

Department of Applied Analysis
and Computer Science

Research Report CSTR 1012

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CRPAK - AN INTERACTIVE SYSTEM

FOR ASSIGNING PAPERS TO REVIEWERS

by

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I What is CRPAK?

CRPAK is a set of routines written in APL which can assist an editor of Computing Reviews in assigning papers to reviewers, and in performing the necessary bookkeeping. The routines are written in such a way that virtually no knowledge of APL is required except sign on,)LOAD,)SAVE, attention and sign off procedures. To the user, CRPAK is an interactive system which retrieves information required for a decision process and performs routine tasks.

Many factors enter into the process of assigning a paper for review to a particular reviewer, some of which may depend on the editor. Obviously the reviewer should be willing and competent to review the paper under consideration which may be written in a language other than English. He should also be "free" in the sense that all reviews of papers assigned earlier have been completed. In practice, the reviewer is not "free" until the reviews have been published. This avoids extensive communication with ACM Headquarters and because of the built in delay ensures that the reviewer will not receive too many assignments per year. A reviewer working independently but in a similar area to that of the paper is likely to take a special interest in the paper and write a competent review promptly. Such assignments are desirable and the list of references to the paper often points to such reviewers. But references also tend to include the names of frequent co-authors or the names of colleagues at the same institution. These may not be suitable reviewers since they are less

likely to write objective, critical reviews. The importance of the paper and the professional stature of the reviewer, his reliability and promptness also influence the assignment.

The automatic selection of a reviewer by computer, taking into account most of the above factors, would require either a tremendous data base of information or else large amounts of input for each paper. The special advantage of the interactive system for this application is that, with a small data base and minimal amount of input, the system assists the editor who may also apply any special knowledge he has about his reviewers to the decision process. The editor's information is frequently "soft information" which would be difficult to quantify reliably. For example, an editor making his first few assignments is likely to assume his reviewers are equally reliable with possibly a few exceptions, but after about a year he will develop a "feel" for his reviewers - the promptness with which they write a review, the quality of the review, and how likely they are to pass the paper on to colleagues.

CRPAK has been used successfully for about two years for assigning numerical analysis papers to reviewers.* The journals reviewed were Numerische Mathematik (NUM), SIAM Review (SRV), SIAM Journal of Applied Mathematics (SAM), SIAM Journal of Numerical Analysis (SNA), and a few others.

The sections which follow, describing how to use CRPAK and what

* Currently CRPAK is also being used for assigning papers in Metatheory, CR category 5.2.

it can do, will be in terms of assignments for papers in numerical analysis. Assignments in other areas may require slightly different criteria but the use of CRPAK would be similar.

CRPAK is a modification and extension of the CLASSPAK SYSTEM for the manipulation of classroom data [1]. A description of APL is given in [2].

II The Data Bases

CRPAK requires the maintenance of three data bases.

1) NAMES of Reviewers and their profiles.

The profiles of the reviewers form a boolean matrix. The name of a reviewer points to a row; the profile attribute or "TITLE" points to the column. Row and/or column indices may be used whenever names and/or titles are inconvenient to type. The information for the profile is obtained primarily from the Reviewer Application Forms.

For the assignment of numerical analysis papers, a profile matrix consisting primarily of qualifications and areas of interest was found to be convenient. The subcategories of numerical analysis as defined by CR are given below:

- 10 - General
- 11 - Error Analysis, Error Arithmetic
- 12 - Function Evaluation
- 13 - Interpolation; Function Approximation
- 14 - Linear Algebra
- 15 - Nonlinear and Functional Equations

- 16 - Numerical Integration and Differentiation
- 17 - Ordinary and Partial Differential Equations
- 18 - Integral Equations
- 19 - Miscellaneous

Since an editor soon becomes familiar with the classification of his field, the columns 10-19 were reserved for the corresponding subcategory. So, for example, a reviewer indicating a willingness to review papers in linear algebra would have a 1 in column 14.

Also, in assigning numerical analysis papers, it is convenient to classify papers into either pure or applied and to rate the difficulty as: 1 - above average; 2 - average; 3 - below average. Columns 2-7 refer to the six different possibilities. The Numerische Mathematik journal publishes papers in French and German as well as English. A "1" in column 20 indicates a willingness to review papers in French, and a "1" in column 21, papers in German. Column 1 indicates whether or not the reviewer is free: columns 8 and 9 were used while updating reviewer profiles. With this organization of the profile matrix the column "TITLES" are those given in Example 1.

