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THE EDIT-COMGEOM CODE

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September 1975

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THE EDIT-COMGEOM CODE

This report assumes a familiarity with the GIFT and MAGIC computer codes. The EDIT-COMGEOM code is a FORTRAN computer code. The EDIT-COMGEOM code converts the target description data which was used in the MAGIC computer code to the target description data which can be used in the GIFT computer code. Changes are also made to the target description data to decrease computer run time and computer memory.
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I. INTRODUCTION

1.1 Background

The original EDIT-COMGEOM code was written by Mr. Larry Bain of Army Materiel Systems Analysis Agency: the version of the EDIT-COMGEOM code presented in this report is an improvement of the original code.

This report assumes a familiarity with the MAGIC\(^1\) and the GIFT\(^2\) codes. The EDIT-COMGEOM code converts target description data used as input to the MAGIC code into target description data which can be used as input to the GIFT code.

The air space (01) enclosing the target used by the MAGIC code can be deleted in the GIFT code. The EDIT-COMGEOM code deletes those regions defined as "01" air spaces and when possible the solids associated with those regions are also deleted. The GIFT code has a new solid type called RPP which requires less computer storage and computer run time than either the BOX or the ARB solid. The EDIT-COMGEOM code converts the BOX and the ARB solids which are equivalent to RPP's into RPP solids.

After the above changes are made, a renumbering and reordering of the target description data for the MAGIC code is required before the data can be used as input for the GIFT code. The EDIT-COMGEOM code does the renumbering and reordering.

1.2 Contents of this Report

This report contains three sections and three appendices. The first section discusses the requirements and limitations of the EDIT-COMGEOM code. The second section describes the input requirements for the code. The third section describes the output of the code. Appendix A is a listing (print-out) of the code. Appendix B is a listing of a sample input. Appendix C is a listing of the output from the sample input.


II. GENERAL DISCUSSION

2.1 Required Tapes

The EDIT-COMGEOM code requires three temporary binary tapes on FORTRAN units 10, 11, and 12. Disc or drum may be substituted for these tapes. The tape on FORTRAN unit 10 contains the region table created by EDIT-COMGEOM Code. The tape on FORTRAN unit 11 contains the MAGIC Solid Table, and the tape on FORTRAN unit 12 contains the original MAGIC Region Table.

An array called "IDENT" is used to store the Region Identification Table. It is dimensioned for 1000 regions. An array called "ISOLID" flags those solids to be kept in the target description data. It is dimensioned for 2500 solids. The Solid Table, Region Table and Region Identification Table will be discussed in more detail in later sections of this report.

2.2 Converting the Code for use by Different Computers

The EDIT-COMGEOM code, listed in Appendix A, runs on either the CDC or Univac computers. The code can be made to run on BRLESC (or IBM) computer by changing the comment cards labeled in card columns 73-80 with "BRLESC" (or "IBM") to executable statements. Cards labeled in columns 73-80 with other computers must be removed or changed to comment cards.

For example, the arrowed lines in the listing of the code in Appendix A are as follows:

```c
C 104 CALL SETCND (4)
C DECODE (80,32,SOL(1)) IREG, (IOP(1),ISOL(1),I=1,9)
```

In order to use the EDIT-COMGEOM code on the BRLESC computer, "C" would be removed. The four lines following the above lines:

```c
104 WRITE (10,31) SOL
REWIND 10
RBAD (10,40) IREG, (IOP(1),ISOL(1),I=1,9)
RBBWIND 10
```

would be removed or changed to comment cards.
III. INPUT

3.1 Control Card

The control card is the first data card. It specifies the FORTRAN input and output unit numbers. The format of the card is shown in Figure 1.

3.2 MAGIC Target Description Data

The MAGIC target description data follows the control card. The form of the data is reported in reference 1, "MAGIC Computer Simulation."

The data consists of:
(a) A Title Card.
(b) A Target Input Constraints Card.
(c) A set of solid descriptions called a Solid Table.
(d) A set of regions described in terms of combinations of solids called a Region Table.
(e) A set of alphanumeric descriptions of a region called a Region Identification Table.

3.3 Target Input Constraints Card

The input data for the EDIT-COMGEOM code uses the same input format as stated in technical note "MAGIC Computer Simulation," except for the Target Input Constraints card. The format of the Target Input Constraints card is shown in Figure 2.

