display]	
Browse backward or forward	==> Manipulate scroll bar
Go back	==> Options 5.2.2
Subtopics Display Options 5.2.6:	
[Subtopics display]	
Browse backward or forward	==> Manipulate scroll bar
Search for selected subtopic	==> Options 5.2.2 or 5.2.6
Go back	==> Options 5.2.2

*Option appears on subsequent exact approach main menus.

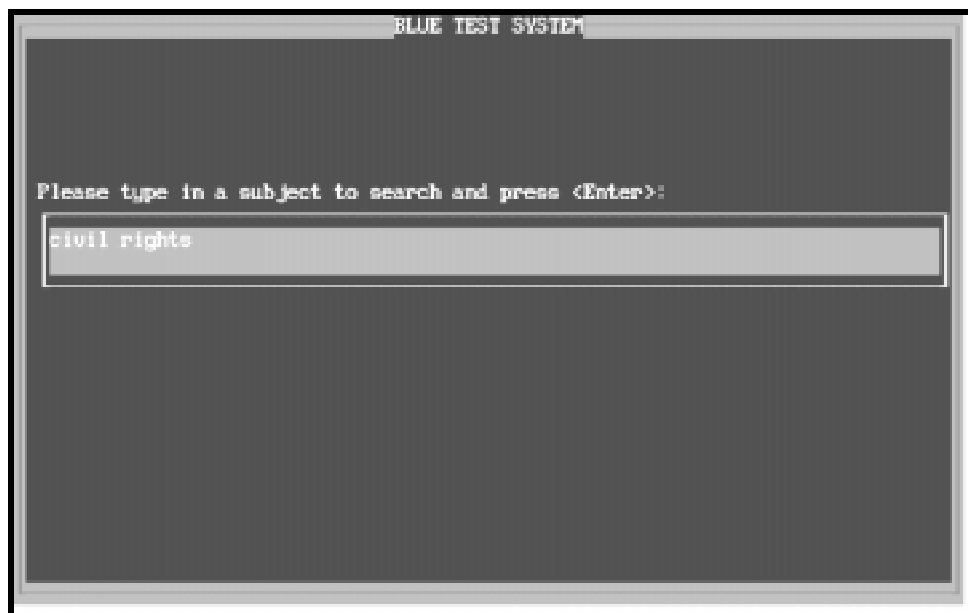


Figure 5.1. User entry of "civil rights" query



Figure 5.2. Intermediary matched terms list for “civil rights”

Figures 5.1–5.8 show the Blue System’s response to the user query “civil rights.” In figure 5.1, the user enters the query “civil rights” into the Blue System. The system’s response to this query is an intermediary screen prompting users to choose between two terms, “Civil rights” and “Human rights.” The Blue System gives users a choice of terms because the query matches the exact form of the subject heading “Civil rights” and the normalized form of the *see* reference “Civil rights (International law)” under which is the authorized subject heading “Human rights” (options 5.2.1, Table 5.2)

The user’s response to the intermediary screen of matched terms is to select the listed term “Civil rights” (figure 5.2). The Blue System responds with the exact approach main menu (options 5.2.2, Table 5.2, and figure 5.3). Although the exact approach main menu gives users ten options, there are many searches in which one or more options are disabled. In figure 5.3, the Blue System constructs a main menu in response to the user query “civil rights.” Options for displaying titles on “various time periods” and “forms of publication” and for continuing the search by going to the “previous screen” are disabled.

At the main menu, user selection of the “general works” option results in a display of bibliographic records bearing the subject heading “Civil rights” (figure 5.5).

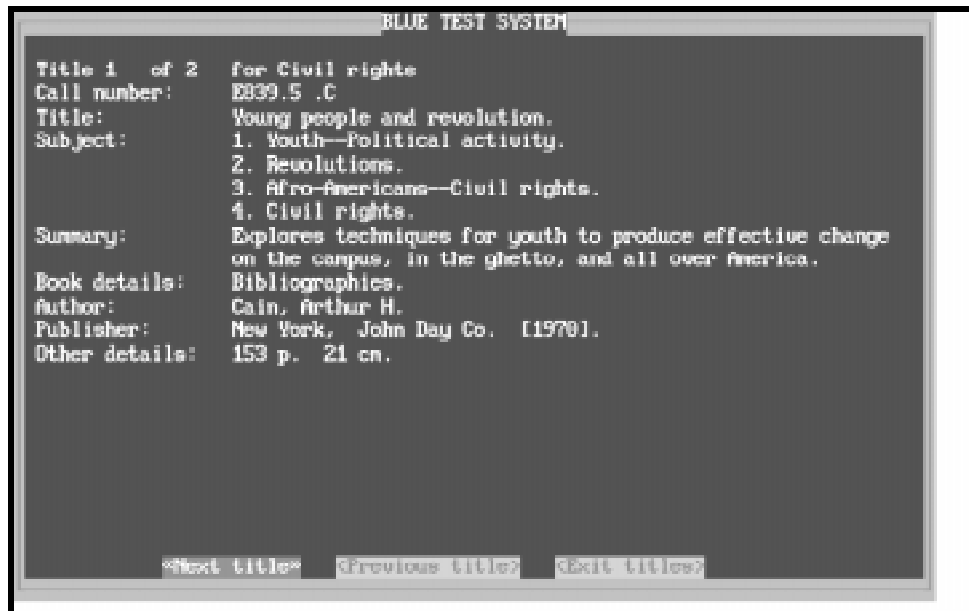


Figure 5.5. Bibliographic record bearing subject heading “Civil rights”

When displaying bibliographic records, users have options to display the next record, previous record, exit records, or, display the second page of a lengthy record (options 5.2.3, Table 5.2). In response to a user selection of the exit records option, the Blue System returns users to the exact approach main menu (options 5.2.2, Table 5.2, and figure 5.3). Users could continue to explore by choosing options to display narrower or broader terms, display titles on specialized subtopics or specific places, or let the system expand their search. For example, user selection of the broader term option produces the display of two subject headings shown in figure 5.6. If the user selects a listed broader term, the Blue System responds with an entirely new exact approach main menu bearing a different set of enabled and disabled options from the exact search main menu (options 5.2.2, Table 5.2). For example, the user’s selection of the broader term “Discrimination” in figure 5.6 produces the new exact search main menu in figure 5.7 that includes enabled options for general works, broader and narrower terms, notes, specific places, expanding the search, starting over, and going to the previous screen.

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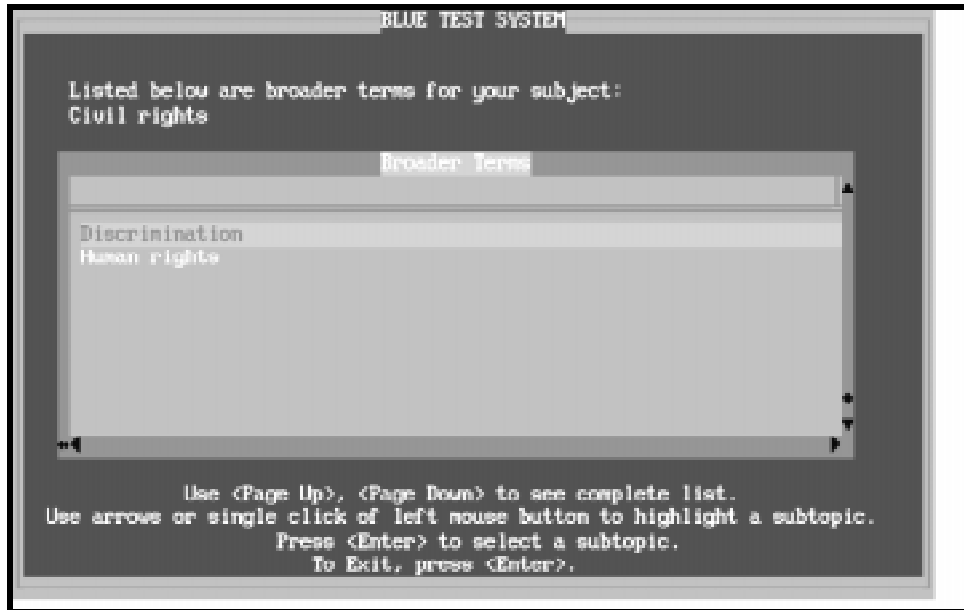
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Figure 5.6. Broader terms for “Civil rights”

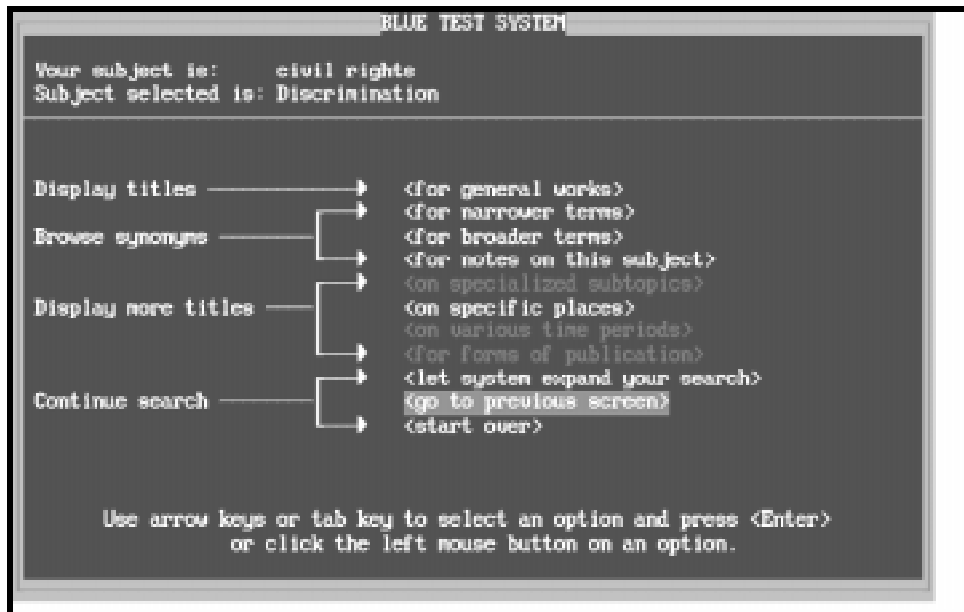


Figure 5.7. New exact search main menu for “Discrimination”

In figure 5.7, the user’s selection of the previous screen option produces the initial main menu. That is, the user’s selection of the “previous screen” option in the new main menu shown in figure 5.7 produces the original main menu shown in figure 5.3.



Figure 5.8. Place subtopics under “Civil rights”

Users could continue exploring by choosing other enabled options such as the option to display specific places. Figure 5.8 shows a list of places produced in response to the user selection of this option. Users manipulate the scroll bar to browse backward and forward in the list (options 5.2.6, Table 5.2). User selection of a listed place results in an entirely new exact approach main menu (options 5.2.2, Table 5.2).

When users select the “Expand search” option, the search trees take control of the Blue System and execute a search for the original query using the next search approach on the search trees that produces retrievals (options 5.2.2, Table 5.1). For example, in response to the “Expand search” option selected by the user interested in “civil rights,” the Blue System executes an alphabetical search because it is the next subject search approach in the search tree for multi-word queries and the user query “civil rights” matches longer subject headings, e.g., “Civil rights demonstrations,” “Civil rights movements.”

The Blue System responds to users selecting the “Start over” option in the exact approach main menu by switching to the Pinstripe System or beginning the first of eleven post-search questions (options 5.2.2, Table 5.2).

5.4 Alphabetical Approach to Subject Searching

5.4.1 Background

The alphabetical approach to subject searching is recommended for user queries that match longer subject headings or *see* references. Systems respond with an alphabetical list of subject headings and *see* references in the neighborhood of the matched term. The objective of displaying alphabetical lists of controlled vocabulary terms to users is to spark their interest in a term that is in close alphabetical proximity to their query. When users select a term from the alphabetical list, systems respond to their selection with the exact approach. The exact approach gives users access to the unique subdivided forms of matched headings, related terms, and other information about the matched heading from LCSH-mr.

