

เอกสารอ้างอิง

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พิมพ์ครั้งที่ 6 : สำนักพิมพ์อักษรวัฒนา.
2. ผศ. ผจก. ชันชะชวณะ. เรขาคณิตพรรณนา.
พิมพ์ครั้งที่ 3 : โรงพิมพ์สามเจริญพานิช, 2522.
3. Microsoft Basic-80 (Version 5.0) Reference Manual.
WA98004 : Microsoft, 1979.
4. PC-8001B Micro Computer User's Manual. Nippon Electric Co., Ltd., 1981.
5. PL/1 Programming Language/One, Volume 1.
Research & Development Division, Planning Department,
Electricity Generating Authority of Thailand.
6. Barden Jr., William. The Z-80 Microcomputer Handbook.
Fourth printing, Howard W. Sams & Co., Inc., 1980.
7. Horowitz, Ellis and Sahni, Sartaj. Fundamental of Data Structures.
Computer Science Press, Inc., 1976
8. Newman, William M. and Sproull, Robert F.
Principles of Interactive Computer Graphics. second edition
Mc Graw-Hill computer science series, 1979
9. Winston, Patrick Henry (editor). The Psychology of Computer Vision.
advanced book program, McGraw-Hill, 1975
10. Zaks, Rodney. Programming the Z80. second edition : Sybex Inc., 1980.

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1 '/3dad1r.A/,/3d.A/
2 '*****
3 'INITIALIZE MODULE:created-Wed.23,Feb.1983
5 '          updated-Wed.29,Jun.1993
6 '*****
7 CLEAR1000
10 PRINTCHR$(12):I=6:J=22:WIDTHB0,25
15 CONSOLE20,5,0,1:KEY1,"console0,25"+CHR$(13)
20 LOCATE0,I
30 PRINTTAB(J)"*****
40 PRINTTAB(J)"* 3-D PERSPECTIVE MODEL PROGRAM *
50 PRINTTAB(J)"* Version A.1 : modular objects *
60 PRINTTAB(J)"*      Feb.,1983 by      *
70 PRINTTAB(J)"*      TAREEPAN TEEPASIRI *
80 PRINTTAB(J)"*****
90 PRINT:PRINT
95 PRINTTAB(J)"      Wait a moment, please.
400 '*****
410 'Load assembly subroutine Line & Erase
420 '*****
500 F$="3D-asm.dat"
510 OPEN F$ AS #1
520 FIELD #1,128 AS A$,128 AS B$
530 GOTO 600
540 DATA &He5,&Hc5,&Hd5,&H13,&H21,&H00,&H00,&H19,&H5e
550 DATA &H23,&H56,&H21,&H00,&H00,&H19,&He5,&H21,&H2f
560 DATA &H90,&H5e,&H23,&H56,&H01,&H80,&H00,&He1,&H7e
570 DATA &H12,&H23,&H13,&H0b,&H79,&Hb0,&Hc2,&H1a,&H90
580 DATA &H21,&H00,&H00,&H19,&H22,&H2f,&H90,&Hd1,&Hc1
590 DATA &He1,&Hc9,&H00,&H60,&Hff, 'load addr=6000H
600 L=&H9000:IF L<0 THEN L=L+65536!
610 RESTORE 540
620 READ D$
630 IF HEX$(D$)="FF" THEN 670
640 POKE L,D$
650 L=L+1
660 GOTO 620
670 DEFUSR 0 = &H9000
680 LZ=&H6000 'start address
690 KZ=1
700 GET #1,KZ
710 D$=A$
720 X$=USR 0 (D$)
730 D$=B$
740 X$=USR 0 (D$)
750 KZ=KZ+1
760 IF LZ>&H61E THEN 800 'end address
770 LZ=LZ+&H80

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780 LZ=LZ+&H80
790 GOTO 700
800 CLOSE #1
3100 '#####
4000 'Initialize system parameters
4100 '#####
5000 ACO=0:ANV=0:AVS=0:OHX(0,0)=0 'entry=0
5005 OB=10 'max. object entries allowed
5010 VX=(640-8)/2 'screen x=4-635
5020 VY=(200-24)/2 'screen y=4-176(line0-21)
5030 VC=2 'screen correction on y(200->400)
5040 ED=VX/TAN(15*44/(360*7)) 'dist. to pic. plane, aperture 30
5050 SX=VX/ED 's/d p.p in x
5060 SY=VY/ED*VC 's/d p.p in y
5070 CX=VX:CY=VY:FS=0 'feedback screen x,y;display flag=none
5080 PSCALE=0:XSCALE=1:YSCALE=1:ZSCALE=1:OSCALE=1:CN=1:CM$="new"
6000 U0=&H619E:U1=&H6199:UE=&H6182:UL=&H61A3
6005 ADD=&H601E
6010 OPEN"chain.stt" FOR OUTPUT AS #1
6020 PRINT#1,PSCALE;XSCALE;YSCALE;ZSCALE;OSCALE;VX;VY;VC;SX;SY;CX;CY;FS;CN;U0;
        U1;UE;UL;ADD;OB;CM$;" ,3dtemp,"
6030 CLOSE#1
6032 REMOVE: MOUNT1
6035 DEFUSRO=UE
6036 X=USRO(0)
6040 '#####
6050 ' Modify Basic Load-Address
6060 '#####
6070 L=&H61E6
6080 POKE &HEB54,VAL("&H"+MID$(HEX$(L),3,2))
6090 POKE &HEB55,VAL("&H"+MID$(HEX$(L),1,2))
7000 RUN"3dmdl.r.B"

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ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย


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2  '/3dmdir.B/,/3d.B/
4  '#####
5  'INPUT MODULE:created -Fri 25,Feb. 1983
6  '      modified-Thu 4,Aug. 1983
9  '#####
13 CLEAR300
15 CONSOLE24,2,0,1:KEY6,"x=usr2(0)*+CHR$(13)
30 '#####
40 '† 3-D PERSPECTIVE MODEL PROGRAM †
50 '† Version A.1 : modular objects †
60 '†      Jun.,1983 by †
70 '†      TAREEPAN TEEPASIRI †
71 '#####
80 A$="chain":OPENA$+".stt" FOR INPUT AS#1
81 INPUT#1,PSCALE,XSCALE,YSCALE,ZSCALE,OSCALE,VX,VY,VC,SX,SY,CX,CY
82 INPUT#1,FS,CN,UO,U1,UE,UL,ADD,OB,CM$,FW$
83 CLOSE:DEFUSR0=U0:DEFUSR1=U1:DEFUSR2=UE:DEFUSR3=UL
84 DIM OT$(3),OHZ(3,5),SOZ(105),SC(8,2),LNZ(12,2),VLZ(3,75)
85 DATA 7,13,19,25,31,37, 5,8,7,6,5,0
86 DATA 1,5,6,2,1,0,2,6,7,3,2,0,3,7,8,4,3,0,4,8,5,1,4,0,1,2,3,4,1,0
87 DATA 6,11,17,22,28
88 DATA 4,5,1,4,0,1,5,6,2,1,0,2,3,6,2,0,3,6,5,4,3,0,1,2,3,4,1,0
89 DATA 6,11,16,21,26
90 DATA 4,5,1,4,0,1,5,2,1,0,2,5,3,2,0,3,5,4,3,0,1,2,3,4,1,0
91 RESTORE5:FORI=0TO105:READ SOZ(I):NEXT
92 DATA box,8,6,0,0, prism,6,5,0,42, pyramid,5,5,0,75
93 RESTORE92:FORI=1TO3:READ OT$(I):FORJ=2TO5:READ OHZ(I,J):NEXTJ:NEXTI
110 DIM SEG$(10,7),WC(80,2),NV(60,2),OMX(5)
120 IFCM$(<)"new"THENA$=FW$:I=1:GOTO10390
230 ACO=0:ANV=0:AVS=1:IV=0
232 OHZ(0,0)=0:VLZ(0,0)=-1:VLZ(0,75)=-1 'data existing flag off
240 VX=(640-8)/2      'screen x=4-635
250 VY=(200-24)/2    'screen y=4-176(line0-21)
260 VC=2              'screen correction on y(200->400)
270 ED=VX/TAN(15844/(36087)) 'dist. to pic. plane,aperture 30
280 SX=VX/ED        's/d p.p in x
290 SY=VY/ED#VC     's/d p.p in y
300 CX=VX:CY=VY:FS=0 'feedback screen x,y;display flag=none
310 PSCALE=1:OSCALE=1:XSCALE=1:YSCALE=1:ZSCALE=1:CN=1
315 FW$="3dtemp":FI$=FW$
317 TX=0:TY=1:SXX=1:SY=1:TZ=2:SZZ=1 'init, feedback=top
319 CSE6=0           'no current obj
320 PRINTCHR$(12)
330 LOCATE0,0:PRINT"3-D INPUT-EDIT MODULE"
1000 '#####
1001 '  MAIN
1002 '#####
1010 LINE23,2:CM=15
1020 DATA new,assign,select,move,delete,feedback,load,save
1025 DATA view,erase,replay,rename,list,l1ist,end
1030 RESTORE1020:I=1
1040 READ CM$:IFI<CN THEN 1040
1050 GOSUB 1320
1060 PRINT"Type command or TAB for menu selection,and RETURN(/=cancel)"
1070 PRINT"COMMAND:";
1080 GOSUB 1280

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1090 IF I$(<)" * THEN 1140
1100 IF CN=CM THEN CN=1:RESTORE 1020 ELSE CN=CN+1
1110 READ CM$
1120 LOCATE0,0:PRINT*3-D INPUT-EDIT MODULE*
1122 GOSUB 1320:PRINT CM$:";
1125 ON CN GOSUB 1211,1212,1213,1214,1215,1216,1217,1218,1219,1220,1221,1222,1223,1224,1225
1130 GOTO 1070
1140 IF A$="" THEN 1190
1150 CN=1:RESTORE 1020
1160 READ CM$:IF A$=LEFT$(CM$,LEN(A$)) THEN 1190
1170 IFCN<CM THEN CN=CN+1:GOTO 1160
1180 GOSUB 1320:BEEP:PRINT"command error..":GOTO 1060
1190 GOSUB 1320:PRINT CM$
1200 ONCN GOTO10030,30030,10130,10130,10130,10130,10370,20030,10070,40355,40415,10330,50000,60000,1205
1205 CLOSE:CONSOLE0,25,0,1:PRINTCHR$(12):X=USR2(0)
1206 BEEP1:BEEP0:PRINT*3-Dimensional Image Model Stop":END
1210 '+++++++ COMMAND MESSAGE
1211 PRINT"clear all data":RETURN
1212 PRINT"new dimension & location of choosen object":RETURN
1213 PRINT"set current object entry":RETURN
1214 PRINT"update or give new location of current object entry":RETURN
1215 PRINT"selected object entry":RETURN
1216 PRINT"regenerate feedback view of all objects":RETURN
1217 PRINT"world or image data from disk file":RETURN
1218 PRINT"world or image data to disk file":RETURN
1219 PRINT"display parallel or perspective view ":RETURN
1220 PRINT"the image displaying on screen":RETURN
1221 PRINT"the image currently reside in buffer area":RETURN
1222 PRINT"old data name to new data name":RETURN
1223 PRINT"list numerical data":RETURN
1224 PRINT"list numerical data on printer":RETURN
1225 PRINT"exit program":RETURN
1250 '----- inkey
1260 I$=INPUT$(1):RETURN
1280 A$=""
1290 GOSUB 1260:IF I$=" " OR I$=CHR$(13) THEN RETURN
1300 PRINTI$;:A$=A$+I$:GOTO 1290
1310 '----- clear line 23
1320 LINE23,2:LOCATE0,23:PRINTSTRING$(79," "):LOCATE0,23:RETURN
1410 '----- clear line 22
1420 LOCATE0,22:PRINTSTRING$(79," "):LOCATE0,22:RETURN
10000 '*****
10010 ' NEW
10020 '*****
10030 ERASEDHX,SEGZ,WC,NV,OMX
10035 GOSUB40360:GOTO93
10040 '*****
10050 ' ORTHO & PERSPECTIVE
10060 '*****
10070 IFDHX(0,0)=0THENPRINT"No data!":GOTO1120
10071 A$="chain":OPENA$+".stt"FOROUTPUT AS#1
10072 PRINT#1,PSCALE;XSCALE;YSCALE;ZSCALE;OSCALE;VX;VY;VC;SX;SY;CX;CY;
10073 PRINT#1,FS;CN;UO;UI;UE;UL;ADD;DB;CM$;"",;FW$;"",
10074 CLOSE#1:REMOVE:MOUNT1
10075 I=1:A$=FW$:GOSUB20040:RUN"Jdmdir.C"
10100 '*****

