LA-UR-81-2265

TITLE: PLOT2K: A GRAPHICS INTERFACE TO SYSTEM 2000

AUTHOR(S): LARRY CREEL

MASTER

SUBMITTED TO: ASTUTE Conference, New Orleans
September 1981



University of California

LOS ALAMOS SCIENTIFIC LABORATORY
Post Office Box 1663 Los Alamos, New Mexico 87545
An Affirmative Action/Equal Opportunity Employer

Form No. 836 R3
St. No. 2629
12/78

UNITED STATES
DEPARTMENT OF ENERGY
CONTRACT W-7405-ENG. 36

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

# PLOT2K
# A GRAPHICS INTERFACE TO SYSTEM 2000

by

Larry Creel

## ABSTRACT

PLOT2K is an interactive graphics interface to the System 2000 data base management system. It runs on a CDC 6600 computer with an NOS or NOS/BE operating system. The graphics package used is DISSPLA. PLOT2K will generate bar chart histograms, pie charts, or x-y point plots and will access any System 2000 data base.

Session 25F
Data Base and Business Products Committee
Title: PLOT2K - A Graphics Interface to System 2000
Speaker: Larry Creel, Los Alamos National Laboratory

INTRODUCTION

PLOT2K is an interactive graphics interface to the System 2000 data base management system. It was developed at the Los Alamos National Laboratory and runs on a Control Data Corporation 6600 computer. This graphics interface provides a simple means of plotting data contained in a System 2000 data base.

The plot file created by PLOT2K is a device-independent file containing MAPPER commands. MAPPER is a utility routine for making plots that was developed at the Los Alamos National Laboratory. It uses the DISSPLA graphics package marketed by ISSCO Corporation. An enhancement to increase the portability of PLOT2K will generate the plot file in DISSPLA rather than MAPPER. This enhancement will come after PLOT2K has been sufficiently tested to ensure that is is debugged.

PLOT2K offers its users several advantages. It is easy to use, requiring no knowledge of programming or of a graphics language. It generates a variety of plots, either in black and white or colors that can be mixed by the user for different intensities. The data to be plotted is conveniently stored in a data base, which eliminates typographical errors and makes data retrieval easy. Finally, PLOT2K is modularized and structured for ease of enhancement and modification.

USING PLOT2K

PLOT2K is based on a feature of System 2000, the SUBMIT command, that allows a user to issue a System 2000 retrieval language command through a Fortran or COBOL program. The user invokes the subroutine SUBMIT and passes it a character string that is the natural language command to be executed. The user retrieves data from the data base through a series of commands that cause x and y values to be placed in a disk file. A PLOT2K graph is generated from this data and from data submitted by the user. SUBMIT is available exclusively on Control Data Corporation computers with the NOS and NOS/BE operating systems. A sample run of PLOT2K is given in the Appendix.

Before using PLOT2K, the user must have a file called S2KCOM in his local file space. S2KCOM must contain the syntactically correct System 2000 LIST commands that cause the correct x and y values to be listed. All other files are created by PLOT2K.

PLOTS AVAILABLE FROM PLOT2K

PLOT2K can produce bar charts, x-y point plots, and pie charts. Interaction with the user is kept to a minimum, and error checking for valid input is performed on each user response. The format required for user response is displayed immediately above where the response is to be entered. The convention for formatting is an X for a character, an I for an integer, and an R for a real decimal number. (See example in the Appendix.) Prompts from PLOT2K are kept as short as possible while their clarity is still maintained.

Bar Chart Histograms

Column bar charts with up to 12 bars per graph are easily created. A limit of 12 was chosen because a plot with more than 12 bars begins to become crowded and 12 is a useful number when data for the months of the year is to be displayed.

A schema showing the areas on the graph that are controlled by the user is given in Fig. 1. The user is able to determine not only the graphic data in these areas but their color as well.

The Main Title area, shown in Fig. 1, allows for three lines of text. The Plotted Data area will contain the histograms. Columns were chosen because rows would not allow as much plotting area on which to draw the bars. The Plot Box and Tick Labels are grouped together because they will be the same color; the same applies to X and Y Axis Titles. For all areas, PLOT2K automatically sizes and centers the text data.

An enhancement currently underway will allow for 12 pairs of bars to be drawn so that comparisons between pairs of data can be more effectively displayed (see Fig. A-2 in the Appendix).