This arrangement of attributes is entirely at the disposal of the user except that column 1 must refer to the attribute "FREE". A listing of a portion of a profile matrix is given in Example 2.

2) COMMENTS

Reviewers occasionally add comments to their application form

Example 1

LIST ALL TITLE
 NO. PROFILE TITLES (21)

001 FREE
 002 PURE-1
 003 APPLIED-1
 004 PURE-2
 005 APPLIED-2
 006 PURE-3
 007 APPLIED-3
 008 UP-DATE
 009 NOT UPDATED
 010 GENERAL
 011 ERROR ANAL ARITH
 012 FUNCTION EVAL
 013 INTERP APPROX
 014 LIN ALG
 015 NON-LIN FN EQ
 016 INT-DIFF
 017 ODE-PDE
 018 INT EQ
 019 MISC
 020 FRENCH
 021 GERMAN
 END

Example 2

LISTPRO 13 14 15,ROWS 1 2 3 4 5

I L N
 N I O
 T N N
 E -
 R A L
 P L I
 G N
 A

NO. NAMES (5) 3 4 5

001 ALBRECHT R F 1 1 1
 002 ANDERSON D G 1 1 1
 003 AHMED N U 0 0 1
 004 AUSTING R H 0 1 0
 005 BALAKRISHNAN A V 0 0 0
 END

Example 3

LIST COMMENT, 20 21 22 23 24
 NO. RVW'R COMMENTS (5) NO. REVIEWER NAME

020 ESPECIALLY PDE S ↔ 145 JAMET P *

021 ODE ↔ 015 BUTCHER J C *

022 NOT SPLINE ↔ 209 JONES W B *

023 FR-GERMAN SHORT ↔ 232 ROWLAND J H *

024 ESP RATIONAL APPROX ↔ 239 WUYTACK L *

END

Example 4

LIST PAPER, 1 2 3 4
 NO. INFO ON PAPERS (4) NO. REVIEWER NAME

001 NUM13 396 AH01701170 ↔ 032 FALB P L

002 NUM13 404EHB0170 ↔ 112 PAINTER R J

003 NUM13 448GTS0170 ↔ 011 ANDREE R V

004 SNA 5 211C-H12681170 ↔ 126 RECHARD O W

END

which must be considered during the assignment process. For example, subcategory 5.17 is ordinary and partial differential equations. Reviewers sometimes wish to review only one or the other. Since comments are relatively few and vary considerably, it is not convenient to reserve a special column of the profile matrix for each comment. Instead a list of COMMENTS is maintained, each of which points to a reviewer. COMMENTS may be referred to by giving their row index (their position in the list) or by giving the name (or number) of the reviewer. If a comment is associated with a reviewer, the last position in the NAME field will contain an asterisk (*). Example 3 lists some comments and shows how they point to a reviewer.

3) PAPER

A list of PAPERS is maintained which contains information about the paper and points to the reviewer. Each row in the PAPER list contains the following information:

<u>Columns</u>	<u>Information</u>
1 - 3	A three character code for the journal
4 - 5	Volume
6 - 9	Page
10 - 12	First author's initials
13 - 16	Date of Assignment (month, year)
17 - 20	Date of Review in CR (month, year)

The system does not restrict the column assignments to the above, but retrieval of a paper is done by matching information typed with the corresponding information in the first few columns of a row (unless a row index is specified). Since it is natural to identify a paper by its journal, volume, and page, these should be the first entries in the row. Example 4 gives a sample list of some papers.

III Notation

In describing the various commands of CRPAK it is convenient to use a special notation for indicating a variety of options.

$\left\{ \begin{array}{c} A \\ B \\ C \end{array} \right\}$ - means that one of A, B, or C must appear in the command.

[,A] - means that the comma and the element A following it are optional and may be omitted.

V - represents a sequence of positive integers separated by spaces.

E - is one of NAME (or N), TITLE, COMMENT, PAPER (or P).

Symbols representing variables will be underlined; all other quantities must appear as printed.