3.4 Order of Input

A summary of the order of the data for EDIT-COMGEOM code is shown in Figure 3. A listing of a sample input for the EDIT-COMGEOM code is located in Appendix B.
<table>
<thead>
<tr>
<th>Name</th>
<th>Columns</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>6-10</td>
<td>The FORTRAN unit number for the input. (If &quot;IN&quot; equals 0, it is set to 5 by the code.)</td>
</tr>
<tr>
<td>IOUT</td>
<td>11-15</td>
<td>The FORTRAN unit number for the output. (If &quot;IOUT&quot; equals zero, it is set to 6 by the code.)</td>
</tr>
</tbody>
</table>

Figure 1. Control Card

<table>
<thead>
<tr>
<th>Name</th>
<th>Columns</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRPP</td>
<td>1-10</td>
<td>The number of rectangular parallelepipeds (RPPs) used to describe the target's environment.</td>
</tr>
<tr>
<td>NSOL</td>
<td>11-20</td>
<td>The number of solids other than the above RPPs used to describe the target.</td>
</tr>
<tr>
<td>NREGON</td>
<td>21-30</td>
<td>The number of regions used to describe the target.</td>
</tr>
</tbody>
</table>

Figure 2. The Target Input Constraints Card
Figure 3. Card Order for Input
IV. OUTPUT

A listing of the output of the EDIT-COMGEOM using the Sample Input of Appendix B is located in Appendix C.

4.1 Solid Table

A sample line of output of the Solid Table is:

\[ \begin{array}{ccccccc}
\text{APP} & -75,000 & 75,000 & -36,000 & 36,000 & 12,000 & 48,000 & 2 & 3 \\
\end{array} \]

The number in columns 1-3 (the number is 1 in the example above) is the new solid number. If the solid number is greater than 1000, only the last three digits are used. The number in columns 70-75 ("2" in the example above) is the solid number used in the MAGIC target description data. The number in columns 76-80 ("3" in the example above) is the card or line count of the GIFT target description data.

Those ARB or BOX solids which have been converted to an RPP have the following message printed:

BOX 3 HAS BEEN CONVERTED TO A RPP.

4.2 Region Table

A sample line of output of the Region Table is:

\[ \begin{array}{cccccccc}
1 & OR & 1 & -2 & -5 & -7 & -6 & 9 & 100R & 38R & 4 & 2 & 81 \\
\end{array} \]

The number in columns 1-5 (the number is 1 in the example above) is the new region number. The number in columns 71-75 ("2" in the example above) is the region number used in the MAGIC target description data. The number in columns 76-80 ("81" in the example above) is the card or line count of the GIFT target description data.

The solid numbers in columns 6-69 in the MAGIC target description used to describe a region are replaced with the new solid numbers represented in the new Solid Table of the output.

4.3 Region Identification Table

A sample line of output for the Region Identification Table is:

\[ \begin{array}{cccc}
1 & 100 & 0 & \text{BODY} & 2 & 96 \\
\end{array} \]

Columns 71-80 are used for labeling as described for the Region Table above. Any alphanumeric region description data located in columns 71-80 of the MAGIC target description data will be deleted.

4.4 Summary Table

The Summary Table contains the number and listing of solids and regions deleted from the MAGIC target description data. In the sample below, 1 solid and 1 region were deleted: the solid deleted and region deleted were both numbered "1".
NUMBER OF SOLIDS DELETED  1
NUMBER OF REGIONS DELETED  1
Appendix A: A Listing of the Code

EDIT-OMEGOM PROGRAM

PROGRAM DELETES ALL REGIONS IDENTIFIED AS AIR 1 AND CHANGES 'MAGIC' BODIES TO 'GIFT' BODIES.

ARRAYS ARE DIMENSIONED FOR 1000 REGIONS AND 2500 SOLIDS.

INPUT

SPECIFY INPUT AND OUTPUT UNITS

6-10 IN = INPUT UNIT - IF 0 DEFAULTS TO CARD READER IN=5

10-15 IOUT = OUTPUT UNIT - IF 0 DEFAULTS TO PRINTER IOUT=6

TITLE CARD

CONTROL CARD

SOLID TABLE

REGION TABLE FOLLOWED BY -1 CARD

IDENT TABLE FOLLOWED BY BLANK CARD

UNIT IN = INPUT OLD COM GEOM DESCRIPTION

UNIT IOUT = OUTPUT NEW COM GEOM DESCRIPTION (EDITED)

UNIT 10 = NEW REGION TABLE (TEMPORARY - BINARY)

UNIT 11 = OLD SOLID TABLE (TEMPORARY - BINARY)