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10110 ' SELECT, MOVE, DELETE
10120 '#####
10130 IFOHZ(0,0)=0THENPRINT"No object,";GOTO10282
10131 IF CM$="feedback" THEN 10300
10132 IFFW$(<)F1$THENPRINT"Incompatible data & image,";GOTO10282
10133 '
10136 GOSUB 40360:GOSUB 40305 'replay selected
10140 GOSUB 1420:I=SEGZ(CSEG,0):J=SEGZ(CSEG,3)
10142 X=WCD(J,0):Y=WCD(J,1):Z=WCD(J,2)
10144 PRINTF$:"current object";CSEG;"*OT%(I)":location=";X;Y;Z
10146 GOSUB 1320
10148 PRINT"TAB:display all or selected obj.,'/' :exit";
10150 ON CN-2 GOTO 10154,10176,10216
10152 '+++++++ SELECT
10154 PRINT",N:next$,P:prior"
10156 PRINT:PRINT"select,";GOSUB 1280
10158 IF I$=" " THEN PRINT:GOSUB 10288:GOTO 10156
10160 IF A$="/" THEN 10278 ELSE PRINT
10162 IF A$(">")"n" AND A$(">")" " THEN 10168
10164 CSEG=CSEG+1:IF CSEG=AVS THEN CSEG=1
10166 GOTO 10136
10168 IF A$(">")"p" GOTO 10156
10170 CSEG=CSEG-1:IF CSEG<1 THEN CSEG=AVS-1
10172 GOTO 10136
10174 '+++++++ MOVE
10176 PRINT:PRINT"Move to location absolute or relative (a$/r):";GOSUB 1280
10178 IF I$=" " THEN GOSUB 10288:PRINT:GOTO 10176
10180 IF A$="/" THEN 10278 ELSE PRINT
10181 C=SEGZ(CSEG,3)
10182 IF A$(">")"r" THEN 10186
10184 INPUT"Relative location (x,y,z) = ";X,Y,Z:GOTO 10192
10186 IF A$(">")"a" AND A$(">")" " THEN 10176
10188 INPUT"New location (x,y,z) = ";X,Y,Z
10190 X=X-WCD(C,0):Y=Y-WCD(C,1):Z=Z-WCD(C,2)
10192 FOR I=1 TO OHZ(SEGZ(CSEG,0),2)
10193 J=C+I-1
10194 WCD(J,0)=WCD(J,0)+X:WCD(J,1)=WCD(J,1)+Y
10196 WCD(J,2)=WCD(J,2)+Z:NEXT I
10198 X=X#PSCALE:Y=Y#PSCALE/VC:I=SEGZ(CSEG,7)
10200 IF CSEG+1=AVS THEN K=IV ELSE K=SEGZ(CSEG+1,7)
10202 FOR J=I TO K-1:FOR A=0 TO 2 STEP 2:VLZ(A,J)=VLZ(A,J)+X:NEXT A
10204 FOR A=1 TO 3 STEP 2:VLZ(A,J)=VLZ(A,J)-Y:NEXT A:NEXT J
10212 GOTO 10136
10214 '+++++++ DELETE
10216 PRINT",RETURN:delete"
10218 PRINT:PRINT" ";GOSUB 1280
10220 IF I$=" " THEN GOSUB 10288:PRINT:GOTO 10218
10222 IF A$="/" THEN 10278 ELSE PRINT
10224 IF A$(">")"d" AND A$(">")" " THEN 10218
10226 '----- Deleting
10228 X=SEGZ(CSEG,3):Y=SEGZ(CSEG,4):Z=SEGZ(CSEG,7)
10230 IF CSEG+1=AVS THEN ACO=X:ANV=Y:IV=Z:VLZ(0,IV)=-1:GOTO 10254
10232 '
10234 A=SEGZ(CSEG+1,3):B=SEGZ(CSEG+1,4):C=SEGZ(CSEG+1,7)
10236 FOR I=A TO ACO-1:FOR J=0 TO 2:WCD(I-A+X,J)=WCD(I,J):NEXT J:NEXT I
10238 FOR I=B TO ANV-1:FOR J=0 TO 2:NV(I-B+Y,J)=NV(I,J):NEXT J:NEXT I

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10240 FOR I=C TO IV:FOR J=0 TO 3:VLX(J,I-C+Z)=VLX(J,I):NEXT J:NEXT I
10241 ACO=ACO-A+X:ANV=ANV-B+Y:IV=IV-C+Z
10242 '
10244 FOR I=1 TO AVS-1
10246 IF SEGZ(I,3)>X THEN SEGZ(I,3)=SEGZ(I,3)-A+X
10248 IF SEGZ(I,4)>Y THEN SEGZ(I,4)=SEGZ(I,4)-B+Y
10250 IF SEGZ(I,7)>Z THEN SEGZ(I,7)=SEGZ(I,7)-C+Z
10252 NEXT I
10253 '
10254 A=SEGZ(CSEG,0):B=SEGZ(CSEG,1):C=SEGZ(CSEG,2)
10255 OHX(0,0)=OHX(0,0)-1:IFOHX(0,0)<0THENOHX(0,0)=0
10256 OHX(A,4)=OHX(A,4)-1:IFOHX(A,4)<0THENOHX(A,4)=0
10257 IF B=0 THEN OHX(A,0)=C ELSE SEGZ(B,2)=C
10258 IF C>0 THEN SEGZ(C,1)=B
10260 IF CSEG+1=AVS THEN CSEG=CSEG-1:GOTO 10274
10262 FOR I=1 TO AVS-2
10264 IF I<CSEG GOTO 10270
10266 FOR J=0 TO 7:SEGZ(I,J)=SEGZ(I+1,J):NEXT J
10268 IF SEGZ(I,1)>CSEG THEN SEGZ(I,1)=SEGZ(I,1)-1
10270 IF SEGZ(I,2)>CSEG THEN SEGZ(I,2)=SEGZ(I,2)-1
10272 NEXT I
10273 '
10274 AVS=AVS-1:GOSUB 40360
10276 '----- Outall
10278 GOSUB 1320:GOSUB 40300:GOTO 1120
10280 '----- Outerr
10282 PRINT"can't "CM$ (return please) ";
10284 GOSUB 1280: GOTO 1120
10286 '----- Highlight
10288 IF SF=1 THEN GOSUB 40300:RETURN
10290 GOSUB 40360:GOSUB 40305:RETURN
10292 '*****
10294 ' FEEDBACK
10296 '*****
10300 GOSUB 10301:GOTO 1120
10301 A$="t":PRINT
10302 INPUT"Feedback view (Top#,Front,Left,Right,Back,Upward) = ";A$
10304 IF A$="t" THEN TX=0:TY=1:SXX= 1:SYY= 1:TZ=2:SZZ= 1:GOTO 10316
10306 IF A$="f" THEN TX=0:TY=2:SXX= 1:SYY= 1:TZ=1:SZZ=-1:GOTO 10316
10308 IF A$="l" THEN TX=1:TY=2:SXX=-1:SYY= 1:TZ=0:SZZ=-1:GOTO 10316
10310 IF A$="r" THEN TX=1:TY=2:SXX= 1:SYY= 1:TZ=0:SZZ= 1:GOTO 10316
10312 IF A$="b" THEN TX=0:TY=2:SXX=-1:SYY= 1:TZ=1:SZZ= 1:GOTO 10316
10314 IF A$="u" THEN TX=0:TY=1:SXX= 1:SYY=-1:TZ=2:SZZ=-1:GOTO 10316
10315 IF A$="/" AND CM$="feedback" THEN RETURN ELSE GOTO 10301
10316 IF SF=10 THEN PRINT:INPUT"Erase (y#/n)";A$:IF A$(">")"n"THEN GOSUB 40360
10318 IV=0:FOR IS=1 TO AVS-1:GOSUB 31010:NEXT IS
10320 FI$=FW$:RETURN
10322 '*****
10324 ' RENAME
10326 '*****
10330 GOSUB 10331:GOTO 1120
10331 A$=FW$:PRINT:PRINT"Rename world data "FW$" to:";:INPUT A$
10333 IF FI$=FW$ THEN FI$=A$
10335 FW$=A$:RETURN
10340 '*****
10350 ' LOAD

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10360 '*****
10370 GOSUB10590
10380 IF1=2 THEN 10510
10390 GOSUB10610:IF ERL=10631 GOTO 10800
10400 FORJ=1TO3:FORK=0TO5: INPUT#1,OHX(J,K) :NEXTK:NEXTJ
10410 INPUT#1,AVS,ACO,ANV,OHX(0,0)
10420 '
10430 FORJ=1TOAVS-1:FORK=0TO7: INPUT#1,SEGZ(J,K) :NEXTK:NEXTJ
10450 FORJ=0TOACO-1:FORK=0TO2: INPUT#1,WC(J,K) :NEXTK:NEXTJ
10470 FORJ=0TOANV-1:FORK=0TO2: INPUT#1,NV(J,K) :NEXTK:NEXTJ
10490 FORJ=0TO5: INPUT#1,OHX(J) :NEXTJ
10492 CSEG=1
10495 '
10500 IF1=1THEN10540ELSECLOSE
10510 GOSUB10620:IF ERL=10631 THEN 10800 ELSE INPUT#1,IV
10520 FORJ=0TO3:FORK=0TOIV: INPUT#1,VLZ(J,K) :NEXTK:NEXTJ
10540 CLOSE:IFCM#="load"THENPRINT"ok":GOTO1120
10550 RETURN
10570 '
10580 '----- filename open
10590 I=3:INPUT"Data(1 world,2 image,3 both#)=";I
10600 A$=FW$:PRINT:INPUT"File name=";A$:RETURN
10610 I$=".nw":GOTO10630
10620 I$=".ni"
10630 ON ERROR GOTO 10640
10631 OPENA$+I$ FOR INPUT AS#1
10632 IF I$=".nw" THEN FW$=A$
10633 IF I$=".ni" THEN FI$=A$
10640 RETURN
10650 I$=".nw":GOTO10670
10660 I$=".ni"
10670 ON ERROR GOTO 10720
10680 OPENA$+I$ FOR INPUT AS #1:CLOSE#1:B$=""
10690 PRINT:FORI=1TO4:BEEP1:BEEP0:NEXTI
10695 PRINT"File("&A$+I$&")exist, Replace or Change (r#/c#);:INPUTB$
10700 IF B$="c" THEN GOSUB 10590:GOTO 10650
10710 IF B$(">)" AND B$(">)" THEN 10690
10720 OPENA$+I$ FOR OUTPUT AS#1
10730 RETURN
10790 '----- File not found
10800 PRINT:BEEP:IF ERR=53 THEN PRINT"Error:File not found";:GOTO 10840
10810 PRINT"File (&A$+I$&) not found !";
10840 PRINT" (return please)";:GOSUB 1280:GOTO1120
20000 '*****
20010 ' SAVE
20020 '*****
20030 GOSUB10590
20040 IF1=2THEN20150
20050 GOSUB10650
20060 FORJ=1TO3:FORK=0TO5: PRINT#1,OHX(J,K); :NEXTK:NEXTJ
20070 PRINT#1,AVS;ACO;ANV;OHX(0,0);
20075 '
20080 FORJ=1TOAVS-1:FORK=0TO7: PRINT#1,SEGZ(J,K); :NEXTK:NEXTJ
20100 FORJ=0TOACO-1:FORK=0TO2: PRINT#1,WC(J,K); :NEXTK:NEXTJ
20120 FORJ=0TOANV-1:FORK=0TO2: PRINT#1,NV(J,K); :NEXTK:NEXTJ
20130 FORJ=0TO5: PRINT#1,OHX(J); :NEXTJ

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20135 '
20140 IF I=1 THEN 20180: ELSE CLOSE
20150 GOSUB 10660: PRINT #1, IV;
20160 FOR J=0 TO 3: FOR K=0 TO IV: PRINT #1, VLX(J,K); : NEXT K: NEXT J
20180 CLOSE: REMOVE: MOUNT 1
20185 IFCM#="save" THEN PRINT "ok";: GOTO 1120
20190 RETURN
30000 '#####
30010 ' ASSIGN
30020 '#####
30030 '++++++ FEEDBACK SCREEN ASSIGN
30120 IFFS=10 THEN 30301
30130 GOSUB 40360 'erase
30135 IFFS=0 THEN A=1 ELSE A=2
30140 B=INT(VX*VY/A/PSCALE): A=INT(VX*A/PSCALE)
30145 I#=LEFT$(STR$(1/PSCALE),5)
30150 PRINT "Feedback" FS; dimension x,y="A","B"; scale=1:I#;
30160 I#="n": INPUT "..Want to change(y/n#)"; I#
30170 IF I#(">")*y THEN 30250 ELSE PRINT
30180 INPUT "Origin (0:center,1:bottom-left,2:bottom-right,3:top-r,4:top-l)"; FS
30185 IFFS>4 THEN FS=0
30186 L=VX#2: PRINT
30190 INPUT "unit of length across the screen(on x-axis,default 640)="; L
30195 IFFS=0 THEN A=1 ELSE A=2
30200 PSCALE=VX/L#A
30210 IFFS=0 THEN CX=VX: CY=VY: GOTO 30140
30220 IFFS=1 THEN CX=0: CY=2#VY: GOTO 30140
30230 IFFS=2 THEN CX=2#VX: CY=2#VY: GOTO 30140
30240 IFFS=2 THEN CX=2#VX: CY=0: GOTO 30140
30245 IFFS=2 THEN CX=0: CY=0: GOTO 30140
30250 GOSUB 1420
30252 A=-CX/PSCALE: B=(2#VX-CX)/PSCALE
30254 C=CY/PSCALE#VC: D=(CY-2#VY)/PSCALE#VC
30260 PRINT "Q: FS" I: "A".."B" y: "C".."D" scale=1:(1/PSCALE)
30265 LOCATE 0,24: PRINT
30270 '++++++ DISPLAY FEEDBACK TOP-VIEW FOR ALL
30275 IF DHZ(0,0)=0 THEN GOSUB 10331: GOTO 30301
30280 IF IV=0 OR FW#(">")#I# THEN GOSUB 10301: GOTO 30300
30290 IF SF=0 THEN GOSUB 40300
30295 '++++++ OBJECT ATTRIBUTES & SPACE ALLOC.
30300 IF AVS>0B THEN PRINT "Sorry,no more space.. ";: GOTO 1070
30301 I#="": PRINT: INPUT "1.box,2.pris,3.pyramid"; I#
30302 IF I#="" THEN NR=1: GOTO 30305
30303 IF I#="/" THEN 1120
30304 IF I#("<1*ORI#>")#3 THEN 30301 ELSE R=VAL(I#)
30305 LOCATE 7,23: ON R GOTO 30306,30307,30308
30306 PRINT "box " : GOTO 30310
30307 PRINT "pris " : GOTO 30310
30308 PRINT "pyramid"
30310 PRINT: INPUT "Dimension in x,y,z="; W,D,H
30320 PRINT: INPUT "location of bottom-left point(x,y,z)="; X,Y,Z
30330 IF DHZ(R,0)=0 THEN DHZ(R,0)=AVS: I=0: GOTO 30370
30340 IS=DHZ(R,0) '1st segment
30350 IF SEGZ(IS,2)(">") THEN IS=SEGZ(IS,2): GOTO 30350
30360 SEGZ(IS,2)=AVS: I=IS
30370 IS=AVS: IC=ACD: INV=ANV

```

