

Paper 129-27

Web Enabling Your Graphs With HTML, ActiveX, and Java Using SAS/Graph® and the Output Delivery System

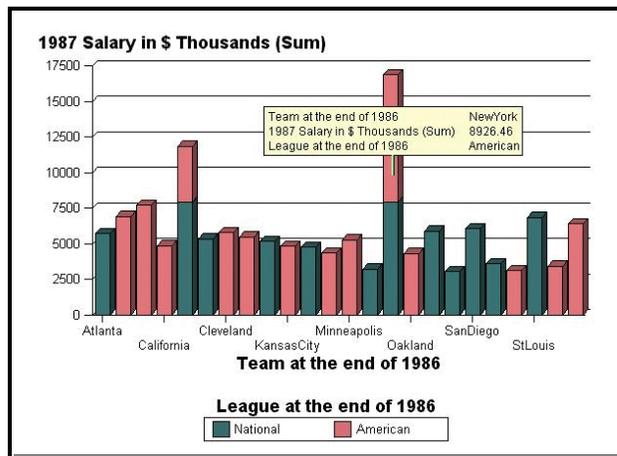
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ABSTRACT

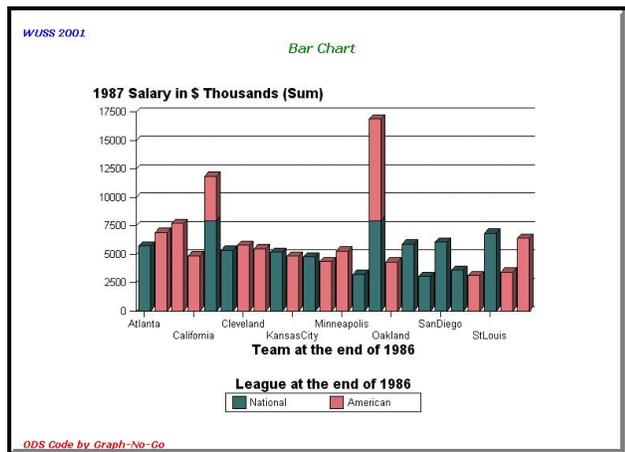
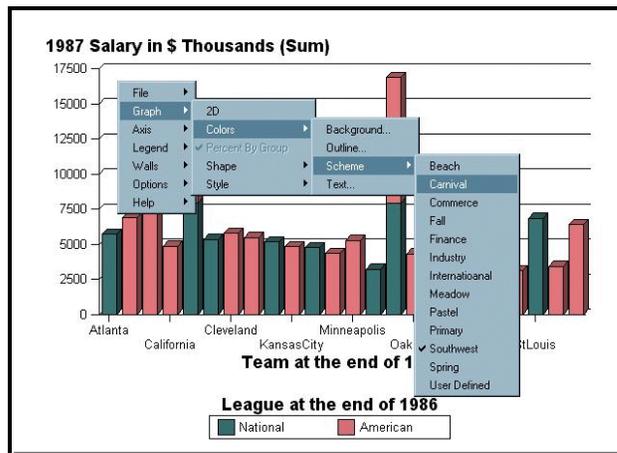
Using the SAS/GRAPH procedures and the Output Delivery System® (ODS) you can output your graphs to web enabled HTML files. Using the flexibility of ODS, you can include the graphs as static GIF or JPEG files, or create interactive, customizable graphs for web distribution using ActiveX controls or Java applets. This is really cool stuff. I could not believe my eyes the first time I saw it in action. In this paper I will lead you through the ODS code statements and options under SAS version 8 for MS-Windows needed to turn plain SAS/GRAPH procedure output into something dazzling. No need to be a SAS/GRAPH wizard to learn this stuff... I was not. Just wrap your existing SAS/GRAPH code with a few ODS statements, options, and a few other tweaks, and your HTML customers will not believe their eyes!

INTRODUCTION

With SAS/GRAPH and ODS, you can easily produce graphs for distribution, whether on the Internet or an Intranet, that are very user-friendly. Web enabling your graphs is simple, if you are running SAS version 8. All you have to do is to use the Output Delivery System and set a few options. You can chose from a static image, interactive Java applet formats, or an interactive ActiveX control format. The static image format will create an HTML document and an associated GIF or JPEG file. The Java and ActiveX device output will only work with the SAS/GRAPH procedures GCHART, GCONTOUR, GMAP, GPLOT, and G3D. Beginning with SAS version 8.1 you can also use the new JAVAMETA device. Below is an example of a Java enabled graph.