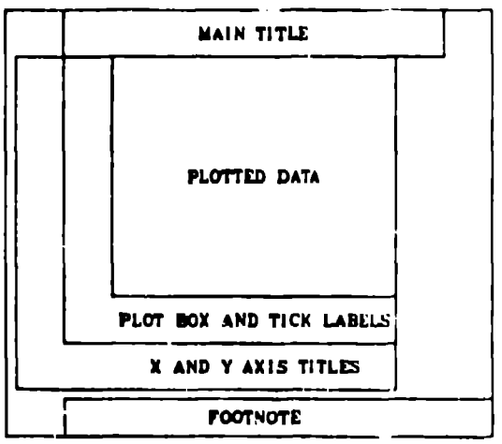


Figure 1. Bar Chart Histograms, Plot Regions

x-y Point Plots

An x-y point graph will allow up to five plots per axis, each of which can be a different color. MAPPER uses five types of line-drawing formats: solid, dot, dash, chain dot, and chain dash. The limit was set at five, because beyond five the plot will try to display more data than it is able to do effectively.

The schema for the x-y point plot is given in Fig 2. All areas are the same as in the histogram schema. The new area called Legend will contain data only if more than one plot is drawn on the axis. In that event, there will be an entry in the legend describing each plot on the axis.

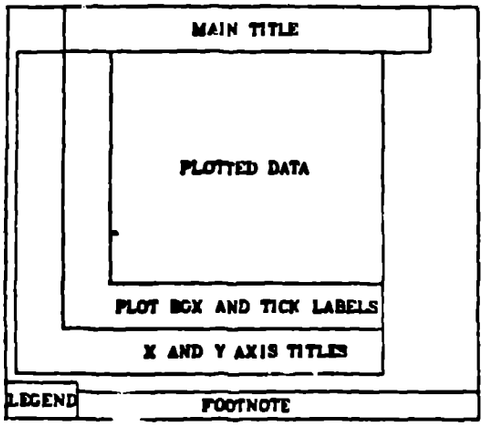


Figure 2. x-y Point Plots: Plot Regions

ie Charts

A pie chart can contain up to 12 sections, each of hich may be the same or a different color. The schema or the pie chart is given in Fig. 3. The Main Title id Footnote areas are the same as in the histogram and y plots. The two areas named Labels each contain ots for up to 11 labels. The pie is divided into ctions with the largest section centered at -90°. A ector is drawn from each section to the label identiing the section. Labelling begins with the lower ot in the right Labels area and continues with each ccessive slot until the mid-point of a section ceeds 90°. At this time, labelling is picked up with e top slot in the left Labels area and continues un- l the last section has been labelled. Note that ter the first section has been entered as the pie, e order in which subsequent sections are entered is material. The size of each section is determined by at percentage of the whole it represents. PLOT2K lculates the percentage automatically.

An enhancement being considered would allow a user specify a particular section of the pie to be reved a small distance from the whole pie for tention-getting purposes.

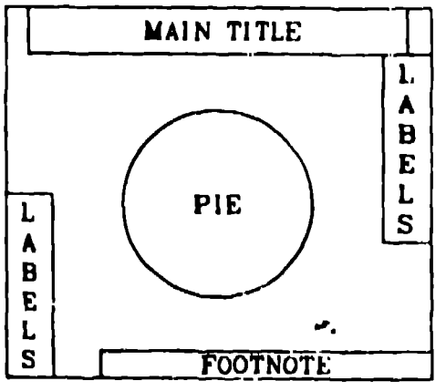


Figure 3. Pie Charts: Plot Regions

DULES OF PLOT2K

PLOT2K is composed of six modules, for ease of lification and enhancement as well as for minimizing amount of memory required at any one time. A procedure file containing job control statements controls the execution of each module.

1. Information Gathering Module

From the user, Module 1 interactively obtains the information PLOT2K needs about the System 2000 data base and the plot labels to generate the plot file. The data obtained is written to disk files that will be read by other modules.

2. Edit Module

Module 2 permits users to modify any existing disk files used by PLOT2K. An option available to users will allow them to skip Module 1 and go directly to Module 2, where they may modify files that were used in a previous run of PLOT2K. This option can be a real timesaver, when only the plotted data changes or only the labels change.

3. System 2000 Command Generating Module

Module 3 reads output files created by Modules 1 and 2. From the information obtained, it writes a file containing System 2000 commands to retrieve data from the data base.

4. System 2000 Interface Module

Module 4 passes the commands from the System 2000 command file written by Module 3 to System 2000. This program is listed in its entirety in Fig. 4. The one delicate area for error handling is the processing of the System 2000 commands. By using a command file, any error that occurs can be easily traced simply by examining the command file and the error file generated by System 2000.

