

Techniques for Creating Annotated 2D and 3D Pie Charts

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ABSTRACT

Pie charts are a commonly requested visual graphic. While the PIE/PIE3D statements for PROC GCHART usually give one the options they need when creating two and three dimensional pie chart, there are circumstances in which it may be more advantageous to create your pie chart through annotation. This paper will discuss annotating a 2D pie chart for the purposes of specifying origin, an option unavailable in PROC GCHART/PIE. Additionally, it will address a macro developed to create annotated 3D pie charts, allowing one to specify the origin and angle of the graph.

INTRODUCTION

For most situations, GCHART most likely has all the functionality and customizability that you need. However, in those situations where you need to place multiple graphs on a single page or just have a desired location for the PIE Chart in the page space, you will run into limitations with the PIE/PIE3D/DONUT options in PROC GCHART. While the majority of GCHART statements (BLOCK, HBAR, and VBAR) allow you to utilize the AXIS statement, PIE/PIE3D/DONUT statements do not utilize this functionality. As such, you will not be able to specify an origin and move your PIE chart to a specific location on the page. In this situation, it is necessary to create the PIE Chart utilizing the ANNOTATE PIE Function.

SAS ANNOTATE AND ANNOTATE STATEMENTS

While often the default capabilities found in the SAS/GRAPH® will meet your needs, there are times that SAS Annotate can be very useful in enhancing your graphic output. SAS Annotate is a powerful tool that allows the user to do one of two things, either you can enhance an existing SAS/GRAPH output or you can create a graph completely out of Annotate Statements. In the former, you are typically adding functionality to a graph such as a data point label, or draw an indicator on the graph. In the later circumstance, the SAS/GRAPH procedures do not offer the capabilities you require to create your desired graph. This is the situation we find ourselves in when we want to move Pie Charts to a specific location in the page space.

VARIABLES FOR ANNOTATED PIE CHARTS

- XSYS/YSYS Represent the coordinate system, and define whether the space is Relative or Absolute
- X/Y Coordinates that define where the PIE Chart is to be placed in the page space
- Rotate Specifies the angle of rotation
- Size Specifies the radius of the circle
- Style Specifies the pattern to used to fill the slices
- Line Specifies the slice lines to be drawn
- Angle Indicates the starting angle of the slice
- Position Controls text alignment

FUNCTIONS FOR ANNOTATED PIE CHARTS

- PIE Creates a slice, arc, or circle
- PIEXY Defines a point on the outside of the slice arc, it is used to update XLAST and YLAST
- CNTL2TXT Copies the coordinates of XLAST and YLAST to XLSTT and YLSTT
- LABEL Places text on the output

TWO-DIMENSIONAL PIE CHART

Below is the code for the data set, called Sales, which be used throughout this paper. The data set indicates the number of sales for three different sales persons, at four different cities.

```
DATA SALES;  
  INPUT CITY ID NUM;  
  DATALINES;  
  15 1 20  
  15 2 51  
  15 3 20  
  41 1 83
```

```

41      2      47
41      3      81
68      1      78
68      2      16
68      3      73
24      1      79
24      2      18
24      3      11
;

```

```
RUN;
```

CALCULATE THE VALUES FOR THE PIE CHART

To create the pie chart in SAS Annotate, the data from Sales needs to be changed into percentages. To do this, we will use PROC FREQ to get the necessary percentages. The data set FREQ will include Percent of Total Frequency, Percent of Row Frequency, and Percent of Column Frequency. The pie chart will be focus on sales performance at a particular city. As such, we will use Percent of Row Frequency (PCT_ROW).

```

PROC FREQ DATA=SALES NOPRINT;
  WEIGHT NUM;
  TABLES CITY*ID / OUTPCT OUT=FREQ;
RUN;

```

DRAW AND LABEL THE TWO-DIMENSIONAL PIE CHART

The following code creates a SAS Annotate dataset that draws the pie chart, colors the slices to the individual sales person, and labels the slices with their associated percentage for the City coded '15'. Much of this code is customizable, as it depends on where you want your pie chart and what you want your chart to look like. These adjustable portions have been underlined and highlighted in bold print.