Is there more? You bet. Right-click with your mouse over the graph. Look at the menu choices given to you. There are many options you can change to alter the way the graph looks.

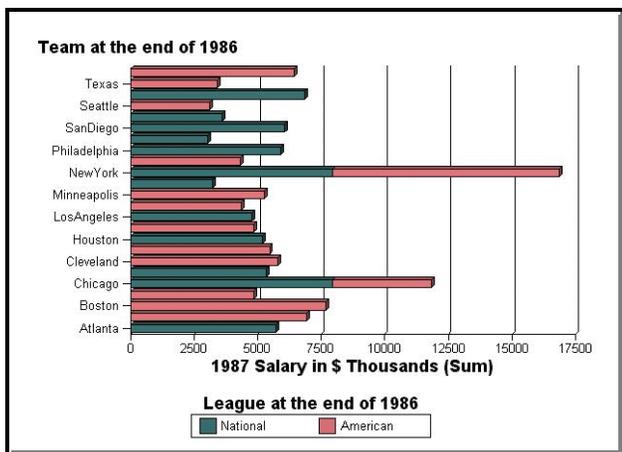


So, now you have a Java enabled HTML document. So, what? Well, there are many really cool features available to you and your users. Load the HTML file with your browser or the SAS Results Viewer (remember, with the Java and ActiveX documents, there will only be an HTML document).

Look what happens when you place your cursor over the bars of the graph. Information about the bar is displayed. SAS is not running here. This is just your browser!

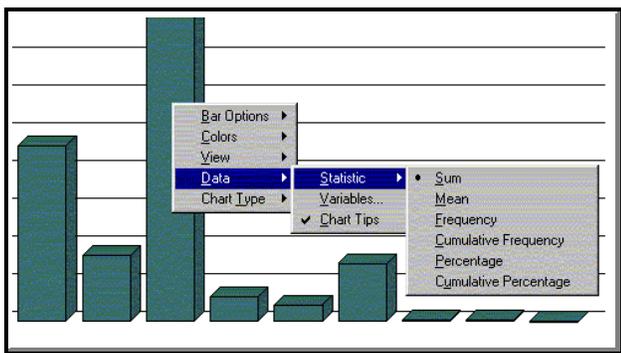
IMPORTANT NOTE!
The Java and ActiveX graphs require applets and controls to be loaded on the PC used to display the graphs. These applets are installed with SAS. However, when distributing the graphs to users who do not have SAS installed on their PC, the applets and controls will need to be installed. The applets and controls are contained on a separate CD with the SAS version 8 software and can also be downloaded from the SAS web site.

For example, you can change the shape of the bars and change their orientation. You can change the bar options, the graph color, and the chart type. You can even switch the variables in the graph. Look at the results below.



This is just a small example of what you and your user can do with your SAS graphs when you use ODS to create them as HTML files with the interactive Java applet option enabled.

Not enough to impress you? How about creating your graph with the interactive ActiveX control device? Load the HTML document you created with your browser or the SAS Results Viewer. Like the Java format, moving your mouse over the graph causes information about the bars to be displayed. But even more impressive, right-clicking your mouse brings up some really cool options.



You can change the bar options, the graph color, and the chart type. That's nice. But look what you can do under the "Data" menu choice. You can change the statistics associated with the numeric variables. Do I know what I'm saying? (Or more accurately, do I know what I'm writing?) Yep, you can change the statistics of numeric variables. Suppose you create a graph with a numeric variable and use the sum statistic. One of your users on the other side of the world might want to view that graph on your web site but see the numeric variable as a cumulative frequency. No problem. How about taking things a bit further. You can even change the way the variables are displayed. When you create a graph, you select a category variable, a response variable, and maybe a group variable and a subgroup variable. From the Data Variable menu choice, you can change the variables you selected for the category, response, group, and subgroup variables. The only caveat is that you can only select from variables used in the graph that you create from your SAS/GRAPH code. Any variables in your data set that you do not use in the graph you create will not be available.

