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Draw statement, the third hand of GTL(Graph Template Language)

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ABSTRACT

The SAS Graph Template Language (GTL) is an extension to the Output Delivery System (ODS) that enables you to create sophisticated graphics. And it is template based language which gives drawer the full space to customize a graph. However, sometimes you will find it difficult to do some small revision when you finish the figure. And you may need to change the layout and even cannot draw that as some statement do not have this or that function.

Luckily, since the release of SAS9.3. we have the draw statements which enable you to customize a graph by drawing visual elements anywhere within the graph and things become easy.

This paper will introduce draw statement and show some examples that how draw statements make difficult things easy in our routine work.

INTRODUCTION

The SAS Graph Template Language (GTL) is template based language that enables us to create various beautiful sophisticated graphics. However, we have to follow its structure and rule e.g we could not customize the color of label of Axis. Of course, we could do it with another method. For example, we could draw the label with scatterplot statement. But it also has its limitation. This paper will introduce how we could draw figures for clinical trial with more flexibility in daily work.

WHAT YOU CAN DRAW WITH DRAW STATEMTNS

There are general eight types of Graphics Element we could draw on the figure. As we always need to add some descriptive text to the figure to make it clearer, so DRAWTEXT is more often used than others.

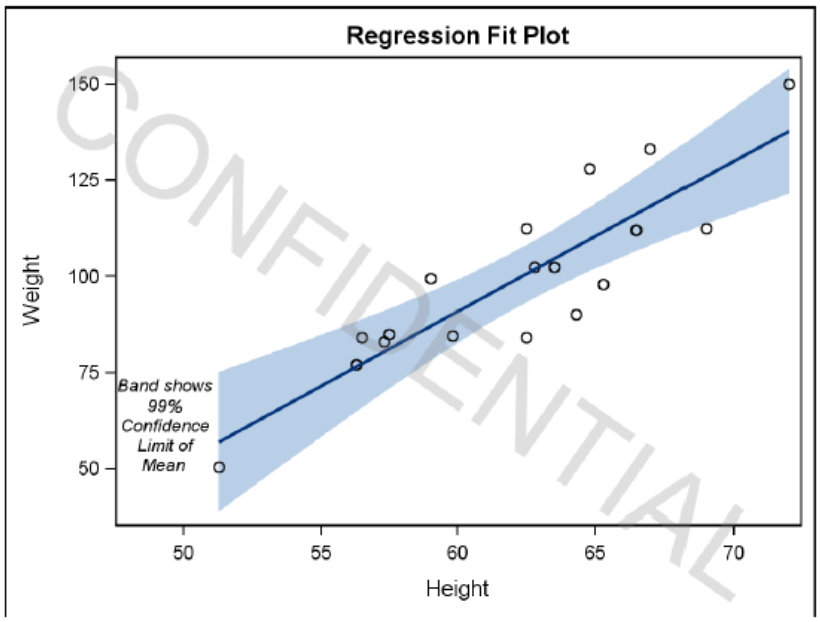
To Draw this Type of Graphics Element	Use this GTL Statement or Block
Text	DRAWTEXT
An arrow	DRAWARROW
A line	DRAWLINE
An oval or circle	DRAWOVAL

To Draw this Type of Graphics Element	Use this GTL Statement or Block
A square or rectangle	DRAWRECTANGLE
A polyline	DRAW statements within a BEGINPOLYLINE/ENDPOLYLINE block
A polygon	DRAW statements within a STARTPOLYGON/ENDPOLYGON block
An image	DRAWIMAGE