Create the Annotate Dataset 'PIECHART'

```

DATA PIECHART;
  SET FREQ (WHERE=(CITY in (15)));
  LENGTH FUNCTION SYTLE $ 8;
  /* X and Y coordinate system is set to data values */
  XSYS='2'; YSYS='2';
  X=50; Y=50;
  /* Draw a pie */
  FUNCTION='PIE';
  /* Color the slices for each sales person */
  IF ID=1 THEN COLOR='CX000080';
  IF ID=2 THEN COLOR='CX008000';
  IF ID=3 THEN COLOR='CX731749';
  /* Draw the portion of the pie */
  ROTATE=360*PCT_ROW/100;
  SIZE=10;
  /* Use a solid pattern fill */
  STYLE='solid';
  LINE=0;
  SUM + ROTATE;
  OUTPUT;

  /* Calculate a point that is half of the arc for each slice (SUM-(ROTATE*.5))
  and within the radius (size=.75) */
  FUNCTION="PIEXY";
  ANGLE=SUM-(ROTATE*.5);
  SIZE=.75;
  OUTPUT;

  /*Copy the coordinates in (XLAST, YLAST) to (XLSTT, YLSTT)*/
  FUNCTION="CNTL2TXT";
  OUTPUT;
  /* Label the Pie Chart with the Slice Percentage at the point stored in XLSTT
  and YLSTT*/
  FUNCTION="LABEL";

```

```

TEXT=TRIM(" "||LEFT(PUT(PCT_ROW,3.)||"%"));
      ANGLE=0; ROTATE=0;
      COLOR="WHITE"; STYLE="ARIAL"; SIZE=.75;
      X=.; Y=.;
OUTPUT;
RUN;

```

Create the Pie Chart Image

To draw our annotated graphics, we will use PROC GSLIDE. PROC GSLIDE creates a text slide that we can use with PROC GREPLAY to create graphical displays.

```

PROC GSLIDE GOUT=work.gseg NAME="PIE1" ANNO=PIECHART;
  RUN;
QUIT;

```

Two-Dimensional Pie Chart Image

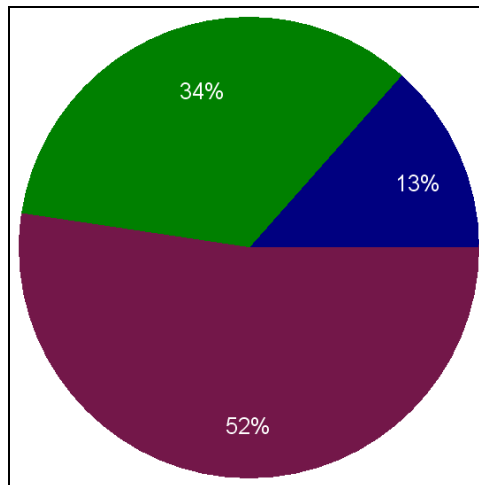


Figure 1

THREE-DIMENSIONAL PIE CHART MACRO

For the three-dimensional pie chart, we will be using the data and code from the two-dimensional pie chart example.

DRAW AND LABEL THE THREE-DIMENSIONAL PIE CHART

Using the code from the two-dimensional pie chart, we create the top layer of the three-dimensional pie chart. This first slice, named PIE1, sets the primary colors and labels for the pie chart.

Create the top of the three-dimensional pie chart

```

DATA PIECHART;
  SET FREQ (WHERE=(CITY in (15)));
  LENGTH FUNCTION SYTLE $ 8;
  /* X and Y coordinate system is set to data values */
  XSYS='2';
  YSYS='2';
  X=50;
  Y=50;
  /* Draw a pie */
  FUNCTION='PIE';
  /* Color the slices for each sales person */
  IF ID=1 THEN COLOR='CX000080';
  IF ID=2 THEN COLOR='CX008000';
  IF ID=3 THEN COLOR='CX731749';
  /* Draw the portion of the pie */
  ROTATE=360*PCT_ROW/100;
  SIZE=20;