When there are many subdivided forms connected with subject headings, the alphabetical approach is not effective for displaying the unique subdivided forms of assigned subject headings because users demonstrate little perseverance when faced with large numbers of retrievals (Van Pulis and Ludy 1988). The alphabetical approach should be treated as an opportunity to stimulate users with controlled vocabulary when their queries do not quite match specific terms. Thus, subject headings displayed to users in an alphabetical approach should be limited to unsubdivided subject headings.

Including subdivided headings in the alphabetical index may induce users to narrow their topics based on the subdivided forms displayed to them. Access to subdivided forms of matched headings are accessible to users who choose a listed subject heading through the exact approach. In the alphabetical approach, the only subdivided forms that systems should display to users are subdivided *see* references.

5.4.2 Responding to User Queries with the Alphabetical Approach

The alphabetical approach was implemented slightly differently in the Blue and Pinstripe Test Systems. When user queries matched longer subject headings or references, the search trees required the Blue System to respond with the alphabetical approach. When the algorithm that governed the Pinstripe system's selection of a subject searching approach selected the alphabetical approach, the Pinstripe System responded with the alphabetical approach regardless of the extent to which the user query matched subject headings or *see* references.

The two test systems responded to user queries matching a longer subject heading or *see* reference with an alphabetical list of subject headings in the alphabetical neighborhood

of the partially matched or entered query. Thus, the alphabetical approach was merely a prelude or preface to the exact approach. User selection of a listed term invoked the exact approach. All options available to users in the exact approach (Table 5.2) were also available to them upon the selection of a listed heading or reference in the alphabetical approach. Table 5.3 lists these options in seven option boxes numbered 5.3.0 to 5.3.6. Options for alphabetical term selection (options 5.3.0) were not included among the exact search approach options. One option works totally different from its counterpart in the exact search: the “go to previous screen” option returns users to the alphabetical list of subject heading and references.

Table 5.3. Alphabetical Search Approach Options

Alphabetical term selection options 5.3.0:	
[Alphabetical term list]	
Choose listed heading	==> Options 5.3.1 or 5.3.2
Browse forward or backward in list	==> Click on scroll bar
Let system expand search	==> Search trees
Undo	==> Options 5.3.0
Start over	==> Switch systems
Intermediary term selection options 5.3.1:	
[Intermediary matched terms list]	
Choose listed heading	==> Options 5.3.2
Main menu display options 5.3.2:	
[Initial exact approach main menu]	
Display general works	==> Options 5.3.3
Display narrower terms	==> Options 5.3.4
Display broader terms	==> Options 5.3.4
Display notes on this subject	==> Options 5.3.5
Display specialized subtopics	==> Options 5.3.6
Display specific places	==> Options 5.3.6
Display various time periods	==> Options 5.3.6
Display forms of publication	==> Options 5.3.6
Go to previous screen	==> Options 5.3.0
Expand search	==> Search trees
Start over	==> Switch systems
Bibliographic Record Display Options 5.3.3:	
[Bibliographic record display]	

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Display next record	==> Options 5.3.3
Display previous record	==> Options 5.3.3
Display second page of record	==> Options 5.3.3
Exit record display	==> Options 5.3.2
Related Terms Display 5.3.4:	
[Broader or narrower terms display]	
Browse backward or forward	==> Manipulate scroll bar
Search for selected term	==> Options 5.3.2
Go back	==> Options 5.3.2
Scope Note Display Options 5.3.5:	
[Scope note display]	
Browse backward or forward	==> Manipulate scroll bar
Go back	==> Options 5.3.2
Subtopics Display Options 5.3.6:	
[Subtopics display]	
Browse backward or forward	==> Manipulate scroll bar
Search for selected subtopic	==> Options 5.3.2 or 5.3.6
Go back	==> Options 5.3.2

Figures 5.9–5.13 show the Blue System’s response to the user query “computer crime.” In figure 5.9, the user enters the query “computer crime” into the Blue System. The system’s response to this query is an alphabetical list of subject headings bearing the longer term “Computer crimes” and four terms preceding and following this term in the alphabet (figure 5.10).

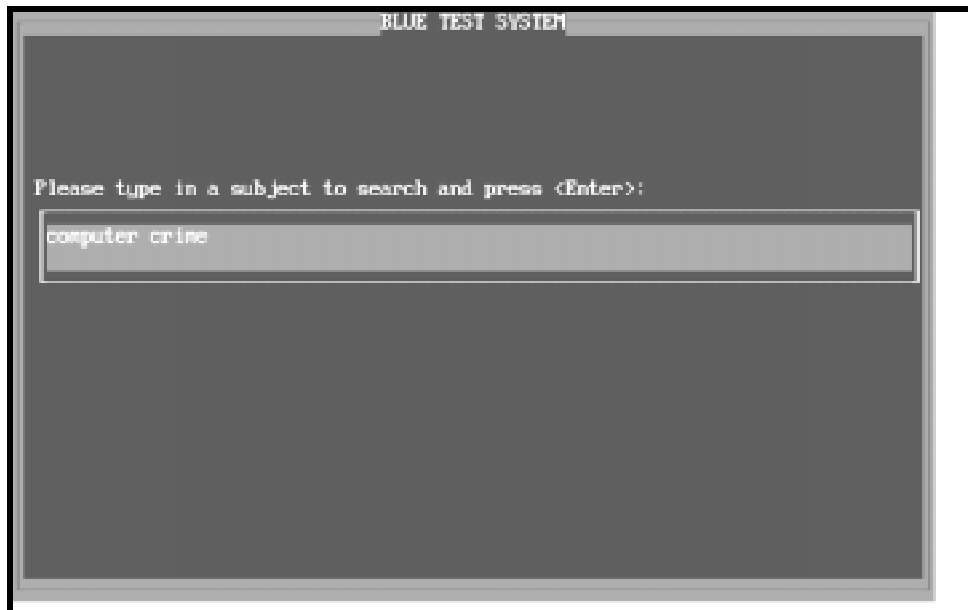


Figure 5.9. User entry of "computer crime" query

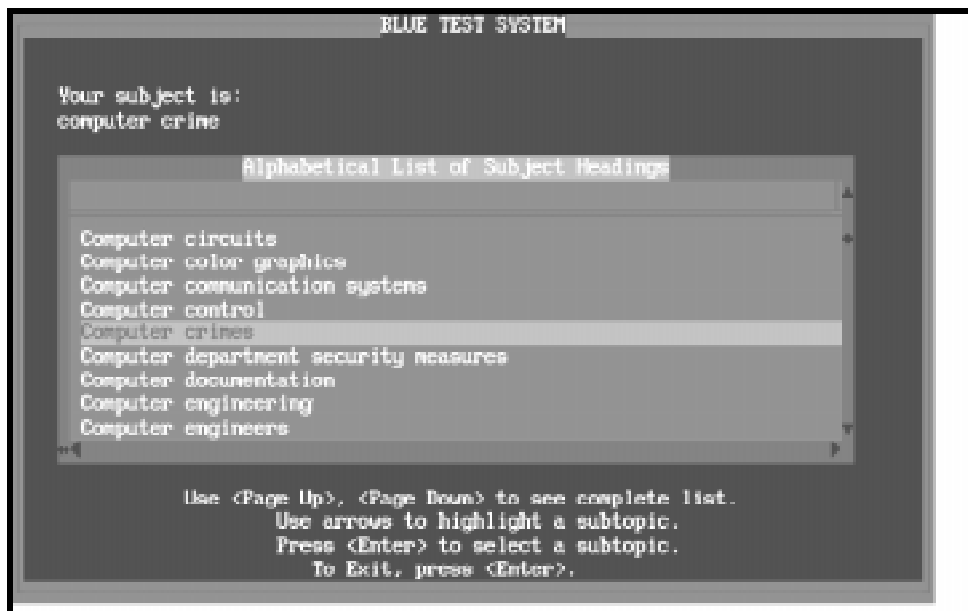


Figure 5.10. Alphabetical list of subject headings provoked by "computer crime" query

The user selects the listed term "Computer crimes" (figure 5.11). This action results in the exact approach main menu (figure 5.12). This menu gives the user options to display general works, display broader or narrower terms, let the system expand the

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search, go to previous screen, or start over. If the user selects the “go to previous screen” option, the Blue System returns to the original alphabetical list of subject headings (figure 5.10).

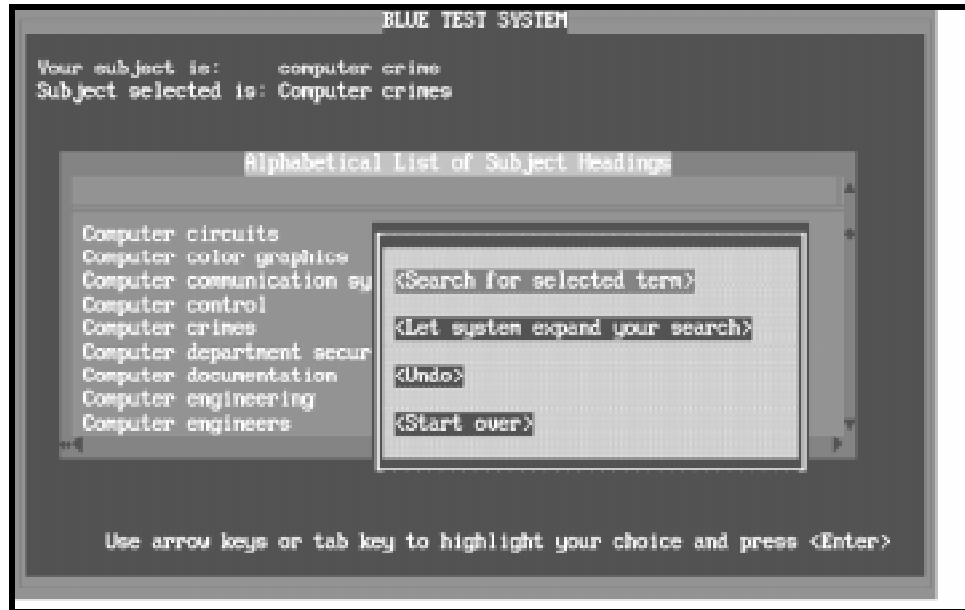


Figure 5.11. User selection of “Computer crimes”

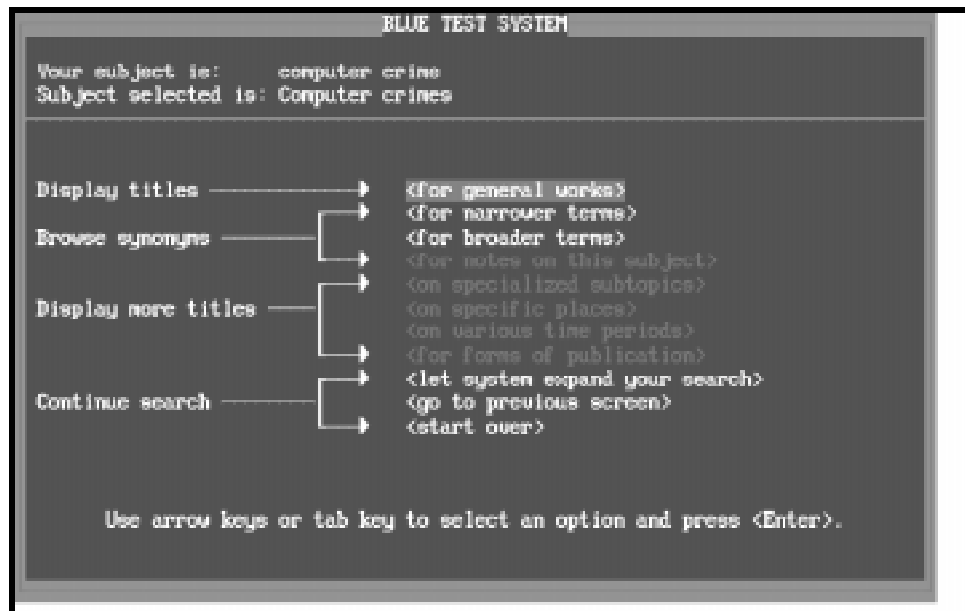


Figure 5.12. Exact approach main menu for “Computer crime”

The user's selection of the "general works" option retrieves only one title (figure 5.13). To find additional material, the user could explore broader or narrower terms. The user could also choose the "let system expand search" option. This action would induce the search trees to take control of the Blue System and execute a search for the original query (i.e., "computer crime") using the next search approach on the search trees that produces retrievals. The Blue System responds to users selecting the "Start over" option by switching to the Pinstripe System or beginning the first of eleven post-search questions (options 5.3.2, Table 5.3).