Still not enough to impress you? The DEVICE=JAVAMETA uses the Java MetaViewApplet that displays SAS metagraphics data as interactive graphics in a web browser. With this device you can browse your graph and page through multiple graphs, display slide shows of multiple graphs, view data tips associated with a graph, pan and zoom a graph, access pop-up menus, and access other graphs or web pages through hotspot links.

SAS ODS CODE

My purpose for this paper is to discuss at length the SAS code necessary to web enable your graphs using ODS. To that end, I will concentrate on the ODS code and related options. I won't discuss at length all of the SAS/GRAPH code that I use to produce the graphs. All of the SAS/GRAPH code will be shown, but some of it will not be discussed. (The complete code for the pie chart we will soon see is shown at the end of the paper.) To start, take a look at the ODS code and related options.

```
ods html file="c:\SUGI 27\pie.html"
  (title="ODS Pie Chart")
  nogtitle nogfootnote style=statdoc
  gpath="c:\SUGI 27\"
  parameters=("DisableDrillDown"="True"
    "ShowBackdrop"="True"
    "BackColor"="white"
    "BackdropColor"="black"
    "Backimage"="file://c:\newlogo.gif"
    "DrawImage"="Positive"
    "ImagePosX"="-1" "ImagePosY"="-1"
    "ColorScheme"="Spring"
    "OutlineColor"="Same"
    "SideColor"="Same"
    "ScrollableLegend"="True"
    "FreqName"="SALARY"
    "FreqDesc"="1987 Salary (Sum)"
    "FreqFmt"="BEST."
    "MenuRemove"="Options.Drilldown"
    "Label_#Response"="1987 Salary (Sum)"
    "gradientbackground"="vertical"
    "gradientstartcolor"="cyan"
    "gradientendcolor"="white")
  ;
goptions device=Java;
goptions xpixels=650 ypixels=450;
ods html close;
```

This code begins with the familiar ODS HTML statement. I have directed the output to a file called "C:\SUGI 27\pie.html", and have added a title to the HTML window "ODS Pie Chart". And, I have added the familiar STYLE option and selected my favorite style, "STATDOC". The rest of the stuff on the ODS statement probably looks unfamiliar. We will spend most of our time looking at these options.

There are only three other pieces of SAS code related to ODS in my code: the GOPTIONS statement with the DEVICE= options, the GOPTIONS statement with the XPIXEL= and YPIXEL= options, and the ODS HTML CLOSE statement. The ODS HTML CLOSE statement is probably familiar to you (and, if not, it is well documented elsewhere) so I won't address it further. Let me tackle the GOPTIONS statements first, because they are the most straightforward. Then, I address the many ODS statement options.

IMPORTANT GOPTIONS

The GOPTIONS statement with the DEVICE= option allows you to determine the type of output you will get. Your choices are ACTIVEX, JAVA, JAVAMETA, HTML, GIF, and JPEG. If you select DEVICE=ACTIVEX, SAS will create an HTML file using ActiveX controls. If you select DEVICE=JAVA or JAVAMETA, SAS will create an HTML file using Java applets. The ActiveX and Java enabled graphs will look and behave like the examples we looked at earlier. If you select DEVICE=HTML or GIF, SAS will create an HTML file with a link to a GIF file, with the GIF file being a static image of the graph. If you select DEVICE=JPEG, SAS will create an HTML file with a link to a JPEG file, with the JPEG file being a static image of the graph.

The GOPTIONS statement with the XPIXEL= and YPIXEL= options define the number of pixels used for the X and Y axis of the graph. The larger these are, the bigger the graphics image will be. Values of 650 and 450 for XPIXEL and YPIXEL, respectively, seem to work well.

ODS STATEMENT OPTIONS

There are a few important options within the ODS statement that you may not be familiar with. We will examine these in dept. But, let's start with the easier stuff.

REALLY IMPORTANT NOTE!

I have found documentation on these options difficult to find. According to the SAS Institute, the only place to find documentation is in the SAS for Windows on-line help. Here's how to find the help. While in SAS for Windows, from the menus, select Help > SAS System Help. Then select the SEARCH tab and search on "applet parameters". From the list of found entries, select "GraphApplet Parameters."

