

Paper 14-28

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

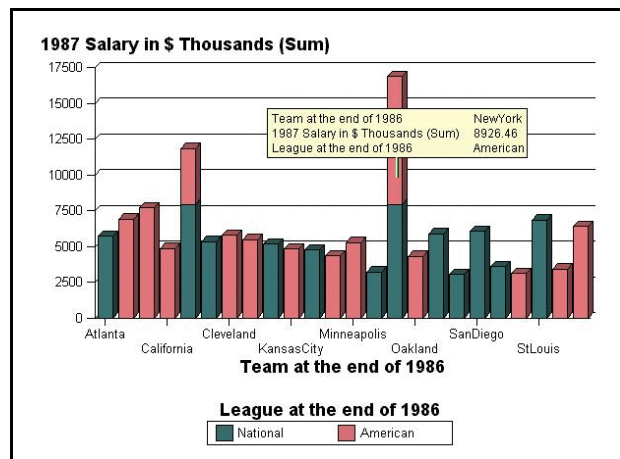
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ABSTRACT

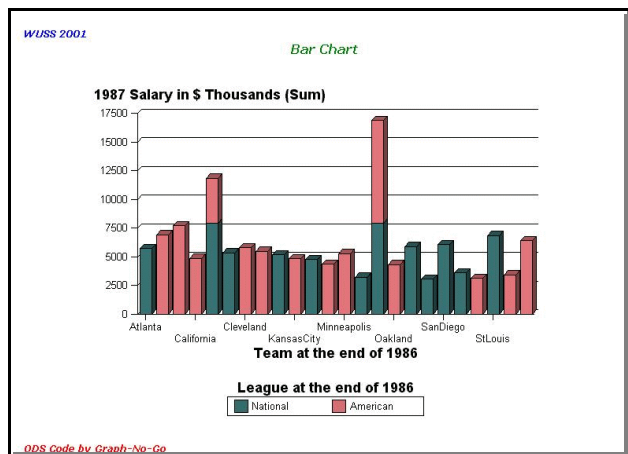
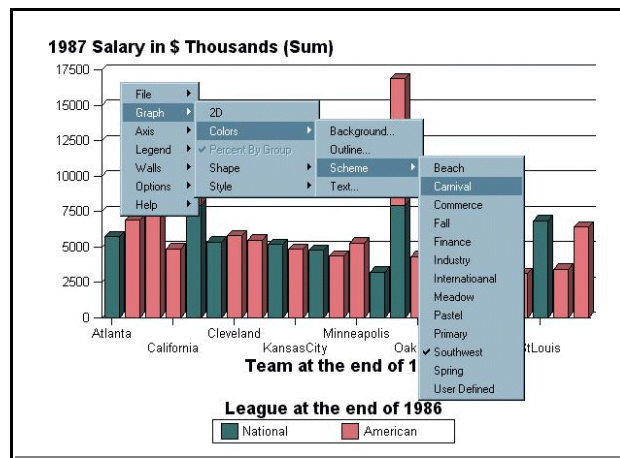
Using the SAS/Graph procedures and the Output Delivery System (ODS) you can output your graphs to web enabled HTML files. Using the flexibility of ODS, you are not limited to creating your graphs as static GIF or JPEG images. More than that, you can create interactive, customizable graphs for web distribution using ActiveX controls or JAVA applets. ODS gives you, the SAS programmer, the capability to create graphs that others can view and interactively change with just their web browser. Yes, I know what I'm saying! This is really cool stuff. I could not believe my eyes the first time I saw this in action. In this paper I will lead you through the ODS code statements and a few SAS/Graph options for MS-Windows needed to turn plain SAS/Graph procedure output into something dazzling. Just wrap your existing SAS/Graph code with a few ODS related statements 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, including on the web, 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, an interactive JAVA applet format, or an interactive ActiveX control format. The static image format will create an HTML document and an associated GIF or JPEG file. 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 set and change to alter the way the graph looks.