```

30380 SEGZ(1S,0)=R:SEGZ(1S,1)=I:SEGZ(1S,2)=O:SEGZ(1S,3)=IC:SEGZ(1S,4)=INV
30385 CSEG=IS
30430 ON R GOTO 30460,30520,30580
30440 '++++++ DATA MODULE
30450 '##### box
30460 FORJ=0T01:WC(IC+J,0)=X:WC(IC+J+2,0)=X+W:WC(IC+J+4,0)=X+W:WC(IC+J+6,0)=X+W
30470 NEXT:FORJ=0T07:WC(IC+J,1)=Y:NEXT
30480 FORJ=1T02:WC(IC+J,1)=Y+D:WC(IC+J+4,1)=Y+D:NEXT
30490 FORJ=0T03:WC(IC+J,2)=Z:WC(IC+J+4,2)=Z+H:NEXT
30500 A$="587156267378485123":GOTO30640
30510 '##### prism
30520 FORJ=0T01:WC(IC+J,0)=X:WC(IC+J+2,0)=X+W:WC(IC+J+4,0)=X+W/2:NEXT
30530 WC(IC,1)=Y:WC(IC+3,1)=Y:WC(IC+4,1)=Y
30540 WC(IC+1,1)=Y+D:WC(IC+2,1)=Y+D:WC(IC+5,1)=Y+D
30550 FORJ=0T03:WC(IC+J,2)=Z:NEXT:WC(IC+4,2)=Z+H:WC(IC+5,2)=Z+H
30560 A$="451156263365123":GOTO30640
30570 '##### pyramid
30580 FORJ=0T01:WC(IC+J,0)=X:WC(IC+J+2,0)=X+W:NEXT
30590 WC(IC+4,0)=X+W/2:WC(IC,1)=Y:WC(IC+3,1)=Y
30600 WC(IC+1,1)=Y+D:WC(IC+2,1)=Y+D:WC(IC+4,1)=Y+D/2
30610 FORJ=0T03:WC(IC+J,2)=Z:NEXT:WC(IC+4,2)=Z+H/2
30620 A$="451152253354123"
30630 '++++++ ROTATE DATA
30640 I$="":PRINT:INPUT"Rotation (x/y/z, degree)=";I$,D6
30650 IFI$="x"THENA=1:B=2:GOTO30680
30660 IFI$="y"THENA=0:B=2:GOTO30680
30670 IFI$="z"THENA=0:B=1ELSEPRINT:GOTO30730
30680 D6=-D6*44/(360*I)
30690 FORJ=1T00HZ(R,2)
30692 C=IC+J-1:E=WC(C,A):F=WC(C,B)
30700 WC(C,A)=E*ICOS(D6)-F*SIN(D6)
30710 WC(C,B)=F*ICOS(D6)+E*SIN(D6):NEXT
30711 X1=WC(IC,0)-X:Y1=WC(IC,1)-Y:Z1=WC(IC,2)-Z
30712 FORJ=1T00HZ(R,2)
30713 C=IC+J-1:WC(C,0)=WC(C,0)-X1:WC(C,1)=WC(C,1)-Y1:WC(C,2)=WC(C,2)-Z1
30714 NEXT:GOTO30640
30720 '++++++ COMPUTE NORMAL VECTORS
30730 FORJ=1T00HZ(R,3)
30740 A=VAL(MID$(A$,J*3,1)):B=VAL(MID$(A$,J*3-1,1)):C=VAL(MID$(A$,J*3-2,1))
30750 X=WC(IC+B-1,0):Y=WC(IC+B-1,1):Z=WC(IC+B-1,2)
30760 X1=WC(IC+A-1,0)-X:X2=WC(IC+C-1,0)-X
30770 Y1=WC(IC+A-1,1)-Y:Y2=WC(IC+C-1,1)-Y
30780 Z1=WC(IC+A-1,2)-Z:Z2=WC(IC+C-1,2)-Z
30790 NV(INV+J-1,0)=Y1*Z2-Z1*Y2+X
30800 NV(INV+J-1,1)=Z1*X2-X1*Z2+Y
30810 NV(INV+J-1,2)=X1*Y2-Y1*X2+Z:NEXT
30820 '++++++ UPDATE ORTHO. MIN-MAX & SCALE
30822 IFDIZ(0,0)>0THENA=1:GOTO30830
30823 FORJ=0T02:OMX(J*2)=WC(IC,J):OMX(J*2+1)=WC(IC,J):NEXT:A=2
30830 FORJ=AT00HZ(R,2):FORI=0T02
30840 IFWC(IC+J-1,I)>OMX(I*2)THENOMX(I*2)=WC(IC+J-1,I)
30850 IFWC(IC+J-1,I)<OMX(I*2+1)THENOMX(I*2+1)=WC(IC+J-1,I)
30855 NEXTI:NEXTJ
30860 J=0:C=VX:GOSUB30870:IFXSCALE>A THENXSCALE=A
30861 J=1:C=VY*VC:GOSUB30870:IFYSCALE>A THENYSCALE=A
30862 J=2:GOSUB30870:IFZSCALE>A THENZSCALE=A

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30863 IF OSCALE>XSCALE THEN OSCALE=XSCALE
30864 IF OSCALE>YSCALE THEN OSCALE=YSCALE
30865 IF OSCALE>ZSCALE THEN OSCALE=ZSCALE
30866 GOTO30900
30869 '----- scale
30870 IFOMX(J#2)=0THENA=1ELSEA=ABS(C/OMX(J#2))
30871 IFOMX(J#2+1)=0THENB=1ELSEB=ABS(C/OMX(J#2+1))
30872 IFA>BTHENA=B:RETURN
30890 '+++++++ FEEDBACK & ENDING
30900 GDSUB31010
30910 AVS=AVS+1
30920 ACD=ACD+OHZ(R,2)
30930 ANV=ANV+OHZ(R,3)
30940 OHZ(R,4)=OHZ(R,4)+1:OHZ(0,0)=OHZ(0,0)+1:SF=10
30945 IFOHZ(0,1)=0 AND AVS>DB THEN PRINT'(caution:space's full now)';GOTO1070
30950 INPUT'Another location(y/n#)';I$:IFI$="y"THEN30320
30960 INPUT'Another dimension(y/n#)';I$:IFI$="y"THEN30310
30970 PRINT:INPUT'Another object(y/n#)';I$:IFI$="y"THEN30301ELSE1120
31000 '----- feedback
31010 R=SEGZ(IS,0):IC=SEGZ(IS,3) 'pointers to ohz,wco
31020 FORI=0TOOHZ(R,2)-1
31025 SC(I,0)=PSCALE*WC(IC+I,TX)*SXX
31030 SC(I,1)=PSCALE*WC(IC+I,TY)*SYY/VC:NEXT
31035 IL=0:GDSUB32010:SEGZ(IS,7)=IV
31040 FORI=0TOIL-1:GDSUB40220:NEXT:VLI(0,IV)=-1 'flag end of line list
31050 GDSUB40300:RETURN
32000 '----- visible line
32010 N=OHZ(R,3) 'no. of surfaces
32015 PR=OHZ(R,5) 'point to soz
32020 INV = SEGZ(IS,4)
32025 IFOT$(R)="pyramid"THENT=4ELSET=3
32030 FORI=1TON
40000 J=INV+(I-1) 'pointer to NV of Ith surf.
40010 IR=SOZ(PR+I-1)+PR 'internal pointer to Ith surf.
40020 P2=SOZ(IR) '2nd point of surf.
40030 '#### test nv
40040 P2=IC+P2-1
40090 IF WC(P2,TZ)*SZZ=>NV(J,TZ)*SZZTHEN 40170
40110 '#### Gen. line
40120 LNZ(IL,0)=SOZ(IR-1) '1st point (relative)
40130 LNZ(IL,1)=SOZ(IR) '2nd point
40132 IL=IL+1:IR=IR+1:IFSOZ(IR)<>0THEN40120
40160 T=T-1:IF T<=0 THEN I=N
40170 NEXT I:RETURN
40210 '----- Viewport Transformation
40220 A=LNZ(I,0)-1:B=LNZ(I,1)-1:IF(AORB)<0THENRETURN
40230 VLI(0,IV)=SC(A,0)+CX
40240 VLI(1,IV)=CY-SC(A,1)
40250 VLI(2,IV)=SC(B,0)+CX
40260 VLI(3,IV)=CY-SC(B,1):IV=IV+1
40280 RETURN
40290 '----- DRAWLINE
40300 SF=10:A=VARPTR(VLI(0,0)):GOTO 40310 'all
40305 IF CSEG+1=AVS THEN SAV=IV ELSE SAV=SEGZ(CSEG+1,7)
40306 SVLI=VLI(0,SAV):VLI(0,SAV)=-1
40308 C=SEGZ(CSEG,7)

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40309 SF=1:A=VARPTR(VLX(0,C))          'selected
40310 POKE ADD,VAL("&H"+MID$(HEX$(A),3,2))
40320 POKE ADD+1,VAL("&H"+MID$(HEX$(A),1,2))
40325 A=USR3(0):IF SF=1 THEN VLX(0,SAV)=SVLX
40326 RETURN
40330 '#####
40340 ' ERASE
40350 '#####
40355 GOSUB40360:GOTO1120
40360 X=USR2(0):SF=0:RETURN
40390 '#####
40400 ' REPLAY
40410 '#####
40415 GOSUB40300:GOTO1120
49000 '#####
49010 ' LIST
49020 '#####
50000 QR=0:GOSUB40360
50001 QR=QR+1:Q1=0:Q2=-1:IFQR>7THENQR=1
50002 DNQRGOTO 52000,53000,54000,55000,56000,57000,58000
50003 LOCATE0,24:PRINT"RETURN for next page, else to exit";
50004 I$=INPUT$(1)
50005 RETURN
50006 '
52000 Q1=Q2+1:Q2=Q2+19:IF Q2>IV-1 THEN Q2=IV-1
52002 GOSUB59000
52004 PRINT"VLX:viewing-lines list":PRINT
52005 PRINT TAB(2);"line#";TAB(11);"X1";TAB(21);"Y1";TAB(41);"X2";TAB(51);"Y2"
52006 PRINT
52010 FORI=Q1TOQ2:PRINT TAB(3);USING"###";I;
52012 PRINT TAB(10);USING"###";VLX(0,I);
52014 PRINT TAB(20);USING"###";VLX(1,I);
52016 PRINT TAB(40);USING"###";VLX(2,I);
52020 PRINT TAB(50);USING"###";VLX(3,I):NEXT
52030 GOSUB 50003:IFI$(<>CHR$(13))THEN 59900
52040 IF Q2=>IV-1 THEN 50001 ELSE 52000
52900 '
53000 Q1=Q2+1:Q2=Q2+19:IF Q2>IL THEN Q2=IL
53002 GOSUB59000
53004 PRINT"LNZ;line end-points list":PRINT
53005 PRINT TAB(2);"line#";TAB(10);"point1";TAB(20);"point2":PRINT
53010 FORI=Q1TOQ2:PRINT TAB(3);USING"###";I;
53012 PRINT TAB(11);USING"###";LNZ(I,0);
53014 PRINT TAB(21);USING"###";LNZ(I,1):NEXT
53030 GOSUB 50003:IFI$(<>CHR$(13))THEN 59900
53040 IF Q2=>IL THEN 50001 ELSE 53000
53050 '
54000 Q1=Q2+1:Q2=Q2+19:IF Q2>ANV THEN Q2=ANV
54002 GOSUB59000
54004 PRINT"NV:normal vectors list":PRINT
54005 PRINT TAB(5);"rec#";TAB(15);" X";TAB(25);" Y";TAB(35);" Z":PRINT
54010 FORI=Q1TOQ2:PRINT TAB(5);I;TAB(10);USING"#####.###";NV(I,0);
54020 PRINT TAB(20);USING"#####.###";NV(I,1);
54025 PRINT TAB(30);USING"#####.###";NV(I,2):NEXTI
54030 GOSUB 50003:IFI$(<>CHR$(13))THEN 59900
54040 IF Q2=>ANV THEN 50001 ELSE 54000

