NONLINEAR ANALYSIS OF RECTANGULAR GLASS PLATES BY FINITE DIFFERENCE METHOD

by

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June 1981

APPENDIX

Listing of Program

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C                                                                       A001
C                                                                       A002
C                                                                       A003
C                                                                       A004
C                              BIHAR                                    A005
C                                                                       A006
C                                                                       A007
C                                                                       A008
C                                                                       A009
C          A FINITE DIFFERENCE COMPUTER PROGRAM                         A010
C               FOR NON-LINEAR ANALYSIS                                 A011
C               OF RECTANGULAR GLASS PANELS                             A012
C                                                                       A013
C                                                                       A014
C                                                                       A015
C                                                                       A016
C               INSTITUTE FOR DISASTER RESEARCH                         A017
C                 CIVIL ENGINEERING DEPARTMENT                          A018
C          TEXAS TECH UNIVERSITY, LUBBOCK, TEXAS 79409                  A019
C                        MAY  1981                                      A020
C                                                                       A021
C                                                                       A022
C                                                                       A023
C                                                                       A024
C                                                                       A025
CCCCCC     BIHAR IS A FORTRAN PROGRAM DESIGNED TO COMPUTE               A026
C          THE LARGE DEFORMATION BEHAVIOURS OF RECTANGULARA027
C          PLATES.  THE GOAL HAS BEEN TO MAKE THE IMPLE-                A028
C          MENTATION OF THE THEORY TRANSPARENT, THEREBY                 A029
C          MAKING ADDITIONS AND ALTERATIONS BY NEW USERS                A030
C          EASIER.                                                      A031
C                                                                       A032
C          THE PROGRAM EXECUTES ENTIRELY IN CORE.  AS A                 A033
C          RESULT, IT CAN BE USED ON ANY OF THE MAJOR                   A034
C          SCIENTIFIC COMPUTERS.  WITH MINOR EXCEPTIONS,                A035
C          ALL OF THE DIMENSIONED VARIABLES ARE STORED                  A036
C          SEQUENTIALLY IN ONE ARRAY WITHOUT GAPS.                      A037
C                                                                       A038
C          ONE OF THE MAJOR FEATURES OF THE PROGRAM IS TO               A039
C          ALLOW THE USER TO DEFER THE ALLOCATION OF CER-               A040
C          TAIN ARRAYS UNTIL EXECUTION TIME.  THEREFORE,                A041
C          THE SIZE OF THESE ARRAYS MAY BE ESTABLISHED                  A042
C          TO MEET THE REQUIREMENTS OF THE CURRENT APPLI-               A043
C          CATION RATHER THAN THOSE OF THE LARGEST                      A044
C          CONCEIVABLE APPLICATIONS.  IT ALSO ALLOWS THE                A045
C          USER TO REALLOCATE THE SAME ARRAYS IN A DIF-                 A046
C          FERENT SIZE LATER IN THE SAME EXECUTION.  IT                 A047
C          PERMITS THE USER TO REQUEST ONLY THE STORAGE                 A048
C          HE NEEDS.                                                    A049
C                                                                       A050
C                                                                       A051
C                                                                       A052
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C                                                                       A053
CCCCCC  AS A USER, PLEASE DON'T WORRY ABOUT THE STORAGE                 A054
C       SIZE REQUIRED.  IT WILL BE HANDLED BY THIS                      A055
C       PROGRAM AUTOMATICALLY. FOR A SPECIFIC PROBLEM,                  A056
C       DATA SET CONTAIN THREE CARDS. DATA SETS CAN BE                  A057
C       REPEATED AS MANY TIMES AS YOU NEED. WHAT YOU                    A058
C       NEED IS TO PREPARE THE INPUT DATA AS SHOWN:                     A059
C                                                                       A060
C       **************************                                      A061
C       * INPUT DATA DEFINITIONS *                                      A062
C       **************************                                      A063
C                                                                       A064
C       *****   CARD I.  (6E10.4,2I5)    *****                        A065
C       AL      HALF LENGTH OF PLATE IN X-DIRECTION.                    A066
C       BL      HALF LENGTH OF PLATE IN Y-DIRECTION.                    A067