UNIT 12 = OLD REGION TABLE (TEMPORARY - BINARY)

DIMENSION TITLE(18)

DIMENSION RPP(18), SOL(18), ISOLID(2500)

DIMENSION IOP(9), ISOL(9)

DIMENSION KARD(11), IDENT(12,150)

EQUIVALENCE (SOL(2),SOLTYP)

LOGICAL DELETE, PRNT

DATA BOX, ARB / 3HBOX, 3HARB /

DATA ATE / 4H8 /

DATA ARS / 3HARS /

DATA BLANK / 3H /

DATA END / 3HEND /

1 FORMAT(5X,215)
2 FORMAT(1H,10HUNIT IN =,14/

1

1H, 10HUNIT OUT =,14/) 50 FORMAT(3I10, 40X, 110)
15 FORMAT(1H, 17A4, A2, 110)
20 FORMAT(310, 40X, 110)
25 FORMAT(1H, 31I0, 40X, 110)
30 FORMAT(17A4, A2, 215)
31 FORMAT(15, A3, 16A4, 215)
32 FORMAT(15, 9(A2, 15))
35 FORMAT(1H, 17A4, A2, 215)
36 FORMAT(1H, 13, A3, 16A4, 215)
40 FORMAT(15, 1X, 9(A2, 15), 1X, 215)
41 FORMAT(5X, 1X, 9(A2, 15), 1X, 215)
42 FORMAT(15, 70X, 15)
43 FORMAT(75X, 15)
45 FORMAT(1H, 15, 1X, 9(A2, 15), 1X, 215)
46 FORMAT(1H, 5X, 1X, 9(A2, 15), 1X, 215)
47 FORMAT(1H, 15, 70X, 15)
48 FORMAT(1H, 75X, 15)
50 FORMAT(3I10, 10X, 7A4, A2, 215)
55 FORMAT(1H, 3I10, 10X, 7A4, A2, 215)
C  INITIALIZE
C
READ 1, IN, IOUT
IF (IN.EQ.0) IN = 5
IF (IOUT.EQ.0) IOUT = 6
WRITE(6,2) IN, IOUT
NCARD = 0
INCCAD = 1
C  CALL DISC (10,200) & CALL DISC (11,200) & CALL DISC (12,200)  
REWIND 10
REWIND 11
REWIND 12
IF (IN.NE.5) REWIND IN
IF (IOUT.NE.6) REWIND IOUT
PRINT = .FALSE.
IF (IOUT.EQ.6) PRINT = .TRUE.
C  CLEAR IDENT STORAGE
C  DO 90 I=1,12
CO 90 IDENT(I) = 0
90  IDENT(I,L) = 0
C  CLEAR SOLID TABLE
C  DO 91 I=1,2500
91  SOLID(I) = 0
C
C  READ AND WRITE TITLE CARD
C
READ (IN,10) TITLE
NCARD = NCARD + INCCAD
IF (PRINT) WRITE(IOUT,15) TITLE, NCARD
IF (.NOT.PRINT) WRITE(IOUT,10) TITLE, NCARD
C
C  READ CONTROL CARD
C
READ (IN,20) NRPP, NSOL, NREGION
NSOLID = NRPP + NSOL
C
C  READ SOLIDS AND STORE ON UNIT 11
C
IF (NRPP.EQ.0) GOTO 101
DO 100 I=1,NRPP
READ (IN,30) RPP
WRITE (11) RPP
100  CONTINUE
101  NSOL = 0
102  READ (IN,31) SOL
IF (SOLTYP.EQ.BLANK) GOTO 103
MSOL = MSOL + 1
IF (MSOL.EQ.NSOL) GOTO 104
103  WRITE (11) SOL
GOTO 102
C  104  CALL SETCWD (4)
C
C  DECODE (60,32,SOL(I)) IREG, (IOP(1),ISOL(I),I=1,9)
C  104  WRITE (10,31) SOL
REWIND 10
READ (10,40) IREG, (IOP(1),ISOL(I),I=1,9)
REWIND 10
SOLTYP = END
WRITE (11) SOL
C
READ REGIONS AND STORE ON UNIT 12