Figure 5.13. Bibliographic record bearing subject heading "Computer crimes"

5.5 Keyword-in-main-heading Search

5.5.1 Background

The keyword-in-main-heading approach was unique to the Blue Test System. There were two situations in which the Blue System invoked keyword-in-main-heading searches: (1) when user queries exceeded one word and failed to produce retrievals through the exact and alphabetical approaches, or (2) when user queries exceeded one word, produced retrievals through the exact and/or alphabetical approaches, but users wished to continue searching. Neither situation guaranteed that keyword-in-main-heading searches would produce retrievals.

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When the keyword-in-main-heading approach yielded retrievals, the Blue System responded with an alphabetical list of subject headings and *see* references bearing user queries words in listed main subject headings. The objective of displaying the alphabetical keyword list of controlled vocabulary terms was the same as the objective of displaying an alphabetical list in the alphabetical approach, viz. to spark users' interest in a term that was partially but not entirely composed of words in the user query. When users selected a term from the alphabetical keyword list, the system responded with the exact approach. The exact approach gave users access to the unique subdivided forms of matched headings, related terms, and other information about the matched heading from LCSH-mr.

When user queries matched words embedded in subject headings, the results of keyword-in-main-heading searches were particularly useful in providing relevant searching terminology. For example, the user entering "jazz music" would retrieve an alphabetical list of subject headings bearing words in the user query:

- Double-bass and piano **music (Jazz)**
- Guitar **music (Jazz)**
- Monologues with **music (Jazz ensemble with chamber orchestra)**
- Piano **music (Jazz)**
- Saxophone **music (Jazz)**

In an alphabetical search, none of these subject headings would be in the alphabetical neighborhood of the subject heading "Jazz (Music)." They would also not be accessible through the exact approach because they are not broader or narrower terms under "Jazz (Music)." Thus, the keyword-in-main-heading approach had the potential to retrieve useful searching terminology that other controlled vocabulary approaches would miss.

5.5.2 Generating Entries for the Keyword-in-main-heading Search

The ASTUTE project team wrote a program to identify words in selected fields of bibliographic records and save them in a database supporting the various keyword approaches of the Blue and Pinstripe Systems. The algorithm for each keyword approach was the same. Thus, procedures used to identify and save words to the database supporting the keyword-in-main-heading database were the same for all other keyword approaches of the Blue and Pinstripe Systems. The program first identified words, converted them to lower case, and eliminated punctuation and characters from the field to be added to the database supporting the keyword-in-main-

heading approach. The program eliminated the following punctuation and characters and replaced them with a space and it replaced 's and 's with an s.

etc.	,	.
:	;	(
)	's (replaced with s)	s' (replaced with s)
[]	'''
"	=	\$
`	#	ASCII character 27
&		

The program then divided phrases into words. Any words separated by a hyphen (-) or slash (/) were also added as separate words. Any slash that was not part of a word was eliminated. The program then eliminated the following words from the word list:

of	and	or
in	the	for
to	by	al
with	at	on
a		

The keyword database supporting the keyword-in-main-heading search contained words from only the \$a subfield of 650 fields of bibliographic records.

5.5.3 Responding to User Queries with the Keyword-in-main-heading Search

The keyword-in-main-heading approach was only implemented in the Blue Test System. This approach was the third approach (after exact and alphabetical approaches) that the Blue System enlisted to produce retrievals for user queries exceeding one word. When user queries matched words in main subject headings, the Blue System responded with an alphabetical keyword list of matched headings. User selection of a listed term invoked the exact approach. Thus, the keyword-in-main-heading approach (like the alphabetical approach) was merely a prelude or preface to the exact approach.

All options available to users in the exact approach (Table 5.2) were also available to them upon the selection of a listed heading in the keyword-in-main-heading approach. Table 5.4 lists these options in six option boxes numbered 5.4.0 to 5.4.5. Options for the selection of a term from the alphabetical keyword list (options 5.4.0) were not included

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in exact search approach options (Table 5.2). One option worked totally different from its counterpart in the exact search: the “go to previous screen” option returned users to the alphabetical keyword list of subject headings. The wording of options in Table 5.4 generally corresponds to the wording on system screens.

Table 5.4. Keyword-in-main-heading Search Approach Options

Alphabetical keyword list options 5.4.0:	
[Alphabetical term list]	
Choose listed heading	==> Options 5.4.1
Let system expand search	==> Search trees
Undo	==> Options 5.4.0
Start over	==> Switch systems
Main menu display options 5.4.1:	
[Exact approach main menu]	
Display general works	==> Options 5.4.2
Display narrower terms	==> Options 5.4.3
Display broader terms	==> Options 5.4.3
Display notes on this subject	==> Options 5.4.4
Display specialized subtopics	==> Options 5.4.5
Display specific places	==> Options 5.4.5
Display various time periods	==> Options 5.4.5
Display forms of publication	==> Options 5.4.5
Go to previous screen	==> Options 5.4.0
Expand search	==> Search trees
Start over	==> Switch systems
Bibliographic Record Display Options 5.4.2:	
[Bibliographic record display]	
Display next record	==> Options 5.4.2
Display previous record	==> Options 5.4.2
Display second page of record	==> Options 5.4.2
Exit record display	==> Options 5.4.1

Related Terms Display 5.4.3:	
[Broader or narrower terms display]	
Browse backward or forward	==> Manipulate scroll bar
Search for selected term	==> Options 5.4.1
Go back	==> Options 5.4.1
Scope Note Display Options 5.4.4:	
[Scope note display]	
Browse backward or forward	==> Manipulate scroll bar
Go back	==> Options 5.4.1
Subtopics Display Options 5.4.5:	
[Subtopics display]	
Browse backward or forward	==> Manipulate scroll bar
Search for selected subtopic	==> Options 5.4.1 or 5.4.5
Go back	==> Options 5.4.1

Figures 5.14–5.19 show the Blue System’s response to the user query “trade and industry.” In figure 5.14, the user enters the query “trade and industry” into the Blue System. The system’s response to this query is an alphabetical keyword list of nine subject headings bearing the two words in the user query, i.e., “trade” and “industry” (figure 5.15).

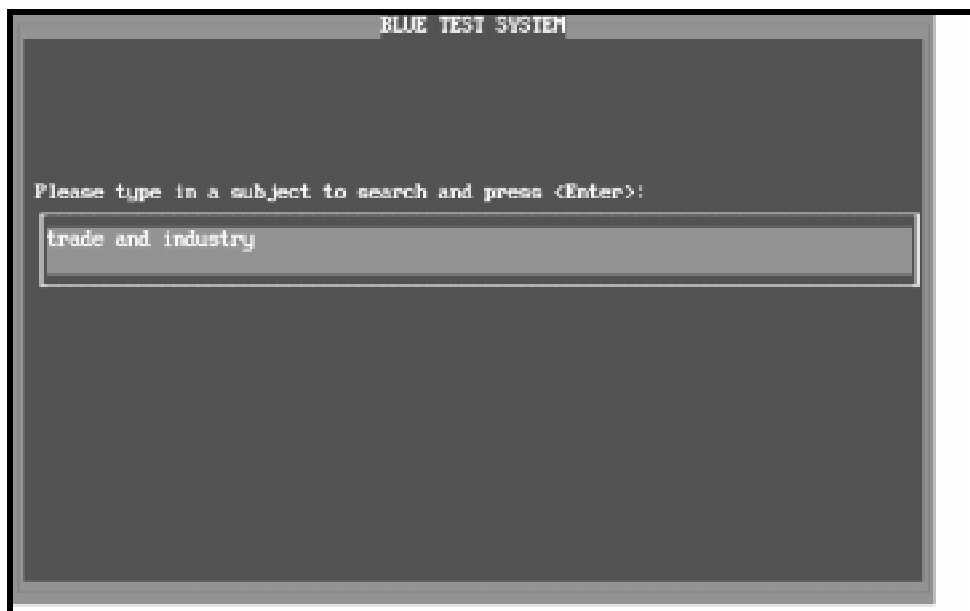


Figure 5.14. User entry of “control systems” query

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Figure 5.15. Alphabetical keyword list for "trade and industry" query

Since the alphabetical keyword list of subject headings only displays a maximum of nine subject headings at a time, the user has to press the <Page Down> key or click on the down arrow in the scroll bar to view the end of the list. In figure 5.16, the user selects the subject heading "Rubber industry and trade." In response, the Blue System conducts an exact search and produces the exact approach main menu bearing enabled options for "general works," "narrower terms," "specialized subtopics" (figure 5.17). If the user chooses the expand search option, the Blue System continues searching for the original query using the keyword-in-subdivided-heading approach which is the next approach in the search trees for queries exceeding one word. If the user chooses to "go to previous screen," the Blue System displays the original alphabetical keyword list (figure 5.15).

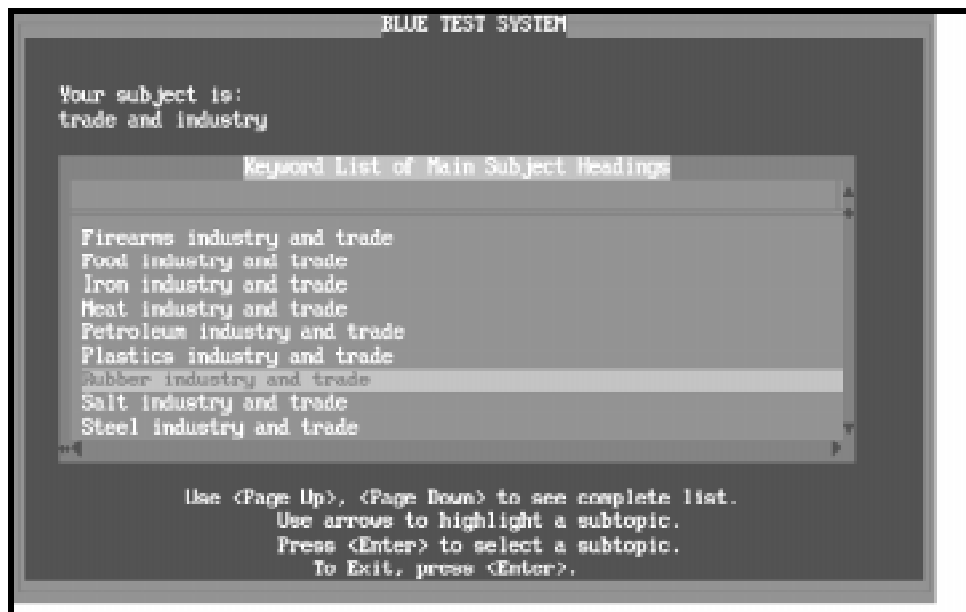


Figure 5.16. Selection of a listed heading from the alphabetical keyword list

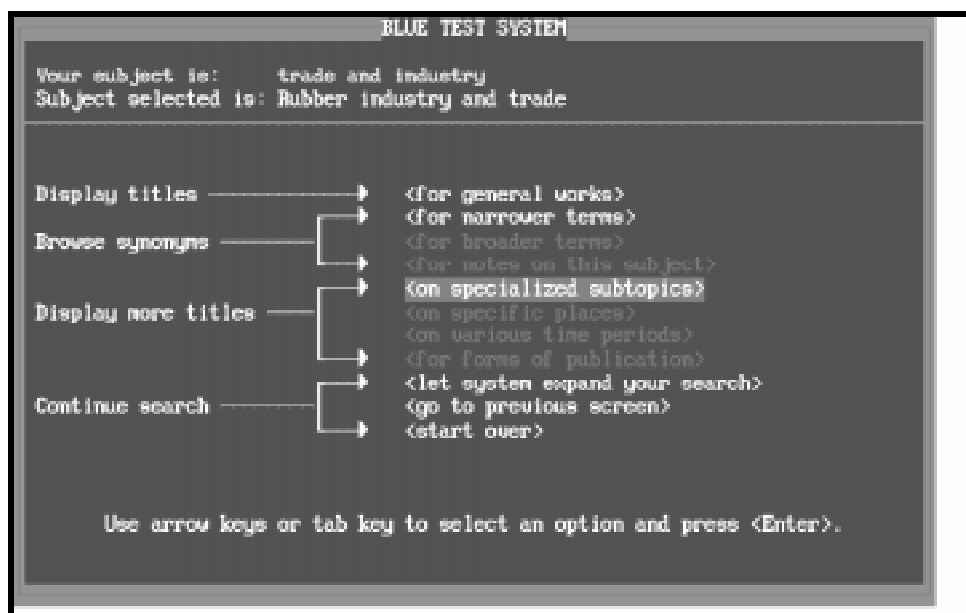


Figure 5.17. Exact approach main menu for "Rubber industry and trade"

Of the options listed in the exact approach main menu, the user selects the "specialized subtopics" option (figure 5.17). The Blue System responds with a single subtopic, "Information services," in figure 5.18. The user selects this subtopic and, eventually, the

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Blue System displays the title shown in figure 5.19 that contains the subject heading “Rubber industry and trade — Information services.”