IV How to Specify Operands

The operands of nearly all commands are vectors (possibly of length 1) of item indices preceded by modifiers to indicate whether the indices refer to NAME, (or N), TITLE, COMMENT or PAPER (P). Occasionally the command itself implies the data type as, for example, in EDITPRO,

and the modifier may be omitted.

1. Vectors as sequences of positive integers: E[,V]

The integers are separated by spaces and preceded by a modifier as in

LIST NAME, 1 2 3

and

EDITPRO 1 2 3, NAME, 1 2 3 4

column numbers row numbers of profile matrix

2. Vectors determined from input data: E[,0] or [0].

Here either the vector is omitted or a single zero (0) is used instead. This form of an operand asks the system to generate a vector to match the data which will be typed. When the system asks for the input, several items may be typed per line, separated by semi-colons (;) provided a vector of length greater than 1 is a permissible operand for the command: a semi-colon at the end of the line preceding the carriage return indicates that input is to be continued. Upon receiving the input the system matches the characters input per item with corresponding characters of NAME, TITLE, COMMENT or PAPER (whichever data type is implied) and generates a vector of indices from these matches. The matching process includes only as many characters as are typed during input. For example, when the system is asking for NAMES, typing an "S" will result in a vector or row numbers corresponding to those rows for which the NAMES start with "S". Examples 5 and 6 illustrate the use of data input instead of row (or column) indices. Note that the system informs the user of ambiguous information.

Example 5

LISTPRO TITLE, 13 14 15, ROWS 0
←REVIEWER NAMES:
 KUNTZ;LUKE;WILL;
←REVIEWER NAMES:
 MADSEN;STEWART;JENKINS
 STEWART AMBIGUOUS.
 JENKINS AMBIGUOUS.

NO.	NAMES	(8)	1	3	4	5
			1	1	1	
084	KUNTZMANN J		1	1	1	
091	LUKE Y L	*	1	0	0	
166	WILLOUGHBY R A		0	1	0	
220	MADSEN N K		0	1	0	
079	STEWART N F	*	1	1	1	
199	STEWART G W		0	1	1	
069	JENKINS W H		1	1	1	
252	JENKINS M A		0	1	1	

END

Example 6

LIST PAPER
←INFO ON PAPERS:
 NUM16 1
 NUM16 1 AMBIGUOUS.

NO.	INFO ON PAPERS (6)	NO.	REVIEWER NAME
216	NUM16 115PGC 171	↔ 084	KUNTZMANN J
217	NUM16 129D G 171	↔ 091	LUKE Y L
218	NUM16 141ASH 171	↔ 166	WILLOUGHBY R A
219	NUM16 145RPB 171	↔ 220	MADSEN N K
220	NUM16 157ELA 171	↔ 199	STEWART G W
221	NUM16 163C L 171	↔ 252	JENKINS M A

END

3. Vectors specified through Special Functions

a) ALL E

The function ALL followed by a modifier generates as output a modifier and all indices of items which are defined in the data type referred to by E.

b) MIDDLE ALL E

The function MIDDLE is used to indicate that only part of the vector generated by the function ALL is to be used. The first entry to be included in the vector will be typed when the system asks for input.

Example 7 illustrates the use of this function and shows the reaction of the system to ambiguous information. All items which match are listed and the user is then requested to specify the starting point unambiguously.

Example 7

```
LIST MIDDLE ALL P
[]←INFO ON PAPER TO DENOTE MIDDLE:
NUM16 14
NUM16 14  AMBIGUOUS.  THE FOLLOWING MATCH:

NUM16 141ASH 171
NUM16 145RPB 171
[]←INFO ON PAPER TO DENOTE MIDDLE:
NUM16 141
NO.  INFO ON PAPERS ( 4)      NO.  REVIEWER NAME
218  NUM16 141ASH 171        ↔ 166  WILLOUGHBY R A
219  NUM16 145RPB 171        ↔ 220  MADSEN N K
220  NUM16 157ELA 171        ↔ 199  STEWART G W
221  NUM16 163C L 171        ↔ 252  JENKINS M A
***END***
```

c) ROWS $\left\{ \begin{array}{c} 0 \\ \underline{V} \end{array} \right\}$

This function generates a NAME vector. The argument "0" will ask for input, search the NAME list for matches and generate a vector of indices. The argument V must be the vector itself.