C       TH      THICKNESS OF THE PLATE.                                 A068
C       PR      POISSON'S RATIO.                                        A069
C       ELAS    MODULUS OF ELASTICITY.                                  A070
C       STIF    SPRING CONSTANT ALONG THE BOUNDARY.                     A071
C       IDIS    INCREMENT OF IN-PLANE DISPLACEMENT                      A072
C               PRINTOUT, IF NO PRINTOUT IS NEEDED,                     A073
C               JUST LEAVE IT BLANK.                                    A074
C       IREF    REFERENCE DATA PRINTOUT                                 A075
C                   0 : NO   ;   1 : YES.                               A076
C                                                                       A077
C       *****   CARD II.  (6I5,12A4)     *****                        A078
C       NBC     BOUNDARY CONDITIONS                                     A079
C                   1 : SIMPLY SUPPORTED                                A080
C                   2 : ELASTIC SUPPORTED                               A081
C                   3 : CORNER SUPPORTED.                               A082
C       NX      NUMBER OF SEGMENTS IN X-DIRECTION.                      A083
C       NY      NUMBER OF SEGMENTS IN Y-DIRECTION.                      A084
C       LINC    NUMBER OF LOAD INCREMENTS.                              A085
C       IPRI    INCREMENTS OF PRINCIPAL STRESSES                        A086
C               PRINTOUT, IF NO PRINTOUT NEEDED,                        A087
C               JUST LEAVE IT BLANK.                                    A088
C       LORNL   PROBLEM TYPE                                            A089
C                   1 : LINEAR ; 2 : NON-LINEAR.                        A090
C       ITITLE  TITLE PRINTOUT FOR EACH CASE.                           A091
C               MAXIMUM LENGTH WILL BE 48 CHARACTERS.                   A092
C                                                                       A093
C       *****   CARD III.  (8E10.4)      *****                        A094
C       Q       LOAD INCREMENTS                                         A095
C               IF INCREMENT IS EQUAL, JUST FILLOUT                     A096
C               THE VALUE AT THE FIRST FIELD; OTHER-                    A097
C               WISE, PUNCH THEM ONE BY ONE. MAXIMUM                    A098
C               NUMBER OF UNEQUAL INCREMENTS WILL BE                    A099
C               EIGHT.                                                  A100
C                                                                       A101
C       AT END OF DATA SETS, A BLANK CARD IS NEEDED                     A102
C       TO INDICATE END-OF-FILE.                                        A103
C                                                                       A104
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C                                                                       A105
CCCCCC  FOR ANY COMPUTER CENTER, IF LIBRARY SUBROUTINE                  A106
C       ALLOC IS NOT AVAILABLE, YOU MUST REACTIVE THE                   A107
C       FOLLOWING STATEMENTS WITH '*' AT SECOND                         A108
C       COLUMN AND FOLLOWED THE INSTRUCTIONS AS                         A109
C       SHOWN BELOW AND, THEN, DEACTIVE THE FOLLOWING                   A110
C       ACTIVE STATEMENTS.                                              A111
C                                                                       A112
C       FOR ANY SPECIFIED PROBLEMS, ONLY TWO INTEGER                    A113
C       NUMBERS NEEDED TO CHANGE IN THE WHOLE PROGRAM.                  A114
C       THESE NUMBERS APPEARED IN THE NEXT TWO EXECUT-                  A115
C       ABLE STATEMENTS AND PLEASE CHANGES AS FOLLOWS:                  A116
C                                                                       A117
C             DIMENSION A (STORAGE SIZE)                                A118
C             NSIZEA = STORAGE SIZE                                     A119
C                                                                       A120
C          STORAGE SIZE  WILL BE GIVEN AS FOLLOWS:                      A121
C                                                                       A122
C            STORAGE SIZE = (11+2*NX4)*NUM + NX3*NY3                    A123
C                                                                       A124
C                         + 0.5*(NUM+1)                                 A125
C          WHERE                                                        A126
C                                                                       A127
C             NX = NUMBER OF SEGMENT IN X-DIRECTION                     A128
C             NY = NUMBER OF SEGMENT IN Y-DIRECTION                     A129
C             NUM = (NX+1) * (NY+1)                                     A130
C             NX3 = NX + 3                                              A131
C             NY3 = NY + 3                                              A132
C             NX4 = 2 * (NX+1) + 1                                      A133
C                                                                       A134
C                                                                       A135
C*      IMPLICIT REAL * 8 (A)                                           A136
