

SAS/GRAPH® - Dressing up an Old Workhorse

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Abstract

SAS/GRAPH® has a long history of being able to generate a large quantity of output by using automated techniques like by-group processing and programmatic annotation. Although data could be clearly presented using GCHART, GPLOT, GMAP etc. the resulting output has long been criticized as being 'unimpressive' by desk-top publishing standards.

The advent of html and Web technology has helped to change the way people relate to information. Web publishing and the need to generate graphs for data warehouse applications has given new life to an old reliable work horse.

This paper will demonstrate some of the design principles and techniques that help to make Web-enabled SAS/GRAPH® not only a work horse but also a contender in the race for better visualization of qualitative information. Work from the development of a browser based intranet data warehouse application (DSSI - Decision Support System Intranet) will be used as examples. Emphasis will be given to the design principles used to display information and the techniques using a mixture of Web technologies and SAS/GRAPH® that produce the results.

Introduction

The focus of this paper is on selected techniques for optimizing the presentation of SAS/GRAPH® output on a web page rather than techniques to enhance the graphs themselves. There are several sources available to help you in this area from SAS and from prior SEUGI and SESUG proceeding that are too numerous to mention here. The techniques described apply to static page design and are accomplished with simple html. Only the SAS macros that support web publishing are required. These are available on the SAS web site www.sas.com. The techniques presented are only a small sample of the principles that make for effective presentation of information but they greatly enhance the usefulness of SAS/GRAPH® and can be expanded.

Page Design and Layout

What is page design and why it is important

Page design is important for several reasons. The web page is the medium to communicate a message. Your intended audience should determine both the content and layout of the page. Obviously a web page can be a link to the world and affect readers perceptions of your organization. A web page could also be used internally to display content that helps analysts or decision makers understand the intricate details of their business.

Page design and layout applies to both paper and electronic presentation. It should be understood that electronic presentation differs in the following ways. Reduced resolution is encountered in electronic presentation of information. Modern color printers can easily exceed 720 X 720 dots per inch, however video displays often have a resolution limited to 640 X 480 pixels for the entire screen. Because of differences in transmission speeds a web page may display in 10 seconds on a directly networked workstation but take 1 to 2 minutes on a modem connected device. Both of these consideration are important in making page design and layout compromises.

Key elements of web page design

Here are some of the key elements and general rules of page design. There are several sources of page design information available on the Web. Reusing the design of pages that are already published is probably the easiest way to create a web application.

- ◆ Limit text centric pages to 100-500 words.
- ◆ Use a Headline, rule, or image every 40-100 words.
- ◆ Keep pages from two to four screens (at 640X480 resolution).
- ◆ Keep page size between 45KB and 65KB including images. This reduces display time.
- ◆ Have first screen of text and key images appear in about 10 seconds. The need to support modem connections would affect this design consideration.
- ◆ Have two to four thematic colors be dominant.
- ◆ Have no more that three fonts in graphics and text.
- ◆ The background should show on at least 75% of the page.

- ♦ Use minimal background graphics and text color should not be close to any background color.
- ♦ Text and Graphics should be consistent in mood and theme.
- ♦ Strive for overall balance and attractiveness in page design.

SAS/GRAPH Data Ink

SAS/GRAPH® supplies the “data ink” content of the graphic component of a page. The size and placement of graphs is important in overall presentation of information. SAS/GRAPH® procedures supply the markers, lines, bars and map elements for presenting the data. Titles, Header, Footer and descriptive text need not to be included in the graphic output but presented as part of the html for the web page itself.

Principle of Small Multiples

What are small Multiples

“Multiple images reveal repetition and change, pattern and surprise – the defining elements in the idea of information” states Edward R. Tufte in his 1997 book Visual Explanations. High density graphs can be reduced drastically in size and can still exhibit the patterns that allow detailed analysis. Having several of these graphs on the same virtual page allows for an instant visual analysis of large amounts of information.

Examples of the principle of small multiples include comparison of a measure over a common horizontal time-scale. The example presented latter in the paper shows hospital admissions by service trended over time. The different cells contain information about a clinical service of admission.

Another example would be a graphic such as a map with different cells representation progressive time periods of the same geographic image with a common analysis variable. Hospital admissions by county with different cells showing progressive time periods would be an example.

Key elements of small multiples

Information presented as small multiples create strongly visual comparative analysis of multivariate data. A virtual page of shrunken high-density graphics contains very little “non-data-ink” and is efficient in interpretation. The use of html tables that reference image files on a web page make the display of small multiples manageable.