Draw statement, the third hand of GTL(Graph Template Language), continued

```
proc template;
 define statgraph modelfit;
  begingraph;
    entrytitle "Regression Fit Plot";
    layout lattice;
      layout overlay / xaxisopts=(offsetmin=.1);
        drawtext textattrs=(style=italic size=8pt)
          "Band shows 99% Confidence Limit of Mean" /
          anchor=bottomleft width=15 widthunit=percent
          xspace=wallpercent yspace=wallpercent
          x=0 y=10 justify=center ;
        modelband "myclm";
        scatterplot x=height y=weight / primary=true;
        regressionplot x=height y=weight / alpha=.01 clm="myclm";
      endlayout;
    endlayout;
    drawtext textattrs=(color=gray size=52pt) "CONFIDENTIAL" /
      transparency=.75 rotate=-35
      width=110 widthunit=percent justify=center ;
  endgraph;
 end;

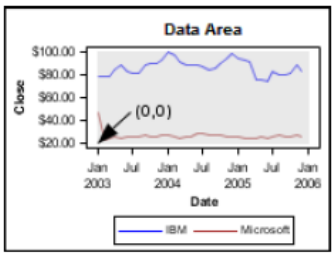
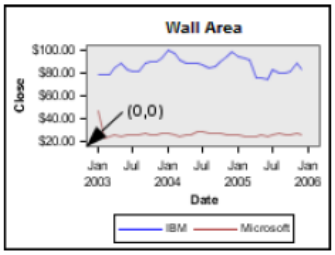
proc sgrender data=sashelp.class template=modelfit;
run;
```

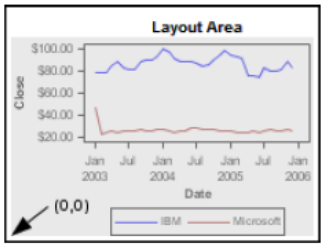
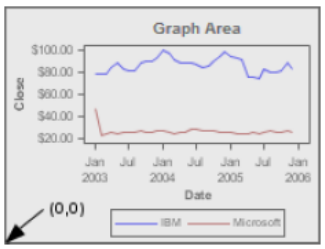


WHERE YOU CAN DRAW THE GRAPHICS ELEMETN

There are general eight types of Graphics Element we could draw on the figure. As we always need to add some descriptive text to the figure to make it clearer, so DRAWTEXT is more often used than others.

DrawingSpace : DATA, WALL, LAYOUT, or GRAPH
DrawingUnits : PIXEL , PERCENT, VALUE(only for the DATA drawing space)

Drawing Space	Description	Example
Data	The area of the graph in which the data is displayed. The data area is indicated by the shaded area in the figure on the right. The origin of the drawing space X and Y coordinates, (0,0), is in the lower left corner as shown. *Note:* The data area does not apply to graphs that do not have axes, such as pie charts, that must be drawn in a REGION layout.	
Wall	The area of the graph that is bound by the X and Y axes, including the secondary axes, if it is used. *Note:* The wall area does not apply to graphs that do not have axes, such as pie charts, that must be drawn in a REGION layout.	

Drawing Space	Description	Example
Layout	The entire area of the layout container that is the immediate parent container of the draw statement. The figure on the right shows the case where a LAYOUT OVERLAY is the parent.	
Graph	The area in which the entire graph is displayed. *Note:* In a multi-cell layout such as GRIDDED or LATTICE, the GRAPHPERCENT and GRAPHPIXEL units span the entire graph, which includes all of the cells in the layout.	

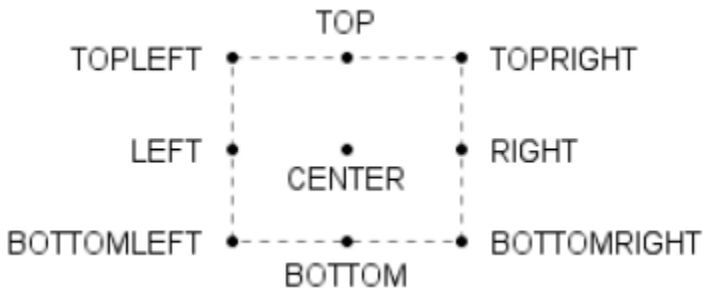
EXAMPLE GRAMMER OF DRAWTEXT STATEMENT

```
drawtext textattrs=() "XXX" / xspace=wallpercent yspace=wallpercent x =0 y=10
                              anchor=bottomleft width=15  widthunit=percent  justify=center  ROTATE=0;
drawtext textattrs=() "XXX" / xspace=datapercent yspace=datapercent x =0 y=10
                              anchor=bottomleft width=15 widthunit=percent  justify=center  ROTATE=0;
```