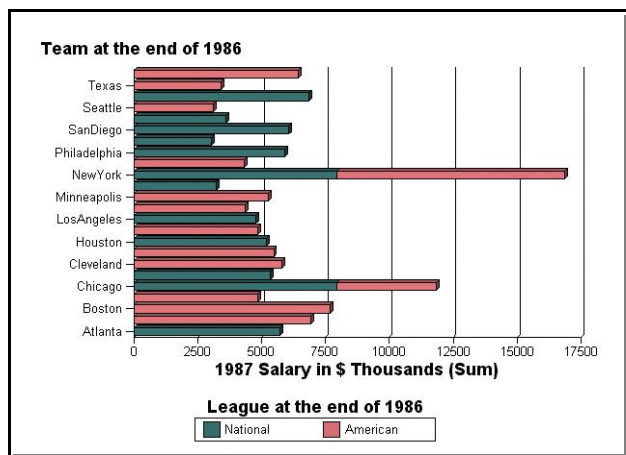
So, now you have a JAVA enabled HTML document. So, what? Well, there are many really cool features available to you and your users. Load the HTML file with your browser (remember, with the JAVA and ActiveX documents, there will only be an HTML document).



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!

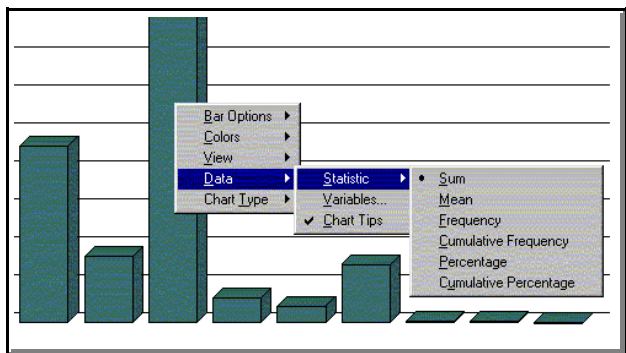
IMPORTANT NOTE!
The JAVA and ActiveX graphs require applets and controls to be loaded on the PC to display the graphs. These applets are installed with SAS. However, when distributing the graphs to users who do not have SAS installed on their PC, the applets and controls will need to be installed. The applets and controls 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. Look at the result below.



This is just an 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. For example, you can change the bar options, the graph color, and the chart type. You can even switch the variables in the graph.

Not enough to impress you? How about creating your graph with the interactive ActiveX control option enabled? Load the HTML document you created with your browser. [This also works if you use the default SAS ODS output viewer.] Like with the JAVA version, moving your mouse over the graph causes information about the bars to be displayed. But 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 uses 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 that are displayed. When you created the graph, you selected 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 created from Graph-N-Go. Any variables in your data model that you did not use in the graph you saved will not be available.

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 2003\pie.html"
  (title="ODS Pie Chart")
  nogtitle nogfootnote style=statdoc
  gpath="c:\sugi 2003\"
  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 pixels=450;
ods html close;
```

This code begins with the familiar ODS HTML statement. I have directed the output to a file called "C:\sugi 2003\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 statements with the DEVICE= options and 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 statement with the DEVICE= options first, because it is the most straightforward. Then, I address the many ODS statement options.

IMPORTANT GOPTIONS

There are several device choices you can make that will determine the type of output you will get. The essential choices are ACTIVEX, JAVA, HTML, GIF, and JPEG. If you select DEVICE=ACTIVEX, SAS will create an HTML file using ActiveX controls. If you select DEVICE=JAVA, 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 depth. But, let's start with the easier stuff.

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.

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(s) it will create and associate with the HTML file(s) it will also create. You will probably want to specify the same location as the HTML file defined as 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 "c:\sas" folder. I have also found that if without the GPATH option and if 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 won't 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 - take a deep breath. There are a great many things you can control and customize about your graph and its associated HTML file with the parameters= option. This option applies to JAVA and ActiveX devices. 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 the 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.

Background Appearance Options:

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

BackColor

Specifies the background color of the HTML file. The default is the default window color of the operating system. This is the area outside the graph. The gradient color options will override this option.

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

Specifies the color of all walls in the graph (including the floor). This is the area within the graph. The default is white. The gradient color options will override this option.

BackImage

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 document base. There is no way to resize the image within SAS/GRAPH. The good folks at the SAS Institute have confirmed that this option does not work properly in version 8.2 when using the JAVA device. It will work when using the ActiveX device, but not when using a GIF file as a background image. You can get it to work with the Java device and when using a GIF image as long as the GIF image is stored in the same location as the Java applet and the URL includes 3 "/" in the reference. For example:

```
"BackImage"="file:///C:\Program Files\SAS Institute\Shared Files\applets\sugi28_logo.gif"
```

DrawImage

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

ImagePosX and ImagePosY

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. The integer values are measurements of pixels. The good folks at the SAS Institute have confirmed that the negative values do not work.

GradientBackground

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. This option will override the BackColor and BackDropColor options.

GradientStartColor

Specifies the top color 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

Specifies the bottom color if GradientBackground parameter is set to "Vertical" or the right color if the GradientBackground parameter is set to "Horizontal." The default value is blue.

ShowBackdrop

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 is "False."

ShowGrid

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 is "True."

Miscellaneous Appearance Options

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

Colors

Specifies the colors that should be used for chart elements. The GOPTIONS COLORS= option has the same effect.

ColorScheme

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

Personally, my favorite scheme is Southwest. Although, I am a little partial to International. Why don't you try 'em all and let me know which is your favorite scheme.



OutlineColor

Specifies the outline color for chart elements. For bar and pie charts this is the outline color of the bars and pie slices, that by default is the same color as the interior of the those elements. For scatter plots it is both the outline color of the markers as well as the color of the line that joins plots when the plots are not subgrouped. The default outline color for scatter plots is gray. In addition to the normal color values the special value "Same" can also be specified. This value sets the color of the outline to the same color as the interior of the elements. This parameter is overridden by the COUTLINE= parameter on the VBAR3D statement

ScrollableLegend

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 have a scrollbar that allows the user to see all legend entries. A value of "True" causes the legend to be scrollable; a value of "False" cause the legend to not be scrollable. The default is "False."

ShowLegend

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 is "True." The good folks at the SAS Institute have confirmed that this option does not work. To disable showing the legend, you can use the SAS/GRAPH statement parameter NOLEGEND.

SideColor

Specifies the side color of pie charts. The default is "Same", that causes the sides of pie slices to be the same as the slice color. Any valid color value may be used, causing entire side of the pie chart to be drawn in the specified color (excluding lighting effects defined by the Specular parameter).

Specular

Specifies the specular intensity of the light source used to light the pie sides. This takes a value between 0.0 and 1.0.

Userfmtn

Specifies a user defined format. The syntax is the same as that of the VALUE and PICTURE statements for PROC FORMAT. Multiple Userfmtn parameters can be specified. The n should be replaced with the appropriate number from 1..n, where n is the number of format parameters to be defined. 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 determines 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.

Drill-down Functional Options

SAS/GRAPH with ODS allows you to create HTML files with internal drill-down capability. There are some parameters necessary to enable the internal drill-down capability. I am showing the parameters below, but am not using them in any of the example code and output (maybe a future paper...)

DdLeveln

Specifies internal drill-down level specifications.

DisableDrilldown

Specifies that drill-down should be disabled for this graph. The value of the parameter does not matter, but a value must be specified as different browsers handle null values differently. Its presence indicates that drill-down should be disabled. Drill-down can again be enabled by the user using the popup menu.

