Conjoining Images and SAS Graphics with DATA Step Graphics Interface (DSGI) Navigator

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ABSTRACT

The DATA Step Graphics Interface provides the graphics routines used by SAS/GRAPH software interactively joined with datasets. SAS programmers can enjoy the ‘smooth-sailing’ or freedom of creating custom graphs in a DATA step programming style. However, just like sailing, there is no freedom without directions. To start a graphic job by selecting a function call such as ‘draw line’ is much easier than deciding where and how to put it. DSGI Navigator, a SAS/AF® Frame Entry application runs with SAS version 6.11 in MS Windows 95, was then designed to ease the task of preparation and maximize the freedom of using DSGI by utilizing the GUI features provided by object classes such as Image and SAS/GRAPH® Output. This application currently has three functions, form reproduce, data mapping and graph join. It also produces DSGI source codes after finishing a function through its DSGI program organizer which makes the codes reusable and portable or smoothes the learning steps for novices to DSGI.

INTRODUCTION

DSGI gives you all the powerful functions and call routines which follow the standards of Graphics Kernal System (GKS). The most outstanding feature of DSGI is directly performing graphics generation with the flexibility of a DATA step. It has some similar function concepts that are offered by SAS/GRAPH annotation facility and both retrieve data values into graphic function calls in DATA steps. But annotation facility takes one more step, PROC, to fulfill a sub-graph with the graphical setup from a main graph. With DSGI, you start with a blank work sheet and do whatever you want. But here comes the problem, without the natural constraints of SAS/GRAPH, how do you start a DSGI task? How do you transform image objects into SAS/GRAPH catalog entries through the magic of DSGI? What is the best way to manipulate graph entries using DSGI as a console? What other potential graphic functions can DSGI do in the real world? What is the strategical method to benefit people who want to learn DSGI? It is the unknown that blocks people from realizing the power of DSGI even though it can be found in the SAS/GRAPH menu. It is also the simplicity of DSGI that ironically forces some people to give up after several tedious tries of pinpointing x/y values. DSGI Navigator is developed to enhance the ‘direction’ and ease of programming with DSGI.

THE DSGI Navigator APPLICATION

The DSGI Navigator, a SAS/AF® Frame Entry based application, employs the most advanced GUI and system resources from SAS version 6.11. It is designed for both real world functionality and possibly a learning tools for people interested in DSGI programming. With work experience in window environment and basic SAS programming knowledge, plus hypertext on line helps, graphs and related DSGI source codes can be created and stored into specific project directory or library. Various graph saving options were considered to increase the utilization of output graphics with other commercial softwares or word processing packages.

Primary Design Goals

• There is no intention to replace any one of SAS/GRAPH procedures with DSGI Navigator at the very first design stage. Even some functions in this application may be found in existing procedures with similarities, but the approaches and results are different.
• A GUI based tool set shall provide a pure visual DSGI programming environment, that is, everything from drawing routines to the place to anchor graphics can be seen and selected or ‘navigated’ all the time. Based on the pre-defined functions in DSGI Navigator, any single DSGI programming code shall be done through a point and click GUI fashion. Global DSGI source code structure has been modulated but can be customized with adequate DSGI knowledge.
• Either the output graphics or the derived source codes can be saved and reused. The output graphic can be saved in SAS/GRAPH catalog entries, external image files or to the clipboard from which cut/paste can be performed and several industry standard output file formats can be used.
This application shall have the capabilities to reproduce any kind of data collection forms into SAS graphs with image copy of original form, and furthermore, to map SAS datasets to these forms and return electronical dataset information back to original and printable data forms.