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54050 '
55000 GOSUB59000
55004 PRINT"DHZ:object header record":PRINT
55005 PRINT TAB(5);"rec#";TAB(10);"1st-seg#";TAB(20);"reserve";
55007 PRINT TAB(30);"co-addr";TAB(40);"surfaces";TAB(50);"objects";
55008 PRINT TAB(60);"so#-addr":PRINT
55010 FORI=0T03:PRINT TAB(5);I;
55015 FORJ=0T05:PRINT TAB(10#J+10);USING"###";DHZ(I,J);NEXTJ:PRINT:NEXTI
55030 GOSUB 50003:IFI#(<)CHR$(13)THEN 59900 ELSE 50001
55050 '
56000 Q1=Q2+1;Q2=Q2+19:IF Q2>AVS-1 THEN Q2=AVS-1
56002 GOSUB59000
56004 PRINT"SEG#:object segment header list":PRINT
56005 PRINT TAB(2);"seg#";TAB(12);"type";TAB(20);"prior";TAB(28);"next";
56007 PRINT TAB(34);"WCO-addr";TAB(44);"NV-addr";
56008 PRINT TAB(53);"..reserve..";TAB(67);"VLI-addr":PRINT
56010 FORI=0T0Q2 :PRINT TAB(3);USING"##";I;
56015 FORJ=0T07:PRINT TAB(8#J+12);USING"###";SEG(I,J);NEXTJ:PRINT:NEXTI
56030 GOSUB 50003:IFI#(<)CHR$(13)THEN 59900
56040 IF Q2=>AVS-1 THEN 50001 ELSE 56000
56050 '
57000 Q1=Q2+1;Q2=Q2+19:IF Q2>ACD THEN Q2=ACD
57002 GOSUB59000
57004 PRINT"WCO:world coordinate point list":PRINT
57005 PRINT TAB(5);"point#";TAB(15);" X";TAB(25);" Y";TAB(35);" Z"
57010 PRINT:FORI=0T0Q2:PRINT TAB(5);I;
57012 PRINT TAB(10);USING"#####.###";WCO(I,0);
57014 PRINT TAB(20);USING"#####.###";WCO(I,1);
57020 PRINT TAB(30);USING"#####.###";WCO(I,2):NEXT
57030 GOSUB 50003:IFI#(<)CHR$(13)THEN 59900
57040 IF Q2=>ACD THEN 50001 ELSE 57000
57050 '
58000 GOSUB 59000
58001 PRINT"MAX X,Y coordinate":PRINT
58002 PRINT TAB(15);"max.";TAB(30);"min.":PRINT
58003 PRINT " X";TAB(11);USING"#####.###";OMX(0);
58004 PRINTTAB(26);USING"#####.###";OMX(1)
58005 PRINT " Y";TAB(11);USING"#####.###";OMX(2);
58006 PRINTTAB(26);USING"#####.###";OMX(3)
58007 PRINT " Z";TAB(11);USING"#####.###";OMX(4);
58008 PRINTTAB(26);USING"#####.###";OMX(5)
58009 PRINT:PRINT "PSCALE : "PSCALE
58010 PRINT "XSCALE : "XSCALE
58020 PRINT "YSCALE : "YSCALE
58030 PRINT "ZSCALE : "ZSCALE
58040 PRINT "OSCALE : "OSCALE
58050 GOSUB 50003:IFI#(<)CHR$(13)THEN 59900 ELSE 50001
59000 PRINTCHR$(12):LOCATED,0:RETURN
59900 PRINTCHR$(12):GOSUB40300:GOTO1120
59901 '#####
59902 ' LLIST
59903 '#####
60000 PRINT"Please set papaer and hit return";
60010 LPRINT"VLI:viewing-lines list":LPRINT
60020 LPRINT TAB(2);"line#";TAB(11);"X1";TAB(21);"Y1";TAB(41);"X2";TAB(51);"Y2
60030 LPRINT

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60040 FORI=0TO1:LPRINT TAB(3);USING"###";I;
60050 LPRINT TAB(10);USING"###";VLI(0,I);
60060 LPRINT TAB(20);USING"###";VLI(1,I);
60070 LPRINT TAB(40);USING"###";VLI(2,I);
60080 LPRINT TAB(50);USING"###";VLI(3,I):NEXT
60110 '
60120 LPRINT:LPRINT:LPRINT:LPRINT"LNZ:line end-points list":LPRINT
60130 LPRINT TAB(2);"line#";TAB(10);"point1";TAB(20);"point2":LPRINT
60140 FORI=0TO1:LPRINT TAB(3);USING"###";I;
60150 LPRINT TAB(11);USING"###";LNZ(I,0);
60160 LPRINT TAB(21);USING"###";LNZ(I,1):NEXT
60200 LPRINT"NV:normal vectors list":LPRINT
60210 LPRINT TAB(5);"rec#";TAB(15);" X";TAB(25);" Y";TAB(35);" Z":LPRINT
60220 FORI=0TO1:LPRINT TAB(5);I;TAB(10);USING"#####.###";NV(I,0);
60230 LPRINT TAB(20);USING"#####.###";NV(I,1);
60240 LPRINT TAB(30);USING"#####.###";NV(I,2):NEXTI
60250 '
60300 LPRINT:LPRINT:LPRINT:LPRINT"OHZ:object header record":LPRINT
60310 LPRINT TAB(5);"rec#";TAB(10);"1st-segZ";TAB(20);"reserve";
60320 LPRINT TAB(30);"co-addr";TAB(40);"surfaces";TAB(50);"objects";
60330 LPRINT TAB(60);"soZ-addr":PRINT
60340 FORI=0TO3:LPRINT TAB(5);I;
60350 FORJ=0TO5:LPRINT TAB(10#J+10);USING"###";OHZ(I,J);NEXTJ:LPRINT:NEXTI
60360 '
60400 LPRINT:LPRINT:LPRINT:LPRINT"SEGZ:object segment header list":LPRINT
60410 LPRINT TAB(2);"seg#";TAB(12);"type";TAB(20);"prior";TAB(28);"next";
60420 LPRINT TAB(34);"WCO-addr";TAB(44);"NV-addr";
60430 LPRINT TAB(53);"..reserve..";TAB(67);"VLI-addr":LPRINT
60440 FORI=0TO45-1:LPRINT TAB(3);USING"###";I;
60450 FORJ=0TO7:LPRINT TAB(8#J+12);USING"###";SEGZ(I,J);NEXTJ:LPRINT:NEXTI
60460 '
60500 LPRINT:LPRINT:LPRINT:LPRINT"WCO:world coordinate point list":LPRINT
60510 LPRINT TAB(5);"point#";TAB(15);" X";TAB(25);" Y";TAB(35);" Z"
60520 LPRINT:FORI=0TO40:PRINT TAB(5);I;
60530 LPRINT TAB(10);USING"#####.###";WCO(I,0);
60540 LPRINT TAB(20);USING"#####.###";WCO(I,1);
60550 LPRINT TAB(30);USING"#####.###";WCO(I,2):NEXT
60560 '
60570 LPRINT:LPRINT:LPRINT:LPRINT"MAX X,Y coordinate":LPRINT
60572 LPRINT TAB(15);"max.";TAB(30);"min.":LPRINT
60574 LPRINT" X";TAB(11);USING"#####.###";OMX(0);
60576 LPRINT TAB(26);USING"#####.###";OMX(1)
60578 LPRINT" Y";TAB(11);USING"#####.###";OMX(2);
60580 LPRINT TAB(26);USING"#####.###";OMX(3)
60585 LPRINT" Z";TAB(11);USING"#####.###";OMX(4);
60590 LPRINT TAB(26);USING"#####.###";OMX(5)
60600 LPRINT:LPRINT:LPRINT:LPRINT"PSCALE : "PSCALE
60610 LPRINT "XSCALE : "XSCALE
60620 LPRINT "YSCALE : "YSCALE
60630 LPRINT "ZSCALE : "ZSCALE
60640 LPRINT "OSCALE : "OSCALE
65000 GOTO1120

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2  '/3dmdir.C/,/3d.C/
3  '#####
5  'DISPLAY MODULE:created -Feb 18,1983
6  '          modified-Mar 16,1983
30 '#####
40 '# 3-D PERSPECTIVE MODEL PROGRAM #
50 '# Version A.1 : modular objects #
60 '#      Mar.,1983 by      #
70 '#      TAREEPAN TEEPASIRI      #
75 '#####
76 CONSOLE24,2,0,1
80 A$="chain":OPENA$+".stt" FOR INPUT AS#1
81 INPUT#1,PSCALE,XSCALE,YSCALE,ZSCALE,OSCALE,VX,VY,VC,SX,SY,CX,CY
82 INPUT#1,FS,CM,U0,U1,UE,UL,ADD,OB,CM$,FW$
83 CLOSE:DEFUSR0=U0:DEFUSR1=U1:DEFUSR2=UE:DEFUSR3=UL
84 DIM OT$(3),OH$(3,6),SO$(105)
85 DATA 7,13,19,25,31,37, 5,8,7,6,5,0
86 DATA 1,5,6,2,1,0,2,6,7,3,2,0,3,7,8,4,3,0,4,8,5,1,4,0,1,2,3,4,1,0
87 DATA 6,11,17,22,28
88 DATA 4,5,1,4,0,1,5,6,2,1,0,2,3,6,2,0,3,6,5,4,3,0,1,2,3,4,1,0
89 DATA 6,11,16,21,26
90 DATA 4,5,1,4,0,1,5,2,1,0,2,5,3,2,0,3,5,4,3,0,1,2,3,4,1,0
91 RESTORE85:FORI=0TO105:READ SO$(I):NEXT
92 DATA box,8,6,0,0, prism,6,5,0,42, pyramid,5,5,0,75
93 RESTORE92:FORI=1TO3:READ OT$(I):FORJ=2TO5:READ OH$(I,J):NEXTJ:NEXTI
110 DIM SEG$(10,7),WC(80,2),NV(60,2)
120 DIM SC(100,1,2),LN$(120,1,2),VL$(3,120),MM$(10,5)
130 DIM OM$(5)
300 LOCATE0,0:PRINT"3-D DISPLAY MODULE      "
320 LOCATE0,24:I=1:A$=FW$:GOSUB 10390:GOTO 30030
1000 '#####
1001 '  MAIN
1002 '#####
1010 LINE23,2:CM=15
1020 DATA new,assign,select,move,delete,feedback,load,save
1025 DATA view,erase,replay,rename,list,l1ist,end
1030 RESTORE1020:I=1
1040 READ CM$:IFI<CM THEN 1040
1050 GOSUB 1320
1060 PRINT"Type command or TAB for menu selection,and RETURN(=/cancel)"
1070 PRINT"COMMAND:";
1080 GOSUB 1280
1090 IF I$<>" " THEN 1140
1100 IF CN=CM THEN CN=1:RESTORE 1020 ELSE CN=CN+1
1110 READ CM$
1120 LOCATE0,0:PRINT"3-D DISPLAY MODULE"
1122 GOSUB 1320:PRINT CM$:";
1125 ON CN GOSUB 1211,1212,1213,1214,1215,1216,1217,1218,1219,1220,1221,1222,1223,1224,1225
1130 GOTO 1070
1140 IF A$="" THEN 1190
1150 CN=1:RESTORE 1020
1160 READ CM$:IF A$=LEFT$(CM$,LEN(A$)) THEN 1190
1170 IFCN<CM THEN CN=CN+1:GOTO 1160
1180 GOSUB 1320:BEEP:PRINT"command error..";GOTO 1060
1190 GOSUB 1320:PRINT CM$
1200 ONCN GOTO10070,10070,10070,10070,10070,10070,10370,20030,30030,40355,40415,10330,10070, 10070,1205

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1205 CLOSE:CONSOLE0,25,0,1:PRINTCHR$(12):X=USR2(0)
1206 BEEP1:BEEP0:PRINT*3-Dimensional Image Model Stop*:END
1210 '+++++++ COMMAND MESSAGE
1211 PRINT*clear all data*:RETURN
1212 PRINT*new dimension & location of choosen object*:RETURN
1213 PRINT*set current object entry*:RETURN
1214 PRINT*update or give new location of current object entry*:RETURN
1215 PRINT*selected object entry*:RETURN
1216 PRINT*regenerate feedback view of all objects*:RETURN
1217 PRINT*world or image data from disk file*:RETURN
1218 PRINT*world or image data to disk file*:RETURN
1219 PRINT*display parallel or perspective view *:RETURN
1220 PRINT*the image displaying on screen*:RETURN
1221 PRINT*the image currently reside in buffer area*:RETURN
1222 PRINT*old data name to new data name*:RETURN
1223 PRINT*list numerical data*:RETURN
1224 PRINT*list numerical data on printer*:RETURN
1225 PRINT*exit program*:RETURN
1250 '----- inkey
1260 I$=INPUT$(1):RETURN
1280 A$=""
1290 GOSUB 1260:IF I$=" " OR I$=CHR$(13) THEN RETURN
1300 PRINTI$;A$=A$+I$:GOTO 1290
1310 '----- clear line 23
1320 LINE23,2:LOCATE0,23:PRINTSTRING$(79," "):LOCATE0,23:RETURN
1410 '----- clear line 22
1420 LOCATE0,22:PRINTSTRING$(79," "):LOCATE0,22:RETURN
10040 '#####
10050 ' INPUT-EDIT module
10060 '#####
10070 A$="chain":OPENA$+".stt"FOROUTPUT AS#1
10072 PRINT#1,PSCALE;XSCALE;YSCALE;ZSCALE;OSCALE;VX;VY;VC;SX;SY;CX;CY;
10073 PRINT#1,FS;CN;UO;UI;UE;UL;ADD;OB;CM$;"",";FW$;"",
10074 CLOSE#1:REMOVE:MOUNT1
10075 RUN"Jdmdlr.B"
10322 '#####
10324 ' RENAME
10326 '#####
10330 GOSUB 10331:GOTO 1120
10331 A$=FW$:PRINT:PRINT*Rename world data ""FW$"" to:;:INPUT A$
10333 IF F1$=FW$ THEN F1$=A$
10335 FW$=A$:RETURN
10340 '#####
10350 ' LOAD
10360 '#####
10370 GOSUB10590
10380 IF1=2 THEN 10510
10390 GOSUB10610:IF ERL=10631 GOTO 10800
10400 FORJ=1TO3:FORK=0TO5: INPUT#1,OHZ(J,K) :NEXTK:NEXTJ
10410 INPUT#1,AVS,ACD,ANV,OHZ(0,0)
10420 '
10430 FORJ=1TOAVS-1:FORK=0TO7: INPUT#1,SEGZ(J,K) :NEXTK:NEXTJ
10450 FORJ=0TOACD-1:FORK=0TO2: INPUT#1,WC(J,K) :NEXTK:NEXTJ
10470 FORJ=0TOANV-1:FORK=0TO2: INPUT#1,NV(J,K) :NEXTK:NEXTJ
10490 FORJ=0TO5: INPUT#1,OMX(J) :NEXTJ
10492 CSEG=1