d) PROP $\left\{ \begin{array}{c} 0 \\ \text{TITLE}, [, 0] \\ [\text{TITLE},] \underline{V} \end{array} \right\}$

This function also generates a NAME vector. It includes all those names whose profile has all the required properties, i.e. whose profile has a "1" in all the designated columns. With the argument "0", or "TITLE [,0]", the columns are determined from input of their title; with the argument "[TITLE,] V" they are referred to by their index. The use of "TITLE" is optional but its presence suppresses a longer heading for the output.. Example 8 shows how this function may be used.

e) OUTSTANDING

This function generates a PAPER vector. It includes all those papers for which the information contains a blank in column 20. In the present system the date of the review appears in columns 17-20. A paper with blanks in these positions has not yet been reviewed.

V How to Initialize Arrays

The first time CRPAK is copied from a library into the user's work space, the function INITIALIZE must be called to set up variables

Example 8

LIST PROP 1 2 15 20 21
CONJUNCTION OF:
COLUMN 1, FREE
COLUMN 2, PURE-1
COLUMN 15, NON-LIN FN EQ
COLUMN 20, FRENCH
COLUMN 21, GERMAN
NO. REVIEWER NAMES (9)

056 HAMMER P C
057 HAMMING R W
058 HANSEN E R *
063 HOUSEHOLDER A S *
064 HOWLAND J L
107 NEWHOUSE A
114 PARKER S T
126 RECHARD O W
213 KNIGHTLY G H
END

Example 9

ADD NAME
←REVIEWER NAMES TO BE ADDED:
FISCHER, CHARLOTTE F.;FISCHER, PATRICK C.
FISCHER, CHARLOTTE F TRUNCATED TO 20 CHARACTERS. RETYPE IF DESIRED.
FISCHER, CHARLOTTE F ↔ ROW 124
FISCHER, PATRICK C. ↔ ROW 130

Example 10

EDIT PAPER, 213
NUM16 73E D 171 ↔ PAPER 213. ←CORRECTION:
NUM16 73E D 171
REVIEWER 36, VARAH J M
CHANGE?

pertaining to the various arrays. INITIALIZE will ask for the maximum number of NAMES, TITLES, COMMENTS, PAPERS, and the number of characters to be allowed for items of each type. It will also check to make sure that a reasonable amount of free space remains for the system to perform the various CRPAK functions. With a workspace of 32K bytes, the formula given below is a rough guide for the maximum allowed dimensions.

Let $i = 1, 2, 3,$ and 4 refer to NAME, TITLE, COMMENT and PAPER lists respectively. Define n_i to be the maximum number of items in list i and w_i the number of characters in an item from list i . Then $\sum_{i=1}^n n_i (w_i + 8)$ should be between 16-17K.

The initialization will be performed only if there is sufficient space to do so. The user will then be asked to

)ERASE INITIALIZE SETCONST

which erases these routines and makes more space available since, once the initialization has been performed, these functions will not be needed again.

VI Commands for maintaining lists

The profile matrix has associated with it a NAME list which refers to the rows, and a TITLE list which refers to columns of the matrix. Both of these lists contain alphanumeric information as well as special symbols. The COMMENT list and PAPER list are two other alphanumeric lists. As defined earlier, let the symbol E refer to the name of one of these four lists and let I and J be integers.

1. ADD E[, I] (Example 9, 15)

This command is used to add items to the list designated by E.

a) I omitted or I = 0: When input is requested the items typed will be added to the end of the list unless the list is filled, in which case the item will be inserted into the first available space in the list. Such spaces are the result of deletions.

b) I < 0: This implies that several items are to be added, one per line and acts as a repeat command. A blank line causes an exit from the command.

c) I > 0: When E designates PAPER, then I is interpreted as the reviewer index (i.e. member of NAME list) associated with the paper. Otherwise I is ignored.

2. EDIT E[, I[, J]] (Example 10)

This command is used to correct information in the designated list. In the case of PAPER or COMMENT, the reviewer name pointed to may also be edited.

a) I omitted or I = 0: The system will ask for the first few characters of the line to be corrected, then locate the whole line and ask that it be retyped. A carriage return will leave the line unchanged. The system informs the user if the input is ambiguous but does not terminate the command.

b) I < 0: This implies that data will be requested and that input is to be continued [even if a line of input is not terminated with a semi-colon]. To exit from the command, a blank line should be entered.

c) I > 0: The row index of the line to be edited is I.

d) J is the number of characters to be left unchanged by the edit command and must not be retyped. If J is omitted, J = 0.

3. DELETE E[, I] (Example 11)

This command is used to delete an item from a list.

a) I = 0 or I omitted: The system asks for input to identify the line of information to be deleted. The input format is the same as for the EDIT command. As each line is located, the system asks the user to verify that the line is to be deleted by typing Y or Yes.

b) I > 0: Row I in the list E is to be deleted.

4. LIST { E[,0]
E,V
ALL E
PROP V
OUTSTANDING } (Examples 1, 3, 4, 6, 7, 8)

This command lists items from the designated list.

All E is equivalent in form to E, V.

PROP V is equivalent in form to NAME, V.

OUTSTANDING is equivalent in form to PAPER, V.

So the fundamental form of this command is

LIST { E,0 }
 { E,V }

The items listed by this command are those whose indices are given by V. When E alone or E,0 is used as the operand, the vector V is determined from input data.

For COMMENTS and PAPERS, the reviewer name and number are also listed.

5. { COMMENT } LISTFOR { 0
 PAPER } [NAME,]V
 ROWS V
 ALL N
 PROP V } (Example 12)

Both the COMMENT list and the PAPER list point to the reviewers. The LISTFOR command makes it possible to list the comments or papers associated with the reviewers in the vector of names. Since the function ROWS V, ALL N, and PROP V all generate a vector of names, the fundamental form of the command is

{ COMMENT } LISTFOR { 0
 PAPER } [NAME,]V

As usual the "0" operand implies that the vector of names will be determined from input data; otherwise the vector V is a vector of NAME indices. The modifier NAME may be omitted since it is implied by the command.

VIII How to use the system to maintain the Profile Matrix

$$1 \quad \left\{ \begin{array}{l} \text{EDITPRO} \\ \text{LISTPRO} \end{array} \right\} \quad \left\{ \begin{array}{l} 0 \\ \text{TITLE} \\ \text{[TITLE,]} \underline{\text{V}} \end{array} \right\}, \quad \left\{ \begin{array}{l} \text{ROWS } 0 \\ \text{ALL NAME} \\ \text{PROP } \underline{\text{V}} \end{array} \right\} \quad (\text{Examples 2, 5})$$

These commands either edit or list parts of the profile matrix. The first operand is a vector of column indices either part of the operand or else determined from input data. The presence of the modifier TITLE suppresses a long header from being typed. The second operand is a vector of row indices. For each item in the NAME vector the row number and name are listed by the "0"'s or "1"'s in the columns specified by the TITLE vector, if the command is LISTPRO. For the EDITPRO command, the above information is listed, a row at a time, and after each row the corrected information is requested. To leave a row unchanged "SKIP" should be typed.

$$3. \text{ SETPRO } \left\{ \begin{array}{l} 0 \\ \underline{\text{I}} \end{array} \right\}, \text{ Boolean function}$$

This command allows a certain column of the Profile matrix to be defined as Boolean function of other columns. The column defined by the Boolean function is column I: if omitted or "0", the system will request the title of the column. The Boolean function should be expressed in terms of vectors PB J. An example is SETPRO 4, ((PB 1) ^ ~ (PB 2))V(PB 3).

2. PB $\left\{ \begin{array}{c} 0 \\ \underline{J} \end{array} \right\}$

The function PB defines a Boolean vector to be one of the columns of the profile matrix. If J is a positive integer, it specifies the column number; if the argument is "0" the system will ask for input of the TITLE for the column.

4. SETFREE

This command sets the bits in column 1 to "1" if the reviewer for the row number has no reviews outstanding.

VIII Commands for Assigning Papers to Reviewers

1) SUGGEST 0 (Example 14)
 [TITLE,]V

The command lists the row number followed by the names and the profile bits in columns 10-19 (which represent the numerical analysis subareas) of all those reviewers who are free (i.e. have a "1" in column 1) and have ones in the columns specified by the operand. As usual, "0" will ask for input to identify the columns, and the presence of TITLE suppresses a long heading on the output.

Up to 10 names are listed, If more names were found the system then asks whether the rest are desired. Typing "Y" or "Yes" will list the rest of the names.

After a reviewer has been selected for a paper, the paper is added to the PAPER list with the

ADD PAPER, I (Example 15)

command since the row number of the reviewer is readily available.

The papers assigned at a particular session are normally then adjacent to each other at the end of the PAPER list.

MEMO types up a memo to go to ACM headquarters which expands the journal name, and lists the papers and the reviewers assigned to them.

2) MEMO { 0 (Example 16)
 [PAPER,]V
 [MIDDLE] ALL PAPER }

Example 14

SUGGEST 2 14 20
CONJUNCTION OF:
COLUMN 2, PURE-1
COLUMN 14, LIN ALG
COLUMN 20, FRENCH
COLUMN 1, FREE

20 NAMES FOUND.

NO.	NAMES	(10)	1	1	1	1	1	1	1	1	1	1	1
			0	1	2	3	4	5	6	7	8	9	
078	KHABAZA I M		1	0	0	0	1	0	0	0	0	0	0
090	LOWELL S C		0	0	0	0	1	0	0	1	0	0	0
106	NEWBERY A C R		1	1	1	1	1	0	0	0	0	0	0
107	NEWHOUSE A		0	0	0	0	1	1	0	0	0	0	0
108	NORTON D A		0	0	0	0	1	0	0	0	0	0	0
114	PARKER S T		1	1	1	1	1	1	1	1	1	1	1
128	DE MEERSMAN R		0	0	0	0	1	0	0	0	0	0	0
138	SHANNO D F		0	0	0	0	1	1	0	0	0	0	0
159	TROTTER H F		0	1	0	1	1	0	0	0	0	0	0
180	FAIRWEATHER G		0	1	0	0	1	0	1	1	0	0	0

END

MORE NAMES?

Example 15

ADD PAPER, 180
☐←INFO ON PAPERS TO BE ADDED:
NUM16 200XYZ 471
NUM16 200XYZ 471 ↔ PAPER 222
REVIEWER 180, FAIRWEATHER G

Example 16

MEMO MIDDLE ALL PAPER
[]←INFO ON PAPER TO DENOTE MIDDLE:
NUM16 115
7 ITEMS:

Note: At this point the system stops to allow the user to adjust the paper to the top of the next page.



TO: MRS. M. NEUMEYER
EDITORIAL ASSISTANT
ACM COMPUTING REVIEWS
1133 AVENUE OF THE AMERICAS
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FROM: CHARLOTTE F. FISCHER
APPLIED ANALYSIS AND COMPUTER SCIENCE
UNIVERSITY OF WATERLOO
WATERLOO, ONTARIO, CANADA

DATE: 2/8/71

ASSIGNMENTS FOR 7 PAPERS ARE GIVEN BELOW.

<u>JOURNAL</u>	<u>VOL</u>	<u>PAGE</u>	<u>AUTH</u>	<u>REVIEWER</u>	<u>PAGE</u>
NUMERISCHE MATH	16	115	PGC	KUNTZMANN J	1
NUMERISCHE MATH	16	129	D G	LUKE Y L	
NUMERISCHE MATH	16	141	ASH	WILLOUGHBY R A	
NUMERISCHE MATH	16	145	RPB	MADSEN N K	
NUMERISCHE MATH	16	157	ELA	STEWART G W	
NUMERISCHE MATH	16	163	C L	JENKINS M A	
NUMERISCHE MATH	16	200	XYZ	FAIRWEATHER G	

*** END OF MEMO ***

The papers included in the list are those specified by the operand which is a PAPER vector. Since generally only those papers assigned at a particular session are to be included, the command is

```
MEMO MIDDLE ALL PAPER.
```

The system then asks for the first paper of the list which is the first paper assigned at that session.

If the APL work space is not large enough to allow for reasonably large arrays and still be able to include MEMO, it can be used as a separate program but with the same data as CRPAK. The APL procedure for this is

```
)SAVE CRPAK  
)LOAD MEMO  
)COPY CRPAK DATA
```

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