1620 GENERAL PROGRAM LIBRARY

MOSES MAXIMUM ONE-PASS SIMULTANEOUS EQUATIONS SOLUTION 5.0.040

DR. JOHN MANIOTES
COMPUTER TECHNOLOGY DEPT.
PURDUE UNIVERSITY
CALUMET CAMPUS
HAMMOND, IN 46323

5.0.040

COMPUTER
TECHNOLOGY

DR. JOHN MANNOTES
COMPUTER TECHNOLOGY DEPT.
PURDUE UNIVERSITY
CALUMET CAMPUS
HAMMOND, IN 46323

DISCLAIMER

Although each program has been tested by its contributor, no warranty, express or implied, is made by the contributor or COMMON, as to the accuracy and functioning of the program and related program material, nor shall the fact of distribution constitute any such warranty, and no responsibility is assumed by the contributor or COMMON, in connection therewith.

COMMON USERS GROUP PROGRAM REVIEW AND EVALUATION

(fill out in typewriter, ink or pencil)

Program No._____ Date_____

Program Name:_____

1. Does the abstract adequately describe what the program is and what it does? Yes____ No____
   Comment_____

2. Does the program do what the abstract says? Yes____ No____
   Comment_____

3. Is the description clear, understandable, and adequate? Yes____ No____
   Comment_____

4. Are the Operating Instructions understandable and in sufficient detail? Yes____ No____
   Comment_____
   Are the Sense Switch options adequately described (if applicable)? Yes____ No____
   Are the mnemonic labels identified or sufficiently understandable? Yes____ No____
   Comment_____

5. Does the source program compile satisfactorily (if applicable)? Yes____ No____
   Comment_____

6. Does the object program run satisfactorily? Yes____ No____
   Comment_____

7. Number of test cases run_____. Are any restrictions as to data, size, range, etc. covered adequately in description? Yes____ No____
   Comment_____

8. Does the Program meet the minimal standards of COMMON? Yes____ No____
   Comment_____

9. Were all necessary parts of the program received? Yes____ No____
   Comment_____

10. Please list on the back any suggestions to improve the usefulness of the program. These will be passed onto the author for his consideration.

Please return to:

Mr. Richard L. Pratt
Data Corporation
7500 Old Xenia Pike
Dayton, Ohio 45432

Your Name _____
Company _____
Address _____
Users Group Code _____

THIS REVIEW FORM IS PART OF THE COMMON ORGANIZATION'S PROGRAM REVIEW AND EVALUATION PROCEDURE. NONMEMBERS ARE CORDIALLY INVITED TO PARTICIPATE IN THIS EVALUATION.

MOSES
MAXIMUM ONE-PASS SIMULTANEOUS EQUATIONS SOLUTION

RONALD HOLLMEIER
PIONEER SERVICE & ENGINEERING CO.
2 NORTH RIVERSIDE PLAZA
CHICAGO, ILLINOIS 60606

3111

FEBRUARY 11, 1966

Modifications or revisions to this program, as they occur, will be announced in the appropriate Catalog of Programs for IBM Data Processing Systems. When such an announcement occurs, users should order a complete new program from the Program Information Department.

TABLE OF CONTENTS

1620 USERS GROUP LIBRARY
PROGRAM ABSTRACT

1. TITLE (If subroutine, state in Title): MOSES - Maximum One-Pass Simultaneous Equations Solution Subject Classification: 5.0
2. Author; Organization: Ronald Hollmeier, Pioneer Service & Engineering Co.

   Date: February 11, 1966 Users Group Membership Code: 3111
3. Direct Inquiries to Name: Ronald Hollmeier, Pioneer Service & Engineering Co., Chicago, Illinois Phone: 312-CE6-7272
4. Description/Purpose: (5. Method; 6. Restriction/Range; When Applicable): Solves sets of linear simultaneous equations by gaussian elimination. Pivoting for size to promote accuracy and eliminate zero diagonal terms is automatic. Equation sets of rank 2 thru 41 can be solved. One constant vector per equation set is allowed.

7. Specifications (Check or fill in appropriate spaces):

   a. Storage used by program: 20 K Core

   b. Equipment required by program: Card X ; Magnetic Tape____; Number of Drives____; Paper Tape____; Disk File____; Number of Drives____; TNS, TNF, MF____; Auto divide____; Indirect addressing____; Floating Point Hardware____; 1620 Model I X ; Model II____; 1443 Printer____; Index Registers____; Binary Capabilities____; Other (specify)____

   Can program be used on lesser machine? NO . Specify which requirements can be easily removed____.

   c. Programmed in: Fortran without Format X ; Fortran with Format____; Fortran II____; Other Fortran (specify)____; SPS (specify assembler used) ____; Other (specify)____

   d. Type of Program: Mainline, complete____; Subroutine____; If subroutine, for use with SPS (specify type of SPS)____; Fortran (specify type of Fortran ____; Other (specify)____

8. Additional Remarks:____

DECK LABELLING KEY

DECK NO. 1

Source deck 51 cards

Sequence No. 30140020 thru 30140520

DECK NO. 2

Object deck 389 cards

Sequence No. 0001 thru 0389

DECK NO. 3

Sample problem input data 43 cards

Sequence No. 001 thru 043

DECK NO. 4

Sample problem results 6 cards

Sequence No. 001 thru 006

MOSES
MAXIMUM ONE-PASS SIMULTANEOUS EQUATIONS SOLUTION

FEBRUARY 11, 1966

RONALD HOLLMEIER
PIONEER SERVICE & ENGINEERING CO.
2 NORTH RIVERSIDE PLAZA
CHICAGO, ILLINOIS 60606
312-CE6-7272

3111

Moses was written to provide a fast and flexible one pass program for solving simultaneous equations sets. The program was written to use the Fortran without Format compiler because it provides a fast object program with sufficient input-output subroutines for ease of operation. An "ABS" subroutine is used and therefore must be among the available subroutines if the program is modified and recompiled. This is mentioned because the "ABS" routine was not part of our original Fortran without Format subroutine set. The object program and subroutines occupy core locations 00000 thru 10026. The symbol table is in 10110 thru 19999

The program will solve any nonsingular set of N equations with N unknown having from 2 thru 41 equations. Using simple Gaussian elimination each equation is completely processed after it is read-in. Pivoting is on the largest term in each row. This is done to maintain as much accuracy as possible with the eight digit limit on mantissa length, and also eliminates any zero diagonal terms. Only terms necessary to produce the solution after the elimination process is completed are saved.