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10495 '
10500 IF I=1 THEN 10540 ELSE CLOSE
10510 GOSUB 10620: IF ERL=10631 THEN 10800 ELSE INPUT#1, IV
10520 FOR J=0 TO 3: FOR K=0 TO 4: INPUT#1, VLZ(J, K) : NEXT K: NEXT J
10540 CLOSE: IFA#(<)"chain" THEN PRINT "ok";
10550 IF CM#="load" THEN 1120 ELSE RETURN
10570 '
10580 '----- filename open
10590 I=3: INPUT "Data(1 world, 2 image, 3 both)= "; I
10600 A# = FW# : PRINT: INPUT "File name="; A# : RETURN
10610 I# = ".mm" : GOTO 10630
10620 I# = ".mi"
10630 ON ERROR GOTO 10640
10631 OPEN A#+I# FOR INPUT AS#1
10632 IF I# = ".mm" THEN FW# = A#
10633 IF I# = ".mi" THEN FI# = A#
10640 RETURN
10650 I# = ".mm" : GOTO 10670
10660 I# = ".mi"
10670 ON ERROR GOTO 10720
10680 OPEN A#+I# FOR INPUT AS #1: CLOSE#1: B#=""
10690 PRINT: FOR I=1 TO 4: BEEP I: BEEP 0: NEXT I
10695 PRINT "File (<A#+I#>) exist, Replace or Change (r#/c)"; INPUT B#
10700 IF B#="c" THEN GOSUB 10590: GOTO 10650
10710 IF B#(<)" AND B#(<)"r" THEN 10690
10720 OPEN A#+I# FOR OUTPUT AS#1
10730 RETURN
10790 '----- File not found
10800 PRINT: BEEP: IF ERR=53 THEN PRINT "Error: File not found"; GOTO 10840
10810 PRINT "File (<A#+I#>) not found !";
10840 PRINT " (return please)"; GOSUB 1280: GOTO 1120
20000 '*****
20010 ' SAVE
20020 '*****
20030 GOSUB 10590
20040 IF I=2 THEN 20150
20050 GOSUB 10650
20060 FOR J=1 TO 3: FOR K=0 TO 5: PRINT#1, DHZ(J, K) ; NEXT K: NEXT J
20070 PRINT#1, AVS; ACO; ANV; DHZ(0, 0);
20075 '
20080 FOR J=1 TO AVS-1: FOR K=0 TO 7: PRINT#1, SEGZ(J, K) ; NEXT K: NEXT J
20100 FOR J=0 TO ACO-1: FOR K=0 TO 2: PRINT#1, WC(J, K) ; NEXT K: NEXT J
20120 FOR J=0 TO ANV-1: FOR K=0 TO 2: PRINT#1, NV(J, K) ; NEXT K: NEXT J
20130 FOR J=0 TO 5: PRINT#1, DMX(J) ; NEXT J
20135 '
20140 IF I=1 THEN 20180: ELSE CLOSE
20150 GOSUB 10660: PRINT#1, IV;
20160 FOR J=0 TO 3: FOR K=0 TO 4: PRINT#1, VLZ(J, K) ; NEXT K: NEXT J
20180 CLOSE: REMOVE: MOUNT 1: IFA#(<)"chain" THEN PRINT "ok": GOTO 1120
20190 RETURN
30000 '*****
30010 ' DISPLAY
30020 '*****
30030 IF DHZ(0, 0)=0 THEN PRINT "No displayable data.."; GOTO 1120
30040 A#="tufbrliap"
30050 PRINT: PRINT "Top, up, front, right, back, left, iso., axo., or perspective:";

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30060 GOSUB 1260
30070 IF I$="/" THEN PRINT:GOTO 1120 ELSE PRINT I$
30080 ID=INSTR(A$,I$):IF ID=0 THEN 30050
30090 A$=MID$(A$,ID,1)
30100 IF ID<>SF THEN 30130
30110 PRINT:PRINT"Display "A$" already (return please)";
30120 GOSUB 1260:GOTO 30050
30130 LOCATE7,23:PRINT":*";
30140 ON ID GOTO 30160,30170,30180,30190,30200,30210,30280,30280,30490
30150 '<<<<<<<<< ORTHO. VIEWING PARAM. and TRANSFORMATION
30160 A=0:B=1:C=2: S1=1 :S2=1 :S3=-1:PRINT"TOP":GOTO 30220
30170 A=0:B=1:C=2: S1=1 :S2=-1:S3=1 :PRINT"UP":GOTO 30220
30180 A=0:B=2:C=1: S1=1 :S2=1 :S3=1 :PRINT"FRONT":GOTO 30220
30190 A=1:B=2:C=0: S1=1 :S2=1 :S3=-1:PRINT"RIGHT":GOTO 30220
30200 A=0:B=2:C=1: S1=-1:S2=1 :S3=-1:PRINT"BACK":GOTO 30220
30210 A=1:B=2:C=0: S1=-1:S2=1 :S3=1 :PRINT"LEFT"
30220 FOR I=0TO ACO-1
30230 SC(I,1,0)=OSCALE*WC(I,A)*S1
30240 SC(I,1,1)=OSCALE*WC(I,B)*S2
30250 SC(I,1,2)=WC(I,C)*S3
30260 NEXT:GOTO 30870
30270 '<<<<<<<<< ISO.VIEWING PARAM.
30280 PRINT"ISOMETRIC":I$="fr"
30290 PRINT:INPUT"Which(fr/f1/br/bl)";I$
30300 LOCATE17,23:A=100:ZF=115.447
30310 IF I$="fr" THEN XF=A :YF=-A:PRINT",front-right":GOTO 30400
30320 IF I$="f1" THEN XF=-A:YF=-A:PRINT",front-left":GOTO 30400
30330 IF I$="br" THEN XF=A :YF=A :PRINT",back-right":GOTO 30400
30340 IF I$="bl" THEN XF=-A:YF=A :PRINT",back-left":GOTO 30400
30350 IF I$="/" THEN 1120 ELSE 30290
30360 '<<<<<<<<< AXD. VIEWING PARAM.
30370 PRINT"AXONOMETRIC"
30380 D=200:GOSUB 30430
30390 LOCATE20,23:PRINT" H°H°V°V°"
30400 XT=0:YT=0:ZT=0
30410 GOTO 30660
30420 '----- viewing degree input
30430 H=-45:V=45
30440 PRINT:INPUT"View from(horiz. degree,vert. degree(from x-axis))=";H,V
30450 A=H*44/(360*7):B=V*44/(360*7)
30460 ZF=D*SIN(A):D=D*COS(A)
30470 YF=D*SIN(B):XF=D*COS(B):RETURN
30480 '<<<<<<<<< PERSPECTIVE VIEWING PARAM.
30490 PRINT"PERSPECTIVE":I$="c"
30495 ED=0:FORI=0TO4STEP2:A=OMX(I)-OMX(I+1):ED=ED+A*A:NEXT
30497 ED=SQR(ED)/2/TAN(11/60) 'dist. in 30/2 degrees
30500 PRINT:INPUT"Eye point in coordinate or degree(c#/d)";I$
30510 IF I$<>"d" THEN 30540
30520 D=ED:INPUT"Distance from origin=";D
30530 GOSUB 30430:GOTO 30620
30540 INPUT"View from point(x,y,z)=";XF,YF,ZF:I$="o":PRINT
30550 INPUT"View destination in coordinate or degree from eye or origin(c/d/o#)";I$
30560 IF I$<>"d" THEN 30620
30570 D=ED
30580 INPUT"View direction(horiz. degree,vert. degree)=";H,V:PRINT
30590 A=H*44/(360*7):B=V*44/(360*7)

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30600 ZT=-D*SIN(A)+ZF:D=D*ICOS(A)
30610 YT=-D*SIN(B)+YF:XT=-D*ICOS(B)+XF:GOTO 30640
30620 IF I<>"c" THEN XT=0:YT=0:ZT=0:GOTO 30640
30630 INPUT"View to point(x,y,z)=";XT,YT,ZT
30640 LOCATE20,23:PRINT"View from"XF",YF",ZF"to"XT",YT",ZT
30650 '<<<<<<<< NON-ORTHO. VIEWING TRANSFORMATION
30660 A=XT-XF:B=YT-YF:C=ZT-ZF
30670 IF ID=9 THEN IB=0 ELSE IB=1
30680 IF (A OR B)<>0 THEN 30780
30690 IF C<=0 THEN 30740
30700 FOR I=0 TO AC0-1
30710 SC(I,IB,0)=XF-WC(I,0)
30720 SC(I,IB,1)=WC(I,1)-YF
30730 SC(I,IB,2)=WC(I,2)-ZF:NEXT:GOTO 30870
30740 FOR I=0 TO AC0-1
30750 SC(I,IB,0)=WC(I,0)-XF
30760 SC(I,IB,1)=WC(I,1)-YF
30770 SC(I,IB,2)=ZF-WC(I,2):NEXT:GOTO 30870
30780 D=SQR(A*A+B*B)
30790 E=SQR(D*D+C*C)
30800 FOR I=0 TO AC0-1
30810 X=XF-WC(I,0):Y=YF-WC(I,1):Z=ZF-WC(I,2)
30820 S=A*X+B*Y
30830 SC(I,IB,0)=(A*Y-B*X)/D
30840 SC(I,IB,1)=(C*S/D-D*Z)/E
30850 SC(I,IB,2)=-(S+C*Z)/E:NEXT
30860 '<<<<<<<< VISIBLE-SURFACE LINE LIST
30870 IL=0:IF ID=9 THEN IB=0 ELSE IB=1
30880 FOR IS=1 TO AVS-1
30890 R=SEGZ(IS,0) 'pointer to OHZ
30910 SEGZ(IS,6)=IL 'keep pointer to line list
30920 IC=SEGZ(IS,3) 'pointer to MC & SC
30930 INV=SEGZ(IS,4) 'pointer to NV
30940 N=OHZ(R,3) 'no. of surfaces
30950 IF OT*(R)="pyramid" THEN T=4 ELSE T=3 'max. vis. surf.
30960 R=OHZ(R,5) 'pointer to SOZ
30970 FOR I=1 TO N
30980 J=INV+(I-1) 'pointer to 1st point of NV
30990 IR=SOZ(R+I-1)+R 'internal pointer to Ith surf.
31000 P2=SOZ(IR) '2nd point of surf.
31010 '**** test nv
31020 P2=IC-1+P2
31021 IF ID>6 THEN 31023
31022 IF SC(P2,1,2)<=NV(J,C)*S3 THEN 31250 ELSE 31100
31023 IF ID=9 THEN 31030
31024 A=XT-XF:B=YT-YF:C=ZT-ZF:E=SQR(A*A+B*B+C*C)
31025 X=XF-NV(J,0):Y=YF-NV(J,1):Z=ZF-NV(J,2)
31026 IF SC(P2,1,2)<=-(A*X+B*Y+C*Z)/E THEN 31250 ELSE 31100
31030 A=WC(P2,0)-XF:B=WC(P2,1)-YF:C=WC(P2,2)-ZF
31050 X=WC(P2,0)-NV(J,0)
31060 Y=WC(P2,1)-NV(J,1)
31070 Z=WC(P2,2)-NV(J,2)
31080 IF (A*X+B*Y+C*Z)<=0 THEN 31250
31090 '**** Gen. line
31100 LN*(IL,IB,0)=SOZ(IR-1) '1st point (relative)
31110 LN*(IL,IB,1)=SOZ(IR) '2nd point

