CODA USER'S MANUAL

J. A. Dewar, J. Gillogly, M. Hammer

March 1985

N-2290-RCC

Prepared for

The Rand Computation Center
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A RAND NOTE

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PREFACE

This Note describes how to access and use CODA -- a Concept Organization and Development Aid. In general terms, CODA is a computer-file data storage and retrieval system aimed at the specialized needs of an individual researcher or a small group of researchers. It is intended to be used in research that involves a growing, generally textual, data base and an evolving concept of how those data interrelate. Its relationship with other file management and data base management systems is described in CODA: A Concept Organization and Development Aid for the Research Environment (Rand Paper P-7035).

Development on CODA was begun in 1982 as an adjunct to work on the Air Force Computer Study under Project AIR FORCE. A rudimentary capability was achieved under funding for that project. The first prototype of the fully realized CODA concept was completed without funding by the authors in their spare time. After testing by several researchers at Rand, the polished prototype version documented in this Note was completed under funding from Rand's Computer Services Department.

CODA is of potential interest to anyone with a data storage and retrieval requirement, but should be of special interest to individual researchers or small research groups at the onset of a research project.
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I. INTRODUCTION

In 1982, the authors were led by their experiences to wonder what the role of computers might be in policy research. The role of computers in analysis, particularly quantitative analysis, is extensive and well documented. Computerized text editing (as used in the preparation of this manuscript) is quickly replacing the typewriter throughout the industrialized world. Artificial Intelligence researchers at Rand and elsewhere are exploring the possibility that computers might do some of a researcher's thinking. Data retrieval systems are bringing vast stores of data within the reach of a researcher's specialized interests. But it seemed as though there ought to be other ways that the power of computers could help the research process.

We focused on the part of the typical research project that involves reading vast amounts of information related to the research topic and remembering the pieces that are pertinent to one's current thesis. This part of research predates computers and is currently supported, to some extent, by a variety of file management and data base management systems. The idea of the computer acting as a long term memory for the researcher seemed like a natural combination of the speed and memory of the computer with the more subtle synthetic powers of the researcher.

In looking at several of the extant storage and retrieval systems, however, they seemed to be directed either toward very large data bases or at personal computer applications. As such, each seemed to have important limitations when applied specifically to the problems of the individual researcher. This led us back to a look at the research process itself in an attempt to define those aspects of search and retrieval that most suited the policy researcher's environment.

The key seemed to be that the research process of an individual was essentially an iterative process characterized by both a growing data base and a series of failed attempts at organizing the data into a coherent whole (followed ultimately by a successful attempt, of course).
This led us to an hypothesis about the utility of computers "optimized" for the policy research process and from there to a list of desired characteristics for the associated computer aid.

HYPOTHESIS: Computers can aid the policy research process by acting as a long term memory (storage and retrieval facility) for the researcher's growing data base and changing concepts.

The realization of this hypothesis in the form of computer software specifications required constant referral back to the research process and an appreciation of the limitations of modern computers. The following list of desiderata reflects the results of that effort along with our justifications for each.

DESIDERATA

1. Flexible tagging rules.
The process whereby a human retrieves data from his/her own memory is ill understood, except that it seems to involve a variety of mental processes. Retrieving data from a computer is more limited, but we wanted the researcher to be able to "mark" data, or put tags on it for later retrieval, as flexibly as possible. The researcher shouldn't be restricted to words that appear in the data or single word tags or ....

2. Quick Boolean searches.
In retrieving data, we found with other retrieval systems that even a 1 to 2 second delay between the request and the results was very distracting to a researcher's thought processes. Boolean searches involve the use of the logical connectives AND, OR, and NOT, require longer than single search requests, in general, yet should respond just as quickly as single search requests if the researcher is not to be distracted from the problem at hand. It should be
emphasized that the requirements here are placed on TAG searches--searches through the entire text (called full-text searches) are exempted from this specification because it was our thought that the primary search method would be by tags and that the researcher would not mind delays for the occasional full-text search.

3. Powerful tag changing capability.

This would seem to be the key for a policy researcher. As one's concepts change, the relevance of one's data to the new concept usually changes also. We wanted the researcher to have the ability to make wholesale changes to the markers or tags on data. This seemed to imply two capabilities: (1) The ability to search the data base and then to "prune" or shape the resulting list of data records, and (2) the ability to then change the tags of those records all at once.

4. Recall by date capability.

This is a common capability in storage and retrieval systems and seemed like a useful adjunct for a research environment that depends heavily on dated articles. This also includes the ability to compare dates (such as all dates between date 1 and date 2, etc.).

5. Data entry from keyboard or file.

The ability to enter data directly from another data file would seem to be useful for two reasons: (1) Many researchers already have electronic data bases that would benefit from this capability, and (2) Rand (among others) now has the capability to get the results of on-line data base searches in electronic form, which could then be easily entered in this form.