HOW THE GRAPHICS ELEMENTS ARE ANCHORED

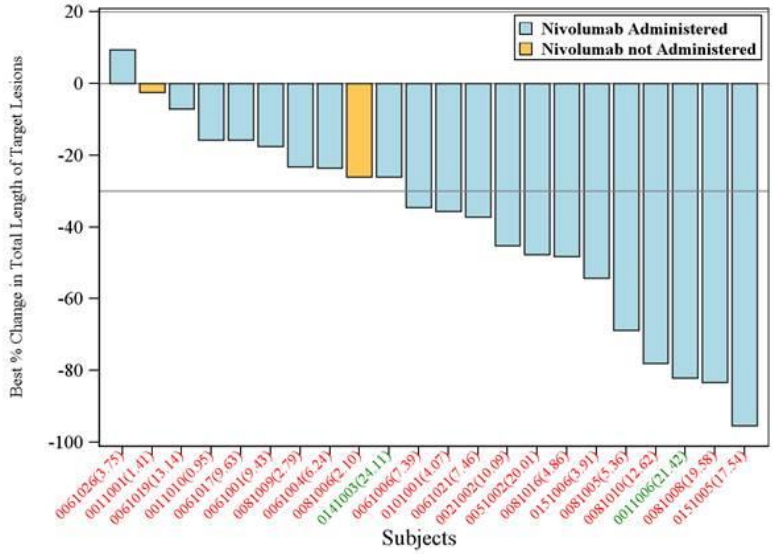
When you specify the X and Y coordinates for a graphics element, the element is drawn from an anchor point that is placed in the drawing area at the X and Y coordinates that you specify. For lines and arrows, the anchor point is the starting point of the line or arrow, which is specified with the X1 and Y1 options on the draw statement. For elements that have height and width, the anchor point can be one of the points shown in the following figure. By default, the anchor point is CENTER. You can use the ANCHOR= option on the draw statements to change the anchor point of your graphics elements.

Draw statement, the third hand of GTL(Graph Template Language), continued



ISSUE 1 DESCRIPTION

- Request: Client ask to show different color for subjects who discontinue and still active on study. Like in green=active on study, in red=discontinue.
- Barchartparm, Oncology
- Axis label : We could use TICKVALUEFITPOLICY=ROTATE to rotate label of axis, but could not define the color of label.
- ScatterPlot + MARKERCHARACTER : We could use Scatterplot statement to draw the label and define its color, but could not rotate the character.



	subjid	month	x_value	y_value	nivot	order	dis
1	0061026	3.75	0061026(3.75)	9.375	Nivolumab Administered	1	Y
2	0011001	1.41	0011001(1.41)	-2.43902439	Nivolumab not Administered	2	Y
3	0061019	13.14	0061019(13.14)	-7.207207207	Nivolumab Administered	1	Y
4	0011010	0.95	0011010(0.95)	-15.78947368	Nivolumab Administered	1	Y
5	0061017	9.63	0061017(9.63)	-15.87301587	Nivolumab Administered	1	Y
6	0061001	9.43	0061001(9.43)	-17.64705882	Nivolumab Administered	1	Y
7	0081009	2.79	0081009(2.79)	-23.27586207	Nivolumab Administered	1	Y
8	0061004	6.24	0061004(6.24)	-23.63636364	Nivolumab Administered	1	Y
9	0081006	2.1	0081006(2.10)	-26.08695652	Nivolumab not Administered	2	Y
10	0141003	24.11	0141003(24.11)	-26.15384615	Nivolumab Administered	1	
11	0061006	7.39	0061006(7.39)	-34.61538462	Nivolumab Administered	1	Y
12	0101001	4.07	0101001(4.07)	-35.67251462	Nivolumab Administered	1	Y
13	0061021	7.46	0061021(7.46)	-37.20930233	Nivolumab Administered	1	Y
14	0021002	10.09	0021002(10.09)	-45.3125	Nivolumab Administered	1	Y
15	0051002	20.01	0051002(20.01)	-47.65625	Nivolumab Administered	1	Y
16	0081016	4.86	0081016(4.86)	-48.27586207	Nivolumab Administered	1	Y
17	0151006	3.91	0151006(3.91)	-54.21686747	Nivolumab Administered	1	Y
18	0081005	5.36	0081005(5.36)	-68.85245902	Nivolumab Administered	1	Y
19	0081010	12.62	0081010(12.62)	-78.02197802	Nivolumab Administered	1	
20	0011006	21.42	0011006(21.42)	-82.14285714	Nivolumab Administered	1	Y
21	0081008	19.58	0081008(19.58)	-83.33333333	Nivolumab Administered	1	Y
22	0151005	17.54	0151005(17.54)	-95.3125	Nivolumab Administered	1	Y