C*      DIMENSION A(11000)                                              A137
C*      NSIZEA = 11000                                                  A138
C*   10 CALL CONST                                                      A139
C*      CALL BIHAR (A,NSIZEA)                                           A140
C*      GO TO 10                                                        A141
C                                                                       A142
C                                                                       A143
        COMMON /B1/ NUM,NX4,NX3,NX2,NX1,NY3                             A144
        EXTERNAL BIHAR                                                  A145
     10 CALL CPUTM (0,M)                                                A146
        CALL CONST                                                      A147
        NSIZEA = (11+2*NX4)*NUM + NX3*NY3 + 0.5*(NUM+1)                 A148
        CALL ALLOC (BIHAR,NSIZEA,8)                                     A149
        CALL CPUTM (1,M)                                                A150
        CPU = M                                                         A151
        CPU = CPU / 100.                                                A152
        WRITE (6,100) CPU                                               A153
    100 FORMAT ('0AMOUNT OF ELAPSED CPU TIME = ',F7.2)                  A154
        GO TO 10                                                        A155
        END                                                             A156
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      SUBROUTINE BIHAR (A,NSIZEA)                                       B001
      IMPLICIT REAL * 8 (A)                                             B002
      COMMON /B1/ NUM,NX4,NX3,NX2,NX1,NY3                               B003
      DIMENSION A(1)                                                    B004
C                                                                       B005
C                                                                       B006
CCCCCC     STORAGE ALLOCATION                                           B007
C                                                                       B008
C                                                                       B009
      N1 = 1                                                            B010
      N2 = N1 + NUM                                                     B011
      N3 = N2 + NUM * NX4                                               B012
      N4 = N3 + NUM * NX4                                               B013
      N5 = N4 + NUM                                                     B014
      N6 = N5 + NUM                                                     B015
      N7 = N6 + NUM                                                     B016
      N8 = N7 + NUM                                                     B017
      N9 = N8 + NUM                                                     B018
      N10 = N9 + NUM                                                    B019
      N11 = N10 + NUM                                                   B020
      N12 = N11 + NUM                                                   B021
      N13 = N12 + NUM                                                   B022
      N14 = N13 + NUM                                                   B023
      N15 = N14 + NX3*NY3                                               B024
C                                                                       B025
C                                                                       B026
CCCCCC     INITIALIZATION                                               B027
C                                                                       B028
C                                                                       B029
   15 DO 20 I = 1 , NUM                                                 B030
         A(I) = 1.0                                                     B031
   20 CONTINUE                                                          B032
      DO 30 I = N2 , N12                                                B033
         A(I) = 0.0                                                     B034
   30 CONTINUE                                                          B035
C                                                                       B036
C                                                                       B037
CCCCCC     PASSING THE ARRAY INDICATORS.                                B038
C                                                                       B039
C                                                                       B040
      CALL SOLVE (A(N1),A(N2),A(N3),A(N4),A(N5),                        B041
     1            A(N6),A(N7),A(N8),A(N9),A(N10),                       B042
     2            A(N11),A(N12),A(N13),A(N14),A(N15))                   B043
C                                                                       B044
C                                                                       B045
  100 RETURN                                                            B046
C                                                                       B047
C                                                                       B048
      END                                                               B049
```