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31130      '##### Boundary check
31140      A=SEGZ(IS,6) '1st IL of segment
31150      IF A=>IL THEN 31200
31160      IF(LNZ(A,IB,0)<>LNZ(IL,IB,1) OR LNZ(A,IB,1)<>LNZ(IL,IB,0))THEN31190
31170      LNZ(A,IB,2)=0 'flag=interior line
31180      GOTO 31220
31190      A=A+1:GOTO31150
31200      LNZ(IL,IB,2)=1000 'flag=boundary line
31210      IL=IL+1
31220      IR=IR+1
31230      IF SOZ(IR)<>0 THEN 31100
31240      T=T-1:IF T<=0 THEN I=N
31250      NEXT I
31270      LNZ(IL,IB,0)=0 'flag end of segment's line list
31280      IL=IL+1
31290      NEXT IS
31300      IF ID<9 THEN 33010 'MINMAX
31310      '##### SCREEN PROJECTION & CLIPPING FOR PERSPECTIVE
31320      JC=0:JL=0:IA=-1:IB=-1 'IA=out flag,IB=in
31330      FOR IS= 1 TO AVS-1
31340      '##### copy segment sc
31350      N=SEGZ(IS,0):IF N=0 THEN 32090 ELSE N=DHZ(N,2) 'no. of co.
31360      SEGZ(IS,5)=JC 'keep pointer to clipped sc
31370      FOR IC=SEGZ(IS,3) TO SEGZ(IS,3)+N-1
31380      FOR J=0 TO 2:SC(JC,1,J)=SC(IC,0,J):JC=JC+1:NEXTJ:NEXTIC
31390      F=-1 'init. off-screen flag
31400      '##### start
31410      IL=SEGZ(IS,6):SEGZ(IS,6)=JL 'pointer to line
31420      P1=LNZ(IL,0,0):P2=LNZ(IL,0,1):FLAG=LNZ(IL,0,2)
31430      X1=SC(P1,0,0):Y1=SC(P1,0,1):Z1=SC(P1,0,2)
31440      X2=SC(P2,0,0):Y2=SC(P2,0,1):Z2=SC(P2,0,2)
31450      W1=SY#Z1:W2=SY#Z1
31460      W3=SI#Z2:W4=SY#Z2
31470      T1=0:T2=1:J=1
31480      '##### Screen test
31490      ON J GOTO 31500,31510,31520,31530,31540
31500      A=W1+X1:B=W3+X2:GOTO 31550
31510      A=W1-X1:B=W3-X2:GOTO 31550
31520      A=W2+Y1:B=W4+Y2:GOTO 31550
31530      A=W2-Y1:B=W4-Y2:GOTO 31550
31540      A=Z1:B=Z2
31550      IF A<0 AND B<0 THEN 32070 'off-screen line
31560      IF A>0 AND B>0 THEN 31610
31570      T=A/(A-B)
31580      IF A<0 THEN 31600
31590      IF T>T1 THEN T1=T:GOTO 31610
31600      IF T<T2 THEN T2=T
31610      J=J+1:IF J<=5 THEN 31490
31620      '##### Line clipping & projection
31630      IF T2<=T1 THEN 32070 'garantee the line is off-screen
31640      IF T1=0 AND T2=1 THEN 31830 'line within screen
31650      DX=X2-X1:DY=Y2-Y1:DZ=Z2-Z1
31660      WX=W3-W1:WY=W4-W2
31670      IF T2=1 THEN 31750
31680      X=W1+T2#WX:Y=W2+T2#WY
31690      SC(JC,1,0)=(X1+T2#DX)/X

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31700 SC(JC,1,1)=(Y1+T2*DY)/Y
31710 SC(JC,1,2)=Z1+T2*DZ
31720 P2=JC-SEGZ(IS,5)+1
31730 IF FLAG=>1000 THEN IA=P2 'cutting screen outward point
31740 JC=JC+1
31750 IF T1=0 THEN 31830
31760 X=W1+T1*WX:Y=W2+T1*WY
31770 SC(JC,1,0)=(X1+T1*DX)/X
31780 SC(JC,1,1)=(Y1+T1*DY)/Y
31790 SC(JC,1,2)=Z1+T1*DZ
31800 P1=JC-SEGZ(IS,5)+1
31810 IF FLAG=>1000 THEN IB=P1 'cutting screen inward point
31820 JC=JC+1
31830 LNZ(JL,1,0)=P1:LNZ(JL,1,1)=P2:F=0 'anyway, this Seg is in screen
31840 LNZ(JL,1,2)=FLAG:JL=JL+1
31850 IF IA=-1 OR IB=-1 THEN 32070
31860 '##### Close the clipped surf.
31870 IF SC(IA,0,1)=SC(IB,0,1) OR SC(IA,0,0)=SC(IB,0,0) THEN 32040
31880 IF SC(IA,0,1)=0 THEN I=1:GOTO 31910
31890 IF SC(IA,0,0)=0 THEN I=2:GOTO 31910
31900 IF SC(IA,0,1)=VY THEN I=3 ELSE I=4
31910 IF SC(IB,0,1)=0 THEN J=1:GOTO 31940
31920 IF SC(IB,0,0)=0 THEN J=2:GOTO 31940
31930 IF SC(IB,0,1)=VY THEN J=3 ELSE J=4
31940 IF I=J THEN 32040
31950 ON I GOTO 31960,31970,31980,31990
31960 X=0:Y=0:GOTO 32000 'top-left
31970 X=0:Y=VY:GOTO 32000 'bottom-left
31980 X=VX:Y=VY:GOTO 32000 'bottom-right
31990 X=VX:Y=0 'top-right
32000 LNZ(JL,1,0)=IA:IA=JC-SEGZ(IS,5)+1
32010 LNZ(JL,1,1)=IA:LNZ(JL,1,2)=FLAG+1:JL=JL+1
32020 SC(JC,1,0)=X:SC(JC,1,1)=Y:JC=JC+1 'z is ignored
32025 I=I+1:IF I>4 THEN I=1
32030 GOTO 31940
32040 LNZ(JL,1,0)=IA:LNZ(JL,1,1)=IB 'last closed line
32050 LNZ(JL,1,2)=FLAG+1:JL=JL+1
32060 IA=-1:IB=-1 're-init in-out flag
32070 IL=IL+1:IF LNZ(IL,0,0)<>0 THEN 31420
32080 SEGZ(IS,1)=F '0=vis.,-1=off-screen
32090 NEXT IS
32100 CLAST=JC-1
33000 '##### MIN-MAX:BOX BOUNDARY
33010 ERASE MMX:DIM MMX(10,5)
33020 IS=1
33030 IF SEGZ(IS,1)<>0 THEN 33190
33040 IF IS<>AVS-1 THEN B=SEGZ(IS+1,5)-1 ELSE B=CLAST
33050 A=SEGZ(IS,5)
33055 IF IS=1 THEN IS=0
33060 FOR I=0 TO 1
33070 MMX(IS,I+1)=SC(A,1,0):MMX(IS,I+3)=SC(A,1,1):NEXT
33080 MMX(IS,5)=A: IF IS=0 THEN IS=1:GOTO 33060
33090 FOR IC=A+1 TO B
33100 FOR I=0 TO 1
33110 IF SC(IC,1,I)>MMX(IS,I#2+1) THEN MMX(IS,I#2+1)=SC(IC,1,I)
33120 IF SC(IC,1,I)<MMX(IS,I#2+2) THEN MMX(IS,I#2+2)=SC(IC,1,I)

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33125 NEXT I
33130 IF SC(MMX(IS,5),1,2)<SC(IC,1,2) THEN MMX(IS,5)=IC
33140 NEXT IC
33150 FOR I=0 TO 1
33160 IF MMX(IS,I#2+1)>MMX(0,I#2+1) THEN MMX(0,I#2+1)=MMX(IS,I#2+1)
33170 IF MMX(IS,I#2+2)<MMX(0,I#2+2) THEN MMX(0,I#2+2)=MMX(IS,I#2+2)
33180 NEXT I:MMX(IS,0)=IS
33190 IS=IS+1:IF IS<=AVS THEN 33030
33200 '<<<<<<<<<< SCALE ADJUST FOR ISO. & AXO.
33210 IF ID=9 THEN 33320
33220 XSCALE=1
33230 FOR I=0 TO 1
33240 A=ABS(VX/MMX(0,I#2+1)):B=ABS(VY#VC/MMX(0,I#2+2))
33250 IF A>B THEN A=B
33260 IF XSCALE>A THEN XSCALE=A
33265 NEXT I
33270 IF XSCALE=1 THEN 33320
33280 FOR IC=0 TO ACO-1
33290 FOR I=0 TO 2:SC(IC,1,I)=SC(IC,1,I)*XSCALE:NEXT I
33300 NEXT IC
33310 '<<<<<<<<<< SORT MIN.X
33320 FOR IS=1 TO AVS-2
33330 X=MMX(IS,2):T=MMX(IS,0):I=IS
33340 FOR JS=IS+1 TO AVS-1
33350 IF MMX(JS,2)=>X THEN 33370
33360 X=MMX(JS,2):T=MMX(JS,0):I=JS
33370 NEXT JS:IF I=IS THEN 33400
33380 MMX(I,0)=MMX(IS,0):MMX(I,2)=MMX(IS,2)
33390 MMX(IS,0)=T:MMX(IS,2)=X
33400 NEXT IS
34000 '<<<<<<<<<< HIDDEN LINE ELEMINATION
34010 IV=0
34020 FOR U=1 TO AVS-1
34030 IS=MMX(U,0)
34040 IF SEGZ(IS,0)=0 OR SEGZ(IS,1)<>0 THEN 36340 'abs. linelist
34050 '##### copy sc of is
34060 IC=1:JC=1
34070 IF U=AVS-1 THEN B=CLAST ELSE B=SEGZ(U+1,5)-1
34080 FOR A=SEGZ(IS,5) TO B
34090 FOR I=0 TO 2:SC(JC,0,I)=SC(A,1,I):NEXT I
34100 JC=JC+1:NEXT A:SEGZ(IS,5)=IC
34110 '##### copy line of is
34120 IL=1:JL=1:I=SEGZ(IS,6)
34130 FOR A=0 TO 2:LNZ(JL,0,A)=LNZ(I,1,A):NEXT A 'relative ln-sc
34140 JL=JL+1:IF LNZ(I,1,0)<>0 THEN I=I+1:GOTO 34130
34150 '##### Trace overlap object(is in 0,js in 1)
34160 K=1:V=U
34170 V=V-1:IF V<1 THEN 34190
34180 JS=MMX(V,0):IF MMX(JS,1)>MMX(U,2) THEN 34230
34190 K=2:V=U
34200 V=V+1:IF V>AVS-1 THEN 36340
34210 IF MMX(V,2)=>MMX(IS,1) THEN 36340 'abs. linelist
34220 JS=MMX(V,0)
34230 IF SEGZ(JS,0)=0 OR SEGZ(JS,1)<>0 THEN 34250
34240 IF MMX(JS,4)<MMX(IS,3) AND MMX(JS,3)>MMX(IS,4) THEN 34270
34250 ON K GOTO 34170,34200

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34260 '#### Overlap test
34270 FLAG=1:L1=IL:L=JL 'flag invis.seg.
34280 IF LN%(L1,0,0)=0 THEN 36010 'SURROUND
34290 IF LN%(L1,0,2)<1000 THEN 34430
34300 P1=LN%(L1,0,0):P2=LN%(L1,0,1)
34310 GOSUB 34460 'line1
34320 L2=SE%(JS,6)
34325 I=SE%(JS,5)-1
34330 IF LN%(L2,1,0)=0 THEN 34430
34340 IF LN%(L2,1,2)<1000 THEN 34420
34350 P3=LN%(L2,1,0)+I:P4=LN%(L2,1,1)+I
34360 GOSUB 34510 'cross1
34370 IF T=0 THEN 34420
34380 Z3=SC(P3,1,2):Z4=SC(P4,1,2)
34390 ZI=(Z2-Z1)/(X2-X1)*(X-X1)+Z1
34400 ZJ=(Z4-Z3)/(X4-X3)*(X-X3)+Z3
34410 IF ZI<>ZJ THEN 34440
34420 L2=L2+1:GOTO 34330
34430 L1=L1+1:GOTO 34280
34440 IF ZI<ZJ THEN 34250 ELSE GOTO 34670 'BCLIP
34450 '----- line1 co.
34470 X1=SC(P1,0,0):Y1=SC(P1,0,1):Z1=SC(P1,0,2)
34480 X2=SC(P2,0,0):Y2=SC(P2,0,1):Z2=SC(P2,0,2)
34490 A1=Y1-Y2:B1=X1-X2:RETURN
34500 '----- cross1
34520 X3=SC(P3,1,0):Y3=SC(P3,1,1)
34530 X4=SC(P4,1,0):Y4=SC(P4,1,1)
34540 A2=Y3-Y4:B2=X3-X4
34550 IF B1<>0 THEN 34580
34560 IF B2=0 THEN T=0:RETURN
34570 X=X1:Y=A2/B2*(X-X3)+Y3:GOTO 34640
34580 IF B2<>0 THEN 34600
34590 X=X3:Y=A1/B1*(X-X1)+Y1:GOTO 34640
34600 A1=A1/B1:A2=A2/B2
34610 IF A1=A2 THEN T=0:RETURN
34612 IF A1<>0 THEN 34616
34614 Y=Y1:X=(Y-Y3)/A2+X3:GOTO 34640
34616 IF A2<>0 THEN 34620
34618 Y=Y3:X=(Y-Y1)/A1+X1:GOTO 34640
34620 X=(Y3-A2*(X3-Y1+A1*(X1))/(A1-A2)
34630 Y=A1*(X-X1)+Y1
34640 IF X1>X2 THEN 34642
34641 IF X<X1 OR X>X2 THEN 34656 ELSE 34643
34642 IF X<X2 OR X>X1 THEN 34656
34643 IF X3>X4 THEN 34645
34644 IF X<X3 OR X>X4 THEN 34656 ELSE 34646
34645 IF X<X4 OR X>X3 THEN 34656
34646 IF Y1>Y2 THEN 34648
34647 IF Y<Y1 OR Y>Y2 THEN 34656 ELSE 34649
34648 IF Y<Y2 OR Y>Y1 THEN 34656
34649 IF Y3>Y4 THEN 34651
34650 IF Y<Y3 OR Y>Y4 THEN 34656 ELSE 34652
34651 IF Y<Y4 OR Y>Y3 THEN 34656
34652 T=1:RETURN
34656 T=0:RETURN
34660 '#### Boundary clip