ISSUE 1 SOLUTION

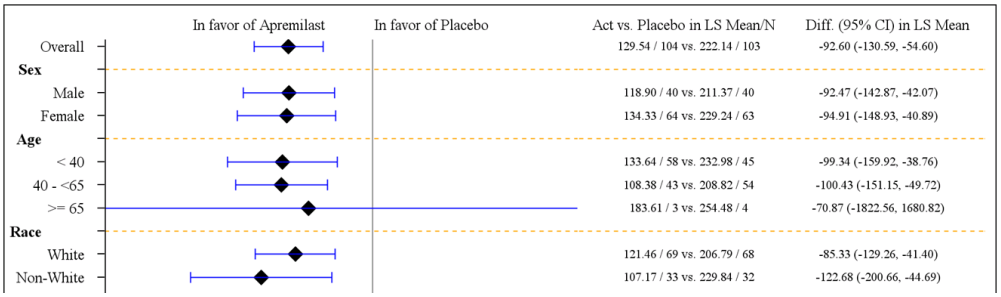
```
DrawText  textAttrs=( COLOR=red SIZE=8)  "0061026(3.75)" /
          Y=-2 X="0061026(3.75)" XSPACE=datavalue YSPACE=datapercent ROTATE=45 ANCHOR=right WIDTH=20;

DrawText  textAttrs=( COLOR=red SIZE=8)  "0011001(1.41)" /
     Y=-2 X="0011001(1.41)" XSPACE=datavalue YSPACE=datapercent ROTATE=45 ANCHOR=right WIDTH=20;

DrawText  textAttrs=( COLOR=green SIZE=8)  "0141003(24.11)" /
     Y=-2 X="0141003(24.11)" XSPACE=datavalue YSPACE=datapercent ROTATE=45 ANCHOR=right WIDTH=20;
```

ISSUE 2 TEXT POSITION, WRAPPING AND INDENTION

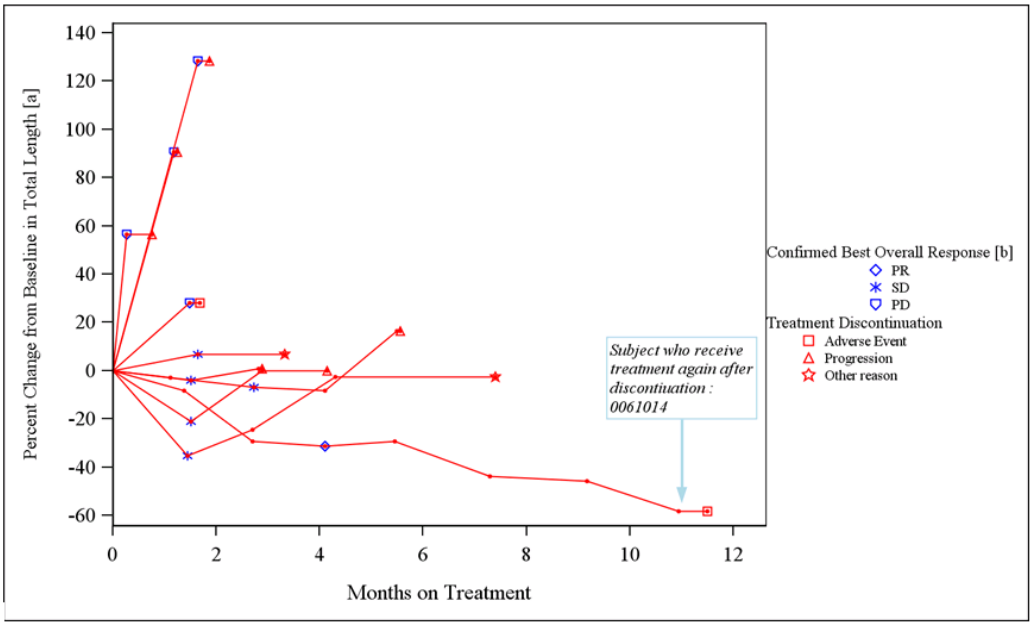
- Sometimes, many of us will found it is difficult to deal with Text position, wrapping and indention.
- In GTL , leading and trailing blanks are removed from the axis tick values and markercharacter strings.
- Forestplot