SAS/GRAPH® fit for the task

SAS/GRAPH® is well suited to produce graphs that are part of a multiple small image design. Images used in creating small multiples focus on the part of the display used to represent data. This means that annotation, and titles and footnotes are not needed in the image. Even axis components of a graph may be kept to a minimum or eliminated. By group processing is very efficient in generating the multiple images. The SAS/GRAPH® code should focus on the presentation of the data and create images that are compact and can be resized with limited loss of information.

Web limitations and limits of design

Multiple image documents have an impact on display speed of web pages. To keep the access time to a minimum several design elements have to be considered.

The file size of the individual images need to be as small as possible. Reduce the number of colors in the images and use gray scale when possible. This focuses the attention on the hierarchy of the variable being measured and help avoid turning the display into a visual puzzle.

The total effectiveness of viewing multiple images is the ability to encompass a large amount of information into a single scan of a page. Therefore the greatest effectiveness of this design will be experienced when the need to scroll is reduced.

Tables and Graphs Together

When to table and when to graph

Small data sets are usually better presented in a table rather than a graph. A general rule of thumb is that 20 number or less work best in tables and graphics should be reserved for the display of large data sets. The use of html tables and web publishing tools makes this an easy choice to implement.

Using both to satisfy diverse needs

Sometime it is beneficial to show data as a table and a graph. This allows a quick visual representation of trends and detailed portrayal of the numbers. With a planned layout this can be accomplished easily on the same web page.

Example with code

The examples below demonstrate the use of the web publishing tools provided by SAS. The code for generating the graph is not shown, however a portion of the resulting html code is . The %DS2HTM macro is used to create the table display from a SAS data set. Please note that the title includes the html reference for the graphic image generated by SAS/GRAPH®. The complete documentation for the macro can be found in the Web Publishing Tool section of the SAS web site.

Example SAS code to generate html:

```
filename file "sasgraph.gif";
GOPTIONS device=gif gsfname=file
gsfmode=replace ...;

/* Plot without titles or footnotes */
TITLE; FOOTNOTE;

PROC GPLOT Data=mydata ...;

/*Titles for html page */
Title ...;

/*Title statement contains image
reference */

Title4 "<FONT SIZE=+3><CENTER>
<IMG SRC=sasgraph.gif>
</CENTER></FONT>";

/*SAS dataset to html macro */
%ds2htm(runmode=b,
        htmlfile=myspage.html,
        data=mydata,
        ...);
```

Html example:

```
<HTML>

<HEAD>
  <META NAME="GENERATOR"
    CONTENT="SAS Institute Inc. HTML
    Formatting Tools, http://www.sas.com/">
</HEAD>

<BODY>

<CENTER>
  ...

  <FONT SIZE=+3><CENTER>
  <IMG SRC=sasgraph.gif>
  </CENTER></FONT>

</P>

<TABLE BORDER=1 WIDTH=80%
  ALIGN=CENTER CELLPADDING=1
  CELLSPACING=1>
  <TR>
    ...
  </TR>
```

Conclusion

The ideas in this paper are building blocks to create web pages that make use of the power of SAS/GRAPH® to present information. The ideas represent just a step out of the starting gate into the larger world of information visualization. For example, the small multiple images could be a linking point to a full web page with a detailed graph or table. This drill-down could link to a pre-generated html document or an interactively generated one using SAS/IntrNet® or CGI Script processing.

SAS/GRAPH® with its ability to create automated 'data-ink' content provides an efficient and meaningful way to create visual displays of information. SAS/GRAPH® teamed with a well designed web page is a work horse of a different color.