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34670 A1=SP:GOSUB 35040 'tedge
34680 GOSUB 35190 'putl1
34690 IF C=1 THEN GOSUB 35220:GOTO 34730 ELSE P1=JC 'putl2
34700 GOSUB 35090 'crossb
34710 IF T=1 THEN P=C:C=D:D=P:GOTO 34680
34720 GOSUB 35240 'putl3
34730 P1=P2:IF P1=SP THEN 34780 'interior clip
34740 L1=L1+1:IF L1>JL THEN L1=IL
34750 IF LN%(L1,0,2)<1000 OR LN%(L1,0,0)<>P1 THEN 34740 'scan adjac. b-line
34760 P2=LN%(L1,0,1):GOTO 34700
34770 '#### interior clip
34780 L2=SEG%(JS,6)
34790 FOR L1=IL TO JL-1
34800 IF LN%(L1,0,2)=>1000 THEN 34980
34810 P1=LN%(L1,0,0):P2=LN%(L1,0,1)
34820 IF LN%(L1,0,2)>0 THEN D=0:GOTO 34950
34830 GOSUB 35090 'crossb
34840 IF T<>0 THEN 34970
34845 '### project line
34850 A1=0:B1=1:GOSUB 35100 'crossp => horiz.p1-p2
34860 GOSUB34649:IF T=0 THEN 34950
34870 D=SIGN(X-X1)
34880 L2=B2:GOSUB 35100 'crossp
34890 IF D=SIGN(X-X1) THEN D=0 :GOTO 34950
34900 GOTO 34980
34950 GOSUB 35240 'putl3
34960 GOTO 34980
34970 GOSUB 35040'tedge
34972 IF C=1 GOTO 34978
34974 GOSUB 35190:P1=JC:GOSUB 35090 'putl1,crossb
34976 IF T=0 THEN 34980
34978 GOSUB 35200:L=L-1:D=0:GOSUB 35220 'newco,putl2
34980 NEXT L1:GOTO 36270 'nextv
34990 '----- test edge
35000 XX=SC(A,I,1)-SC(B,I,1)
35002 YY=SC(A,I,0)-SC(B,I,0)
35006 IF YY<>0 THEN 35010
35008 IF XX>0 THEN XX=1 ELSE XX=5
35010 IF YY<0 THEN 35020
35012 IF XX>0 THEN XX=2
35014 IF XX=0 THEN XX=3
35016 IF XX<0 THEN XX=4
35018 RETURN
35020 IF XX<0 THEN XX=6
35025 IF XX=0 THEN XX=7 ELSE XI=8
35030 RETURN
35040 A=P1:B=P2:I=0:GOSUB 35000:P=XX
35050 A=P3:B=P4:I=1:GOSUB 35000
35052 P=P-XX:IF P<0 THEN P=P+8
35053 IF P>0 AND P<4 THEN 35060
35054 IF P>4 THEN 35070
35060 C=1:D=0:RETURN 'out
35070 C=0:D=1:RETURN 'in
35080 '----- crossb-crossp
35090 GOSUB 34460 'line1
35100 B=L2

```



```

35110 B=B+1
35120 IF LN%(B,1,0)=0 THEN B=SEG%(JS,6)
35130 IF B=L2 THEN T=0:RETURN
35140 IF LN%(B,1,2)<1000 THEN 35110
35150 P3=LN%(B,1,0):P4=LN%(B,1,1)
35160 GOSUB 34510 'crossl
35170 IF T=0 THEN 35110 ELSE RETURN
35180 '----- put1
35190 LN%(L,0,0)=P1:LN%(L,0,1)=JC:LN%(L,0,2)=LN%(L1,0,2)+C
35200 SC(JC,0,0)=X:SC(JC,0,1)=Y:JC=JC+1:GOTO 35250
35210 '----- put2
35220 LN%(L,0,0)=JC:LN%(L,0,1)=P2:LN%(L,0,2)=LN%(L1,0,2)+D:GOTO 35250
35230 '----- put3
35240 LN%(L,0,0)=P1:LN%(L,0,1)=P2:LN%(L,0,2)=LN%(L1,0,2)+D
35250 L=L+1:RETURN
36000 '***** Surround box test
36010 IF MMX(IS,1)=>MMX(JS,1) AND MMX(IS,3)=>MMX(JS,3) AND MMX(IS,4)<=MMX(JS,4)
    AND MMX(U,2)<=MMX(V,2) THEN A=JS:B=IS:GOTO 36040
36020 IF MMX(IS,1)<=MMX(JS,1) AND MMX(IS,3)<=MMX(JS,3) AND MMX(IS,4)=>MMX(JS,4)
    AND MMX(U,2)=>MMX(V,2) THEN A=IS:B=JS:GOTO 36040
36030 GOTO 34250
36040 I=MMX(A,5) 'point no. of max.Z of the smaller
36050 X1=SC(I,1,0):Y1=SC(I,1,1):A1=0:B1=0
36060 L2=SEG%(B,6):F=0 'side flag:0=1 side
36070 GOSUB 36290 'crossr
36080 W1=X:Z3=SC(P3,1,2):Z4=SC(P4,1,2)
36090 D=X-X1:Z1=(Z4-Z3)*D/(X4-X3)+Z3
36100 GOSUB 36290 'crossr
36110 IF T=0 THEN 36210
36120 IF SIGN(D)<>SIGN(X-X1) THEN 36140
36130 IF ABS(D)<ABS(X-X1) THEN 36100 ELSE 36080
36140 IF F=0 THEN F=1 ELSE 36200
36150 W3=X:Z3=SC(P3,1,2):Z4=SC(P4,1,2)
36160 E=X-X1:ZJ=(Z4-Z3)*E/(X4-X3)+Z3
36170 GOSUB 36290 'crossr
36180 IF T=0 THEN 36210
36190 IF SIGN(E)<>SIGN(X-X1) THEN 36130
36200 IF ABS(E)<ABS(X-X1) THEN 36170 ELSE 36150
36210 IF F=0 THEN 34250 'cut surrounder on 1 side=apart
36220 Z=(ZJ-Z1)*(X1-W1)/(W3-W1)+Z1 'depht of point x1,y1 of surrounder
36230 IF Z=>SC(I,1,2) THEN 36255 'surrounder is behind
36240 SEG%(A,1)=-1 'eleminate the smaller
36250 IF A=IS THEN 36410 ELSE 36270 'nextu else nextv
36255 IF A=JS THEN 34780 'interior clip
36260 '***** nextv
36270 IF L>JL THEN IL=JL:JL=L
36275 GOTO 34250
36280 '----- crossr
36290 T=0
36300 IF LN%(L2,1,0)=0 THEN RETURN
36305 P3=LN%(L2,1,1):P4=LN%(L2,1,2)
36310 GOSUB 34510 'crossl
36320 L2=L2+1:IF T=0 THEN 36300 ELSE RETURN
36330 '***** Absolute line list & viewport transform.
36340 IF SEG%(IS,1)<>0 THEN 36410
36350 SEG%(IS,7)=IV

```

```

36360 FOR I=IL TO L-1
36370 A=LNZ(IL,0,2)
36380 IF A<>0 AND A<>1000 THEN 36400
36390 GOSUB 36470 'vtrans
36400 NEXT I
36410 NEXT U
36420 '<<<<<<< DRAW IMAGE & ENDING
36425 PRINTCHR$(12):BEEP:PRINT"ALREADY....!";:INPUTA
36430 GOSUB 40300 'draw
36440 CONSOLE21,4:LOCATE0,24:PRINT
36450 LINE 21,0:CONSOLE24,1:SF=ID:GOTO 1120
36460 '----- Viewport Transformation
36470 A=LNZ(I,0,0):B=LNZ(I,0,1)
36480 VLX(0,IV)=SC(A,0,0)+VX
36490 VLX(1,IV)=VY-SC(A,0,1)/VC
36500 VLX(2,IV)=SC(B,0,0)+VX
36510 VLX(3,IV)=VY-SC(B,0,1)/VC:IV=IV+1
36520 VLX(0,IV)--1 'flag end of line list
36530 RETURN
40290 '----- DRAWLINE
40300 A=VARPTR(VLX(0,0))
40310 POKE ADD,VAL("&H"+MID$(HEX$(A),3,2))
40320 POKE ADD+1,VAL("&H"+MID$(HEX$(A),1,2))
40325 A=USR3(0):RETURN
40330 '*****
40340 ' ERASE
40350 '*****
40355 GOSUB40360:GOTO1120
40360 X=USR2(0):SF=0:RETURN
40390 '*****
40400 ' REPLAY
40410 '*****
40415 GOSUB40300:GOTO1120

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จุฬาลงกรณ์มหาวิทยาลัย

**** Z-80 ASSEMBLY LIST ****

PAGE= 1

ADRS	OBJECT	OP	OPRAND	COMMENT
6000	00	NOP		
6001	00	NOP		
6002	00	NOP		
6003	00	NOP		
6004	00	NOP		
6005	00	NOP		
6006	00	NOP		
6007	00	NOP		
6008	00	NOP		
6009	00	NOP		
600A	00	NOP		
600B	00	NOP		
600C	00	NOP		
600D	00	NOP		
600E	00	NOP		
600F	00	NOP		
6010	00	NOP		
6011	00	NOP		
6012	00	NOP		
6013	00	NOP		
6014	00	NOP		
6015	00	NOP		
6016	00	NOP		
6017	00	NOP		
6018	00	NOP		
6019	00	NOP		
601A	C7			
601B	00			
601C	7F			
601D	02			
601E	00	NOP		
601F	00	NOP		
6020	C5	PUSH	BC	
6021	E5	PUSH	HL	
6022	210080	LD	HL,8000H	
6025	AF	XOR	A	
6026	83	ADD	A,E	
6027	2807	JR	Z,#+9	#+9=6030H
6029	47	LD	B,A	
602A	115000	LD	DE,0050H	
602D	19	ADD	HL,DE	
602E	10FD	DJNZ	#-1	#-1=602DH
6030	D1	POP	DE	

Z-80 ASSEMBLY LIST

PAGE= 2

ADRS	OBJECT	OP	OPRAND	COMMENT
6031	CB3A	SRL	D	
6033	CB1B	RR	E	
6035	CB3A	SRL	D	
6037	CB1B	RR	E	
6039	CB3A	SRL	D	
603B	CB1B	RR	E	
603D	19	ADD	HL, DE	
603E	C1	POP	BC	
603F	C9	RET		‡ RETURN ‡
6040	2A0460	LD	HL, (6004H)	
6043	ED5B0060	LD	DE, (6000H)	
6047	A7	AND	A	
6048	ED52	SBC	HL, DE	
604A	D26D60	JP	NC, 606DH	
604D	EB	EX	DE, HL	
604E	ED4B0460	LD	BC, (6004H)	
6052	ED430060	LD	(6000H), BC	
6056	220460	LD	(6004H), HL	
6059	2A0260	LD	HL, (6002H)	
605C	ED4B0660	LD	BC, (6006H)	
6060	ED430260	LD	(6002H), BC	
6064	220660	LD	(6006H), HL	
6067	210000	LD	HL, 0000H	
606A	A7	AND	A	
606B	ED52	SBC	HL, DE	
606D	E5	PUSH	HL	
606E	2A0660	LD	HL, (6006H)	
6071	ED5B0260	LD	DE, (6002H)	
6075	A7	AND	A	
6076	ED52	SBC	HL, DE	
6078	110100	LD	DE, 0001H	
6078	015000	LD	BC, 0050H	
607E	D28E60	JP	NC, 608EH	
6081	EB	EX	DE, HL	
6082	210000	LD	HL, 0000H	
6085	A7	AND	A	
6086	ED52	SBC	HL, DE	
6088	11FFFF	LD	DE, FFFFH	
608B	01B0FF	LD	BC, FFBOH	
608E	C5	PUSH	BC	
608F	D9	EXX		
6090	C1	POP	BC	
6091	D9	EXX		

**** Z-80 ASSEMBLY LIST ****

PAGE= 3

ADRS	OBJECT	OP	OPRAND	COMMENT
6092	ED531060	LD	(6010H),DE	
6096	D1	POP	DE	
6097	E5	PUSH	HL	
6098	29	ADD	HL,HL	
6099	220E60	LD	(600EH),HL	
609C	A7	AND	A	
609D	ED52	SBC	HL,DE	
609F	E5	PUSH	HL	
60A0	FDE1	POP	IX	
60A2	A7	AND	A	
60A3	ED52	SBC	HL,DE	
60A5	221660	LD	(6016H),HL	
60A8	E8	EX	DE,HL	
60A9	29	ADD	HL,HL	
60AA	D1	POP	DE	
60AB	220C60	LD	(600CH),HL	
60AE	A7	AND	A	
60AF	ED52	SBC	HL,DE	
60B1	E5	PUSH	HL	
60B2	DDE1	POP	IX	
60B4	A7	AND	A	
60B5	ED52	SBC	HL,DE	
60B7	221460	LD	(6014H),HL	
60BA	D9	EXX		
60BB	2A0060	LD	HL, (6000H)	
60BE	ED580260	LD	DE, (6002H)	
60C2	E5	PUSH	HL	
60C3	CD2060	CALL	6020H	
60C6	D1	POP	DE	
60C7	3E07	LD	A,07H	
60C9	A3	AND	E	
60CA	1E80	LD	E,80H	
60CC	CAD660	JP	Z,60D6H	
60CF	50	LD	D,B	
60D0	47	LD	B,A	
60D1	CB3B	SRL	IX	
60D3	10FC	DJNZ	1-2	1-2=60D1H
60D5	42	LD	B,D	
60D6	D9	EXX		
60D7	D9	EXX		
60D8	3E41	LD	A,41H	
60DA	D3EF	OUT	(EFH),A	
60DC	7E	LD	A,(HL)	