The GTITLE and GFOOTNOTE Options

The GTITLE and GFOOTNOTE affect the title and footnotes created when you select GIF or HTML as your output device. Selecting GTITLE and GFOOTNOTE tells SAS/GRAPH to place any titles and footnotes you have defined in the resulting GIF file. Selecting NOGTITLE and NOGFOOTNOTE tells SAS/GRAPH to not place any titles and footnotes you have defined in the resulting GIF file, but instead to place the titles and footnotes in the associated HTML file. When selecting NOGTITLE and/or NOGFOOTNOTE, you will see the titles and footnotes with the graph when you open the HTML file. However, if you simply open the GIF file, you will not see the titles and footnotes. What is the difference? I think the output looks better with the titles and footnotes in the HTML file, and it makes the GIF and JPEG file smaller when the titles and footnotes are in the HTML file.

The GPATH Option

The GPATH option is important if you are using DEVICE=HTML, GIF, or JPEG. This option tells SAS/GRAPH where to store the GIF or JPEG file. You will probably want to specify the same location as the HTML file you defined for the ODS output file. I have found that under SAS for Windows if I do not use the GPATH option when creating a GIF or JPEG graph that SAS/GRAPH will place the graphics image in the sasroot folder. I have also found that without the GPATH option, because the HTML and the GIF or JPEG file are not created in the same location, there will be no link in the HTML file to the graphics image. When this happens, your browser will display the icon it uses in place of a graphics file that it cannot find. And when this happens, it will not help to move the graphics file to the same location as the HTML file, because there is no linkage in

the HTML file. If you do specify a GPATH when creating a GIF or JPEG file you can specify a location other than the location of the HTML file. Using the GPATH option causes SAS/GRAPH to include in the HTML file the linkage to the graphics file.

The PARAMETERS= Option

This option is the big one - so take a deep breath. When using the Java, Javameta, and ActiveX device output there are a great many things you can control and customize about your graph and its associated HTML file with the PARAMETERS= option. The form of the PARAMETERS= option is:

```
parameters=("parameter-name"="parameter-value")
```

The SAS documentation noted earlier states that the parameter-name is not case sensitive, but the parameter-value is case sensitive for some of the parameters. So, if one doesn't seem to behave the way you expect, check for case sensitivity. Following are most of the parameters that you can set with the PARAMETERS= option. The SAS help referenced earlier contains a few others that I have not needed to use. Some of the options discussed below will not be seen in our code example. Borrowing from the SAS help documentation, I have grouped the options according to function.

Controlling the Background Appearance

The following parameters affect either the background of the HTML file or the graphics image.

BackColor

This parameter specifies the background color of the HTML file. The default value is the default window color of the operating system.

THE COLORS!

Your SAS on-line documentation contains a file named "sasdoc\sashtml\gref\zgscheme.htm" that lists all of the available predefined colors. Very handy.

BackDropColor

This parameter specifies the color of all walls in the graph (including the back and floor). The default value is white. The 'walls' are the inside Y axes on a 3D chart. The 'floor' is the inside X axis on a 3D chart. The 'back' is the back of the chart on a 2D or 3D chart.

BackImage

This parameter specifies the URL of a background image to be used as the background for the graph or as an icon image (see DrawImage for specifying placement options). By default, no image is used and the background is drawn in a single solid color (see BackColor). If the URL begins with "http:" or "file:", the URL is assumed to be absolute; otherwise it is assumed to be relative to the HTML file you created with ODS.

DrawImage

This parameter specifies how the image specified using the BackImage parameter should be drawn. Valid values are "Center", "Position", "Scale", "Tile." The default value is Scale.

GradientBackground

This parameter specifies a gradient colored background for the HTML file. The colors used to draw the background are defined by the GradientStartColor and GradientEndColor parameters. The parameter accepts one of two values, "Vertical" or "Horizontal", which define the orientation of the color gradient. The GradientBackground parameter is ignored if the BackImage parameter is specified.

GradientStartColor

This parameter specifies the top color for the background if GradientBackground parameter is set to "Vertical" or the left color if the GradientBackground parameter is set to "Horizontal". The default value is white.

GradientEndColor

This parameter specifies the bottom color for the background if GradientBackground parameter is set to "Vertical" or the right color if the GradientBackground parameter is set to "Horizontal." The default value is blue.

ImagePosX and ImagePosY

These parameters specifies the location of the upper left corner of the image specified by BackImage. This parameter takes integer values and will be ignored unless the DrawImage value is set to "Position." Positive integer values place the image from the top-left corner of the HTML file. Negative integer values place the image from the bottom-right corner of the HTML file.

ShowBackdrop

This parameter specifies whether the backdrop for bar charts and scatter plots should be displayed. A value of "True" causes the backdrop to be displayed; a value of "False" cause the backdrop to be suppressed. The default value is "False."

ShowGrid

This parameter specifies whether the axis grid on the backdrop for bar charts and scatter plots should be displayed. A value of "True" causes the grid to be displayed; a value of "False" cause the grid to be suppressed. The default value is "True."

Controlling Other Appearance Attributes

The following parameters affect the appearance of the HTML file and graphics imagine in ways other than the background.

Colors

This parameter specifies the colors that should be used for chart elements. The GOPTIONS COLORS= option has the same effect. You use this option by placing the names of the colors you wish to use in a series as follows: "Colors"="Red Blue Green Yellow"

ColorScheme

This parameter specifies which predefined color scheme to use. By default no scheme is used. The GOPTIONS COLORS= option has the same effect, and will override the ColorScheme parameter. This parameter is a very handy way to select the colors for your charts. Available values are:

Beach, Carnival, Colorprint, Commerce, Fall, Finance,
Greyscale, Industrial, International, Meadow, Pastel,
Primary, Southwest, Spring

My favorite scheme is Southwest. Try them all and then e-mail me telling me your favorite scheme.

OutlineColor

This parameter specifies the outline color for chart elements. For bar and pie charts this is the bar and pie slice outline color, that by default is the same color as the interior of the bar and pie slice. For scatter plots it is both the outline color of the markers as well and color of the line that joins plots when the plots are not subgrouped. The default outline color for scatter plots is gray. Instead of a color value, the special value "Same" can be specified. This value sets the color of the outline to the same color as the interior of the elements.

ScrollableLegend

This parameter specifies whether the legend is scrollable. When creating graphs that require large legends, the legend can force the graphs to be very small. This parameter can be used with graphs requiring large legends, causing the legend to take only 20% of the entire graph area and will create a scrollbar that allows you to scroll to see all of the legend. A value of "True" creates a scrollable legend; a value of "False" does not create a scrollable legend. The default value is "False."

ShowLegend

This parameter specifies whether the legend should be displayed. A value of "True" causes the legend to be displayed; a value of "False" causes the legend to be suppressed. The default value is "True."

SideColor

This parameter specifies the side color of pie sides on 3D pie charts when created using with DEVICE=JAVA. (This parameter does not work with any other chart type or ODS device destination.) Any valid color value may be used, causing the entire side of the pie chart to be drawn in the specified color (excluding lighting effects defined by the Specular parameter). The value "Same" causes the sides of pie slices to be the same as the slice color. The default value is "Same".

Specular

This parameter specifies the specular intensity of the light source used to light the pie sides on 3D pie charts when created using with DEVICE=JAVA. (This parameter does not work with any other chart type or ODS device destination.) It takes values between 0.0 and 1.0, with 0.0 being the lightest intensity.

Userfmtn

This parameter specifies a user defined format. The syntax is the same as the format of the VALUE and PICTURE statements for PROC FORMAT. Multiple Userfmtn parameters can be specified. The n should be replaced with a number from 1 to n, used to distinguish between multiple formats. For example, to define a simple YES/NO format, you could specify the following parameter:

```
parameter-name="userfmt1" value="VALUE YES/NO 1='Yes'
2='No'
```

View2D

This parameter specifies whether the chart is drawn as two-dimensional or three-dimensional. If set to "True", the chart is drawn as a two-dimensional chart. If set to "False", the chart is drawn as a three-dimensional chart. The default value depends on the type of statement used to create the chart. The statements, HBAR, VBAR, and PIE cause the default to be two-dimensional. Their 3D equivalents, HBAR3D, VBAR3D, and PIE3D cause the default to be three-dimensional.

Controlling Drill-Down Functions

SAS/GRAPH with ODS allows you to create HTML files with drill-down capability. There are some parameters necessary to enable the drill-down capability. I am showing the parameters below, but am not using them in any of the example code and output, nor will I elaborate on them. (Maybe a future paper...) The SAS web site has a page titled 'javaapplets.htm' that provides some information on these parameters.

*DdLeveln, DisableDrilldown, DrillDownFunction | DrillFunc,
DrillDownMode, DrillPattern, DrillTarget, HelpLocation,
Locale, PatternStrip*

Controlling General Functions

There are also several options for customizing other features.

FreqName

This parameter specifies a name for a new variable that contains the frequency count when a frequency chart is produced. By default, the name assigned to this variable is "Frequency."

FreqDesc

This parameter specifies a description that is associated with the SAS data set variable specified by the *FreqName* parameter. By default, the description assigned is "x (Frequency)", where "x" is the name of the category variable for which the frequency count is associated.

FreqFmt

This parameter specifies a format for the SAS data set variable specified by the *FreqName* parameter. By default, the new variable has the BEST format.

IgnoreGroup

This parameter specifies that the chart should initially ignore any group variable. Initially the chart does not use the variable assigned to the group role even if that variable was specified in ODS.

IgnoreSubGroup

This parameter specifies that the chart should initially ignore any subgroup variable. Initially the chart does not use the variable assigned to the subgroup role even if that variable was specified in ODS.

ImageURL

This parameter specifies the URL that is to be loaded when the user clicks on the image specified by the *BackImage* parameter. The URL is only valid if the image is drawn using the "Center" or "Position" values.

MenuRemove

This parameter specifies that certain options appearing on the context sensitive menu be suppress. You address menu options by using a period between the names of each menu level. Any menu items below the last referenced menu level will not be displayed. For example, to suppress any of the menu options for 'Variables', specify:

```
"MenuRemove"="Variables"
```

Similarly, to suppress any of the drill-down options, specify the following:

```
"MenuRemove"="Options.Drilldown"
```

You can determine all the possible menu items to remove by not using the option to create your graph, then review the graph with your browser, right-click, and simply review the options that appear. Include those you do not want by spelling them exactly as they appear on the menu.

Label #element

This parameter specifies labels for various elements of the chart. The "element" can be one of the following (substituting the element name in the parameter "Label_#element"):

Category Label for the X axis for the chart. This parameter will be overwritten by the AXIS statement LABEL parameter. Thus, it serves the same function.

Response Label for the Y axis for the chart. This parameter will

be overwritten by the AXIS statement LABEL parameter. Thus, it serves the same function.

Series Label for the Series element, if one is defined.
Group Label for the Group element, if one is defined.
Subgroup Label for the Subgroup element, if one is defined.

For example:

```
"Label_#Response"="1987 Salary (Sum)"
```

NoJSObject

This parameter specifies that no Netscape JavaScript objects should be created. Specifying this parameter means that no JavaScript callback options can be used within the graph.

SimpleThreshold

This parameter specifies an integer for the threshold that is used to determine if the graph should be rendered using simple geometry. If the chart contains less elements, simple geometry is not used. The default value is 1000. A value of "Never" may be used, forcing regular shapes to be drawn.

StateRedraw

This parameter specifies whether the graph is re-drawn when the state of the graph is restored from cookie information. A value of "True" causes the graph to be re-drawn; a value of "False" does not cause the graph to be re-drawn. The default value is "True."

StyleBy

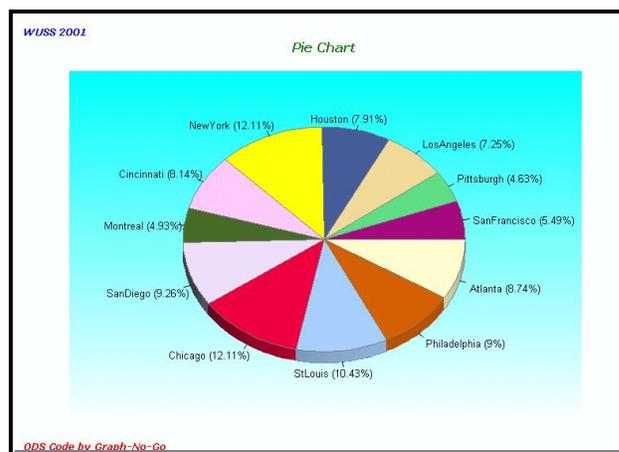
This parameter specifies the default StyleBy used. This is similar to the PATTERNID statement in the GCHART procedure and affects how colors and patterns are assigned in the output. Valid values are: "Category", "Chart", "Group", "Series", and "Subgroup."