110 WRITE (12) IREG, IOP, ISOL
IF (IREG.LT.0) GOTO 111
READ (IN,40) IREG, (IOP(I), ISOL(I)), I=1,9
GOTO 110

CHECK FOR REGION RPP
111 READ (IN,50) KARD
IF (KARD(1).NE.0) GOTO 121

READ IDENT TABLE AND STORE IN ARRAY IDENT

120 READ (IN,50) KARD
IF (KARD(1).EQ.0) GOTO 200
121 L=KARD(1)
IDENT(1,L)=0
IF (KARD(3).EQ.1) GOTO 120
IF (KARD(2).EQ.999) GOTO 120
DO 122 I=1,11
IDENT(I,L)=KARD(I)
122 CONTINUE
IDENT(12,L)=KARD(1)
GOTO 120

READ OLD REGION TABLE FROM UNIT 12
DELETE AIR 1
FLAG SOLIDS USED IN REGION DESCRIPTION
STORE NEW REGION TABLE ON UNIT 10

200 NEWREG=0
NREG=0
REWIND 12
210 READ (12) IREG, IOP, ISOL
IF (IREG) 290, 220, 230
SAME REGION
220 IF (DELETE) GOTO 210
GOTO 250
NEW REGION
230 NREG=NREG+1
IF (IDENT(1,NREG).NE.0) GOTO 240
DELETE = .TRUE.
GOTO 210
KEEP THIS REGION
240 DELETE = .FALSE.
NEWREG = NEWREG + 1
IDENT(1,NREG) = NEWREG
FLAG SOLIDS USED
250 DO 251 I=1,9
IF (ISOL(I).EQ.0) GOTO 251
L = IARS(ISOL(I))
ISOLID(L) = 1
251 CONTINUE
STORE NEW REGION
WRITE (10) NEWREG, IOP, ISOL, IREG
GOTO 210
END OF REGIONS FLAG
290 WRITE (10) IREG, IOP, ISOL, IREG
SET UP SOLIDS
NEWsol = 0
DO 300 I=1,NSOLID
IF (ISOLID(I).EQ.0) GOTO 300
NEWsol = NEWsol + 1
ISOLID(I) = NEWsol
300 CONTINUE

NBWRPP = 0
IF (NRPP.EQ.0) GOTO 310
DO 301 I=1,NRPP
IF (ISOLID(I).NE.0) NEWRPP=NEWRPP+1
301 CONTINUE

WRITE NEW CONTROL CARD

NEWsol = NEWsol - NEWRPP
NCARD = NCARD + INCCRD
IF(PRNT) WRITE(IOUT,25) NEWRPP,NEWsol,NEWREG,NCARD
IF(.NOT.PRNT) WRITE(IOUT,20) NEWRPP,NEWsol,NEWREG,NCARD

WRITE NEW RPP CARDS

REWIND 11
IF (NRPP.EQ.0) GOTO 330
DO 320 IRPP=1,NRPP
READ (11) RPP
IF (ISOLID(IRPP).EQ.0) GOTO 320
NCARD = NCARD + INCCRD
IF (PRNT) WRITE(IOUT,35) RPP,IRPP,NCARD
IF (.NOT.PRNT) WRITE(IOUT,30) RPP,IRPP,NCARD
320 CONTINUE

WRITE NEW SOLID TABLE

NSOL=NRPP
READ (11) SOL
IF (SOLTYPC.EQ.0) GOTO 400
IF (SOLTP.Y.NE.BLANK) GOTO 350
SAME SOLID
IF (DELETE) GOTO 340
GOTO 370

NEW SOLID
NSOL = NSOL + 1
IF (ISOLID(NSOL).NE.0) GOTO 360
DELETE = .TRUE.
GOTO 340

KEEP THIS SOLID
360 DELETE = .FALSE.
NEWsol = MOD(ISOLID(NSOL),1000)

CHANGE 'MAGIC' ARS TO 'GIFT' ARS
IF (SOLTP.Y.NE.ARS) GOTO 364
DO 362 I=4,18
IF (SOL(I).NE.BLANK) GOTO 370
362 CONTINUE
READ(11) SOL
SOLTYPC=ARS
GOTO 370