**** Z-80 ASSEMBLY LIST ****

PAGE= 4

ADRS	OBJECT	OP	OPRAND	COMMENT
60DD	B3	OR	E	
60DE	77	LD	(HL),A	
60DF	3E01	LD	A,01H	
60E1	D3EF	OUT	(EFH),A	
60E3	D9	EXX		
60E4	FDE5	PUSH	IY	
60E6	E1	POP	HL	
60E7	CB7C	BIT	7,IY	
60E9	C23961	JP	NZ,6139H	
60EC	7C	LD	A,H	
60ED	B5	OR	L	
60EE	CA3961	JP	Z,6139H	
60F1	2A0260	LD	HL,(6002H)	
60F4	ED5B1060	LD	DE,(6010H)	
60F8	19	ADD	HL,DE	
60F9	220260	LD	(6002H),HL	
60FC	CB7A	BIT	7,IY	
60FE	CA1661	JP	Z,6116H	
6101	ED5B0660	LD	DE,(6006H)	
6105	E5	PUSH	HL	
6106	A7	AND	A	
6107	ED52	SBC	HL,DE	
6109	E1	POP	HL	
610A	D8	RET	C	
610B	ED5B1860	LD	DE,(6018H)	
610F	A7	AND	A	
6110	ED52	SBC	HL,DE	
6112	D8	RET	C	
6113	C32861	JP	6128H	
6116	ED5B0260	LD	DE,(6002H)	
611A	2A0660	LD	HL,(6006H)	
611D	A7	AND	A	
611E	ED52	SBC	HL,DE	
6120	D8	RET	C	
6121	2A1A60	LD	HL,(601AH)	
6124	A7	AND	A	
6125	ED52	SBC	HL,DE	
6127	D8	RET	C	
6128	D9	EXX		
6129	09	ADD	HL,BC	
612A	D9	EXX		
612B	ED5B1660	LD	DE,(6016H)	
612F	CB7A	BIT	7,IY	



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 ภาควิชาการศึกษานานาชาติ

ADRS	OBJECT	OP	OPRAND	COMMENT
6131	CA3F61	JP	Z,613FH	
6134	FD19	ADD	IY,DE	
6136	C33F61	JP	613FH	
6139	ED5B0E60	LD	DE,(600EH)	
613D	FD19	ADD	IY,DE	
613F	DDE5	PUSH	IX	
6141	E1	POP	HL	
6142	CB7C	BIT	7,IX	
6144	C27961	JP	NZ,6179H	
6147	7C	LD	A,H	
6148	B5	OR	L	
6149	CA7961	JP	Z,6179H	
614C	2A0060	LD	HL,(6000H)	
614F	23	INC	HL	
6150	220060	LD	(6000H),HL	
6153	EB	EX	DE,HL	
6154	2A0460	LD	HL,(6004H)	
6157	A7	AND	A	
6158	ED52	SBC	HL,DE	
615A	D8	RET	C	
615B	2A1C60	LD	HL,(601CH)	
615E	A7	AND	A	
615F	ED52	SBC	HL,DE	
6161	D8	RET	C	
6162	D9	EXX		
6163	CB3B	SRL	IX	
6165	3003	JR	NC,#+5	#+5=616AH
6167	CBFB	SET	7,IX	
6169	23	INC	HL	
616A	D9	EXX		
616B	ED5B1460	LD	DE,(6014H)	
616F	CB7A	BIT	7,IX	
6171	CA7F61	JP	Z,617FH	
6174	DD19	ADD	IX,DE	
6176	C37F61	JP	617FH	
6179	ED5B0C60	LD	DE,(600CH)	
617D	DD19	ADD	IX,DE	
617F	C3D760	JP	60D7H	
6182	3E41	LD	A,41H	
6184	D3EF	OUT	(EFH),A	
6186	3E00	LD	A,00H	
6188	2100B0	LD	HL,8000H	
618B	77	LD	(HL),A	

**** Z-80 ASSEMBLY LIST ****

PAGE= 6

ADRS	OBJECT	OP	OPRAND	COMMENT
618C	110180	LD	DE,8001H	
618F	01FF3F	LD	BC,3FFFH	
6192	EDB0	LDIR		
6194	3E01	LD	A,01H	
6196	D3EF	OUT	(EFH),A	
6198	C9	RET		* RETURN *
6199	3E01	LD	A,01H	
619B	D3EF	OUT	(EFH),A	
619D	C9	RET		* RETURN *
619E	3E00	LD	A,00H	
61A0	D3EF	OUT	(EFH),A	
61A2	C9	RET		* RETURN *
61A3	2A1E60	LD	HL,(601EH)	
61A6	23	INC	HL	
61A7	7E	LD	A,(HL)	
61A8	CB7F	BIT	7,IX	
61AA	C0	RET	NZ	
61AB	2A1E60	LD	HL,(601EH)	
61AE	110060	LD	DE,6000H	
61B1	010800	LD	BC,0008H	
61B4	EDB0	LDIR		
61B6	2A1E60	LD	HL,(601EH)	
61B9	110800	LD	DE,0008H	
61BC	19	ADD	HL,DE	
61BD	221E60	LD	(601EH),HL	
61C0	CD4060	CALL	6040H	
61C3	C3A361	JP	61A3H	
61C6	E6F1	AND	F1H	
61C8	E9	JP	(HL)	
61C9	F1	POP	AF	
61CA	C9	RET		* RETURN *
61CB	00	NOP		
61CC	C9	RET		* RETURN *
61CD	00	NOP		
61CE	7F	LD	A,A	
61CF	23	INC	HL	
61D0	A9	XOR	C	
61D1	23	INC	HL	
61D2	C9	RET		* RETURN *

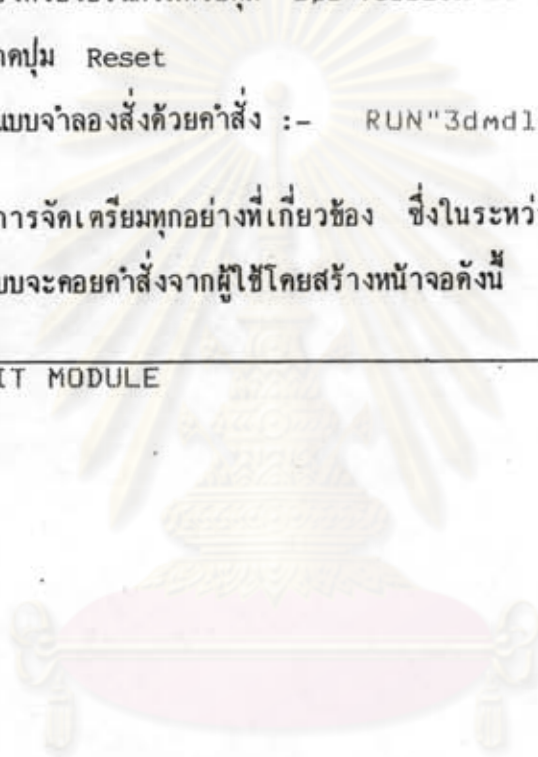
ภาคผนวก ข

ตัวอย่างการใช้งานแบบจำลอง

แบบจำลองประกอบด้วยโปรแกรมหลักภาษาเบสิก 3 โปรแกรม คือ "3dmdlr.A"
"3dmdlr.B" และ "3dmdlr.C" ซึ่งเก็บในแฟ้มข้อมูลจานแม่เหล็ก การใช้งานจะต้องทำการ
บูท (Boot)ระบบเครื่องด้วยโปรแกรมควบคุม DQS version 28 K โดยการเสียบแผ่นจาน
แม่เหล็กดังกล่าว แล้วกดปุ่ม Reset

การใช้งานแบบจำลองสั่งด้วยคำสั่ง :- RUN"3dmdlr.A"

ระบบจะทำการจัดเตรียมทุกอย่างที่เกี่ยวข้อง ซึ่งในระหว่างนั้นจะบอกให้ผู้ใช้คอย
เมื่อเสร็จเรียบร้อยระบบจะคอยคำสั่งจากผู้ใช้โดยสร้างหน้าจอดังนี้

3-D INPUT-EDIT MODULE

ศูนย์วิทยทรัพยากร จุฬาลงกรณ์มหาวิทยาลัย
Type command or TAB for menu selection, and RETURN (/=cancel.) COMMAND :

การป้อนข้อมูลใช้คำสั่ง assign โดยใส่เป็นตัวย่อเช่น a ก็ได้ ระบบจะแสดง
อัตราส่วนจอภาพให้ทราบ เพื่อให้เปลี่ยนแปลงถ้าต้องการ

เมื่อเคาะ RETURN ถือว่าไม่มีการเปลี่ยนแปลงระบบจะให้เลือกชนิดวัตถุว่าจะเป็น
BOX, PRISM หรือ PYRAMID

สมมติเลือก BOX ระบบจะถามสัดส่วนตามแกนทั้งสามดังนี้

Q: 0 X: -316..316 Y: -176..176 scale=1: 1

box

Dimension in x,y,z=_

สมมุติตอบไปดังนี้

Dimension in x,y,z= 50,70,120

ระบบก็จะถามตำแหน่งดังนี้

Location of bottom-left point(x,y,z)=_

สมมุติตอบเป็นจุด 0,0,0 จากนั้นระบบจะถามความเอียงในรูปของการหมุนรอบแกนดังนี้

Rotation(x/y/z,degree)=_

สมมุติตอบว่า z,25 ก็หมายถึง หมุนรอบแกน z ไป(ตามเข็มนาฬิกา) 25 องศา จากนั้นระบบ
ก็จะวนถามความเอียงไปจนกว่าผู้ใช้จะเคาะ RETURN เจย ๆ สมมุติผู้ใช้ไม่ระบุความเอียงอีก
ระบบก็จะคำนวณสร้างข้อมูลและตอบรับเป็นภาพดังนี้

3-D INPUT-EDIT MODULE

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จุฬาลงกรณ์มหาวิทยาลัย



box

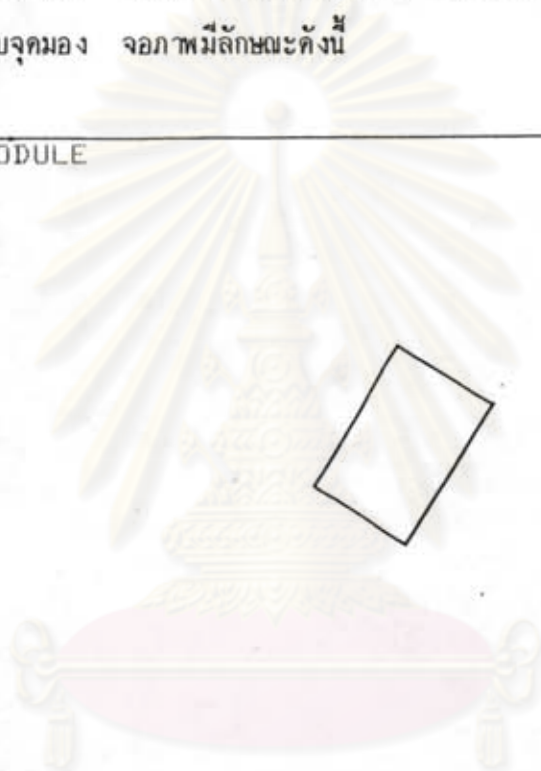
จากนั้นระบบก็จะถามว่าผู้ใช้ต้องการเพิ่มข้อมูลอีกหรือไม่ ถ้าผู้ใช้เลือกการเพิ่มข้อมูล ระบบก็จะกลับไปรอคำสั่ง 2 บันทึกสุดท้ายของจอภาพจะเป็นดังนี้

assign :new dimension & location of choosen object
COMMAND :

บันทึกครั้งสุดท้ายจะแสดงคำสั่งปัจจุบัน พร้อมด้วยคำอธิบายโดยย่อ

ต่อไปสมมติใช้คำสั่ง view ระบบก็จะนำไปโปรแกรมส่วนสร้างทัศนียภาพขึ้นมาทำงาน แล้วรอรับข้อมูลเกี่ยวกับจุดมอง จอภาพมีลักษณะดังนี้

3-D VIEWING MODULE



PERSPECTIVE

Eye point in coordinate or degree(c*/d) _

เมื่อเคาะ RETURN เลข ก็หมายถึงจะระบุจุดมองเป็นค่าพิกัดระบบจะถามดังนี้

View from point(x,y,z)=_

สมมติเลือกจุด 0,-800,250 ระบบก็จะถามจุดแสดงทิศทางการมองดังนี้

View destination in coordinate or degree or origin(c/d/o*)_

เมื่อเคาะ RETURN เลขจะหมายถึงมองไปยังจุดกำเนิดแกนพิกัด จากนั้นระบบจะสร้างทัศนียภาพ แล้วแสดงออกมา ระหว่างนั้นจะบอกข้อมูลเกี่ยวกับการมองดังนี้

PERSPECTIVE view from 0, -800, 250 to 0, 0, 0
เมื่อกำหนดการสร้างภาพเสร็จสิ้นลง ก็จะแสดงออกมาดังนี้

3-D VIEWING MODULE



view :display parallel or perspective view
COMMAND :

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ประวัติผู้เขียน

นายธารพันธ์ ทีปะศิริ เกิดเมื่อวันที่ 12 มีนาคม พ.ศ. 2495 ที่จังหวัดพระนครศรีอยุธยา สำเร็จการศึกษาปริญญาสถาปัตยกรรมศาสตรบัณฑิต จุฬาลงกรณ์มหาวิทยาลัย เมื่อ พ.ศ. 2520 ได้เข้าศึกษาต่อในระดับปริญญาโทบัณฑิต สาขาวิทยาศาสตร์คอมพิวเตอร์ จุฬาลงกรณ์มหาวิทยาลัย เมื่อ พ.ศ. 2524

ปัจจุบันทำงานในตำแหน่งผู้ช่วยหัวหน้าส่วนคอมพิวเตอร์ บริษัทไทยประกันชีวิต จำกัด



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย