ABSTRACT

With about 2000 papers published in the SUGI Proceedings over the past eight years, it is easy to overlook useful ideas and code. Programmers working in many different disciplines grapple with the same problems - how to do preliminary data checking, how to determine what statistical procedures are appropriate for analysis, how to select tables or graphs for effective presentation of the data. Size and structure of the dataset or database can add another dimension to the problem. Many of the presentations made at SUGI describe particular solutions to such issues.

This paper provides an annotated bibliography of published SUGI presentations focusing on applications for exploratory data analysis, that is, data checking and presentation. Frequently, more than one presentation has been made for what is essentially the same problem. In this paper, presentations addressing the same issues have been grouped together. This review should not be construed as a complete review of the Proceedings; it is intended to illustrate some of the resources available to the SAS programmer.

INTRODUCTION

This bibliography is the result of an extensive review of the SUGI Proceedings from 1985 - 1990. All papers in the Proceedings were at least looked at to select the material in this paper. Papers were selected for inclusion in this bibliography if they dealt with graphics. A further requirement was that enough code to run the program be included in the paper and that the code be written using only SAS procedures. This was done because it is not always possible to contact an author to get a copy of the code and not everyone will have all of the different software products used in an application. Mapping applications, although frequently thought of as graphical in nature were excluded. Use of color was not addressed explicitly in this bibliography even though many of the referenced papers discussed color. This decision was made because many graphs ultimately end up published and/or photocopied. These media are still predominantly black and white. If the graph's message depends on color, then its impact will be lost when it is published. Finally, papers that focused on presenting material available directly from SAS manuals were generally not referenced here.

Since all of the material presented in this bibliography has been taken from the SUGI Proceedings, a non-standard reference procedure has been used. The paper title is presented in all capital letters. Authors are listed on a separate line (in capital letters) followed by the notation:

yy.pppp

where yy is the year in which the Proceedings were published and pppp is the first page of the paper. Annotations elaborating on material covered in the paper follow on the next lines.

Eleven subheadings have been provided to help group papers on similar topics together. Since papers often deal with several topics and one person's perception of what is important differs from another's, it is recommended that this bibliography be used only as a starting point in finding helpful programming tools in the Proceedings.

BASIC GRAPHING SKILLS

AN INTRODUCTION TO SAS/GRAPH SOFTWARE FOR NEW OR NERVOUS USERS

HOWARD 90.0147

Illustrates simple processes to move from tabular reports to concise graphical displays. Examples include code to produce tables or plots with varying levels of options (line plots, bar charts, 3D bar charts, and pie charts).

EFFECTIVELY GRAPPLING WITH GRAPHICS

POTTER 90.0193 and 89.0194

Discusses principles of producing well-designed graphs. Illustrates improvements in clarity that can result from using options in GPLOT and GCHART.

PC SAS/GRAPH WORKSHOP: USING SAS/GRAPH TO PLOT AND ANNOTATE DATA

STRAND & KANCIRUK 89.0982

Begins with a simple plot and goes through 11 steps to complete a more elaborate figure.
PRODUCING MULTIPLE GRAPHS USING MACROS - 60% CODE REDUCTION
REMSBURG 89.1166
Use of macros to create standardized line plots. The title and Y variable are changed using macro variables.

SAS/QC AND SAS/GRAPH AN EFFICIENT AND EASY WAY TO ANALYZE PRODUCT CHARACTERISTICS AND CAPABILITIES
MCHENRY 88.0231
Describes use of PROC CAPABILITY in SAS/QC to produce distribution plots. Also has an example bar chart.

CUSTOMIZING GRAPHICS FOR TECHNICAL REPORTS USING SAS/GRAPH SOFTWARE - PART I
SINGER & BOBIK 88.0795
Provides code to begin with a default bar chart and produce a customized chart including several options. Graphs not illustrated in the paper.

PLOTTING BEYOND DEFAULTS
POTTER 88.1323
Discusses features of GPLOT and GCHART. Begins with simple plots using defaults and adds options.

MANAGEMENT GRAPHICS IN A QUALITY ASSURANCE ENVIRONMENT
MCLELLAND 87.1005
Includes code for 6 graphs: bar, horizontal bar, line plot, 3D chart, map, and a company logo.

MULTIPLE PLOTS PER PAGE

A TUTORIAL ON SAS/IML GRAPHICS
BINKLEY 90.0109
Describes graphics primitives and how to create customized routines within IML. The example produces a line plot and 2 bar charts with pie chart insets on a single page.

BUILDING AN EXECUTIVE CHARTBOOK USING THE SAS SYSTEM WITH EXAMPLES OF NEW SAS/GRAPH SOFTWARE FEATURES
BULKLEY 85.0244
Includes code to make 6 graphs (line plots, bar charts, 3D plot, and map) and plot them on a single page.

MULTIPLE Y AXES PER PLOT

THE GPLOT PROCEDURE: QUICK TRICKS FOR THE NEW USER
CARPENTER 89.0591
Discusses the addition of points coordinated with symbol statements to produce multiple Y axes on a single plot. Varying levels of complexity are presented.

SAS GRAPHICS COMPETITION WINNER: BEST PRESENTATION OF DATA - COLOR
BLAZEK & SCOTT 88.1477
Several sets of pairs of 3D and contour plots from a response surface analysis are plotted on the same page.

THE SAS SYSTEM: AN AID IN CARING FOR THE PREGNANT DIABETIC PATIENT
KROURY ET AL. 89.1049
Provides code to place a Y axis on the right and one on the left and plot both sets of data using a single X axis.

USING PROC GREPLAY'S TEMPLATE FACILITY TO ROTATE MULTIPLE PLOTS PER PAGE IN BATCH COMPUTING
GEREND & RAFTERY 88.0370
Describes how to use template in PROC GREPLAY.

MULTIPLE PLOTS ON TWO PAGES
REMSBURG 88.0782
Gives code to put multiple Y variables on a single plot using a single X axis legend.

SAS GRAPHICS COMPETITION WINNER: BEST PRESENTATION OF DATA - MONOCHROME
DAILY PERFORMANCE REPORT FOR TUESDAY, FEBRUARY 14, 1989
YEN 89.1686
Provides code to generate a report consisting of 1 page of statistics and company logo and 1 page with multiple line plots.
USING AXIS AND LEGEND STATEMENTS
BULKLEY 86.0215
Has 4 examples and code. The 4th example has 4 Y axes on the left with one X axis.

LABELING

ENHANCING SAS/GRAPH OUTPUT WITH THE ANNOTATE FACILITY
FIRST 90.0203 and 89.0204
Describes how to use ANNOTATE for text placement, symbol placement, line drawing, polygon construction, map labeling, custom legends, and line types.

IF AN AXIS IS TOO LONG FOR THE PAGESIZE=, LINESIZE=, HSIZE= OR VSIZE= OPTIONS ...
FANELIZE ROUTINES
REPOLE 90.0656
Provides a macro to create multiple pages for a single chart. Splitting is done so that the final chart can be put together easily.

CREATING CUSTOM SYMBOLS WITH THE GFONT PROCEDURE
BLETTNER 88.0705
Gives code to create a number of symbols including male and female figures, cross, flower, square, star, a variety of arrows, and card symbols.

CREATING BAR CHARTS WITH CUSTOMIZED CHARTING SYMBOLS
POVERS & MARTIN 88.0777
Illustrates creation of bar charts using a stacked character rather than a bar. Code is given to create a fish symbol.

FINETUNING AND ENHANCING PLOTS

DISPLAYING MULTIPLE GRAPHIC OUTPUT
HITCH 90.0697
Explains the importance of calculating cell size to avoid lettering distortions due to rotations, etc.

AN AUTOMATED, INTELLIGENT ALGORITHM FOR GPLOT PROCEDURE AND PLOT PROCEDURE GRAPHICS
AXIS SCALING
MURTO 90.1150
Provides macro code to produce uncluttered axes with ‘nice’ endpoints so that data fills 70-80% of the plot area with 4-5 major ticks and some minor ticks.

JITTERING AND OTHER GRAPHICS MACROS FOR EXPLORATORY DATA ANALYSIS
MUHLBAIER 87.0916
A macro is presented so that points can be randomly moved slightly so that they don’t lie exactly on one another.

MEASURING DATA VARIABILITY
GEHM 86.0187
Includes a discussion on how to select ‘bin width’ for charts, that is, the bar width limits when the data are continuous.

ENHANCING SAS/GRAPH PROCEDURE OUTPUT WITH THE ANNOTATE FACILITY
KELLY 86.0978
Includes examples of preparing tables, developing custom interpolations with shading, and drawing maps with embedded bar charts.

ADDING STATISTICAL INFORMATION TO PLOTS

ERROR BARS WITH LINE GRAPHS AND BAR CHARTS
SHAW & MOST 90.1419
Code to put error bars on line plots and bar charts is given. Additionally, the code removes overlapping bars from line plots.

ENHANCING THE VISUAL IMPACT AND CLARITY OF GRAPHICS OUTPUT USING THE CUSTOMIZING POWER OF THE ANNOTATE= DATA SET
HESEL 89.0623
Gives code to use ANNOTATE to place labels at key points on a plot without knowing that location beforehand. One example shows how to add vertical bars identifying the mean and +/- 1 standard deviation to a line plot.

ANNOTATE WITH THE GGRAPH, GCHART AND GMAP PROCEDURES – USING THE DATA SYSTEMS
FRIEBEL 88.1332
Describes how to use ANNOTATE. One application takes percentile information from PROC UNIVARIATE to put bands on a scatter plot.

A FLEXIBLE MEAN-STANDARD ERROR PLOT: MACRO PROGRAM
SULLIVAN & YUH 87.0503
Presents code to plot means with non-overlapping standard error bars.

INDIVIDUALIZED REPORTING USING PROC CHART
BERNHOLC 85.0156
Uses PROC CHART to report an individual’s test score which is compared to a scale of scores corresponding to response types (e.g., normal, high).

BOX PLOTS

USING SAS/GRAPH SOFTWARE TO DISPLAY
BOX-WHISKER PLOTS
SCOTT 87.0455
Box plots using SAS/GRAPH software

Olmedo 85.0888

Multivariate, similarity and cluster plots

SAS Graphics Competition Winner: Most Creative Use of the Software - Color

Simularity Matrices

Mercer 90.1584

Provides code to produce 2D or 3D displays of similarity matrix data using GMAP. Code to draw the information as a contour plot is also included.

Using SAS/GRAPH software to create enhanced dendrograms

Buckner & Lotz 89.1363

Includes code to take cluster output and create dendrograms, using GPLOT.

Using SAS software to quantify dissimilarity among environmental samples

Rinehart 87.1053

Describes a statistical procedure to classify groups of multivariate data by dissimilarity rather than similarity. Includes code to plot the analysis parameters.

Assessing relationships among multivariate data points by transforming them into 2-d curves

Croy 86.0806

Includes code to draw Andrew's curves. These are plots of multivariate data represented by an alternating sin - cos function.

Advanced graphic skills and unusual plots

Using SAS/GRAPH software to analyze student study habits

Wallace 90.0674

Gives an example of using ANNOTATE= datasets to create a bar chart with an unequal number of bars per group.

Making more with less - inventing the three-dimensional pie chart using release 5.16 of SAS software

Werts 90.0702

Uses PROC GMAP to create a 3D pie chart.

SAS Graphics Competition Winner: Best Presentation of Data - Color

Larson-Miller Parameter plot of creep-rupture data

Stowe 90.1573

Provides code to create a complex graph which measures a response (creep-rupture) occurring as a function of a continuous variable (time) at a variety of values for a fixed variable (temperature). An inset describes the general form of the plot.

SAS Graphics Competition Winner: Best Presentation of Data - Monochrome

The 'Black Holes' of power

Iannacchione 90.1580

Includes code for power calculations for proportions. The information is plotted onto publication quality graphs.

You too can produce and customize complex graphs using the annotate facility and the GSLIDE procedure with release 6.03 of SAS/GRAPH software

Lovell 89.0629

Describes a complex set of 2 bar charts with 5 sets of bars each using reflected scales to put 2 types of information in each set. A combination of ANNOTATE and GSLIDE were used.

Horizontal contour lines using the G3D procedure

Carpenter 88.0382

Provides code for a macro to place Z-coordinate isopleths on 3D figures.

SAS Graphics Competition Winner: Most Creative Use of the Software - Monochromatic

Gibes 88.1500

Spider plot code.

PROC GREPLAY -- developing a presentation that your users will appreciate

Booth 87.0168

Discusses using GREPLAY to organize pictures and create templates. Some suggested templates include triangular, multiple, and book templates.

Graphical presentation of product pricing

Rose & Morvitz 87.0474

Provides code to draw economic data for which certain line intersections form the boundaries for an inset graph.

SAS/GRAPH: Data analysis, presentation graphics, or pretty pictures?

Marshall 87.0534

Includes ANNOTATE code to make bar charts with blank spaces rather than frames and grid markings and to make dot charts.
GRAPHIC DISPLAY OF DATA IN CLINICAL TRIALS

OVEN 87.0920
Provides ANNOTATE and GLOT/GCHART code to draw (1) bar chart with error bars, (2) scatter plot with regression line, (3) line plot with target range, (4) 1 Y variable and 2 X axis panels, (5) 2 Y variables with 1 X axis, and (6) 4 panels with target ranges.

USING SAS SOFTWARE GRAPHICAL PROCEDURES FOR THE OBSERVER AGREEMENT CHART

BANGDIVALA & BRYAN 87.1083
Provides a detailed discussion of all steps used to create an observer agreement chart including listings of the data sets at each step. An actual program listing is not included, however.

AN INTRODUCTION TO SAS/IML SOFTWARE, AN INTERACTIVE MATRIX LANGUAGE

EATON 86.0923
Includes a 3D graph as an example.

CREATIVE USES OF PROC CREPLAY

KALT 86.0985
Includes creative template design (3D box, book), multiple graphs per page, combination of text and graphics, use of zooming/rotating.

SAS GRAPHIC MACROS FOR PRODUCING 2-DIMENSIONAL AND 3-DIMENSIONAL STEP-GRAPHS

FELSOVALYI 85.0799

'PROC GMAP' AS A PRODUCTIVITY AID IN SEMICONDUCTOR DEVICE MANUFACTURING

WASLACK & HENDRIX 85.0898
Uses GMAP and GCHART to draw plots for data collected on a field or grid where the number or intensity of some variable is measured in each grid area.

FREEHAND DRAWING

SAS/GRAPH SOFTWARE MEETS THE LOGO TURTLE

FRIENDLY 90.0645
Provides code to emulate the Logo graphics package to draw objects. Macros allow for relative moves and draws and also for the creation of simple shapes that can be called recursively.

THE DATA STEP GRAPHICS INTERFACE

WALKER 89.0561
Describes a SAS interface to the graphics subroutine library that can be used in the data step.

SAS GRAPHICS COMPETITION WINNER: MOST CREATIVE USE OF THE SOFTWARE - COLOR

O'BRIEN & SHEPARD 88.1491
Created SAS ANNOTATE macros to draw schematics.

THE WILD SIDE OF THE ANNOTATE FACILITY

KELLY 87.0008
Includes code for adding color and complexity to basic geometric designs, filling in areas, drawing truly round circles. No pictures.

MISCELLANEOUS

SAS GRAPHICS COMPETITION WINNER: MOST CREATIVE USE OF THE SOFTWARE - MONOCHROME

SEVEN SHUFFLES

KANN 90.1590
Tracks the location of an object in repeated selections using a card deck as the example.

SAS GRAPHICS COMPETITION WINNER: MOST CREATIVE USE OF THE SOFTWARE - MONOCHROME

WORF 89.1707
This program produces a calendar with Julian dates.

EXPLORING THE MANDELBROT SET

PATALOCCHI & SCHLADENHAUFFEN 87.0929
The Mandelbrot set was generated using Fortran (code included), then read into SAS and plotted using an ANNOTATE data set.

DISCLAIMER
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