DrillDownFunction | DrillFunc

Specifies the name of the JAVAScript function to call when DrillDownMode is set to "Script".

DrillDownMode

Specifies the drill-down mode to use when drilling down. The default is "Any". Valid values are as follows.

Any	In this mode, the graph first attempts to drill-down using "Local" mode. If that fails, it attempts to drill-down using JAVAScript ("Script"). If both these fail, the graph attempts to drill-down using "URL" mode. If all these fail, the graph attempts to drill-down using "HTML" mode.
HTML	This mode uses a substitution pattern to dynamically generate a URL based on the selected chart elements.
Local	This mode constructs a new chart based on existing data within the graph and replaces the old chart with a new chart containing the drill-down information.
Script	This mode invokes the user specified JAVAScript function with information about the selected chart elements. The user function is expected to perform the requested drill-down action.
URL	This mode is provided for compatibility with previous SAS/Graph drivers such as the GIF driver. It supports the old HTML= drill-down syntax.

DrillPattern

Specifies the drill-down pattern when drill-down mode is HTML.

DrillTarget

Specifies the drill-down window target to use when drilling down using HTML mode. The default is "_blank".

HelpLocation

Specifies the URL from which the graph is to display help. The default is the help location for a particular applet release that SAS Institute provides on its external Web site. The parameter can be either "Default" or a valid URL.

Locale

Specifies the language and country to use when displaying locale-sensitive strings. The default is to use the region settings of the browser's host machine. This parameter can be used to override the browser's default locale.

PatternStrip

Specifies that preceding and trailing white space are to be removed from drill-down substitution patterns before adding to them the generated drill-down string. A value of "True" causes the removal of the white spaces; a value of "False" leaves the white spaces. The default is "False."

General Functional Options

There are also several options for customizing other features.

FreqName

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

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

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

IgnoreGroup

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

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

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.

NoJSObject

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

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. Also accepts the value "Never". If the parameter is set to "Never", then the regular shapes are always drawn.

StateRedraw

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 is "True."

StyleBy

Specifies that the default StyleBy for charts to be specified. Valid values are: "Category", "Chart", "Group", "Series", and "Subgroup." The good folks at the SAS Institute have confirmed that this option does not work in version 8.2.

Tips

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 is "True."

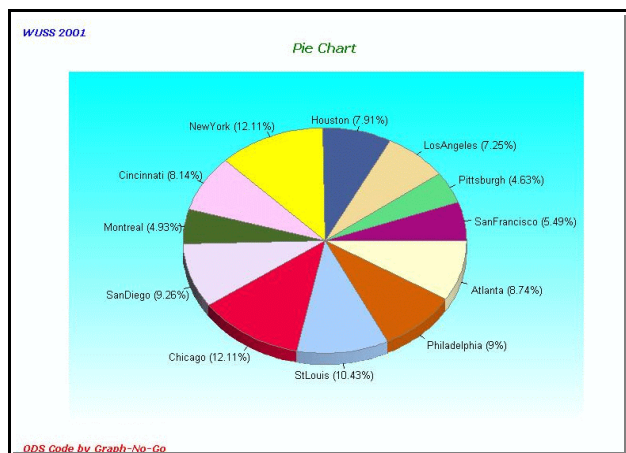
REALLY IMPORTANT NOTE!

There are many SAS/GRAPH Options 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:

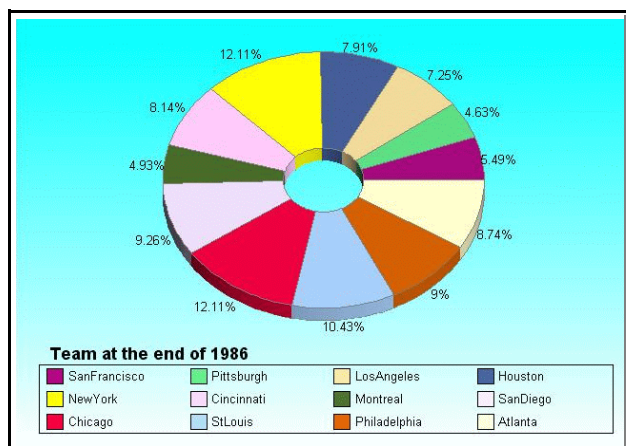
<http://ftp.sas.com/techsup/download/technote/ts601.html>
<http://ftp.sas.com/techsup/download/technote/ts602.html>

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's see what we can do to a pie chart.



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.



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

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```

/* Begin ODS output */
ods listing close;
ods html file="c:\sugi 2003\pie.html" (title="ODS Pie Chart") nogtitle nogfootnote
style=statdoc
  gpath="c:\sugi 2003\"
  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");

/* 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 2003";
  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 slice=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;

```