These, then, formed the basic capabilities that we thought defined a computer capability "optimized" for the needs of the policy researcher. With these specific capabilities in mind, we again looked at the available software for file and data base management. Without
claiming we did an exhaustive search, we did talk with a variety of data base specialists, search the on-line literature, and visit computer shows. In the end, we were sufficiently disappointed with the matches between our desiderata and the available software that we decided to build our own. As a point of interest, the common mismatches were either slow response times (typical of microprocessor-based systems) or insufficient capability to make easy, wholesale changes to the tags in the system (typical of systems aimed at very large data bases).

The resulting system was called CODA (for Concept Organization and Development Aid) and that system is the topic of this Note. In the following sections we will describe how to use the prototype system we built.

Technically, the prototype CODA system has been written under UNIX (4.1 BSD) and is running on VAX 11/780s (TPs #3 and #4 and the classified text processor). It is written in C and uses the Curses screen management package. Data entry from the keyboard uses the Rand editor. CODA provides a menu-driven interface to users with a variety of terminal types, including Rand's standard Ann Arbor terminals (in several models) and personal computers connected to the VAX via modems.

The CODA program most properly qualifies as a file management system aimed at small data bases and a very limited number of users. The specifications followed in its development were the desiderata listed above. Although intended as a research aid, CODA is useful for general data storage and retrieval applications.

CODA is menu-driven because of our feeling that the typical non-computer-oriented researcher would find such a system the quickest and easiest to learn and the most comfortable to work with. There are at least two ways of describing such a system. One is by describing, from outside the system, what its functional capabilities are as a data storage and retrieval system. That is the purpose of this document. The other way of describing a menu-driven system is from inside the system by describing for the user the options available in the current menu. That form of documentation is contained in the on-line CODA program, and is accessible in any menu just by typing "?". With these two types of documentation the aim is to get the user actually using the system very quickly.
The following section gives the primary "buzz words" that are used in describing CODA and the sections following describe the functional capabilities of the system and how to take advantage of them. Potential users should be sure to read Section VII on "General Cautions."
II. BUZZ WORDS/GLOSSARY

Before proceeding with the description of CODA, it is important to discuss briefly the major "buzz words" that we have come to use in our descriptions of the system.

tag: A user-supplied word or phrase that is typically used in CODA for retrieving a piece of data. In other systems it is called a keyword. "Tag" is used in CODA because it need not be something that actually appears in a record. A given record can have many tags.

record: Another word for datum, referring to an individual recallable piece of data in the system. In CODA a record is any (formatted or unformatted) text that is of interest to the researcher. It is intended to include anything from a single word to several paragraphs to a table of numbers to a collection of symbols, etc.

hit: Any record that contains the specified search tag (or tag combination). If, for example, CODA was commanded to return all records having "important" as a tag, CODA would return that it had found (say) 34 "hits" or records that contain "important" as a tag.

index: Undoubtedly the ugliest of CODA's buzz words. There are two kinds of indices in CODA: date indices and others. Date indices are a way of grouping different kinds of dates for recall. In this way, the user is able to differentiate between, for example, the date that the material in a record was published and the date on which it was entered into the system. The idea of the other indices is much like that of the indices in a book. It is a way of grouping tags both for display and for search purposes. For display purposes, the intention was to give the user something akin to the author index found in some books. It is much easier to look up a half-remembered author in a smaller author index than it is to do so in the full index. In addition, one can retrieve specifically an author's works, for example, rather than retrieving his works as well as anything written about him.
III. GETTING IN AND OUT OF CODA

Getting Into CODA:

1. Log on to TP #3 or the classified computer

2. TYPE cd (CODA directory name) <CR>.\footnote{<CR> stands for carriage return and means that you should hit the return key.} It is best to have one's CODA data bases in a separate directory.\footnote{To make such a directory, type: mkdir (CODA directory name).}

3. TYPE cod\footnote{This implies CODA is a system routine. If something goes wrong at this point, ask for help.} <CR>. CODA will beep when it is loaded and ready.

4. If this is the first time you have entered CODA in this directory, you will be asked if you want a new data base set up. When this happens, TYPE y (no <CR> is necessary).

Getting Out of CODA:

The general procedure for getting out of CODA is:

1. Get to the MAIN MENU (see "Changing from One Menu to Another")

2. TYPE e ("END OF SESSION" option).

\footnote{A better way of doing steps 2 and 3 is to set up an alias in your .login file that, when typed, changes directory and runs CODA. For example,}

alias tcoda "cd (CODA directory); coda"

sets up tcoda as an alias. Whenever tcoda is typed in your main directory, it will change directories and run CODA all in one step. This one step procedure eliminates possible mistakes from the two step procedure. When the alias is entered in your .login file, it may be used every subsequent time you log in.
Alternatively,

ON AMBASSADOR TERMINALS

1. HIT the <ESC> key--you will be asked if you really want to quit.
2. TYPE y.

ON OTHER ANN ARBOR TERMINALS

1. HIT <[> key while depressing <CTRL> key (<CTRL-[>).
2. TYPE y.
IV. DATA ENTRY

All data entry is done from the DATA ENTRY Options menu. If you are not in this menu and it is not clear how to get there, see "Changing from One Menu to Another."