An alternate method of tracing an error in the command file is to invoke System 2000 interactively and have it execute the command file. Any errors will be reported by System 2000; if the problem is a lack of output from System 2000, that, too, will be obvious.

```
      program prog4(instrt,tape9=instrt)
      dimension kardi(8)


   10 continue
      read (9,30) kardi
   30 format (1x,8a10)
      if (eof(9).ne.0.) go to 80
      call submit (kardi,rtncd)
      go to 10
   80 continue



      rewind 9
      stop
      end
```

Figure 4. Program Listing for Module 4

5. x-y Data Managing Module

The output file generated by System 2000 in Module 4 consists of x and y axis values. Module 5 reads this file and writes the x and y values to separate files in a format that Module 6 expects.

6. Plot Generating Module

Module 6 reads the file generated by the previous

odules and creates a device-independent plot file. At his time, the procedure allows the user to branch back o Module 1 or Module 2 (to create another plot) or ex-t.

ONCLUSION

PLOT2K is a versatile tool for generating graphs rom a System 2000 data base. Its chief virtue is the se with which it can be used, modified, and developed. is makes the graphics plot accessible to a wide range users and allows it to be altered to suit a wide nge of needs.

ACKNOWLEDGEMENTS

PLOT2K was created to satisfy the requirements for a Masters degree from the Department of Computer Science, University of New Mexico. I wish to thank Karl J. Melendez, who sponsored me in this undertaking, and R. F. Hults, who realized the need for an interface such as PLOT2K and suggested I use it for my masters project. Both men are staff members in the Computing Division at the Los Alamos National Laboratory.

---

## APPENDIX

## SAMPLE RUN OF PLOT2K

A sample run of PLOT2K is given below. This run generated the bar chart shown in Fig. A-1.

**the following is a listing of the input file the user is required to have in his local file space.**

```
list,f=s2kcom
 LIST C300, C345 WH C200 EQ LASL
 AND (C300 EQ CYBER 73 OR C300 EQ CDC 6600
 OR C300 EQ VAX,4M,FPA OR C300 EQ VAX,1.5M)
 AND C100 EQ
 LABMK14;
 EOI ENCOUNTERED.
/

-s2kpl
  X  WILL PLOT FILE GO TO MICROFILM OR TEKTRONIX ? (M/T)
? m
                 WELCOME TO
            SYSTEM 2000 PLOTTING

FOR THE FOLLOWING FILE NAMES INDICATE WHETHER YOU
HAVE THE FILE ALREADY (H), WANT TO CREATE THE FILE (C),
OR WANT A DESCRIPTION OF THE FILE (D)

  X  PS2KA & PS2KB  (H/C/D)
? c
  X  PS2KC          (H/C/D)
? c
  X  PS2KD          (H/C/D)
? c
  X  S2KOPT         (H/C/D)
? c
  X   DOES FILE NAMED S2KCOM EXIST AS LOCAL FILE ? (Y/N)
? y
### CREATE S2KOPT ###

  XXXXXXXXXX  DATABASE NAME ?
? benchmk
  XXXXXXXXXX  DATABASE PASSWORD ?
? kathy
  X   PLOT TYPE ? ( LINE, BAR, PIE )
? b
  X  IS X-AXIS DATA ALPHANUMERIC OR NUMERICAL ? (A/N)
? a
  X  IS Y-AXIS DATA ALPHANUMERIC OR NUMERICAL ? (A/N)
? n
  X  REPLACE S2K ORDERING COMPONENT IDENTIFIERS ? (Y/N)
? n
```

```
*** CREATE PS2KA & PS2KB ***

  (80 CHARACTERS)  TOP LINE OF TITLE
? example plot of plt2k
  (80 CHARACTERS)  MIDDLE LINE OF TITLE
? data portrayed is rates for solving
  (80 CHARACTERS)  BOTTOM LINE OF TITLE
? an integer arithmetic monte carlo code
  (80 CHARACTERS)  FOOT NOTE
? example footnote
  (80 CHARACTERS)  X AXIS TITLE ( HORIZONTAL )
? los alamos computers
  (80 CHARACTERS)  Y AXIS TITLE ( VERTICAL )
? cpu run times in seconds
  X  WANT A SHADED FONT ?
? n
  X   BLACK & WHITE OR COLOR SLIDE ? (B/C)
? c
  X   WANT DEFAULT COLORS ? (Y/N)
? n
COLOR CHOICES (RED,GREEN,BLUE,YELLOW,MAGENTA,CYAN,WHITE,EXOTIC)
FIRST LETTER SUFFICIENT (R,G,B,Y,M,C,W,E)

  X   MAIN TITLE COLOR ?
? c
CYAN    CHOSEN.

  X   PLOTTED DATA  COLOR ?
? w
WHITE   CHOSEN.

  X   PLOT BOX AND TICK LABELS COLOR ?
? y
YELLOW  CHOSEN.

  X   AXES TITLES COLOR ?
? m
MAGENTA CHOSEN.

  X   FOOT NOTE COLOR ?
? c
CYAN    CHOSEN.

ENTERING EDIT PHASE

  X  LOOK, MODIFY, OR END ? (L/M/E)
? e
ARE YOU FINISHED MAKING PLOTS ?
? yes
RETURN(MAPBN,EMAPN,TEKIN,TEKOUT,MCOL)
/get,mapper/un=library
/-mapper
```

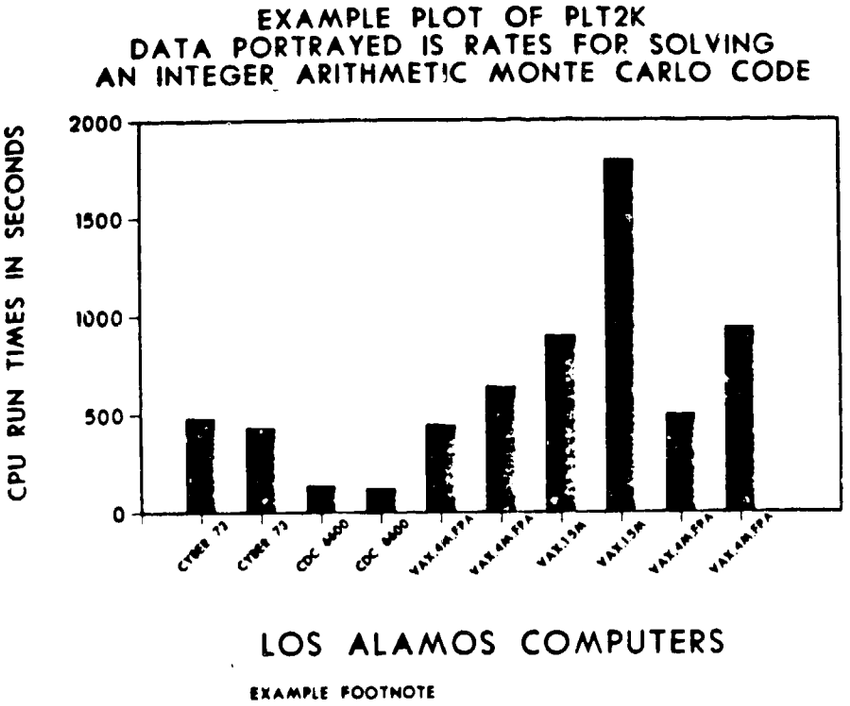


Figure A-1. Bar Chart Generated by the Sample Run

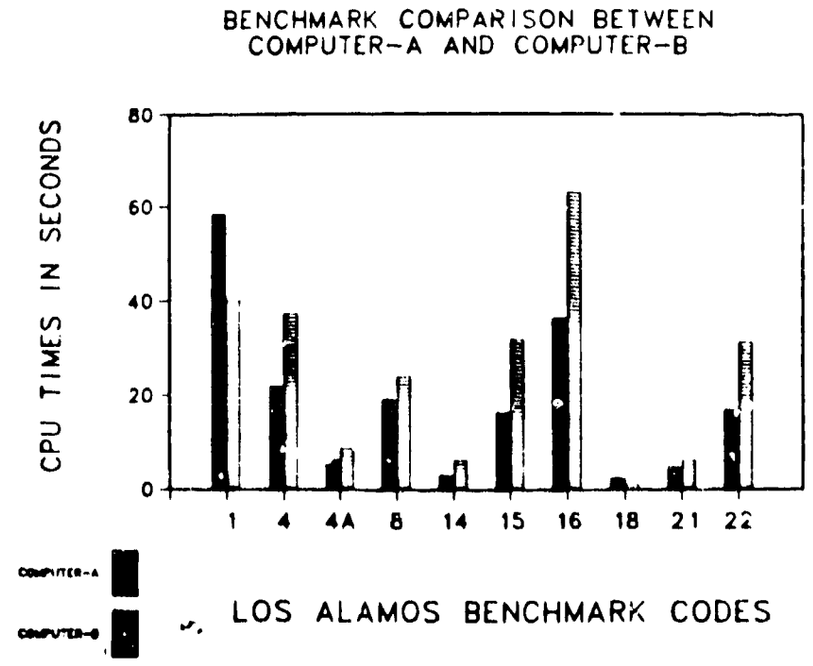


Fig. A-2 Bar Chart Using Pairs of Bars