Solutions computed using this program have been checked against those produced by Simultaneous Equations Ala-King program No. 5.0.008. . This was done for matrices of rank 6, 24, 36, and 41. Results compared favorably in all cases. However, no attempt at error analysis has been made, and the eight digit mantissa may limit the usefulness of this program where extreme accuracy is required. Program running times, exclusive of loading, range from approximately 25 seconds, to 26.25 minutes for 6 and 41 equation matrices respectively.

Input requirements, in order, are as follows:

1) N - Number of equations
2) B(1) -- B(N) - Equation constants
3) A(1) --- A(N*N) - Equation coefficients

Coefficients are entered row by row. Input is in free form subject only to the usual requirements of the Fortran without Format subroutines.

Output consists of equation solutions, one per card in order X(1) --- X(N).

No sense switches are used. The program will work with any 1620 Model I having card reader and punch.

COMPUTER TECHNOLOGY

SAMPLE PROBLEM INPUT DATA

```
6                                                                    1
     -24719.9340000000                                               2
      28319.4220000000                                               3
      -5407.6971000000                                               4
          .0000000000                                                5
          .0000000000                                                6
          .0000000000                                                7
        294.3113200000                                               8
         39.4664600000                                               9
        -30.9567290000                                              10
          2.4579793000                                              11
          5.3140150000                                              12
         -7.9745280000                                              13
         39.4664600000                                              14
        373.9386800000                                              15
         70.5523170000                                              16
          -.1489070000                                              17
         -7.0165537000                                              18
        -70.9269090000                                              19
        -30.9567320000                                              20
         70.5523160000                                              21
        397.5333700000                                              22
          7.7321770000                                              23
         81.2899830000                                              24
          4.5585743000                                              25
          2.4579793000                                              26
          -.1489070000                                              27
          7.7321770000                                              28
         33.3270330000                                              29
          -.7021131700                                              30
          1.1670051000                                              31
          5.3140150000                                              32
         -7.0165536000                                              33
         81.2899830000                                              34
          -.7021131600                                              35
         33.2608180000                                              36
          2.6584285000                                              37
         -7.9745280000                                              38
        -70.9269090000                                              39
          4.5585744000                                              40
          1.1670051000                                              41
          2.6584285000                                              42
         29.7637160000                                              43
```

SAMPLE PROBLEM RESULTS

```
-121.88338                                                           1
 208.05722                                                           2
-143.17812                                                           3
 35.348009                                                           4
 378.07925                                                           5
 449.91809                                                           6
```


PROGRAM LISTING

```
      DIMENSION K(41), A(862), B(41)                          30140020
      READ, N                                                 30140030
      DO 20 I = 1, N                                          30140040
   20 READ, B(I)                                              30140050
      LL = 0                                                  30140060
      NN = N - 1                                              30140070
      DO 140 M = 1, N                                         30140080
      L = LL + 1                                              30140090
      LL = LL + N                                             30140100
      DO 40 J = L, LL                                         30140110
   40 READ, A(J)                                              30140120
      IF(L - 1) 90, 90, 50                                    30140130
   50 JJ = 0                                                  30140140
      MN = M - 1                                              30140150
      DO 80 I = 1, MN                                         30140160
      J = K(I) + L                                            30140170
      DUM = A(J)                                              30140180
      A(J) = A(L)                                             30140190
      LL = LL - 1                                             30140200
      DO 70 J = L, LL                                         30140210
      JJ = JJ + 1                                             30140220
   70 A(J) = A(J+1) - DUM*A(JJ)                               30140230
   80 B(M) = B(M) - DUM*B(I)                                  30140240
   90 DUM = 0.                                                30140250
      DO 110 J = L, LL                                        30140260
      IF(DUM - ABS(A(J))) 100, 110, 110                       30140270
  100 DUM = ABS(A(J))                                         30140280
      JJ = J                                                  30140290
  110 CONTINUE                                                30140300
      DUM = A(JJ)                                             30140310
      A(JJ) = A(L)                                            30140320
      LL = LL - 1                                             30140330
      DO 120 J = L, LL                                        30140340
  120 A(J) = A(J+1)/DUM                                       30140350
      B(M) = B(M)/DUM                                         30140360
  140 K(M) = JJ - L                                           30140370
      DO 170 M = 1, NN                                        30140380
      I = N - M                                               30140390
      LL = L - 1                                              30140400
      L = L - M                                               30140410
      DUM = B(I)                                              30140420
      JJ = K(I) + I                                           30140430
      B(I) = B(JJ)                                            30140440
      DO 160 J = L, LL                                        30140450
      I = I + 1                                               30140460
  160 DUM = DUM - A(J)*B(I)                                   30140470
  170 B(JJ) = DUM                                             30140480
      DO 180 I = 1, N                                         30140490
  180 PUNCH, B(I)                                             30140500
      STOP                                                    30140510
      END                                                     30140520
```