YET ANOTHER VERSION OF MINI-GD3.

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ABSTRACT

This note describes the implementation of CERN portable graphics package mini GD3 / PIGS on DEC VT125 terminals and the Versatec electrostatic plotter.

INTRODUCTION

Mini-GD3 / PIGS is a portable, general purpouse graphics package written entirely in FORTRAN. It has been available in a batch-oriented version on the large IBM mainframe at CERN for several years. Thanks to the earlier effort 1 the MGD3/PIGS package is also available in an interactive version on the LINAC office computer for TEKTRONIX 4105 terminals.

The new implementation is intended to facilitate a large degree of device independence for graphics applications.

The implementation consists of three different device dependent object libraries and one common library;

VD:[7,7]MGD3.OLB for TEKTRONIX 4105 terminals,
LB:[7,11]VT125.OLB for DEC vt125 terminals and
LB:[7,11]VERSATEC.OLB for Versatec plotters.
LB:[7,11]PEP.OLB Common library with user coordinate spec. (CPUWIN) and character plotting (CPSYM) routines.

USER COORDINATE SYSTEMS.

With the Versatec plotter and mini-GD3 it is now possible to create plots with known size and aspect ratio. This is accomplished through a call to the new subroutine

CPUWIN(XMIN, XMAX, YMIN, YMAX).

XMIN leftmost user coordinate, REAL XMAX rightmost - " - , REAL YMIN lowermost - " - , REAL YMAX uppermost - " - , REAL

The coordinates XMIN, XMAX etc. are all given in centimeters and must lie in the interval [0-26] cm for the X-direction and [0-18] cm for the Y-direction. This creates

a window (XMIN-XMAX) cm wide and (YMAX-YMIN) cm high with its lower left hand corner at XMIN, YMIN. The routine also set the virtual coordinate system so that the lower left hand corner of the window is 0.0, 0.0 and the upper right hand corner is (XMAX-XMIN), (YMAX-YMIN). Since CPUWIN sets both screen window and virtual coordinate window it should be FOLLOWED by a call to CPVWIN if you want another virtual coordinate system than the default.

It is possible to save the current setting of the coordinate transformation (screen window, virtual window, scaling, transposition and rotation) and later restore it for further use. This could be used for example if you wanted to switch between several different windows on the display screen. The routines for saving and restoring the current state of the 2-dimensional coordinate transformation are;

CPTMS2(T)
CPTMR2(T)

T must appear in a dimension statement i.e: DIMENSION T(6).

Or if you are drawing in three dimensions use:

CPTMS3(U)
CPTMR2(U)

Where U is dimensioned as an array of 12 floating point numbers i.e:

DIMENSION U(12)

An effort has been made to ensure that the aspect ratio of pictures produced by different devices is the same. This means that pictures will normally not cover the entire screen on the vt125 resp. the whole paper on a plot from versatec.

DRAWING SOFTWARE CHARACTERS.

Since software generated characters are the only ones that will be reproduced the same on different output devices it is recomended that these are used when writing code that will be used on more than one kind of display. In order to simplify the writing of software characters in different sizes and orientations we supply a subroutine which prints a string of software characters;

CPSYM(X,Y,ROT,SIZ,STRING,LEN)

X X-coordinate of starting point for string, REAL
Y Y-coordinate - " - , REAL
ROT rotation in radians, REAL
SIZ character size scale factor, REAL

STRING character array, CHARACTER

LEN number of characters in string, INTEGER

SIZ is the size scale factor with size 1.0 corresponding to characters 5.0 mm high and 3.0 mm wide. After a call to CPSYM rotation, scaling and translation are unchanged.

POLYGON FILLING

This feature has been brought over to the versatec from the earlier Tektronix 4105 implementation. For details see 1. To fill a polygon bounded by vertices at (x0,y0) through (xn,yn) use the following call sequence:

CALL CPCOLO(iarg)
CALL CPPBG2(x0,y0,IBORDR)
CALL CPDRW2(x1,y1)
CALL CPDRW2(x2,y2)
...
CALL CPDRW2(xn,yn)
CALL CPPEND

THE CAPTUREFILE.

First a short description of MGD3 capture files. The capturefile consists of a number of 16 bit values called items. The three most significant bits of every item are called the item code and the remaining 13 are the item value. Item code 0 is used to indicate a special control operation. Item codes 2 through 5 are used for draw and move instuctions, in this case the item value gives the coordinate (in the range 0 to 8191). Item codes 6 and 7 are unused.

If the item code is zero then the item value indicates what operation to perform:

ITEM VALUE: OPERATION: No operation (used for padding). Next page (or frame, or picture). Set line width, the next item contains the line width. Set window, followed by 5 values: IXMIN, IXMAX, IYMIN, IYMAX, IWIDTH - Not implemented.

These are additions to the capturefile facility.

10	Specify color, nex item same as argument to CPCOLO.
11	Begin panel, followed by x and y co- ordinates and border argument; 1 if border of fill area is visible, 0 if it is invisible.
12	End panel.

The capturefile generation is controlled by calls to CPCAP (for details see 2), and a previously written capturefile can be read by CPREP (capturefile REPlay). Capturefiles can be generated with all three versions of

MGD3 for later replaying on any type of device supported. Note however that the panel and area filling features are not available on the VT125 terminal.

Once a capturefile has been created it can immediately be plotted on a terminal or plotter by the use of one of three programs; VTPLOT, DECPLOT and TEKPLOT. These programs can be found in directory [7,11]. All three programs assume that the capturefile is called PLOTFILE.DAT and is in your current directory. After the file has been plotted it is deleted. If several versions of the file PLOTFILE.DAT exists they will all be plotted and later deleted starting with the most recent.