DIMENSION AND RATIO

SAS/AF® Frame Entries classes, like SAS/GRAPH OUTPUT and IMAGE are extensively used as both displays and workplaces in the DSGI Navigator. Graphical attributes and methods interact among frames, widgets and classes and play the major roles not just for GUI tools but also the underlying job flows. Each function contains a frame with its cursor tracker method enabled. Since the origin point is at the upper left corner of the frame, an override method was created to redefine the origin point (lower left) of the workspace/display widget, not the frame, so x,y values of the moving cursor are displayed at the right spot. Current the size of display or workspace is 800x600 screen pixel in landscape orientation. The same size display in portrait mode might need monitor resolution up to 1280x1024 to represent all details on the screen or work with scroll bar which may cause some inconvenience. Or else, in the worst case, it has to be laid down. Most business forms are printed on 11"x8.5" paper which ratio is 1.29. likewise the resolution of 800x600 or 1024x768 is 1.33. This key factor is important to adjust output graphs generated by DSGI statements in percentage graphic unit (100x100). The DSGI Navigator provide self-generate codes in two optional unit value, Pixel Location on screen or Percentage to the height and width of a form. The second option provides the possibility to resize and print the output graphics from A4, for example, to B3 or any size if the ratio value changed.

FUNCTIONS

Three established function panels currently in DSGI Navigator are displayed below in their task flow sequence:

1 Form Reproduce

Transitions and migrations among databases happen everyday in business. For example, data collected and recorded on paper forms are entered into DB and printed through FormFlow®, a form design software. With Open Data Base Connectivity (ODBC) interface and various data conversion softwares, data can be imported and exported in lots of formats. If the final destination DB is or can be a SAS database, wouldn’t it be nice to finish all these in SAS with less steps and still obtain the same quality printout forms? The function ‘form reproduce’ was designed to convert a business form to a SAS DSGI graph by taking an image copy of this form either from the software that creates it or from a scanner of the worksheet. (Figure 1)

![Figure 1 - Form Reproduce with an image file included](image1.png)

Then with the build-in drawing buttons in DSGI Function Panel, For example, TEXT button. It branches to text entry frame where users can enter either DSGI program comments to the background codes or the form description and select a proper font size in font size frame (Figure 2) before put it to the right spot through simple point and clicks.

![Figure 2 - Form Reproduce at Text Drawing](image2.png)
users can get the DSGI program stored in the background and if necessary, modify the source codes through the Program Organizer. Program editor can be setup to the one users preference. Dynamically users can view the current work right away to ensure the precision of output, or the work partially done last time before start it again.

2 Data Mapping

After a data form is successfully converted to a SAS graph created by DSGI program, the data source shall be converted to or entered as a SAS dataset so the further representation of business forms and information can be fulfilled completely in SAS system. Any format or informat associated with a data variable shall be carefully created and defined to reflect the true layout of that variable in a form. When the Data Mapping function is activated, the target form image is brought into the workspace first, the prepared dataset is selected (Figure 3).

![Figure 3 - Data Mapping at dataset selection](image)

Its contents, such as type, length, format and label are displayed in an Extended Table Entry. (Figure 4) With a variable selected, the spot to anchor it in a data field and the suitable font size to display, it can be determined quite easily by referencing an image font size option window. Proper program logics shall be added into the main DSGI program in DSGI Program Organizer to ensure correct display information, such as numerical variable SEX may have to be mapped back to Male/Female check boxes on a form. Most cases like this can be easily done by users who are familiar with DATA _NULL_ programming. To ease the data variables mapping steps, an option to reuse the row or column position of previous mapped variable can line up group of variables in certain data collection sequence.

Since this data mapping function can determine how/where/what/when to present data related to a form, It can be quite useful to present data in various layouts or patterns. For example, in real business world, certain information may be reviewed with corporation internal setup. Market price prediction in a form can be blocked according to reviewer’s department, title and function. Likewise data management control information shall only be seen by data processing staffs. Time released information can be scheduled base on system clock. So a dataset associated a form can include more information than those collected from a form and be presented in business nature.

![Figure 4 - Data Mapping at variable selections](image)

3 Join Graphs

Graphs created either by SAS/GRAPH procedures or DSGI can be grouped and saved into graph catalogs according to their business purposes. There are several ways to generate a graph which contains all the possible information in graphical format, i.e. double vertical axes plot, multiple variables plot, or even a mix of these two types of graphs with descriptive annotations. For a page layout with multiple graphs, PROC GREPLAY is right there to serve this purpose with SAS default or user defined template options.

The Join Graphs function comes with a totally different idea to produce a combo graph from a SAS/GRAPH catalog. First, it provides direct edit on a graph through either built in DSGI drawing buttons or SAS/GRAPH editor. Second, since a GUI frame entry is used to select and preview graphs in advance, the way to join graphs can be decided visually in a free form style. In this frame (Figure 5), there are two graph display areas with their own x/y reference system.
The within or cross over reference options grant users a free-form resizing and overlapping of two graphs. As a result at 1 to 1 ratio (Figure 6), it can overlap graphs like PROC GREPLAY does, but it does not need any template at all to produce a new graph. This is a demonstration that represents SAS dataset in original data collection form described in previous two functions. The advantages of this form data presentation are more than just producing on screen data review tools. The efficiency of program execution and output generation was one of major triggers to develop this DSGI application. To accomplish overall efficiency, static graphs are only generated once and reused as ‘wallpaper’. The rest graphs generated dynamically are relatively simpler and smaller compared to the wallpaper. The static graph, like a business form, can be saved as a graph entry in a catalog or preprinted first so related data graphs can be over printed on it later.

A joined graph with any visually decided ratio can also be easily created. This is done through the ViewPort Allocation options (Figure 7 upper right).

Even more, the DSGI source code is always ready for reuse. Noteworthy, if there is a well defined SAS graph catalog structure in a shareable platform such as a client server system. Instead of sending an image or graph file to a remote partner, just e-mail the tiny ASCII program file to execute on the remote site. It can be a big plus to time savings.

The source code generated by DSGI Navigator for the example (Figure 6) is listed below:

```sas
/* DSGI program used to join SAS/Graphs in the same graph catalog */
/* Programmer ID: SUNERIC */
/* Date/Time: 27AUG96 08:47 */
data _null_; run;
rc=gset('catalog','dsgi','gseg');
rc=ginit();
rc=graph('delete','joinhere');
rc=graph('clear','joinhere');

**** graph1 drawing;
rc=gset('viewport',1,0,0,1,1);
rc=gset('window',1,0,0,100,100);
rc=gset('transno',1);
rc=graph('insert','PDSALEFM');

**** graph2 drawing;
rc=gset('viewport',2,0,0,1,1);
rc=gset('window',2,0,0,100,100);
rc=gset('transno',2);
rc=graph('insert','PDSALEDT');

rc=graph('update','noshow');
rc=gtterm(); run;
```
FUTURE EXPANSION

DSGI Navigator exhibits its unique strategy to take advantage of using DSGI programming. Besides current established functions, there are some other possible expansions:

**Enhanced Data Browser**

This function will not only browse a SAS dataset in its original form with proper page selection, but combined with data base validation, data fields in question or errors can be printed on pages of pre-printed forms. Graphic attributes can be changed (i.e., shaded or text color changed to red) so data collectors at different sites can easily spot the problem data.

**SAS/GRAPH Catalog Supervisor**

With the on-line visualization capabilities, DSGI Navigator may transform a new application which can supervise and organize SAS graphs and image files created by other commercial softwares. Functions can be designed like browse, copy, manage or manipulate SAS graph within or across catalog entries or even joined with PROC GREPLAY/GPLOT etc. to mix flexibility with conventional SAS graph creations.

**WHAT SAS MAY HELP**

As a GUI tools, SAS/AF and Screen Control Language really demonstrate their capabilities to satisfy various business needs. There are a lot of frame entries that deal with library, file, and graph were found handy in AF system resources and adapted in the DSGI Navigator. Unfortunately there are no documentation or open codes at all for fine tunes or further customization. It is understandable at this early stage a lot of programming resources maybe still needs some improvements or well documentation. An open environment of AF toolkits design and implementation like Visual Basic® will definitely benefit all parties in exploring the power of SAS/AF.

CONCLUSION

DSGI Navigator reveals a more human nature way to produce graphs with DSGI and handle graphs more straight forward through eyes. Its DSGI codes automation feature leads a new sequence of creating graphs before writing codes which can be executed to regenerate the same graphs remotely.

For more information regarding DSGI Navigator please contact

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ACKNOWLEDGMENTS

I would like to thank Harvey Monder for his DSGI Publications and direct guidance and opinions to this application. Also I wish to thank Fei Tan's third-party challenges to the function ideas and suggestions during the development. A sincere thank is also due Teresa Cuchiaro for her reviewing and edit checking of this paper.

REFERENCE


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