North Carolina Baptist Hospital

NCBH ADMISSIONS

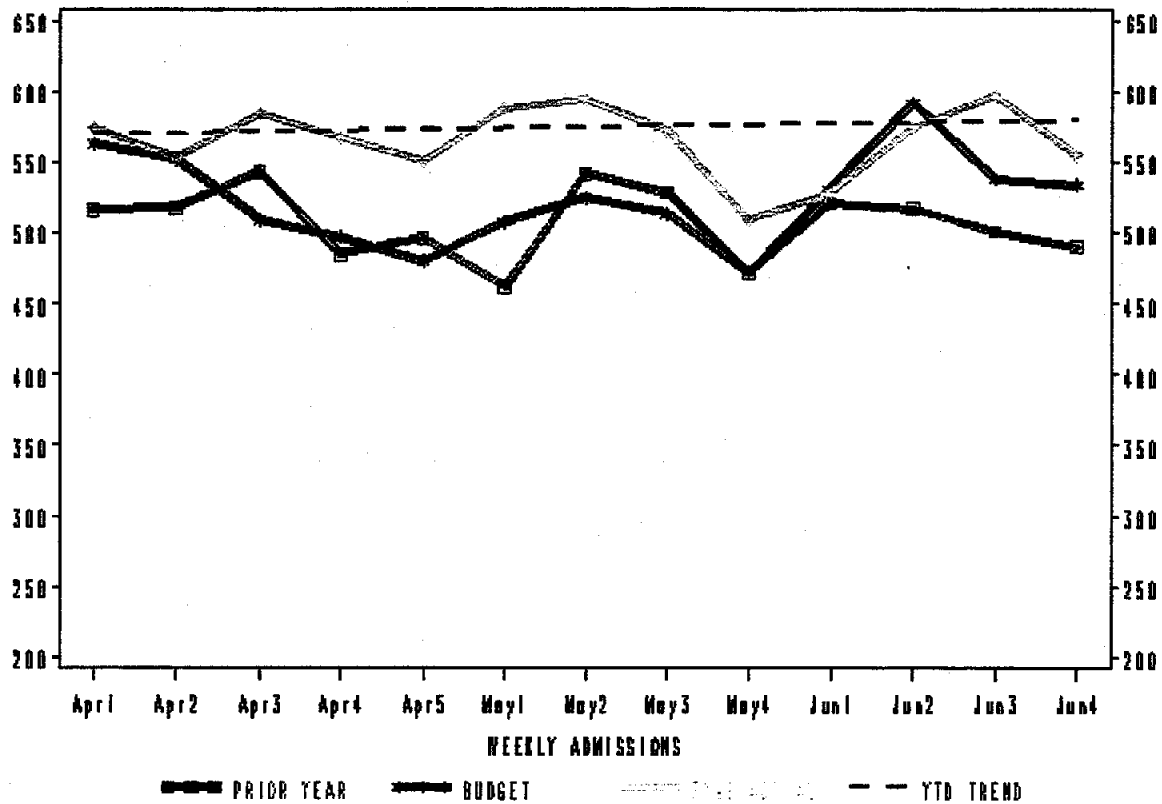


Figure 1

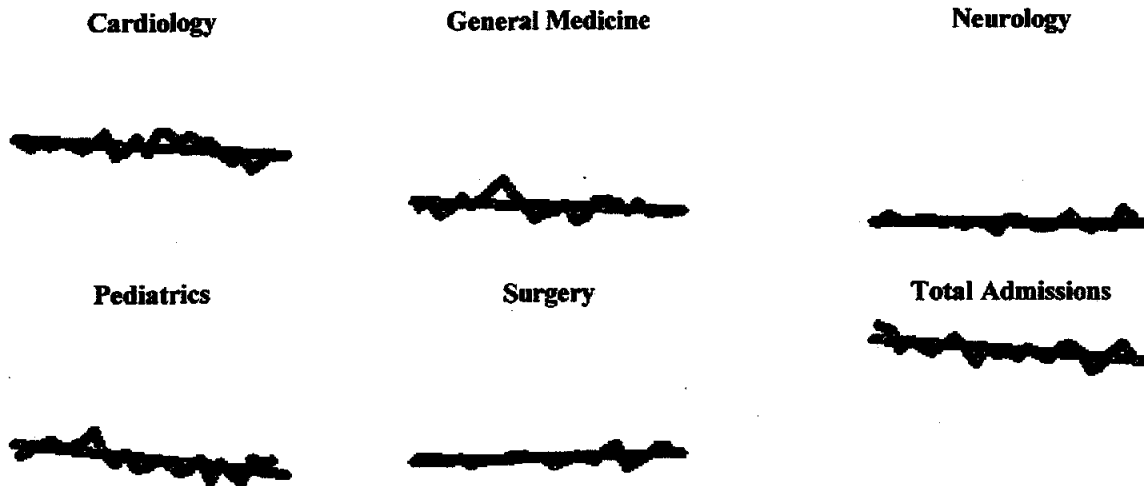
Figure 2

WEEK ID	PRIOR YEAR	1998 WKLY ACUTAL	1998 WKLY BUDGET	VARIANCE %	1998 YTD ACUTAL	1998 YTD BUDGET
Apr1	525	563	532	6	22245	21401
Apr2	529	547	485	13	22792	21886
Apr3	548	574	551	4	23366	22437
Apr4	492	565	551	3	23931	22988
Apr5	502	544	544	0	24475	23532

...

Example of small Multiples

Admission for 1st Quarter by week



References

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Acknowledgments

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Tung Mui Lau-Merrill of Comp-Aid Consulting provided the material for the coding example in the Tables and Graphs Together section of the paper.

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