There are three main data entry options: entry via the keyboard with and without a template and entry directly from another file. The general instructions for each of these options are described below and specific details of data entry are given in succeeding paragraphs.

Entry from Keyboard:

1. Get to DATA ENTRY menu.

2. TYPE b ("Enter Data (from Keyboard)" option)

This will put you into a two-window editor. The editor is Rand's editor and can be used in exactly the same way.

Entry from Keyboard with Template:

CODA can set up a template for data entry. An example of such a template is shown in Fig. 1.

---

TITLE:
DATE RECEIVED :
AUTHOR(S) :
CONTACT AUTHOR:
ADDRESS :
PHONE NUMBER :
CO-EDITOR :
ASSOCIATE EDITOR:
OUTSIDE REFEREES:
MONTH ASSIGNED :

HISTORY OF MANUSCRIPT:

---

Fig. 1 -- Data entry template example
To create a data template:

1. If you are in CODA, get out.

2. TYPE e data.template (answer "y" when the system asks you if you want to create it).

3. Type in your template and exit normally from the editor. From then until the data.template file is deleted or changed, the template will appear in the top window during data entry from the keyboard.

Entry from Data File:

Data may be entered directly from another computer file. If there are several data in the file, the data must be separated by a unique, printable character, not found in any datum (e.g., ",", ",", ",", etc.).

To enter data into CODA:

1. Get to DATA ENTRY menu.

2. TYPE c ("Transfer Data (from file)" option. This will prompt for the name of the file.

3. CODA will ask if session tags have been entered. These will form the initial tags for each datum in the file. If there are no session tags in effect, type "n" and CODA will put you into the session tags option (see "Session Tags"). If no session tags have been entered, the data from the file will have no tags associated with them in CODA and will not be recallable later. IT IS IMPORTANT TO RECOGNIZE THAT CODA CAN ONLY TRANSFER DATA FROM A FILE--NOT TAGS. ENTERING SESSION TAGS IS THE ONLY WAY OF PUTTING TAGS ON THE DATA AS THEY ARE BEING TRANSFERRED. AT LEAST ONE TAG MUST BE APPENDED IN THIS WAY SO THAT THE DATA CAN BE RECALLED LATER. ADDITIONAL TAGS CAN BE ADDED IN THE USUAL WAYS AFTER THE DATA HAVE BEEN TRANSFERRED.

4. TYPE (filename). If the file is not in the current directory, the full path name must be given. In addition, the file must be readable by the current user.
5. Once session tags are confirmed, CODA will ask for the character that separates the data in the file.

   TYPE (data separator character).

   A CARRIAGE RETURN (<CR>) INSTEAD OF A SEPARATOR CHARACTER WILL ENTER THE ENTIRE FILE AS A SINGLE DATUM.

   CODA will confirm the separator (except the (<CR>)) and will then enter all of the data in the file into the CODA database, with the given session tags, and will return to the DATA ENTRY menu when completed.

To Enter Data:

   The top window is for data. The cursor should be in the top window ready for data entry. DO NOT LEAVE THE FIRST LINE BLANK. In fact, since this is what shows up on the hit list, it is advisable to have the first line summarize the data in some way.

To Change Windows:

   1. TYPE z while depressing <CTRL> key (<CTRL-z>) EXCEPT ON AMBASSADOR TERMINALS. On Ambassador terminals the <CHG WIN> key MUST be used (and on other terminals with a <CHG WIN> key it MAY be used. This will change from either window to the other.

To Enter (Non-Date) Tags:

   1. Place cursor in the tags window after the desired index (General is the "default" or usual index).

   2. Enter the tags.

   SEPARATE TAGS BY SEMI-COLONS.

   EACH DATUM MUST HAVE AT LEAST ONE TAG.

   Tags can contain any characters (including spaces) EXCEPT ".", ",", ",#", and ",@". In addition, the tag "all" should not be used (as it is reserved for recalling all data in the database). Tags should be restricted to 80 characters or less.

   EXAMPLES: AGM-130
              worth remembering
              ?
              Arthur, R. A.
THE FORMAT OF THE TAGS WINDOW IS IMPORTANT. Each index name must be preceded by a "@" or a "#" and must be followed by a ":". If, somehow, they are altered, CODA will print out an error message after you exit data entry and put you back into data entry until the problem is fixed.

To Enter Dates:

1. Place cursor in tags window after desired date index (see "Indices" about creating a date index).

2. DATE MUST BE OF THE FORM mm/dd/yyyy WITH THREE EXCEPTIONS:
   a. Leading zeroes may be suppressed.
   b. Two-digit years may be used for this century (except 00).
      Example: 12/21/78 for December 21, 1978
   c. Month/year may be used.
      Example: 5/45 for May 1945

To Exit from Data Entry:

This is the same as exiting from the editor. In the case of the Rand editor:

1. HIT the <CMD> key.

2. TYPE ex(it) or b(ye) <CR>. The letters in parentheses are optional.

Session Tags:

Session tags are a labor-saving device. They are a way of putting one or more tags on each of several data to be entered subsequently. For example, if several data to be entered come from the same source and relate to the same topic, appropriate tags can be entered as session tags. Those session tags will show up in the tags window of every subsequent data entry until the session tags are changed or deleted. To enter session tags:
1. Get into DATA ENTRY menu.

2. TYPE a ("Set Up Session Tags" option).

3. Enter tags as in the "To Enter (non-date) Tags" section of "DATA ENTRY."

If the Editor Crashes:

Use recovery mode 3 (you will have to do this twice--once for each window). This will put you back in the editor (one window) from which you should then exit normally.
V. DATA RECALL

In CODA, data can be recalled by tags, dates (which are just special tags), and by full-text search.

Recall by Tags:

1. Get into DATA RECALL menu.
2. TYPE a ("Enter tags for search" option).
3. TYPE in tag expression.

SEARCHES ARE INSENSITIVE TO CAPITAL LETTERS: For example, a search for "Begin" will return the same list as a search for "begin" or "beGin". Also, SEARCHES ARE INSENSITIVE TO INDICES UNLESS AN INDEX IS SPECIFIED: For example, a search for "Begin" will get all data with "Begin" as a tag in the "Author" index, as well as all data with "begin" as a tag in the "General" index.

If one or more tags in your expression are not in the tag glossary, you will be asked if you want a full-text search on your tag expression.

Recall by Index and Tag:

1. Get into DATA RECALL menu.
2. TYPE a ("Enter tags for search" option).
3. TYPE #(index name):(tag).

The "#" and ":" are required so that CODA knows this is an index:tag pair. CODA will retrieve only those records with tags in the index specified. In the above example, "#Author:Begin" would retrieve only those records with Begin as author. To recall a tag expression using index and tag, the index must accompany each tag. For example, recall using "#Author: Begin & Brown" will retrieve all data on which Begin is an author and with Brown as a tag (in any index). Recalling with "#Author: Begin & #Author: Brown" will retrieve all data with both Begin and Brown as authors. Typing "#(index name): all" will retrieve all records with tags in the given index.
Recall by Full-Text Search:

Full-text search looks for a pattern or patterns in all the data in the system. FULL-TEXT SEARCH DOES NOT SEARCH THROUGH THE TAGS, IT ONLY SEARCHES THROUGH THE DATA. A tag search for a given tag will return all those data that have that tag. By contrast, a full-text search with the same tag will give only those data that have the tag in their text. Full-text searches are most useful for finding data that, for example, have "cancer" in their text, but may not have "cancer" as a tag. (If desired, "cancer" can then be added as a tag.)

To do full-text searches:

1. Get into DATA RECALL menu.
2. TYPE a ("Enter tags for search" option).
3. HIT the <CTRL> and "f" keys (CTRL-F).
4. TYPE in the search expression.

This expression can be a complex expression using the combining operators as described in "recall by tags". CODA will beep when the full-text search is complete.

Recall by Mixed Tag and Full-Text Search:

If the user wants a complex expression containing tags and full-text search patterns:

1. Get into DATA RECALL menu.
2. TYPE a ("Enter tags for search" option).
3. TYPE in the search expression.

Recall by Dates:

Legal date recall expressions must be of the following form:

\[
\text{@(date name) [from to through thru] mm/dd/yyyy [to through thru] mm/dd/yyyy}
\]

where the options in the second [ ] can only follow the "from" selection.
The interpretations of these expressions are as follows:

@{date name} is (or =) must be followed by a legal date (i.e.,
of the form mm/dd/yyyy where leading
zeroes can be suppressed, "19" can be
suppressed from years in this century,
and month/year can be used).

@{date name} from can use any legal date form

Example: "@{datename} from 12/82"
will return all data with
(data name) dates of 12/1/82
and later.

@{date name} to can use any legal date form

Example: "@{date name} to 10/26/55"
will return all data with
(data name) dates BEFORE
10/26/55.

@{date name} through behaves like "@{date name} to" except
that it also returns data with the
specified date.

Example: @{date name} thru 12/82 will
return all data with (date
name) dates THROUGH 12/31/82.

@{date name} from mm/dd/yyyy [to
through] mm/dd/yyyy behaves like

@{date name} from mm/dd/yyyy & @{date name} [to
through] mm/dd/yyyy

DATE SEARCHES MAY BE COMBINED WITH OTHER SEARCHES USING THE
COMBINING OPERATIONS (see "Recall by Tags").

Looking at Tags, Indices:

Tags may be divided into two or more indices. There is always
the "General" index. In addition, dates for date processing
must be in their own index(es) and the user is free to create
other indices (see "Indices") such as author, journal, etc. It
is possible to have either the indices or the tags for a given
index displayed from four of the eight CODA menus. There are
options to see the indices or tags in the DATA RECALL, INDEX
CHANGE, REFINE HIT LIST, or CHANGE HIT TAG menus. (For listing
all tags, see "Indices").
VI. WORKING WITH A HIT LIST

A data recall expression gives rise to a hit list. The hit list shows the CODA identifying number and first line from each datum that satisfied the data recall expression.

Paging Through the Hit List:

If there are more hits than will fit on the screen:

HIT the <+PAGE> key to go forward through the list or,

HIT the <-PAGE> key to go backward through the list.

CODA will beep if there are no more hits in the direction you have requested it to page.

Looking at Hit List Records:

To see the entirety of a record (but not the tags!) shown on the hit list:

1. TYPE a ("Look at specific record" option)

2. TYPE the number of the record and HIT <CR>

This will cause the record to be displayed in the top window and a new menu (RECORD Options) to appear. From here you can:

- Look at the record and its tags (Option a)
- Edit the record and/or its tags (Option a)
- Look at the record following this one in the hit list (Option b)
- Look at the record preceding this one in the hit list (Option c)
- Output the record (with or without tags) to the printer or to a file (Option d)
- Delete the record from the hit list (Option e)
- Expunge the record from the database (Option f)
- Go on to something else (Options g and h)

Outputting Records:

Hit list records can be output one at a time (as described above in "Looking at hit list records," or more than one at a time in the Hit List Options menu. In the latter case:

1. TYPE b ("Output Specific Record(s)" option)

2. TYPE "all" to have all hit list records output OR
   TYPE the individual record identifiers, separated by commas and ending with a carriage return (<CR>).

DO NOT TYPE <CR> UNTIL YOUR LIST OF RECORD IDENTIFIERS IS COMPLETE. THE SYSTEM WILL AUTOMATICALLY GIVE YOU A NEW LINE IF YOU GO PAST THE END OF A LINE.

After identifying the list of records to be output, CODA will prompt for three choices:

a. "Output complete record (c) or to first blank line (b)?"

   CODA will output each record in its entirety or output each record up to the first blank line. (If, for example, there were a blank line between the first, or summary, line and the remainder of the text, outputting "all" to the first blank line would output the hit list.) A <CR> WILL VOID THE PROCESS.

b. "Output to printer (p) or file (f)?"

   CODA will output directly to the printer using the current user's default print commands, or it will output to a file (which is prompted for). IN OUTPUTTING TO THE PRINTER, EACH DATUM BECOMES A SEPARATE JOB. In general, this means that if several records are to be printed, it is better to put them in a file and then print out the file (after exiting CODA). Coda will append the data if the specified file already exists and will open the file if it does not. A <CR> WILL VOID THE PROCESS.

c. "Include tags in output?"

   Answering yes or no will include or omit the tags for the records being output.
Deleting Records from a Hit List:

Records can be deleted from a hit list one at a time (as described in "Looking at Hit List Records"), or more than one at a time in the Hit List Options menu. In the latter case:

1. TYPE c ("Delete specific record(s) from hit list" option)

2. TYPE the individual record identifiers, separated by commas and ending with a carriage return (<CR>). (You can type "all" here to delete all records, but it has dubious value in this case.)

Expunging Records from the Database:

Again, records can be expunged from the database one at a time (see "Looking at Hit List Records"), or more than one at a time in the Hit List Options menu. In the latter case:

1. TYPE d ("Expunge specific record(s)" option)

2. TYPE the individual record identifiers, separated by commas and ending with a carriage return (<CR>). (Again, you can type "all" here, but this is of VERY dubious value.)

Because expunging records from the database is so permanent, CODA will echo your selection and request verification of their demise.

Adding, Changing, and Renaming Tags on Hit List Records:

Tags can be changed on one record at a time (see "Looking at Hit List Records") or they can be changed on all records of a hit list simultaneously. In the latter case:

1. TYPE e ("Change tags on these hits" option).

This will cause a new menu (CHANGE HIT TAG Options) to appear. From here you can:

- Add a tag to all hit records (Option a)
- Delete a tag from all hit records (Option b)
- Rename a tag on all hit records (Option c)
- Look at all system indices (Option d)
- Look at all tags for an index (Option e)

- Go back to the hit list options (Option f)

The rules for specifying the tags are the same as those for data entry. If no index precedes the tag, it is assumed to be in the "General" index. If it isn't in the General index it must be preceded by "(# or @)(indexname):".

**Refining the Hit List:**

The expression used to get the hit list can be modified to expand or contract the hit list without going back to data recall. To do this, while in the HIT LIST Options:

1. TYPE f ("Refine this hit list" option)

This will cause a new menu (REFINE HIT LIST Options) to appear. From here you can:

- Expand the current hits to include those that have a given tag (or that satisfy a given tag expression) (Option a)

- Contract the current hit list to exclude those that do NOT have a given tag (or that do NOT satisfy a given tag expression) (Option b)

- Contract the current hit list to exclude those that DO have a given tag (or that DO satisfy a given tag expression) (Option c)

- Look at all system indices (Option d)

- Look at all tags for an index (Option e)

- Go back to the hit list options (Option f)

Again, the rules for specifying tags (or tag combinations) are the same as those for data recall. If no index precedes a tag, it is assumed to be in the "General" index. If it isn't in the General index it must be preceded by "(# or @)(indexname):".
VII. INDICES

Indices are a way of grouping tags by similarities. There are two kinds of indices in CODA--date indices and others. Date indices require a very special format (see "To Enter Dates") that allows recall involving numerical manipulations with the dates (e.g., recall all data with date tags between date 1 and date 2). The remaining indices behave more like indices in the back of a book. CODA, like many large books, has a general index which is a catch-all for tags not identified with a specific index. In addition, CODA allows for special indices such as an author's index (found in some books), an index of journals, and so forth. If, on data entry, a tag (say, "Brown") is entered in a given index (say, "Author"), then it will subsequently appear in that index whenever the tags for that index are listed. As with books, it is often much easier to find a half-remembered author in an author index than it is to search through a larger general index for the author.

In recalling data by tags (see also "Data Recall"), CODA allows one to search either for records specifically with Brown as the author (by specifying "$Author:\text{Brown}$ as the recall expression) or for any records with Brown as a tag (by specifying "Brown" as the recall expression). The latter will retrieve all records with Brown as a tag in ANY index.

Adding, Changing, Deleting Indices:

1. Get into INDEX CHANGE menu

To add an index:

2. TYPE a ("Create an index" option)

CODA will prompt for the index name and will insist that either a "$" (for a date index) or a "$" (for others) precede the name.
To delete an index:

2. TYPE b ("Delete an index" option)

CODA will prompt for the index name and insist on the ":#" or ":@" that identifies the index type. In addition, CODA will prompt if the tags for that index are to be deleted also, or if they are to be moved to the "General" index.

To rename an index:

2. TYPE c ("Rename index" option)

CODA will prompt for the name of the index to be changed. It will not allow the "General" index to be changed. It will then prompt for the new index name (with ":#" or ":@"). It won't allow the new index name to be an existing index--that is, CODA CANNOT COMBINE INDICES.

Printing Out All Tags for an Index:

1. Get into INDEX CHANGE menu

2. TYPE d ("Print out all tags (for an index)" option)

CODA will prompt for the index name. The tags for that index will be printed in accordance with the user's normal "print" command (including print type, bin, offset, etc.).
VIII. GENERAL CAUTIONS

This section describes some general considerations in working with CODA that do not fit neatly into any of the previous sections.

Left Arrow:

When you are typing text as part of a CODA command (such as a tag expression, index name, or file name) and need to backspace in order to make a correction, DO NOT USE THE LEFT ARROW (←) KEY. Use the <BACK SPACE> key.

Upper/Lower Case Problems:

Since CODA is insensitive to upper and lower case in tag searches, the following situation can occur: two separate data will have the tags Brown and brown, respectively. Recalling using either "Brown" or "brown" will get both of them. HOWEVER, trying to change the tag "brown" to "Brown" will not work (because CODA considers them to be the same). If such a change is desirable it can be done by:

1. Changing the tag "brown" to some tag NOT ALREADY IN THE DATA BASE (such as "foo").

2. Change the tag "foo" to "Brown". This will ensure that all instances of the tag "brown" will now have a capital B at the start.

Interrupting a CODA Task:

There will, perhaps, be times when it is important to stop, by any means possible, what CODA is doing. There is a dramatic means for doing this that should only be used in dramatic situations. It works for any situation except when editing in CODA:

1. Hit z while depressing the <CTRL> key (<CTRL-z>). This will produce the message "Stopped".

2. Type "ps". This will produce the current process IDs (PIDs), including the one for CODA.
3. Type `kill (CODA PID) <CR>`. This will kill CODA processing.

4. Get back into CODA.

THIS SHOULD ONLY BE USED IN EXTREME CASES AND HOLDS THE POTENTIAL FOR DAMAGING CODA'S DATA BASES.

"Stopped" Message:

If `<CTRL-z>` is inadvertently hit, the message "Stopped" will appear and you will be thrown out of CODA. To get back into CODA:

1. **TYPE fg** (for "foreground"). This will put you back into CODA but may disable some of the keyboard keys (such as +PAGE and -PAGE). In any case, it is best to exit normally from CODA at that point and reenter it.
IX. CHANGING FROM ONE MENU TO ANOTHER

CODA is entirely menu-driven. It has a total of eight menus that are arranged on four "levels" and can be pictured as shown in Fig. 2. The concept of levels is more easily seen in Fig. 3. (A full listing of the menus as they appear in the program is found in App. A.) This diagram shows the accessibility of any menu from any other. In CODA there are asterisks that appear with each menu title and in parentheses after menu options that allow you to change menus. This is intended to give some feel for how "deep" into the menu structure you are at any point. The asterisks in Fig. 3 correspond to the asterisks found on the menus in the program. For example, to get from TAG CHANGE Options to DATA ENTRY Options either you can go to HIT LIST Options, from there to DATA RECALL Options, from there to the MAIN MENU and from there to DATA ENTRY; or you can go to HIT LIST Options, from there to the MAIN MENU, and from there to DATA ENTRY.

MAIN MENU

DATA ENTRY OPTIONS
DATA RECALL OPTIONS
HIT LIST OPTIONS
RECORD OPTIONS
CHANGE HIT TAG OPTIONS
REFINE HIT LIST OPTIONS
INDEX CHANGE OPTIONS

Fig. 2 -- CODA menu titles and levels
Fig. 3 -- Menu accessibility diagram
X. READ-ONLY CODA

By special request we installed a read-only version of CODA. This allows a user to see the CODA data and recall it, much as in the regular version, but doesn't allow the user to make changes to the CODA data base. The selection of the read-only mode is automatic in the following sense: calling CODA in a directory containing a CODA data base will result in one of three possible actions—(1) if the caller has read and write privileges (see the UNIX Manual for details) in that directory, the full CODA program will be called, (2) if the caller has only read privileges in that directory, the read-only version will be called, and (3) if the caller has neither read nor write privileges in that directory, CODA will not be called at all. The owner of the CODA data base establishes through protection codes (using "chmod" on the CODA files) and group privileges who will have which type of CODA access for a given CODA directory. Those unfamiliar with the protection codes and group privileges should consult someone familiar with the UNIX system about establishing CODA privileges in their CODA directories. The default privileges are to allow everyone in one's group full CODA privileges and to allow all other users read-only privileges.

As you might expect, the read-only version of CODA is a modified version of the full version. Figure 4 shows the modified menu structure for the read-only version and the menus as they appear in the program are listed in App. B.

MAIN MENU
DATA RECALL OPTIONS
HIT LIST OPTIONS
RECORD OPTIONS
REFINE HIT LIST OPTIONS

Fig. 4 -- Read-only CODA menu titles and "levels"
The Data Recall Options are exactly as they are in the full CODA and are described in Section V. The remaining functional capabilities relate to working with a hit list and have been modified to disallow any options that could alter the data base. The read-only CODA functional capabilities in working with a hit list are described below for read-only CODA users.

**Paging Through the Hit List:**

If there are more hits than will fit on the screen:

- HIT the `<PAGE>` key to go forward through the list or,
- HIT the `<-PAGE>` key to go backward through the list.

CODA will beep if there are no more hits in the direction you have requested it to page.

**Looking at Hit List Records:**

To see the entirety of a record (but not the tags!) shown on the hit list:

1. TYPE a ("Look at specific record" option)
2. TYPE the number of the record and HIT `<CR>`

This will cause the record to be displayed in the top window and a new menu (RECORD Options) to appear. From here you can:

- Look at the record following this one in the hit list (Option a)
- Look at the record preceding this one in the hit list (Option b)
- Output the record (with or without tags) to the printer or to a file (Option c)
- Delete the record from the hit list (Option d)
- Go on to something else (Options e and f)
Outputting Records:

Hit list records can be output one at a time (as described above in "Looking at hit list records," or more than one at a time in the Hit List Options menu. In the latter case:

1. TYPE b ("Output Specific Record(s)" option)

2. TYPE "all" to have all hit list records output OR TYPE the individual record identifiers, separated by commas and ending with a carriage return (<CR>).

DO NOT TYPE <CR> UNTIL YOUR LIST OF RECORD IDENTIFIERS IS COMPLETE. THE SYSTEM WILL AUTOMATICALLY GIVE YOU A NEW LINE IF YOU GO PAST THE END OF A LINE.

After identifying the list of records to be output, CODA will prompt for three choices:

a. "Output complete record (c) or to first blank line (b)?"

CODA will output each record in its entirety or output each record up to the first blank line. (If, for example, there were a blank line between the first, or summary, line and the remainder of the text, outputting "all" to the first blank line would output the hit list.) A <CR> WILL VOID THE PROCESS.

b. "Output to printer (p) or file (f)?"

CODA will output directly to the printer using the current user's default print commands, or it will output to a file (which is prompted for). CODA WILL APPEND THE DATA IF THE SPECIFIED FILE ALREADY EXISTS AND WILL OPEN THE FILE IF IT DOES NOT. A <CR> WILL VOID THE PROCESS.

c. "Include tags in output?"

Answering yes or no will include or omit the tags for the records being output.

Deleting Records from a Hit List:

Records can be deleted from a hit list one at a time (as described in "Looking at Hit List Records"), or more than one at a time in the Hit List Options menu. In the latter case:

1. TYPE c ("Delete specific record(s) from hit list" option)
2. TYPE the individual record identifiers, separated by commas and ending with a carriage return (<CR>). (You can type "all" here to delete all records, but it has dubious value in this case.)

Refining the Hit List:

The expression used to get the hit list can be modified to expand or contract the hit list without going back to data recall. To do this, while in the HIT LIST Options:

1. TYPE d ("Refine this hit list" option)

This will cause a new menu (REFINE HIT LIST Options) to appear. From here you can:

- Expand the current hits to include those that have a given tag (or that satisfy a given tag expression) (Option a)

- Contract the current hit list to exclude those that do NOT have a given tag (or that do NOT satisfy a given tag expression) (Option b)

- Contract the current hit list to exclude those that DO have a given tag (or that DO satisfy a given tag expression) (Option c)

- Look at all system indices (Option d)

- Look at all tags for an index (Option e)

- Go back to the hit list options (Option f)

Again, the rules for specifying tags (or tag combinations) are the same as those for data recall. If no index precedes a tag, it is assumed to be in the "General" index. If it isn't in the General index it must be preceded by "(# or @)(indexname):".
Appendix A

CODA MENUS

CODA is a menu-driven system with eight menus. It is self-documenting in that each menu has its own information file that can be accessed by typing '?' as your option for that menu.

The menus are on four "levels" and can be described as follows:

**MAIN MENU**
- DATA ENTRY OPTIONS
- DATA RECALL OPTIONS
- HIT LIST OPTIONS
- RECORD OPTIONS
- CHANGE HIT TAG OPTIONS
- REFINE HIT LIST OPTIONS
- INDEX CHANGE OPTIONS

What is reproduced here is each of the menus as it appears in the system.

* MAIN MENU *

- a. INTRODUCTION TO CODA
- b. DATA ENTRY
- c. DATA RECALL
- d. INDEX CHANGES
- e. END OF SESSION

**DATA ENTRY Options**

- a. Set up session tags
- b. Enter data (from keyboard)
- c. Transfer data (from file)
- d. Back to MAIN MENU (*)

**DATA RECALL Options**

- a. Enter tags for search
- b. Look at all system indices
- c. Look at all tags (for an index)
- d. Back to MAIN MENU (*)
*** HIT LIST Options ***

- Look at specific record
- Output specific record(s)
- Delete specific record(s) from hit list
- Expunge specific record(s) Option?
- Change tags on these hits
- Refine this hit list
- Back to DATA RECALL (**)
- Back to MAIN MENU (*)

**** RECORD Options ****

- Edit this record (and tags)
- Go forward to next hit list record
- Go back to previous hit list record
- Output this record Option?
- Delete this record from hit list
- Expunge this record
- Back to HIT LIST Options (***)
- Back to DATA RECALL Options (***)

***** CHANGE HIT TAG Options *****

- Add a tag to these hits
- Delete a tag from these hits
- Rename a tag on these hits Option?
- Look at all system indices
- Look at all tags (for an index)
- Back to HIT LIST Options (***)

****** REFINE HIT LIST Options ******

- Current hits OR those with...
- Current hits BUT ONLY those with...
- Current hits BUT NOT those with... Option?
- Look at all system indices
- Look at all tags (for an index)
- Back to HIT LIST Options (***)

** INDEX CHANGE Options **

- Create an Index
- Delete an Index
- Rename Index
- Print out all tags (for an index) Option?
- Look at all system indices
- Look at all tags (for an index)
- Back to MAIN MENU
Appendix B

READ-ONLY CODA MENUS

Read-only CODA has five menus. It is self-documenting in that each menu has its own information file that can be accessed by typing '??' as your option for that menu.

The menus are on four "levels" and can be described as follows:

MAIN MENU
DATA RECALL OPTIONS
HIT LIST OPTIONS
RECORD OPTIONS
REFINE HIT LIST OPTIONS

What is reproduced here is each of the menus as it appears in the system.

* MAIN MENU *

a. INTRODUCTION TO CODA  c. END OF SESSION
b. DATA RECALL
Option?

** DATA RECALL Options **

a. Enter tags for search  c. Look at all tags (for an index)
b. Look at all system indices  d. Back to MAIN MENU (*)
Option?

*** HIT LIST Options ***

a. Look at specific record  d. Refine this hit list
b. Output specific record(s)  e. Back to DATA RECALL (**)  
c. Delete specific record(s) from hit list  f. Back to MAIN MENU (*)
Option?
**** RECORD Options ****
  a. Go forward to next hit list record  
  b. Go back to previous hit list record  
  c. Output this record  
      Option?
  d. Delete this record from hit list  
  e. Back to HIT LIST Options (****)  
  f. Back to DATA RECALL Options (**)

**** REFINED HIT LIST Options ****
  a. Current hits OR those with...  
  b. Current hits BUT ONLY those with...  
  c. Current hits BUT NOT those with...  
      Option?
  d. Look at all system indices  
  e. Look at all tags (for an index)  
  f. Back to HIT LIST Options (****)