ISSUE 3

- Like add additionally information
- Client ask to mark one subject who receive treatment again after discontinuation
- Oncology

Figure 14.2.2.1
Percent Change from Baseline in Total Length of Target Lesions up to Initial Progression
All-Subjects-Treated Population, Pancreatic Cancer, Arm A Part 1 (Nivolumab 3 mg/kg)

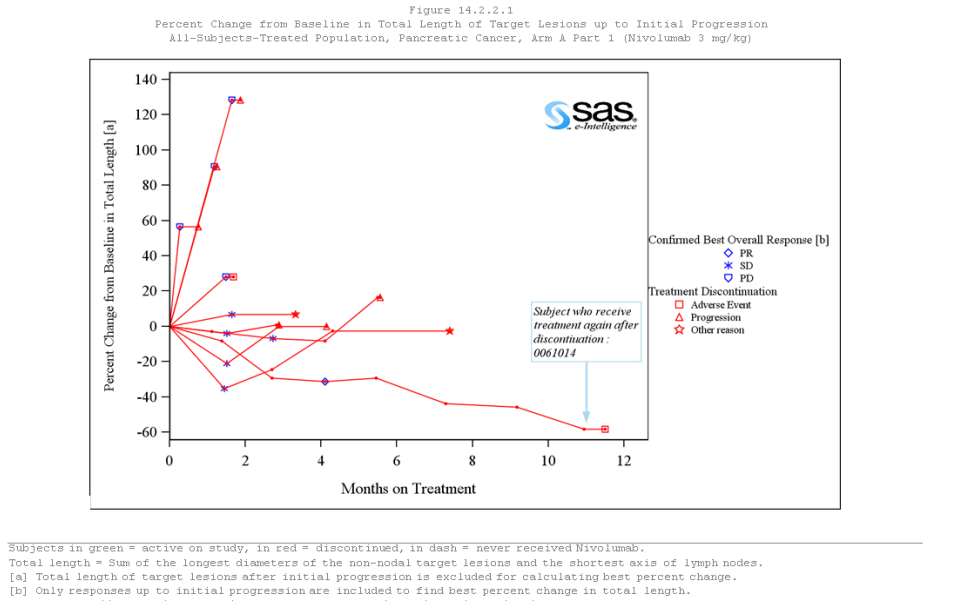


Subjects in green = active on study, in red = discontinued, in dash = never received Nivolumab.
Total length = Sum of the longest diameters of the non-nodal target lesions and the shortest axis of lymph nodes.
[a] Total length of target lesions after initial progression is excluded for calculating best percent change.
[b] Only responses up to initial progression are included to find best percent change in total length.

ISSUE 3 SOLUTION

```
drawarrow x1=11 y1=-20 x2=11 y2=-55
          / x1space=datavalue y1space=datavalue x2space=datavalue y2space=datavalue arrowheadshape=filled lineattrs=(color=lightblue) ;
drawtext textattrs=(style=italic size=8pt) "Subject who receive treatment again after discontiuation : 0061014"
          / width=25 anchor=bottom border=true borderattrs=(color=lightblue) x=11 y=-20 xspace=datavalue yspace=datavalue;
```

SHOW WHICH APPLICATION TO DRAW THIS FIGURE




```
drawimage "XXX\hi.jpg" / x=98 y=98 drawspace=wallpercent width=30 widthunit=percent
                         anchor=topright  height=20 heightunit=percent ;
```

CONCLUSION

Draw statement does make drawing figures with GTL more flexible. This paper details how we leverage this function to do our daily work.

REFERENCES

SAS(R) 9.3 Graph Template Language: Reference, Third Edition. Available at http://support.sas.com/documentation/cdl/en/grstatgraph/65377/HTML/default/viewer.htm#titlepage.htm

SAS(R) 9.3 Graph Template Language: User's Guide

http://support.sas.com/documentation/cdl/en/grstatug/63302/HTML/default/viewer.htm#titlepage.htm

CONTACT INFORMATION

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