```

```

/* Use a solid pattern fill */
    STYLE='solid';
    LINE=0;
    SUM + ROTATE;

    OUTPUT;
/* Find a point that is half of the arc (rotate*.5) for each slice (SUM)
and within the radius (size=.75) */
    FUNCTION="PIEXY";
    ANGLE=SUM-(ROTATE*.5);
    SIZE=.75;

    OUTPUT;
/*Copy the coordinates in (XLAST, YLAST) to (XLSTT, YLSTT)*/
    FUNCTION="CNTL2TXT";
    OUTPUT;
/* Label the Pie Chart with the Slice Percentage at the point stored in
XLSTT and YLSTT*/
    FUNCTION="LABEL";
    TEXT=TRIM("      ||LEFT(PUT(PCT_ROW,3.))||%"");
    ANGLE=0; ROTATE=0;
    COLOR="WHITE";
    STYLE="ARIAL";
    SIZE=2;

    X=.;
    Y=.;

    OUTPUT;
RUN;

PROC GSLIDE GOUT=work.gseg NAME="PIE1" ANNO=PIECHART;
    RUN;

    QUIT;

```

PIE CHART MACROS

Macro to create Pie Chart Slices

The PIECHARTS Macro uses the code from before. It creates multiple slices of the pie chart slightly offset from the PIE1 Pie Chart to create the three-dimensional effect. The slices are offset by the macro variable (&I/ &N). In this example, 20 slices were used to create the three-dimensional shadow. The thickness of the pie chart can be manipulated by the number of slices. Additionally, the colors of the slices are slightly darker to further enhance the shadow effect of the slices.

```

%MACRO PIECHARTS;

    %LET N=20;

    %DO I=2 %TO (&N + 1) %BY 1;

DATA PIECHART&i;

    SET FREQ (WHERE=(CITY in (15)));

/* X and Y coordinate system is set to data values */
    XSYS='2';
    YSYS='2';
    X=50+(&I/&N); /*Offsets the pie chart to create a shadow
effect*/
    Y=50+(&I/&N);

/* Draw a pie */
    FUNCTION='PIE';

/* Color the slices for each vendor */
    IF ID=1 THEN COLOR='CX00008B';
    IF ID=2 THEN COLOR='CX006400';
    IF ID=3 THEN COLOR='CX731727';

```

```

/* Draw the portion of the pie */
    ROTATE=360*PCT_ROW/100;
    SIZE=20;

/* Use a solid pattern fill */
    STYLE='solid';
    LINE=0;
OUTPUT;
RUN;

PROC GSLIDE GOUT=work.gseg NAME="PIE&I" ANNO=PIECHART&I;
    RUN;
        QUIT;

    %END;
%MEND;

```

Macro to create Pie Chart Slices

The PIE3D Macro puts the Pie Chart slices together into one image. The slices are REPLAYED in a backwards order putting the first slice with the labels on the top of the stack.

```

%MACRO PIE3D;

    OPTIONS ORIENTATION = LANDSCAPE;

    GOPTIONS RESET=GOPTIONS DEVICE=PNG;

    PROC GREPLAY IGOUT=work.gseg NOFS TC=SASHELP.TEMPLT TEMPLATE=WHOLE;
        TREPLAY

        %DO J=(&N+1) %TO 1 %BY -1;
            1:PIE&J
        %END;

    NAME="PIE3D";

    RUN;
        QUIT;

%MEND;
    %PIE3D;

```

Three-Dimensional Pie Chart Image

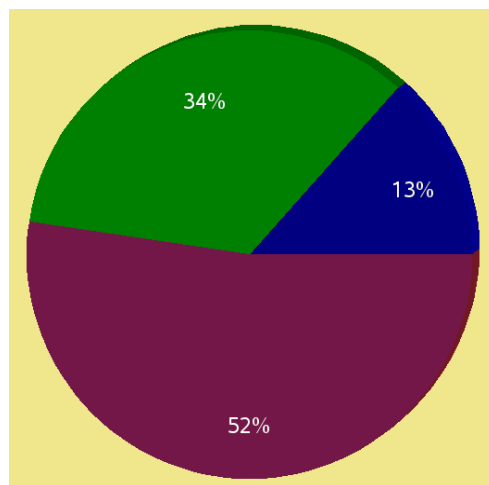


Figure 2

Conclusion

This paper showed how to create two and three-dimensional pie charts through SAS Annotate. While the SAS PROC GCHART will often suffice, should you want to manipulate the origin of your pie chart then SAS Annotation is required.

References

<http://support.sas.com/kb/40/502.html>

<http://support.sas.com/documentation/cdl/en/graphref/63022/HTML/default/viewer.htm#annodictchap.htm>

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