DESCRIPTION OF CHANGED ROUTINES

The following routines have a different interpretation in this implementation than in the earlier versions of mGD3.

- CPIN Reads one line of input on the vt125.
 Null function with Versatec.
- 2. CPCOLO(I), TVCOLO(I) These routines are used to set background colors (fill patterns) for area filling (panels). They work in a way similar to the same routines in the Tektronix implementation. Only background colours are supported. That is, the high bit of the argument should be one and the three low-order bits designate what fillpattern to use.
- 3. CPPBG2(X,Y,IB), CPPBG9(IX,IY,IB), TVPBG9(IX,IY,IB) Start area fill mode. the X and Y (or IX and IY) give the first point of the polygon covering the area to be filled. IB is a flag that indicates if the border of the area is visible or not (IB=zero => border invisible). Not avalable in the vt125 implementation.
- CPPEND, TVPEND ends area fill mode, plotting now works as usual. Not avalable in the vt125 implementation.
- 5. CPLW(I) Sets line width or brightness to I. I is between 1 and 5 on the Versatec plotter and between 0 and 3 on the vt125. Color 0 (black) on the VT125 can be used to selectively erase previously drawn lines.

USER ROUTINES FOR COORDINATE SYSTEMS

There has been added some FORTRAN routines for coordinate systems. They may be found in the library LB:[7,11]PEP.OLB. They are

SCAXIS(X,Y,ANGLE,AXLEN,ZMIN,ZMAX,ZSTR,STRLEN)

Draws scaled axis with step in [1,2,4,5,8,10,20]. User window should be saved before the call and restored after the use of the axis.

X, Y Position for axis, REAL

ANGLE Direction of axis (deg.) (horizontal=0., vertical=90.), REAL

AXLEN Length of axis (cm), REAL

ZMIN Min. value for axis, REAL

ZMAX Max. value for axis, REAL

ZSTR Units for axis, CHARACTER

STRLEN Length of ZSTR, > 0 for text above axis else < 0., INTEGER

AXIS(X,Y,ANGLE,AXLEN,ZMIN,ZMAX,ZSTR,STRLEN)

Draws scaled axis. User window should be saved before calling and restored when finished. Parameters as before.

HEADNG(STR, LEN)

Draws heading for coordinate system. Should be called before call to AXIS, SCAXIS or FRAME.

STR String, CHARACTER
LEN Length of STR, INTEGER

FRAME(X,Y,XAXIS,XMIN,XMAX,XSTR,XLEN, YAXIS,YMIN,YMAX,YSTR,YLEN)

Draws a rectangular coordinate system. User window should be saved before calling and restored when finished.

X.Y Position for coordinate system, REAL XAXIS Length of x-axis (cm), REAL Min. value for x-axis, REAL MIMX XMAX Max. value for x-axis, REAL Units for x-axis, CHARACTER XSTR XLEN Lenght of XSTR, INTEGER YAXIS Length of y-axis (cm), REAL Min. value for y-axis, REAL YMIN Max. value for y-axis, REAL YMAX YSTR Units for y-axis, CHARACTER YLEN Lenght of YSTR, INTEGER

FRAME 1 (XMIN, XMAX, XSTR, XLEN, YMIN, YMAX, YSTR, YLEN, HEADNG, LEN)

Draw one frame in one plot. User window should be saved before calling and restored when finished.

MIMX Min. value for x-axis, REAL Max. value for x-axis, REAL XMAX XSTR Units for x-axis, CHARACTER Lenght of XSTR, INTEGER XLEN Min. value for y-axis, REAL MIMY Max. value for y-axis, REAL YMAX YSTR Units for y-axis, CHARACTER YLEN Lenght of YSTR, INTEGER HEADNG Heading for frame, CHARACTER LEN Length of HEADNG, INTEGER

FRAME2(XMIN, XMAX, XSTR, XLEN, YMIN, YMAX, YSTR, YLEN, HEADNG, LEN, FRAME)

Draw two frames in one plot. User window should be saved before call for first frame and restored when that frame is finished. The second frame may then be used in the same manner.

MIMX Min. value for x-axis, REAL XMAX Max. value for x-axis, REAL XSTR Units for x-axis, CHARACTER Lenght of XSTR, INTEGER XLEN Min. value for y-axis, REAL MIMY YMAX Max. value for y-axis, REAL YSTR Units for y-axis, CHARACTER YLEN Lenght of YSTR, INTEGER HEADNG Heading for frame, CHARACTER Length of HEADNG, INTEGER LEN FRAME Frame nb 1 or 2, INTEGER

POST SCRIPTUM

This paragraph describes some incompatibilities with earlier versions of GD3.

The inclusion of area fill in the versatec library made it necessary to add the following common area to that library:

COMMON /CPCPF/IFILL, XC(100), YC(100), IBORDR

Where IFILL is a counter of vertices in the fill area border encountered (IFILL = 0 means area filling off), XC and YC are arrays holding the coordinates of the polygon bounding the fill area and IBORDR is a flag indicating if the border of the fill area is visible (IBORDR = 0 means the border is invisible).

There is a new subroutine called CPPSTR that is only for internal use by MGD3.

The following routines are not supported in the new implementation.

- 1. CPVCUR
- 2. CPSCUR

REFERENCES

- 1. PS/LI/Note 85-5 U. Raich
- DD Writeup, MGD3 documentation
 User Guide VT125, EK-VT125-UG-001

Distribution

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