CHECK BOX OR ARS FOR DEGENERATION TO AN RPP BODY
364 IF (SOLTP.Y.NE.BOX) GOTO 365
CALL CKBOX (SOL,NEWsol,NCARD,INCCRD,NSOL,IOUT,PRNT)
GOTO 340
365 IF(SOLTYP.NE.ARB) GOTO 370
IF(SOL(3).NE.AT.E.AND.SOL(3).NE.BLANK) GOTO 370
CALL CKAAB(SOL.NEWSOL.NCARD,INCCRD,NSOL,IOUT,PRNT)
GOTO 340
C WRITE NEW SOLID
370 NCARD = NCARD + INCCRD
IF(PRINT) WRITE(IOUT,36) NEWSOL,(SOL(I),I=2,18),NSOL,NCARD
IF(.NOT.PRINT) WRITE(IOUT,31) NEWSOL,(SOL(I),I=2,18),NSOL,NCARD
GOTO 340
C WRITE NEW REGION TABLE
400 REWIND 10
410 READ (10) NEWREG,IOP,ISOL,IREG
IF (NEWREG.LT.0) GOTO 490
DO 420 I=1,9
IF (ISOL(I).EQ.0) GOTO 420
L = IABS(ISOL(I))
ISOL(I) = ISIGN(ISOL(L),ISOL(I))
420 CONTINUE
NCARD = NCARD + INCCRD
IF (IREG.EQ.0) GOTO 430
NREG = IREG
IF(PRINT) WRITE(IOUT,45) NEWREG,(IOP(I),ISOL(I),I=1,9),NREG,NCARD
IF(.NOT.PRINT) WRITE(IOUT,40) NEWREG,(IOP(I),ISOL(I),I=1,9),NREG,NCARD
GOTO 410
430 IF(PRINT) WRITE(IOUT,46)(IOP(I),ISOL(I),I=1,9),NREG,NCARD
IF(.NOT.PRINT) WRITE(IOUT,44)(IOP(I),ISOL(I),I=1,9),NREG,NCARD
GOTO 410
C END OF REGION FLAG
490 NCARD = NCARD + INCCRD
IF(PRINT) WRITE(IOUT,47) NEWREG,NCARD
IF(.NOT.PRINT) WRITE(IOUT,42) NEWREG,NCARD
C BLANK CARD FOR REGION RPP
NCARD = NCARD + INCCRD
IF(PRINT) WRITE(IOUT,48) NCARD
IF(.NOT.PRINT) WRITE(IOUT,43) NCARD
C WRITE NEW IDENT TABLE
C DO 500 L=1,NREGON
IF (IDENT(L,L).EQ.0) GOTO 500
NCARD = NCARD + INCCRD
IF(PRINT) WRITE(IOUT,55) (IDENT(I,L),I=1,12),NCARD
IF(.NOT.PRINT) WRITE(IOUT,50) (IDENT(I,L),I=1,12),NCARD
500 CONTINUE
C END OF TABLE FLAG
NCARD = NCARD + INCCRD
IF(PRINT) WRITE(IOUT,48) NCARD
IF(.NOT.PRINT) WRITE(IOUT,43) NCARD
C LIST SOLIDS DELETED
C NSOL = 0
DO 1000 I=1,NSOLID
IF (ISOLID(I).NE.0) GOTO 1000
NSOL = NSOL + 1
ISOLID(NSOL) = I
1000 CONTINUE
PRINT 1001, NSOL
IF (NSOL.NE.0) PRINT 1002, (ISOLID(I), I=1,NSOL)
C
1001 FORMAT(IH,*NUMBER OF SOLIDS DELETED*, IS )
1002 FORMAT(IH ,10I5)
C
LIST REGIONS DELETED
C
NREG = 0
DO 2000 I=1, NREGOM
IF (IDENT(I,1).NE.0) GOTO 2000
NREG = NREG + 1
ISOLID(NREG) = I
2000 CONTINUE
PRINT 2001, NREG
PRINT 2002, (ISOLID(I), I=1,NREG)
C
2001 FORMAT(1HO,*NUMBER OF REGIONS DELETED*, IS )
2002 FORMAT(IH ,10I5)
C
STOP
END

SUBROUTINE CKARBISOLONEWSOLONCARDoINCCRD,NSOMOL,PRNT
C
THIS SUBROUTINE CHANGES AN ARB TO A RPP
C
DOUBLE PRECISION X,Y,Z,A,B,C
DIMENSION SOL(18),X(8),Y(8),Z(8),R(8),IV(4,6),A(6),B(6),C(6)
DIMENSION TEMP(10)
LOGICAL PRNT
DATA ARB /3HARB/
DATA ATE /4H8 /
DATA BLANK /4H /
DATA RPP /3HRPP/
DATA IV / 1,2,3,4, 5,6,7,8, 1,5,8,4, 2,3,7,6, 1,2,6,5, 4,3,7,9/
1 FORMAT(2A3,16A4)
2 FORMAT(6F10.0)
3 FORMAT(10X,6F10.0)
4 FORMAT(IH ,13,A3,A4,6F10.4,215)
5 FORMAT(IH ,13,7X,6F10.4,215)
6 FORMAT(5H ARB ,I3,29H HAS BEEN CONVERTED TO A RPP.)
7 FORMAT(6(1X,4I1))
8 FORMAT(10X,6(1X,4I1))
9 FORMAT(15A4)
10 FORMAT(IH ,13,7X,6(1X,4I1),30X,215)
11 FORMAT(13,A3,A4,6F10.4,215)
12 FORMAT(13,7X,6F10.4,215)
13 FORMAT(13,7X,6(1X,4I1),30X,215)
TOL=0001
HSOL=SOL(3)
C
CONVERT TO FLOATING POINT FORMAT
C
REWIN D 12
DO 100 I=1,18,2
ENCODE(60,9,TEMP(I))(SOL(J), J=4,18)
DBCODE(60,2,TEMP(1)) X(I),Y(I),Z(I),X(I+1),Y(I+1),Z(I+1)
C
C DBCODE(60,2,SOL(4)) X(I),Y(I),Z(I),X(I+1),Y(I+1),Z(I+1)
C WRITE(12,1) SOL
100 IF (N.NE.4.OR.HSOL.NE.ATE) READ(11) Sol
C  IF(HSOL.EQ.BLANK) WRITE(12,1) SOL
C  RABIND 12
C  DO 101 I=1,9,2
C  101 READ(12,3) X(I),Y(I),Z(I),X(I+1),Y(I+1),Z(I+1)
C  IF(HSOL.EQ.BLANK) READ(12,9) IV
C  IF(HSOL.EQ.BLANK) DECODE(30,7,SOL(4)) IV
C  IF(HSOL.EQ.ATE) GOTO 110
C  ENCODE(32,9,TEMP(I))(SOL(I),J=4,11)
C  DECODE(30,7,TEMP(I)) IV
C  FIND EQUATION OF FACES, TEST FOR RPP
C  110 NZ=0
C  DO 120 J=1,6
C  CALL EQFACE (AP,BP,CP,X(L),Y(L),Z(L),1,2,3)
C  IF(ABS(A(I)).LE.TOL) NZ=NZ+1
C  IF(ABS(B(I)).LE.TOL) NZ=NZ+1
C  120 IF(ABS(C(I)).LE.TOL) NZ=NZ+1
C  IF(NZ.EQ.12) GOTO 200
C  FAILED, REMAINED AN ARB
C  NCARD=NCARD+INCCRD
C  IF(PRNT) WRITE(IOUT,4) NEWSOL,ARB,HSOL,(X(I),Y(I),Z(I),I=1,2),NSOL,
C  1 NCARD
C  IF(.NOT.PRNT) WRITE(IOUT,11) NEWSOL,ARB,HSOL,(X(I),Y(I),Z(I),I=1,2)
C  1 ,NSOL,NCARD
C  DO 130 I=3,8,2
C  NCARD=NCARD+INCCRD
C  IF(PRNT) WRITE(IOUT,5) NEWSOL,X(I),Y(I),Z(I),X(I+1),Y(I+1),Z(I+1),
C  1 NSOL,NCARD
C  IF(.NOT.PRNT) WRITE(IOUT,12) NEWSOL,X(I),Y(I),Z(I),X(I+1),Y(I+1),
C  1 Z(I+1),NSOL,NCARD
C  CONTINUE
C  IF(HSOL.EQ.ATE) RETURN
C  NCARD=NCARD+INCCRD
C  IF(PRNT) WRITE(IOUT,10) NEWSOL,IV,NSOL,NCARD
C  IF(.NOT.PRNT) WRITE(IOUT,13) NEWSOL,IV,NSOL,NCARD
C  RETURN
C  CONVERT TO RPP
C  200 DO 210 I=2,8
C  IF(X(I).NE.X(I+1)) X(2)=X(I)
C  IF(Y(I).NE.Y(I+1)) Y(2)=Y(I)
C  210 IF(Z(I).NE.Z(I+1)) Z(2)=Z(I)
C  R(1)=AMIN1(X(1),X(2))
C  R(2)=AMAX1(X(1),X(2))
C  R(3)=AMIN1(Y(1),Y(2))
C  R(4)=AMAX1(Y(1),Y(2))
C  R(5)=AMIN1(Z(1),Z(2))
C  R(6)=AMAX1(Z(1),Z(2))
C  NCARD=NCARD+INCCRD
C  IF(PRNT) WRITE(IOUT,4) NEWSOL,RPP,BLANK,R,NSOL,NCARD
C  IF(.NOT.PRNT) WRITE(IOUT,11) NEWSOL,RPP,BLANK,R,NSOL,NCARD
C  WRITE(6,6) NSOL
C  RETURN
C  END
C
SUBROUTINE CKBOX (SOL,NEWSOL,NCARD,INCCRD,NSOL,IOUT,PRNT)
C
C THIS SUBROUTINE CONVERTS A BOX TO A RPP
C
DIMENSION SOL(10),B(12),TEMP(10),R(6)
LOGICAL PRNT

19
DATA BOX /3HBOX/
DATA RPP /3HRPP/.
1 FORMAT(2A3,16A1)
2 FORMAT(6F10.0)
3 FORMAT(10X,6F10.0)
4 FORMAT(1H,13A3,4X,6F10.4,215)
5 FORMAT(1H,13X,6F10.4,215)
6 FORMAT(15H BOX ,13,29H HAS BEEN CONVERTED TO A RPP.)
7 FORMAT(15A4)
8 FORMAT(13,A3,4X,6F10.4,215)
9 FORMAT(13,7X,6F10.4,215)
C CONVERT TO FLOATING POINT FORMAT
   ENCODE(60,7,TEMP(1))(SOL(1),1=4,18)
   DECODE(60,2,TEMP(1))(B(1),1=1,6)
C DECODE(60,2,SOL(4))(B(1),1=1,6)
C RBWIND 12
C WRITE(12,1) SOL
READ(11) SOL
   ENCODE(60,7,TEMP(1))(SOL(1),1=4,18)
   DECODE(60,2,TEMP(1))(B(1),1=7,12)
C READ(12,1) SOL
C RBWIND 12
C WRITE(12,3) B
C CHECK FOR RPP
NZ=0
DO 100 I=4,12
   IF(B(I).EQ.0.0) NZ=NZ+1
   IF(NZ.EQ.6) GOTO 200
C FAILED, REMAINS A BOX
NCARD=NCARD+INCCRD
   IF(.NOT.PRINT) WRITE(IOUT,4) NEWSOL,BOX,(B(I),I=1,6),NSOL,NCARD
   IF(.NOT.PRINT) WRITE(IOUT,8) NEWSOL,BOX,(B(I),I=1,6),NSOL,NCARD
NCARD=NCARD+INCCRD
   IF(.NOT.PRINT) WRITE(IOUT,5) NEWSOL,(B(I),I=7,12),NSOL,NCARD
   IF(.NOT.PRINT) WRITE(IOUT,9) NEWSOL,(B(I),I=7,12),NSOL,NCARD
RETURN
C CONVERT BOX TO RPP
200 B(4)=B(1)+B(4)+B(7)+B(10)
   B(5)=B(2)+B(5)+B(8)+B(11)
   B(6)=B(3)+B(6)+B(9)+B(12)
   R(1)=AMIN(B(1),B(4))
   R(2)=AMAX(B(1),B(4))
   R(3)=AMIN(B(2),B(5))
   R(4)=AMAX(B(2),B(5))
   R(5)=AMIN(B(3),B(6))
   R(6)=AMAX(B(3),B(6))
   NCARD=NCARD+INCCRD
   IF(.NOT.PRINT) WRITE(IOUT,4) NEWSOL,RPP,R,NSOL,NCARD
   IF(.NOT.PRINT) WRITE(IOUT,8) NEWSOL,RPP,R,NSOL,NCARD
WRITE(6,6) NSOL
RETURN
END

SUBROUTINE EQFACE (X,Y,Z,A,B,C,K,L,M)
C
C THIS SUBROUTINE CALCULATES A,B,C OF THE EQUATION OF FACE AX+BY+CZ=1.0
C IF ALSO CALCULATES THE POINT OF INTERSECT OF THREE PLANES
C
DOUBLE PRECISION A, B, C, D, X, Y, Z
DIMENSION X(8), Y(8), Z(8)
D = X(K) * Y(L) * Z(M) + X(M) * Y(K) * Z(L) + X(L) * Y(M) * Z(K) - X(M) * Y(L) * Z(K) - X(L) * Y(K) * Z(M)
I = Y(K) * Z(M) - X(K) * Y(M) * Z(L)
IF (D .EQ. 0.0) D = 0.00001
A = (Y(K) * (Z(L) - Z(M)) + Y(L) * (Z(M) - Z(K)) + Y(M) * (Z(K) - Z(L))) / D
B = (Z(K) * (X(L) - X(M)) + Z(L) * (X(M) - X(K)) + Z(M) * (X(K) - X(L))) / D
C = (X(K) * (Y(L) - Y(M)) + X(L) * (Y(M) - Y(K)) + X(M) * (Y(K) - Y(L))) / D
RETURN
END
## Appendix B: A Sample Input for Code

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Appendix C: Sample Output of Code

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### SAMPLE INPUT USED IN NMC DOCTUMENTATION

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C. Publication

18. Countries and International Agreement(s) of Foreign Nationals:

10. Material will be submitted for publication in:

Journal Title: Country:

D. Report

20. Project No.: IT662618AH80
21. Period Covered (mm/yyyy): 9/1/75


E. Multimedia

23. Location:

F. Author's Statement

24. All authors have concurred in the technical content and the sequence of authors. All authors have made a substantial contribution to the manuscript, and all authors who have made a substantial contribution are identified in Block 4.

ARL Lead Author or COR □ X Clifford W. Yapp

Date 01/03/2013

Section II - Approval to be completed by designated individual

G. Technical Review

25. Technical Reviewer Name □ X Clifford W. Yapp

Date 01/03/2013

H. Technical Publications Editorial Review

26. Editor Name □ X Clifford W. Yapp

Date 01/03/2013

I. Supervisor Review

27. Supervisor Name □ X Clifford W. Yapp

Date 01/04/2013
Section III - To be completed by an ARL Trained Internal OPSEC Reviewer

OPSEC Review Checklist

OPSEC POC: Complete and explain any positive responses in block 28.

Note: ARL must be the proponent of the proposed information for release.

1. Does this material contain Sensitive Information? □ YES □ NO
   a. Any weapon systems/component test results?
   □ YES □ NO
2. Does this information contain state-of-the-art, breakthrough technology? □ YES □ NO
   d. Any ARL-originated studies or after action reports containing advice and recommendations?
   □ YES □ NO
3. Does the United States hold a significant lead time in this technology? □ YES □ NO
   e. Weakness and/or vulnerability information?
   □ YES □ NO
4. Does this information reveal aspects of reverse engineering? □ YES □ NO
   f. Any information on countermeasures?
   □ YES □ NO
5. Does this material reveal any security practices or procedures? □ YES □ NO
   h. Any Force Protection, Homeland Defense (security) information?
   □ YES □ NO
6. Would release of this information be of economic benefit to a foreign entity, adversary, or allow for the development of countermeasures to the system or technology? □ YES □ NO
   i. Information on subjects of potential controversy among military services or other federal agencies?
   □ YES □ NO
7. Does this material contain:
   a. Any contract proposals, bids, and/or proprietary information?
   □ YES □ NO
   j. Information on military applications in space, nuclear chemical or biological efforts: high energy laser information; particle beam technology; etc?
   □ YES □ NO
   b. Any information on inventions/patent application for which patent secrecy orders have been issued?
   □ YES □ NO
   k. Contain information with foreign policy or foreign relations implications?
   □ YES □ NO
8. Does this information reveal any security practices or procedures? □ YES □ NO

J. Internal OPSEC Review

26. OPSEC Review Comments / Explanations / Continuations:

29. Internal OPSEC Approval Statement:

I, the undersigned, am aware of the adversary's interest in DoD publications and in the subject matter of this material and that, to the best of my knowledge, the net benefit of this release outweighs the potential damage to the essential security of all ARL, AMC, Army, or other DoD programs of which I am aware.

[Signature]

OPSEC Reviewer Name

Date 7 Jan 2013

Section IV - To be completed by designated individual.

K. Security

30. Foreign Disclosure Office (Limited distribution information for release to foreign nationals)

FDO Reviewer Name

FDO Reviewer Signature X

Date

NIA: X

31. Classified Information:

Security Manager X

Security Manager

Date

NIA: X

32. Foreign Intelligence Office (Limited distribution information)

FIO Reviewer Name

FIO Reviewer Signature X

Date

NIA: X

33. ARL OPSEC Officer

Material has been reviewed for OPSEC Policy and □ IS / □ IS NOT acceptable for public release.

Comments:

[Signature]

ARL OPSEC Officer Name

ARL OPSEC Officer Signature

Date 1/1/13

L. Division Chief

34. The information contained in this material has received appropriate technical / editorial review and

[Signature]

Division Chief Name

Division Chief

Date 2/3/13

M. Public Affairs Office

35. The information contained in this material has received appropriate technical / editorial review and

[Signature]

PAO Reviewer Name

PAO Reviewer Signature

Date 1/10/13