Tips

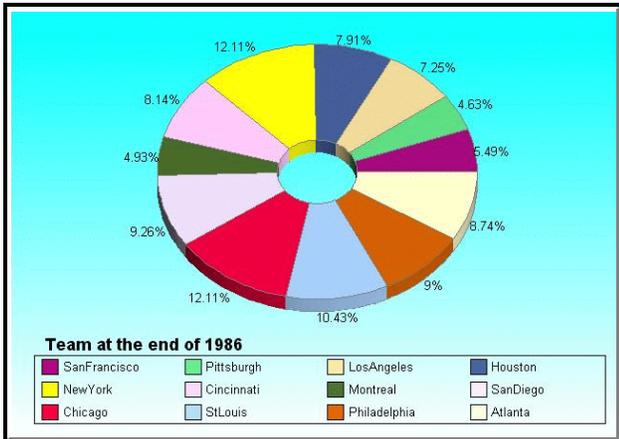
This parameter specifies whether the graph should display tool tips. A value of "True" causes tips to be displayed; a value of "False" causes tips not to be displayed. The default value is "True."

RESULTS

To the code we have already seen, we simply add our trusty LEGEND, AXIS, TITLE, and FOOTNOTE statements, and a graphing procedure, such as the GCHART procedure. Let us see what we can do to a pie chart.



[The careful eye will detect that I created this example for the WUSS 2001 conference.] Because I chose to create this graph with the Java device, I later decided to customize it with my browser to change it to a donut pie chart with a legend.



CONCLUSION

I told you web-enabling your graphs with ODS, Java, and ActiveX was easy and really cool. Give it a try. You are just a few minutes away from creating your own examples of web enabled graphs.

REALLY, REALLY IMPORTANT NOTE!

There are many SAS/GRAPH GOPTIONS and other statement options that are just not supported by the Java and ActiveX devices. Using the unsupported options will not generate an error in the SAS log, but will generate a note in the log. There are too many unsupported options to document in this paper. But, the SAS Institute does have technical support documents TS601 and TS602 that detail the unsupported options. You can find these documents at:

<http://ftp.sas.com/techsup/download/technote/ts601.html>
<http://ftp.sas.com/techsup/download/technote/ts602.html>

REFERENCES

SAS Java applets and ActiveX controls available at:

http://www.sas.com/apps/apps/demosdownloads/activex_prod_8_1_downarea.jsp?productID=100037

A handy SAS Institute document describing web enabling graphs, especially using drill-down capabilities can be found at:

http://www.sas.com/apps/apps/demosdownloads/activex_prod_8_1_downarea.jsp?productID=100038

ACKNOWLEDGMENTS

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```

/* Begin ODS output */
ods listing close;
ods html file="c:\SUGI 27\pie.html" (title="ODS Pie Chart")
  nogtitle nogfootnote style=statdoc gpath="c:\SUGI 27\";
/*parameter options are shown earlier in paper*/

/* Set the SAS/Graph options */
goptions reset=all hpos=40 text=CX800080 xpixels=600 ypixels=300;

/* Set the Titles/Footnotes */
title1 justify=left color=blue font="Arial" height=10 pt "SUGI 27";
title2 justify=center color=green font="Arial" height=14 pt "Pie Chart";
footnote1 justify=left color=red font="Arial" height=6 pt "ODS Code by Graph-No-Go";

/* Set the SAS/Graph device driver */
goptions device=Java;

/* LEGEND1 specifies the pie legend */
legend1 shape=bar(1,1)cells across=1 cborder=CX000000
  label=(justify=center position=(top center))
  position=(bottom right) value=(justify=left);

proc gchart data=SUGI.baseball(where=(LEAGUE EQ 'National'));
  pie3d TEAM /
    type=SUM sumvar=SALARY angle=0 fill=solid value=arrow percent=inside
    discrete otherlabel="Other" other=4 /*matchcolor*/
    woutline=1 coutline=CX000000 ctext=gray
    noheading legend=legend1 midpoints= "SanFrancisco" "Pittsburgh" "LosAngeles"
      "Houston" "NewYork" "Cincinnati" "Montreal" "SanDiego" "Chicago" "StLouis"
      "Philadelphia" "Atlanta";
run;
quit;

/* Reset all graphics options */
goptions reset=all;

/* End ODS output */
ods html close;

```