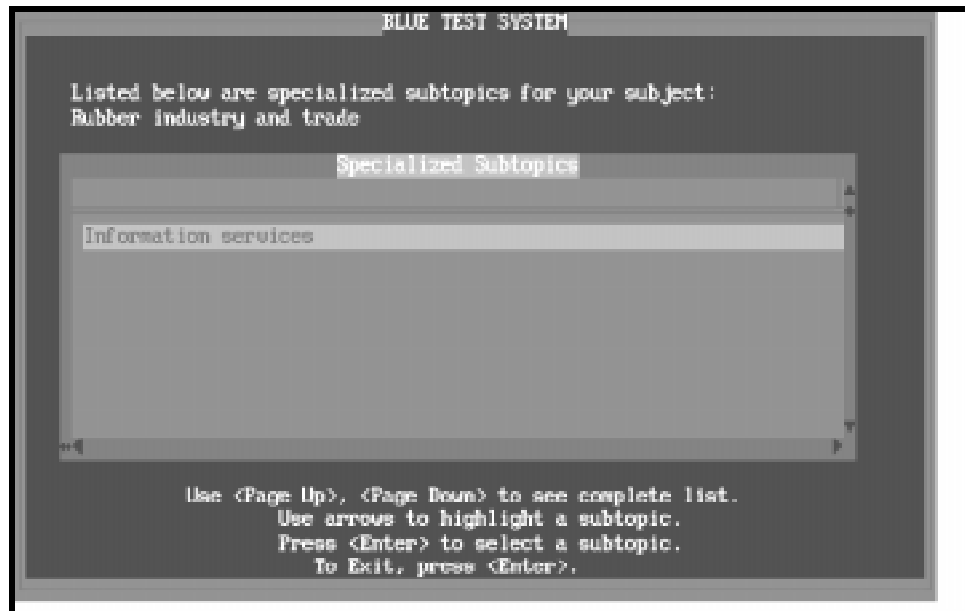


Figure 5.18. Selection of “Information services” subtopic in an exact search



Figure 5.19. Bibliographic record bearing subdivided heading “Rubber industry and trade”

5.6 Keyword-in-subdivided-heading Search

5.6.1 Background

The keyword-in-subdivided-heading search was implemented in both Blue and Pinstripe Test Systems. The two situations in which the Blue System invoked the keyword-in-subdivided-heading searches were similar to the situations in which this system invoked the keyword-in-main-heading search, viz. when user queries exceeded one word and failed to produce retrievals through the exact, alphabetical, and keyword-in-main-heading searches, and when user queries exceeded one word, produced retrievals through the exact, alphabetical, and/or keyword-in-main-heading searches, but users wished to continue searching. Neither situation guaranteed that keyword-in-subdivided-heading searches produced retrievals. The Pinstripe System randomly selected the keyword-in-subdivided-heading search through a random search selection algorithm.

When the keyword-in-subdivided-heading search yielded retrievals, the Blue and Pinstripe Systems responded with an alphabetical keyword list of subdivided subject headings bearing the words in the user query. The objective of displaying alphabetical keyword list of subject headings was the same as the objective of displaying an alphabetical list in the alphabetical approach and an alphabetical keyword list in the keyword-in-main-heading search, viz. to spark users' interest in a term that was partially but not entirely composed of words in the user query. When users selected a term from the alphabetical keyword list, the systems responded with a set of bibliographic records bearing the selected subject heading.

5.6.2 Generating Entries for the Keyword-in-subdivided-heading Search

The ASTUTE project team wrote a program to identify words in selected fields of bibliographic records and save them in a database supporting the various keyword approaches of the Blue and Pinstripe Systems. The program for the keyword-in-subdivided-heading search was the same as the program that handled words for the keyword-in-main-heading search (see section 5.5.2). The only difference was that the former program generated words for the database supporting the keyword-in-subdivided-heading search and the latter program generated words for the database supporting the keyword-in-main-heading search.

The keyword database supporting the keyword-in-subdivided-heading search contained words from the fields and subfields listed in Table 5.5.

**Table 5.5. Fields/Subfields in the
Keyword-in-subdivided-heading Search Database**

USMARC Field Name	Format Type	Tag	Subfields
Subject (corporate body)	bibliographic	610	abndcxyz
Subject (meeting name)	bibliographic	611	andcktxyz
Subject (uniform title)	bibliographic	630	apsdxyz
Subject (topical)	bibliographic	650	axyz
Subject (geographic)	bibliographic	651	axyz

5.6.3 Responding to User Queries with the Keyword-in-subdivided-heading Search

The keyword-in-subdivided-heading search was implemented in both Blue and Pinstripe Systems. With respect to the former, this search was the fourth search (after exact, alphabetical, and keyword-in-main-heading searches) that the Blue System enlisted to produce retrievals for user queries exceeding one word. When user queries matched words in main or subdivided subject headings, the Blue and Pinstripe Systems responded with an alphabetical keyword list of matched headings. User selection of a listed term resulted in a set of bibliographic records bearing the selected subject heading.

Table 5.6 lists options in two option boxes numbered 5.6.1 to 5.6.2. There are options for selecting a term from the alphabetical keyword list (options 5.6.1) and options for displaying bibliographic records (options 5.6.2).

Table 5.6. Keyword-in-subdivided-heading Search Approach Options

Alphabetical keyword list options 5.6.1:	
[Alphabetical term list]	
Choose listed heading	==> Options 5.6.2
Let system expand search	==> Search trees
Undo	==> Options 5.6.1
Start over	==> Switch systems

Bibliographic Record Display Options 5.6.2:	
[Bibliographic record display]	
Display next record	==> Options 5.6.2
Display previous record	==> Options 5.6.2
Display second page of record	==> Options 5.6.2
Exit record display	==> Options 5.6.1

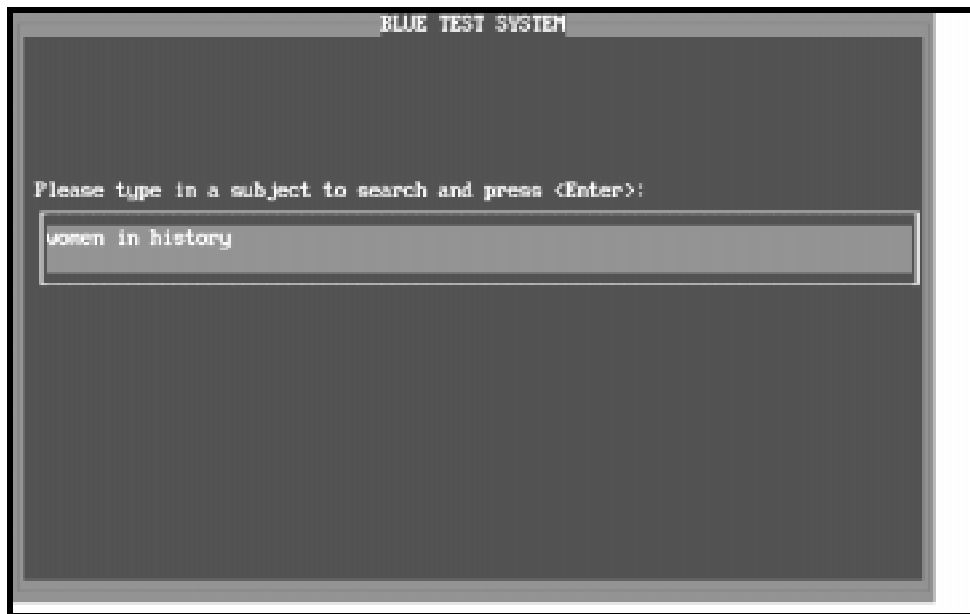


Figure 5.20. User entry of “women in history” query

Figures 5.20–5.23 show the Blue System’s response to the user query “women in history.” In figure 5.20, the user enters the query “women in history” into the Blue System. The system’s response to this query is an alphabetical keyword list of about two dozen subdivided subject headings bearing the two words in the user query, i.e., “women” and “history” (figure 5.21).

Since alphabetical keyword displays of subject headings are limited to a maximum of nine subject headings at a time, the user has to press the <Page Down> key or click on the down arrow in the scroll bar to view the end of the list (figure 5.21).

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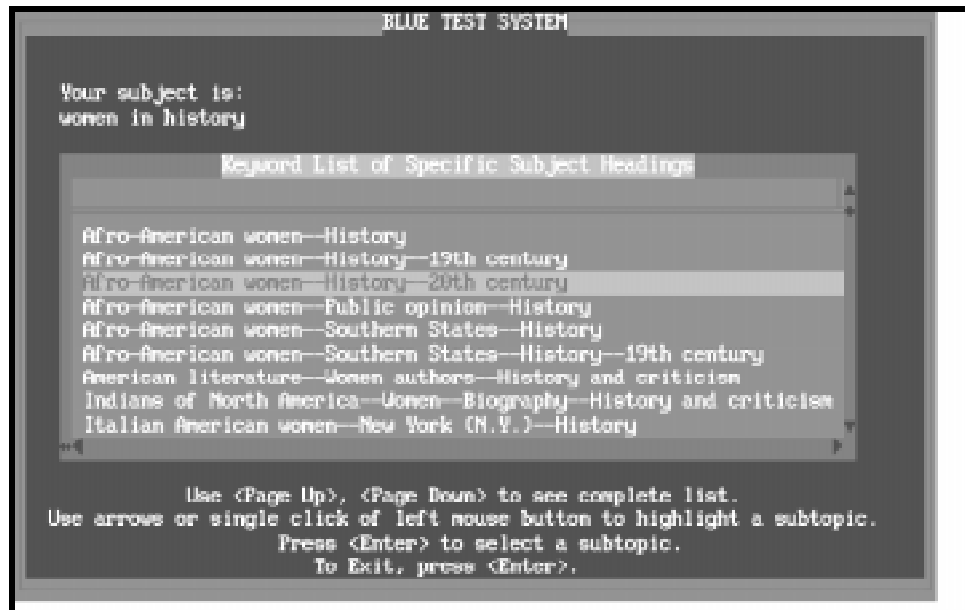
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Figure 5.21. Alphabetical keyword list for “women in history” query

In figure 5.22, the user selects the subject heading “Afro-American women — History — 20th century.” In response, the Blue System displays the first in a set of four titles (figure 5.23). The user can display other retrieved titles by clicking on “next title” and “previous title” options.

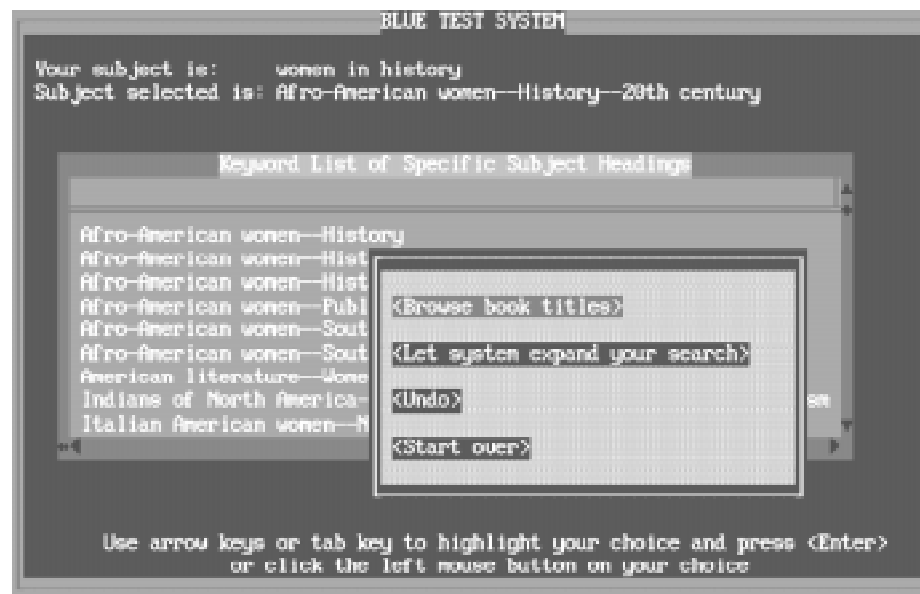


Figure 5.22. User selection of subdivided heading

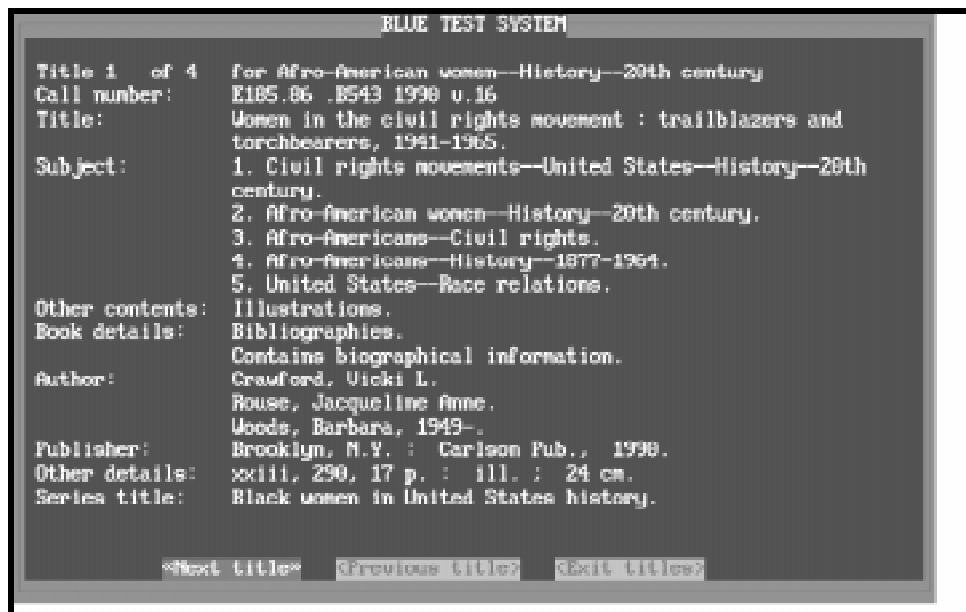


Figure 5.23. Bibliographic record bearing selected subdivided heading

To exit the title display, the user clicks on the “exit titles” option. This action returns the system to the alphabetical keyword list (figure 5.22).

5.7 Title-keyword Search

5.7.1 Background

The title-keyword search was only implemented in the Blue System. The search trees controlling this system called for the title-keyword approach in three situations: (1) when one-word user queries failed to produce retrievals through exact and alphabetical approaches, (2) when user queries exceeding one word failed to produce retrievals through the exact, alphabetical, and keyword-in-heading approaches, or (3) when user queries exceeded one word, produced retrievals through the exact, alphabetical, and/or keyword-in-heading approaches, but users wished to continue searching. None of these situations guaranteed that title-keyword searches would produce retrievals.

Prior to submitting queries exceeding one word to any keyword approach, the Blue System performed a keyword-in-record search of all subject-rich fields of bibliographic records for each word in the query. If it was unable to produce retrievals for one or more words of the user query, it displayed the query to users and prompted them to

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check their query's spelling. If the Blue System produced retrievals for every word of the user query, it ignored these intermediary results and returned control to the search tree for multi-word queries featuring keyword approaches (figure 4.5B).

5.7.2 Generating Entries for the Title-keyword Search

The ASTUTE project team wrote a program to identify words in selected fields of bibliographic records and save them in a database supporting the various keyword approaches of the Blue and Pinstripe Systems. The program for the title-keyword search was the same as the program that handled words for the keyword-in-main-heading search (see section 5.5.2). The only difference was that the former program generated words for the database supporting the title-keyword search and the latter program generated words for the database supporting the keyword-in-main-heading search.

The keyword database supporting the title-keyword search contained words from the fields and subfields listed in Table 5.7.

Table 5.7. Fields/Subfields in the Title-keyword Search Database

USMARC Field Name	Format Type	Tag	Subfields
Uniform title	bibliographic	130	atnpksd
Augmented title	bibliographic	214	a
Uniform title	bibliographic	240	anpks
Translation of title	bibliographic	242	anpb
Collective uniform title	bibliographic	243	a
Title statement	bibliographic	245	anpb
Subject (personal name)	bibliographic	600	tps
Subject (corporate name)	bibliographic	610	tps
Subject (meeting names)	bibliographic	611	andckt
Subject (uniform title)	bibliographic	630	tnk
Added entry (personal name)	bibliographic	700	ktnps
Added entry (corporate name)	bibliographic	710	tps
Added entry (meeting name)	bibliographic	711	ancktp
Added entry (uniform title)	bibliographic	730	atnpks
Added entry (title traced)	bibliographic	740	a
Variant (personal name)	bibliographic	870	t

5.7.3 Responding to User Queries with the Title-keyword Search

The title-keyword search was only implemented in Blue System. Title-keyword searches were the third and last approach given to one-word queries that failed to produce retrievals through exact and alphabetical approaches. Title-keyword searches were the fifth search (after exact, alphabetical, keyword-in-main-, and keyword-in-subdivided-heading searches) that the Blue System enlisted to produce retrievals for user queries exceeding one word. When user queries matched title words, the Blue System displayed the first in a set of bibliographic records bearing user query words.

A single option box is given table 5.8. The only options available in title-keyword searches were connected with displaying bibliographic records (options 5.8.1).

Table 5.8. Title-keyword Search Options

Bibliographic Record Display Options 5.8.1	
[Bibliographic record display]	
Display next record	==> Options 5.8.1
Display previous record	==> Options 5.8.1
Display second page of record	==> Options 5.8.1
Exit record display	==> Search trees

Figures 5.24–5.26 show the Blue System’s response to the user query “black soldiers.” In figure 5.24, the user enters the query “black soldiers” into the Blue System. Figure 5.25 shows the system’s response to this query which is a display of the first of three retrieved titles.

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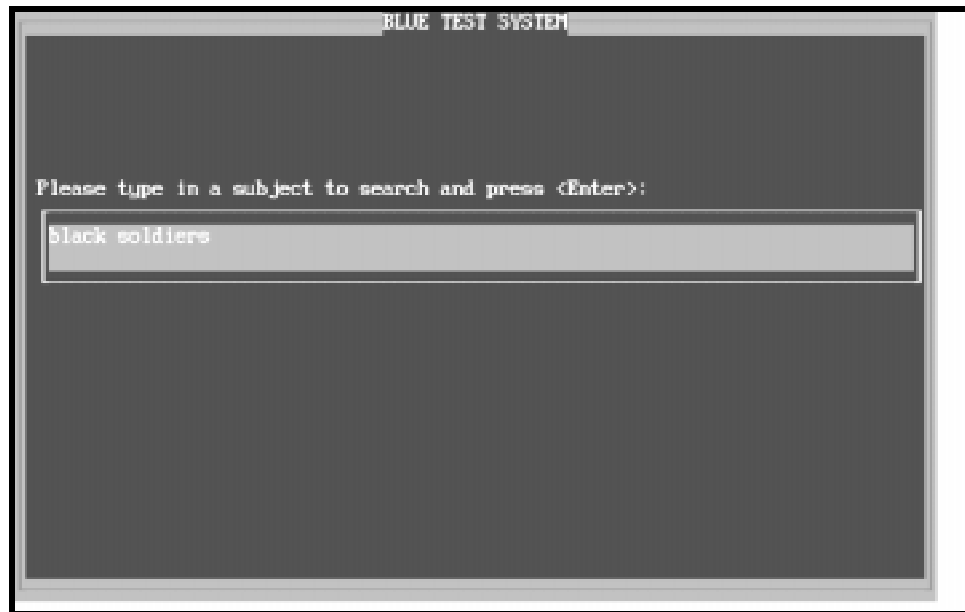
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Figure 5.24. User entry of "black soldiers" query



Figure 5.25. Bibliographic record bearing title words matching user query

Figure 5.26 shows the second of three retrieved titles. Note how both query words, i.e., "black," "soldiers," occur in the titles of the two bibliographic records.

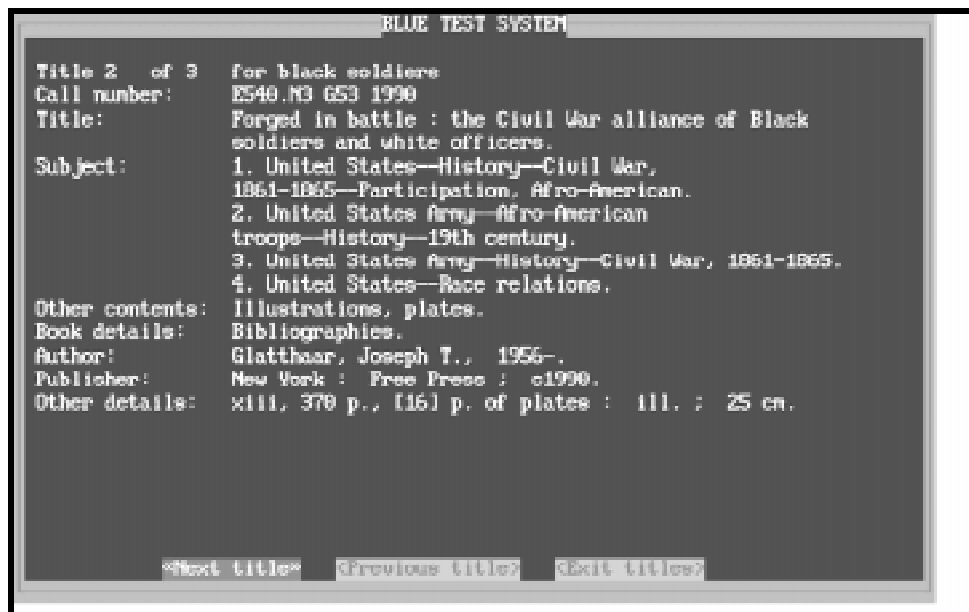


Figure 5.26. Bibliographic record bearing title words matching user query

To exit the title display, the user clicks on the “exit titles” option. Since the query exceeds one word, the Blue System gives the user the option to continue searching. If the user chooses to continue, the Blue System submits this query to a keyword search of subject heading fields and keyword-in-record search. If this query had been a one-word query, the Blue System would have switched to the Pinstripe System or initiated the post-search questionnaire.

5.8 Remaining Keyword Searches

5.8.1 Introduction

Two keyword searches remain: (1) keyword search of subject heading fields, and (2) keyword-in-record search. The former was unique to the Blue System. The latter was implemented in both Blue and Pinstripe Systems.

The two situations in which the Blue System invoked a keyword search of subject heading fields were similar to the situations in which this system invoked keyword-in-heading searches, that is, when user queries exceeded one word and failed to produce retrievals through previously executed searches, and when user queries exceeded one word and produced retrievals through previously executed searches but users wished to continue searching.

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When the Blue System was unable to produce retrievals through all previously executed searches (i.e., exact, alphabetical, keyword-in-heading, title-keyword, and keyword in subject heading fields), it submitted queries to keyword-in-record searches as a last resort. When users chose to continue searching after their queries produced retrievals through one or more previously executed searches, the Blue System submitted queries to keyword-in-record searches. The Pinstripe System randomly selected the keyword-in-record search through a random search selection algorithm.

5.8.2 Generating Entries for Remaining Keyword Searches

The ASTUTE project team wrote a program to identify words in selected fields of bibliographic records and save them in a database supporting the various keyword approaches of the Blue and Pinstripe Systems. The programs for keyword in subject heading field and keyword-in-record searches were the same as the program that handled the keyword-in-main-heading search (see section 5.5.2). The only difference was that the former programs generated words for two separate databases that supported the keyword search of subject heading fields and keyword-in-record searches, respectively.

The keyword databases supporting the keyword-in-record search contained words from the fields and subfields listed in Table 5.9. Fields marked with an asterisk also contributed to the keyword database supporting the keyword search of subject heading fields.

Table 5.9. Fields/Subfields in the Keyword-in-record Database

USMARC Field Name	Format Type	Tag	Subfields
Illustration codes	bibliographic	008	positions 18–21
Nature of contents codes	bibliographic	008	positions 24–27
Biography code	bibliographic	008	position 34
Festschrift code	bibliographic	008	position 30
Main entry (corporate name)	bibliographic	110	abncktp
Main entry (meeting name)	bibliographic	111	andc
Main entry (uniform title)	bibliographic	130	atnpksd
Augmented title	bibliographic	214	a
Uniform title	bibliographic	240	anpks
Translation of title	bibliographic	242	anpb
Collective uniform title	bibliographic	243	a

Title statement	bibliographic	245	anpb
Series statement added entry	bibliographic	440	ap
Series statement (untraced)	bibliographic	490	a
Contents note	bibliographic	505	a
Summary	bibliographic	520	a
Subject (personal name)	bibliographic	600	tps
*Subject (corporate name)	bibliographic	610	abndcxyztps
*Subject (meeting names)	bibliographic	611	andcktxyz
*Subject (uniform title)	bibliographic	630	apsdxyztnk
*Subject (topical)	bibliographic	650	axyz
*Subject (geographic)	bibliographic	651	axyz
Subject (uncontrolled)	bibliographic	653	a
Subject (genre/form)	bibliographic	655	axyz
Added entry (personal name)	bibliographic	700	ktnps
Added entry (corporate name)	bibliographic	710	tps
Added entry (meeting name)	bibliographic	711	ancktp
Added entry (uniform title)	bibliographic	730	atnpks
Added entry (title traced)	bibliographic	740	a
Added entry (physical characteristics)	bibliographic	755	axyz
Series (personal name)	bibliographic	800	a
Series (corporate name)	bibliographic	810	t
Series (meeting name)	bibliographic	811	at
Series (uniform title)	bibliographic	830	at
Variant (personal name)	bibliographic	870	t
Variant (corporate name)	bibliographic	871	t
Variant (meeting name)	bibliographic	872	t
Variant (uniform title)	bibliographic	873	a

*Fields/subfields contributing to keyword search of subject heading fields database.

5.8.3 Responding to User Queries with Remaining Keyword Searches

The keyword search of subject heading fields was only implemented in Blue System. User queries exceeding one word that failed to produce retrievals through five other searches were given to this search. Keyword-in-record searches were the search of last resort for queries exceeding one word. When keyword-in-record searches failed to

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make retrievals in the Blue System, the system notified users of its failure. The system then switched to the Pinstripe System (if users had not begun in the Pinstripe System) or initiated the post-search questionnaire (if users had begun in the Pinstripe System). When user queries produced retrievals through the keyword search of subject heading fields (Blue System only) or keyword-in-record searches (Blue and Pinstripe Systems), the system displayed the first in a set of bibliographic records bearing user query words.

Table 5.10 enumerates options available to searchers in keyword searches of subject heading fields or keyword-in-record searches. The only options available in these searches are connected with displaying bibliographic records (options 5.10.1).

Table 5.10. Subject Heading Keyword and Keyword-in-record Search Options

Bibliographic Record Display Options 5.10.1	
[Bibliographic record display]	
Display next record	==> Options 5.10.1
Display previous record	==> Options 5.10.1
Display second page of record	==> Options 5.10.1
Exit record display	==> Search trees

Figures 5.27–5.28 show the Blue System’s response to the user query “electric powered automobiles.” In figure 5.27, the user enters the query “electric powered automobiles” into the Blue System. Figure 5.28 shows the system’s response to this query which is a display of the first of two retrieved titles. In the first record, user query words match a word in the title, i.e., “powered,” and words in subject headings, i.e., “electric” and “automobiles.”

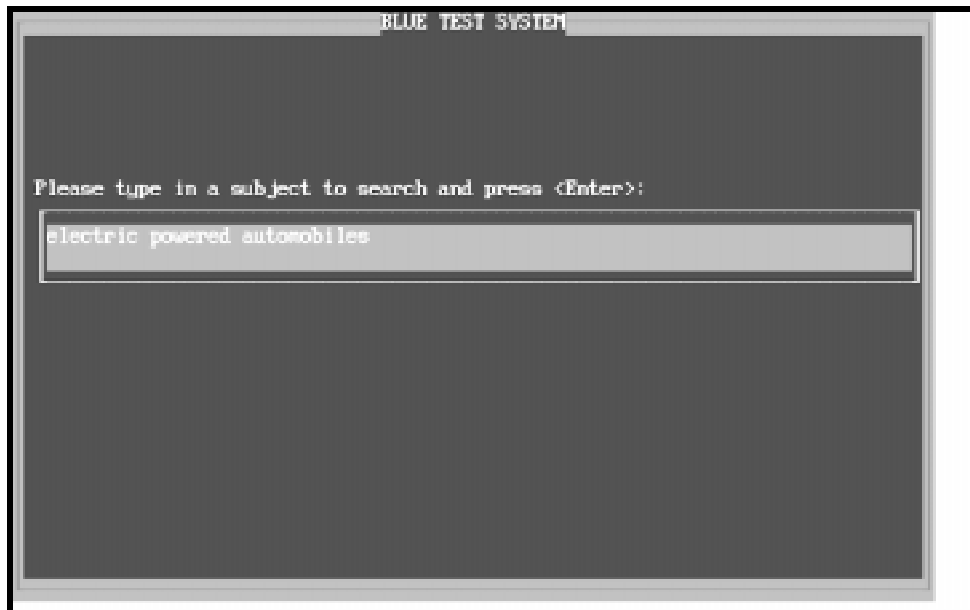


Figure 5.27. User entry of "electric powered automobiles" query

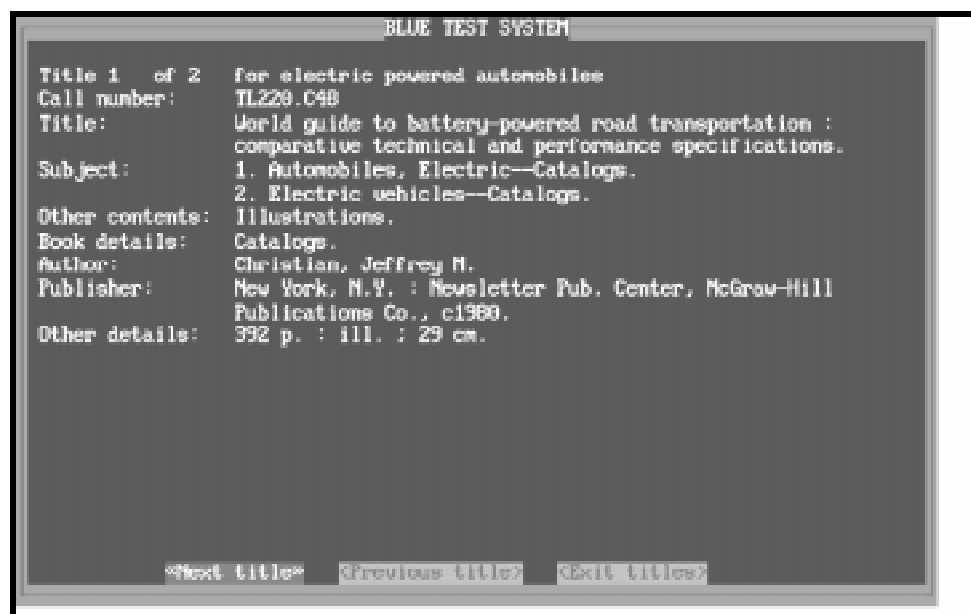


Figure 5.28. Bibliographic record bearing words matching user query

5.9 Personal-name Searches

5.9.1 Background

The functionality of personal-name searches must take into account the content and structure of assigned subject headings for personal names. Personal-name headings come from the assigned subject headings in libraries' bibliographic records. Catalogers establish these headings by following AACR2 rules and guidelines and previous LC practice. They refer to the Library of Congress Name Authority File (LCNAF) to verify personal names. References are generated from LCNAF records for names used in libraries' bibliographic records. Catalogers also refer to SCM:SH to add subdivisions to personal-name headings. The results are single assigned subject headings bearing elements for personal names, topical subjects, and, possibly, geographic names. The order of elements in such headings are: (1) last name, (2) first name or initial, (3) possibly, a middle name or initial, (4) possibly, one or more dates, (5) possibly, topical subdivisions, and (6) rarely, geographic subdivisions. Subdivisions appended to personal-name headings are usually for topical subjects; however, several subdivisions under names of persons authorize use of geographic subdivisions (Library of Congress 1990, H1110).

The empirical study of user queries which served as the impetus for the formulation of search trees tested in this research project demonstrated that users rarely expressed all six elements of personal-name headings in their queries (Drabenstott and Vazine-Goetz, 1994). Furthermore, when two or more elements were included, users rarely entered elements in the sequence prescribed by personal-name headings.

To improve the performance of personal-name subject searching, systems must ask users whether their queries involve personal names. When users identify such queries, systems also need users to provide them with information about the particular elements included in queries to distinguish personal-name elements from topical-subject elements. Systems can then accommodate the rigid structure of personal-name headings by searching for as many elements as needed to provide useful retrievals.

Recommendations from the empirical study regarding subject searches for personal-name subject queries involved three subject searching approaches, i.e., keyword-in-subdivided heading, keyword-in-record, and alphabetical searches. The types of searches systems undertake depend upon the elements users offer in their subject queries for personal names. Systems present results for only those searches that produce postings in the library catalog. Table 4.1 lists the sequence of the three recommended subject searching approaches and the query elements each approach enlists to produce

retrievals. If an approach fails to produce retrievals, systems proceed with the next approach and element(s) on the list.

At the most, systems need three elements, viz. last names, first names, and topics, to perform keyword searches of single subdivided headings. If such searches fail to produce retrievals, systems drop first names and perform keyword-in-subdivided-heading searches for the remaining two elements. Keyword searches of all subject-rich fields of bibliographic records may yield retrievals for queries that are combinations of personal names and topics. If keyword approaches fail to produce retrievals, the system omits the topical element(s) and performs an alphabetical search using as many name elements as match assigned subject headings and references in the catalog.

For example, the three elements “kennedy” (last name), “robert” (first name), and “presidential primaries” (topic), would probably not be successful retrieving single assigned subject headings bearing these words, i.e., first two listed approaches in Table 4.1, because the topic elements are not used in subdivisions under subject headings for personal names. Keyword-in-record approaches may yield bibliographic records bearing the topic elements and name elements because titles and/or note fields may contain the topic elements, viz. “presidential primaries.” Retrieved records may have assigned subject headings such as “Kennedy, Robert Francis, 1925–1968 — Career in politics” or “Kennedy, Robert Francis, 1925–1968 — Political and social views.” If users are not satisfied with the results, systems could continue with the alphabetical approach but they should omit the topical element of the query to effect a match of a personal-name subject heading.

When users do not enter a topical element(s), the alphabetical approach is recommended. Systems respond with an alphabetical list of assigned subject headings for personal names in the alphabetical neighborhood of the entered last name. Alphabetical lists could be limited to the name subfields of personal-name subject headings, i.e., subfields \$a, \$q, \$b, \$c, and \$d. Subject headings subdivided by topical or geographic subdivisions would not be included to reduce the amount of information on screens. Alphabetical indexes of personal-name subject headings that are limited to name subfields are sufficient for letting users find and verify the name they are looking for. Once they select a main heading, systems can then display the topical and geographic subdivisions appended to it through the exact approach or display the bibliographic records bearing unsubdivided and subdivided forms of the selected heading.

When users enter a last name only, systems also respond with the alphabetical approach. Alphabetical lists are also the last resort when systems are unable to find matches of two or more query elements. For example, a query with two elements

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“nixon” (last name) and “prosecution” (topic) may not retrieve single headings or bibliographic records, but an alphabetical search for the last name “nixon” will probably place the user at a location in the index where she can browse forward to find the assigned subject heading “Nixon, Richard Milhous, 1913– 1994.” Selecting this heading will give her the opportunity to display assigned headings with subdivisions such as “Impeachment” or “Pardon” which may be appropriate to this topic.

The alphabetical approach recommended here is similar to approaches described by other researchers who have studied personal-name queries (Dickson 1984, 36; Taylor 1984, 15). They recommended that systems first find assigned headings matching surnames and given names in user queries. If they fail, systems should then look for assigned headings matching surnames and the first letter of given names. Lastly, systems should look for assigned headings that match the surnames users enter.

On their own, online systems cannot distinguish between query terms that are topical subjects and terms that are personal names. Systems need to enlist users’ assistance to identify the various elements of personal-name queries. They can then make useful responses to user queries even though the structure of controlled vocabulary terms and user queries differ.

5.9.2 Keyword Searches for Personal Names

The ASTUTE project team limited keyword searching in the Blue and Pinstripe Test Systems to a single keyword search, i.e., keyword-in-record searches, for two reasons. First, UM-Dearborn bibliographic records contained few (about a dozen) subdivided subject headings for personal names. Thus, the likelihood that a user query would produce retrievals as a result of keyword-in subdivided-heading searches was so low that the team felt such searches would be a waste time and computer resources. Second, most subdivided subject headings for personal names in Earlham College bibliographic records were unique, i.e., assigned to a single bibliographic record. Thus, a successful keyword-in-subdivided-heading search would produce an intermediary display of the single retrieved heading which would eventually result in the display of a single bibliographic record. Since keyword-in-record searches would retrieve this same record, and, possibly, additional one(s), the project team decided to streamline keyword searches for personal names by implementing a single search — the keyword-in-record search. Keyword-in-subdivided-heading searches of personal name and topic elements would be appropriate for much larger databases.

The ASTUTE project team used the same program to identify words in selected fields of bibliographic records and save them in a database supporting the keyword-in-record search for personal names as the program had written for other keyword approaches

(see section 5.5.2). The keyword database supporting this search contains words from the fields and subfields listed in Table 5.11.

Table 5.11. Fields/Subfields in the Personal-name, Keyword-in-Record Database

USMARC Field Name	Format Type	Tag	Subfields
Illustration codes	bibliographic	008	positions 18–21
Nature of contents codes	bibliographic	008	positions 24–27
Biography code	bibliographic	008	position 34
Festschrift code	bibliographic	008	position 30
Main entry (corporate name)	bibliographic	110	abncktp
Main entry (meeting name)	bibliographic	111	andc
Main entry (uniform title)	bibliographic	130	atnpksd
Augmented title	bibliographic	214	a
Uniform title	bibliographic	240	anpks
Translation of title	bibliographic	242	anpb
Collective uniform title	bibliographic	243	a
Title statement	bibliographic	245	anpb
Series statement added entry	bibliographic	440	ap
Series statement (untraced)	bibliographic	490	a
Contents note	bibliographic	505	a
Summary	bibliographic	520	a
Subject (personal name)	bibliographic	600	aqbcktxyznps
Subject (corporate name)	bibliographic	610	abndcxzytps
Subject (meeting names)	bibliographic	611	andcktxyz
Subject (uniform title)	bibliographic	630	apsdxyztkn
Subject (topical)	bibliographic	650	axyz
Subject (geographic)	bibliographic	651	axyz
Subject (uncontrolled)	bibliographic	653	a
Subject (genre/form)	bibliographic	655	axyz
Added entry (personal name)	bibliographic	700	ktnps
Added entry (corporate name)	bibliographic	710	tps
Added entry (meeting name)	bibliographic	711	ancktp
Added entry (uniform title)	bibliographic	730	atnpks
Added entry (title traced)	bibliographic	740	a
Added entry (physical characteristics)	bibliographic	755	axyz

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Series (personal name)	bibliographic	800	a
Series (corporate name)	bibliographic	810	t
Series (meeting name)	bibliographic	811	at
Series (uniform title)	bibliographic	830	at
Variant (personal name)	bibliographic	870	t
Variant (corporate name)	bibliographic	871	t
Variant (meeting name)	bibliographic	872	t
Variant (uniform title)	bibliographic	873	a

Keyword-in-record searches for personal-name queries were implemented in both Blue and Pinstripe Systems. The Blue System performed a keyword-in-record search using first name, last name, and topic elements. If it failed to yield retrievals, it omitted the first name element and tried again using only last name and topic elements.

A random selection algorithm governed the Pinstripe System's selection of the keyword-in-record search. The Pinstripe System performed a keyword-in-record search using all user-query elements; it did not omit query elements to effect retrievals.

The single option box is given in table 5.12 for keyword-in-record searches. When this search produced retrievals, the system displayed the first record and provided options to display the next record, previous record, second page of a record, or exited the record display.

Table 5.12. Personal-name, Keyword-in-record Search Options

Bibliographic Record Display Options 5.12.1	
[Bibliographic record display]	
Display next record	==> Options 5.12.1
Display previous record	==> Options 5.12.1
Display second page of record	==> Options 5.12.1
Exit record display	==> Search trees

Figures 5.29–5.32 show the Blue System's response to the user query bearing elements for "jefferson" (last name), "thomas" (first name), and "on slavery." In figure 5.29, the user enters the last name element of the query "jefferson" into the Blue System. The user's pressing of the <Enter> key prompts the Blue System to respond with a second pop-up box requesting the first name element of the query. In figure 5.30, the user enters the first name element "thomas." When the user presses the <Enter> key, the system prompts the user to enter a topic element. In figure 5.31, the user enters the topic element of the query.

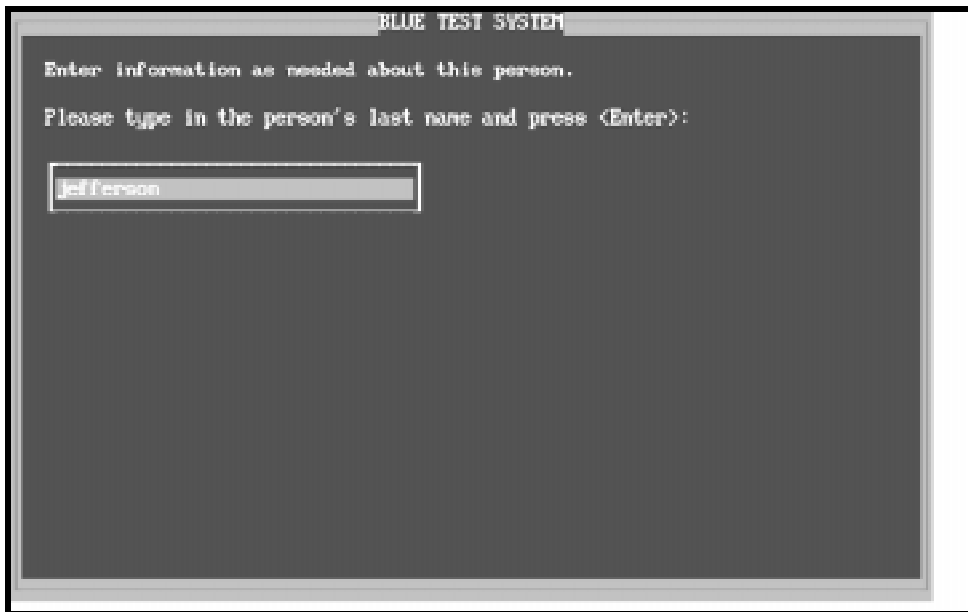


Figure 5.29. User entry of last name query element

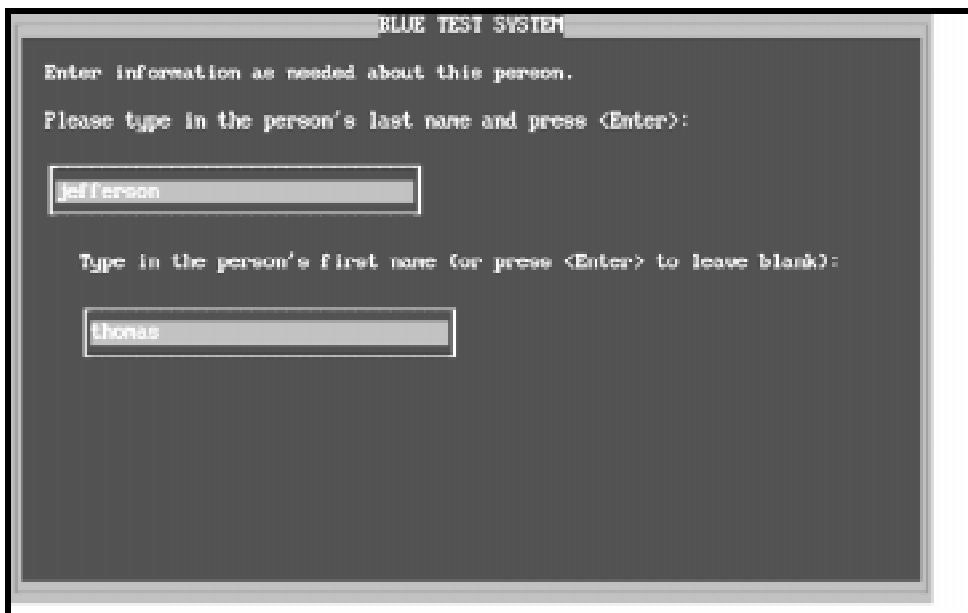


Figure 5.30. User entry of first name query element

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BLUE TEST SYSTEM

Enter information as needed about this person.

Please type in the person's last name and press <Enter>:

Jefferson

Type in the person's first name (or press <Enter> to leave blank):

Thomas

Type in a topic connected with this person
(or press <Enter> to leave blank):

on slavery

Figure 5.31. User entry of topic query element

The Blue System retrieves two titles bearing the words in the user query. Figure 5.32 shows the first of the two retrieved titles.

BLUE TEST SYSTEM

Title 1 of 2 for jefferson, thomas—on slavery

Call number: E332.2 .M54 1991

Title: The wolf by the ears : Thomas Jefferson and slavery.

Name as subject: 1. Jefferson, Thomas, 1743-1826—Views on slavery.
2. Jefferson, Thomas, 1743-1826—Relations with Afro-Americans.

Subject: 1. Presidents—United States—Biography.
2. Slavery—United States.

Book details: Bibliographies.
Contains biographical information.

author: Miller, John Chester. 1907-.

Publisher: Charlottesville : University Press of Virginia : c1991.

Other details: xii, 319 p. : 23 cm.

<Next title> <Previous title> <Exit titles>

Figure 5.32. Bibliographic record bearing words in user query

When the Blue-system user is done reviewing retrieved bibliographic records, the system prompts the user to continue searching. The system responds to users who choose to continue searching with the results of an alphabetical search. If the user continues the search shown in figures 5.29–5.32, the Blue System would display an alphabetical list of personal names. Choosing the name heading “Jefferson, Thomas, 1743–1826” results in 62 titles. The user would have to review the records to determine whether certain titles might discuss Jefferson’s views on slavery.

The Pinstripe System does not give users an opportunity to continue searching. It switches to the Blue System (if the Pinstripe System is the first system in which the user conducts a search) or initiates the post-search questionnaire (if the user has already searched the Blue System for the particular query).

5.9.3 Alphabetical Approach for Personal Names

The alphabetical approach was only implemented in the Blue System. The Blue System performed an alphabetical search in three situations: (1) when keyword-in-record searches failed to produce retrievals, (2) when keyword-in-record searches produced retrievals but the user chose to continue searching, and (3) when users only entered name elements in their personal-name subject queries.

Only the personal name subject heading field (USMARC tag 600) contributed to the alphabetical list of name headings. Terms in subfields \$a, \$b, \$q, \$c, and \$d were displayed to users.

Table 5.13 enumerates options available to searchers in alphabetical searches of subject headings for personal names. Options were available for manipulating the alphabetical subject list (options 5.13.0) and displaying retrieved bibliographic records (options 5.13.1).

Table 5.13. Alphabetical Search Approach Options for Personal-name Queries

Alphabetical name selection options 5.13.0:	
[Alphabetical name list]	
Choose listed name heading	==> Options 5.13.1
Browse backward or forward in list	==> Click on scroll bar
Undo	==> Options 5.13.0
Start over	==> Switch systems
Bibliographic Record Display Options 5.13.1:	
[Bibliographic record display]	
Display next record	==> Options 5.13.1
Display previous record	==> Options 5.13.1
Display second page of record	==> Options 5.13.1
Exit record display	==> Switch systems

Figure 5.33–5.36 show the Blue System’s response to the user query “tecumseh.” In figure 5.33, the user enters this personal-name subject query. The Blue System responds with an alphabetical list bearing the personal-name subject heading “Tecumseh, Shawnee Chief, 1763–1813” (figure 5.34).

BLUE TEST SYSTEM

Enter information as needed about this person.

Please type in the person's last name and press <Enter>:

Type in the person's first name (or press <Enter> to leave blank):

Type in a topic connected with this person (or press <Enter> to leave blank):

Figure 5.33. User entry of personal-name query for “tecumseh”

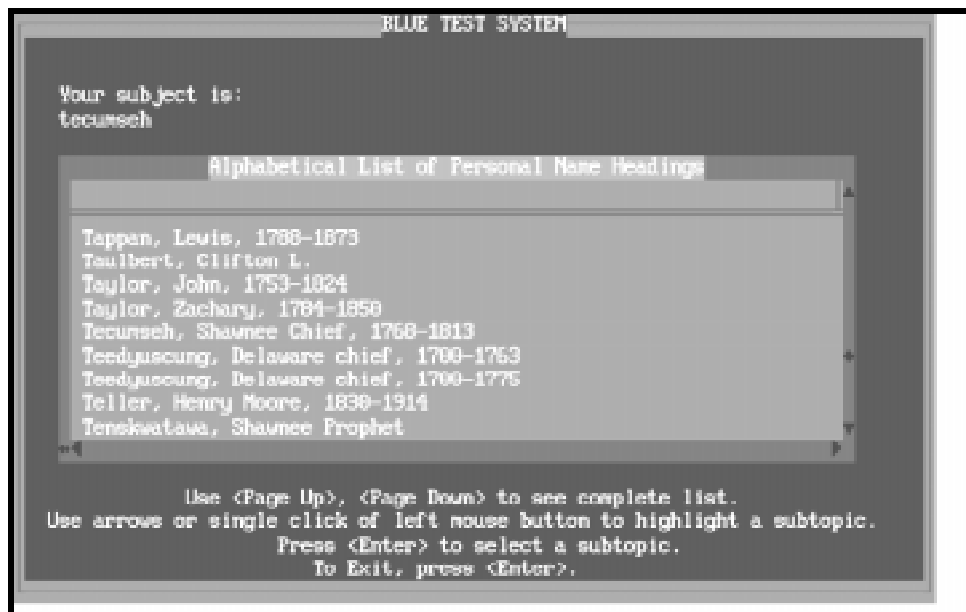


Figure 5.34. Alphabetical list of personal-name subject headings in response to "tecumseh" query

Figure 5.35 shows the user selecting the Tecumseh subject heading from the alphabetical list of personal-name subject headings. The Blue System's response to the user's selection is to display the first of ten retrieved titles (figure 5.36).

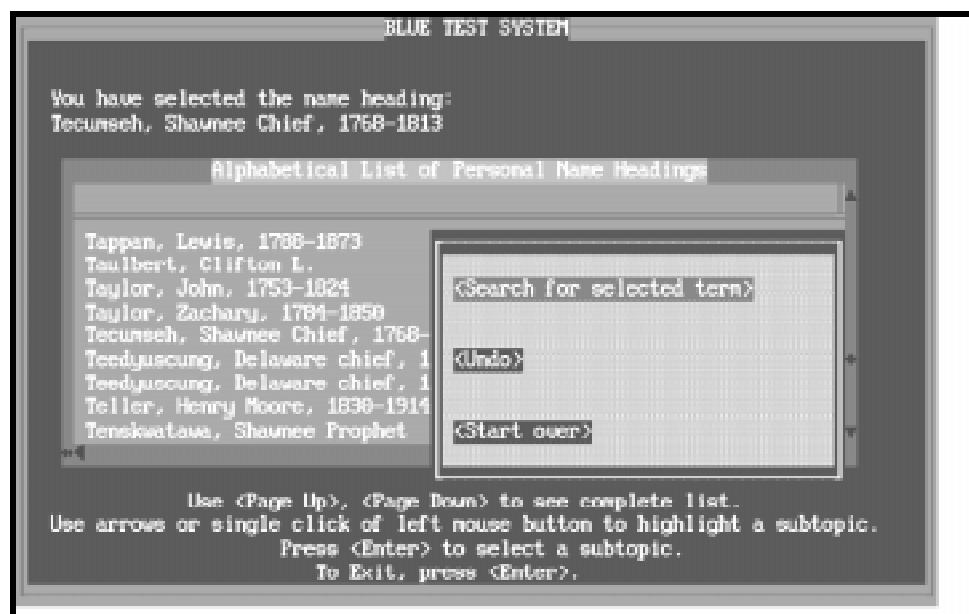


Figure 5.35. User selection of a personal-name subject heading

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Figure 5.36. Bibliographic record bearing the subject heading “Tecumseh”

5.10 Pinstripe System’s Random Selection Algorithm

The Pinstripe System featured three subject searching approaches for subjects generally: (1) alphabetical, (2) keyword-in-subdivided-heading, and (3) keyword-in-record searches. The implementation of these three searches was almost the same as the implementation of these searches in the Blue System. The only difference was that the Pinstripe System’s selection of a subject searching approach in response to a user query was governed by a random selection algorithm.

The Pinstripe System’s random selection algorithm used a random function provided by FoxPro to facilitate the selection of an approach. The alphabetical approach was assigned a value range from 1 to 100, the keyword-in-subdivided-heading search was assigned a range from 101 to 200, and the keyword-in-record approach was assigned a range from 201 to 300.

The first step in selecting a search was for the Pinstripe System to call the random function which returned a decimal number between 0 and 1. This number was multiplied by 300 and the product was compared to the range for each approach to select a search type. Let’s say that the random function called the decimal number 0.28. The system figured the product of 0.28 by 300 equaled 84. It compared 84 to the

range for the three searches and selected the alphabetical search because it fell into the 1 to 100 range.

The Pinstripe System featured only the keyword-in-record search for subject searches for personal names. This system did not delete topical elements from personal-name queries to effect matches.

5.11 Displaying Bibliographic Records

The Blue and Pinstripe Systems displayed bibliographic records and collected relevance assessments from end users in the same way. Table 5.14 lists fields and subfields that contributed text to bibliographic record displays. Names listed in the “USMARC Field Name” column of Table 5.14 were same names as the field labels that introduced such data in bibliographic record displays. They were also listed in the same order as they appeared in such displays.

Table 5.14. Fields/Subfields for Bibliographic Record Displays

USMARC Field Name	Format Type	Tag	Subfields
Call number	bibliographic	099	ab
		092	ab
		050	ab
Title	bibliographic	245	apb
Alternate title	bibliographic	130	atnpksd
		214	a
		240	anpks
		242	anpb
		243	a
		730	atnpks
		740	a
873	a		
Name as subject	bibliographic	600	aqbcdktxyznps
Subject	bibliographic	610	abndcxy
		611	andcktxyz
		630	apsdxyztnk
		650	axyz
		651	axyz
Summary	bibliographic	505	a
Contents	bibliographic	520	a

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Other contents	bibliographic	008	positions 18–21 (replace codes with text equivalent)
Book details	bibliographic	870 871 008	t t positions 24-27, 30, 34 (replace codes with text equivalent)
Author	bibliographic	100 110 700 710	aqbcde abndcktp aqbcdektmps abncdtps
Sponsor	bibliographic	111 711	andc andcktp
Edition	bibliographic	250	a
Publisher	bibliographic	260	abc
Other details	bibliographic	300	abc
Series title	bibliographic	440	ap
Other series	bibliographic	490 800 810 811 830	a a t at at

Figures 5.5, 5.13, 5.19, 5.23, 5.25, 5.26, 5.28, 5.32, and 5.36 showed bibliographic record displays in the ASTUTE experimental online catalog. The system gave users three options following record displays: (1) display next title, (2) display previous title, or (3) exit title display. When users chose any of these options, the system produced a pop-up window that asked users to rate the usefulness of the displayed title. For example, let's say that the user who displayed the title in figure 5.25 selected the "next title" option. Before displaying the next title, the system would produce the pop-up box shown in figure 5.37.

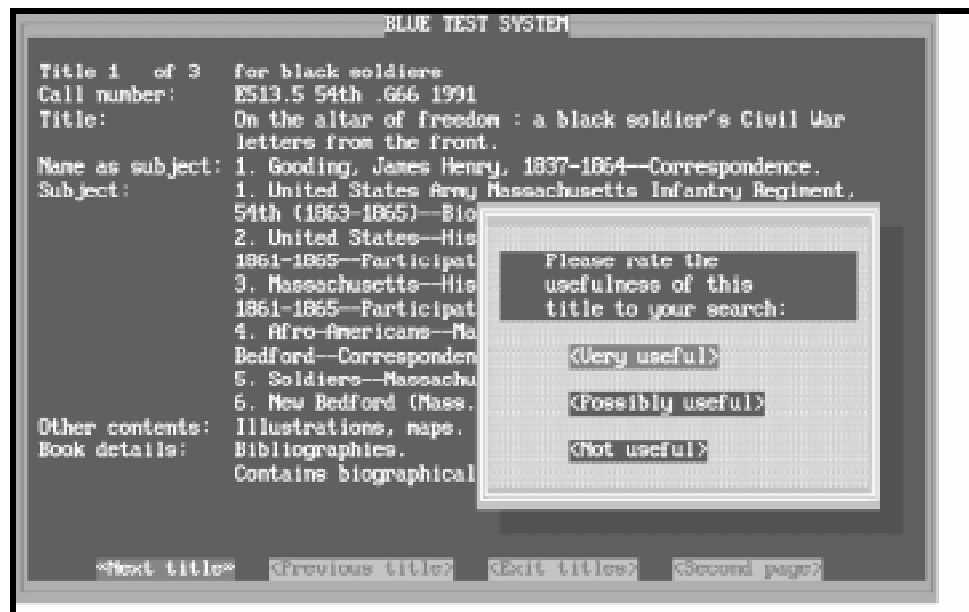


Figure 5.37. Prompting users for relevance assessments

The pop-up window in figure 5.37 prompts users to rate the title “very useful,” “somewhat useful,” or “not useful.”

5.12 Chapter Summary

This chapter provided a non-technical discussion of ASTUTE functionality. ASTUTE was composed of two experimental online catalogs: (1) the Blue System in which search trees controlled the system’s selection of a subject searching approach in response to user queries, and (2) the Pinstripe System which chose subject searching approaches randomly in response to user queries. It gave the background and rationale for subject searching approaches in the experimental systems, described the fields that contributed words and phrases to searchable FoxPro databases, discussed the process of the various subject searches, and gave examples of subject searches in the Blue and Pinstripe Systems to demonstrate functionality and system responses to user queries.

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