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Adding Graph Visualization on SAS® ODS Output

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ABSTRACT

SAS® tools are normally used to produce statistical graphs such as pie charts, bar charts, various plots, dashboards and even geographical maps. However, many SAS users may want to enhance their output by incorporating various diagrams such as networking, cluster, and process flows. In this paper, we introduce a method to add specific graphs onto SAS® ODS output by interacting with "Graphviz" (an open source graph visualization software) in BASE SAS.

INTRODUCTION

The open source software, Graphviz, represents structural information in the form of diagrams of abstract graphs especially in the fields of networking, bioinformatics, software engineering, database, and web designing. The paper will provide a step by step explanation on creating Graphviz code by using BASE SAS and, more importantly, generating a specific graph by running the created Graphviz code.

GRAHPVIZ BASICS

The Graphviz layout programs take descriptions of graphs in a simple text language and generate diagrams in useful formats, such as images and SVG for web pages. There are several layout languages one can use to generate graphs for example dot, neato, fdp, etc.

In this paper, the dot layout language was used to create the graph and a piece of code below shows the reader how to use dot to draw a relationship diagram.

By using the dot program below, users can easily generate the diagram in Figure 1. The program is very easy to understand and use. More detailed dot language grammar is available on the official site of Graphviz.

```
digraph G {
    P1->P2[label=Friend];P1->P3[Label=Son];
    P1->P4[label=Father];P1->P5[label=Husband];
}
```
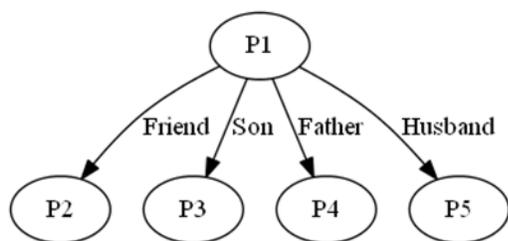

Figure 1. Relationship Diagram

WRITING GRAPHVIZ CODE USING BASE SAS

The practical example of Graphviz can be shown on association analysis for market basket transactions. After performing the analysis, several association rules are formed such as frozenmeal→cannedveg, cannedveg→beer, beer→frozenmeal, freshveg→fish, beer→wine, and wine → confectionery. The following code shows the creation of the dot layout code for the association rules above in BASE SAS and the generation of the diagram by calling the external Graphviz software in two steps.

In the first step, the dot layout code that is needed to generate the association rule diagram is put into the variable graphcode as text. Then, the FILE Statement and the PUT Statement in data step will be used to output text onto a dot file. The code is showed below.

```
data _null_;
    graphcode = "digraph G{
                frozenmeal->cannedveg;
                cannedveg->beer;
                beer->frozenmeal;
                freshveg->fish;
                beer->wine;
                wine -> confectionery;
           }";
    file "c:\temp\association.dot";
    put graphcode;
run;
```

FILE STATEMENT

The dot file is specified here for the current out file for the PUT Statement. This dot file will be interpreted by Graphviz to create the image file in a later step.

PUT STATEMENT

The PUT Statement is used to write the completed dot layout program to the external file defined in the FILE Statement above.

The second step is to call the Graphviz software to run the program that was generated in the last step.

```
data _null_;
X 'cd G:\Graphviz\bin';
call system("G:\Graphviz\bin\dot -Tjpg c:\temp\ association.dot -o c:\temp\
association jpg");
run;
```

The section of code above calls the output dot program and generates the association graph in a defined directory.

X STATEMENT

A Windows command is called by the X Statement to ensure that the path navigator is positioned at Graphviz's running directory.

CALL SYSTEM STATEMENT

A Graphviz command is submitted by the CALL SYSTEM Statement to generate the image in the defined folder with the specified type.

TJPG OPTION

Tjpg option is used to define the output type of the image. The users can also use other options to generate the different images, for example using the Tpng option to create png image.

O OPTION

The generated image will be stored in a temp folder in the C drive.

ADDING THE GRAPH ONTO SAS® ODS OUTPUT

After generating the association graph, we can merge it into the SAS ODS output like pdf, rtf, and html file. Here, a pdf file type is used as an example. The code for rtf and html is very similar to the code that is used for the pdf output.
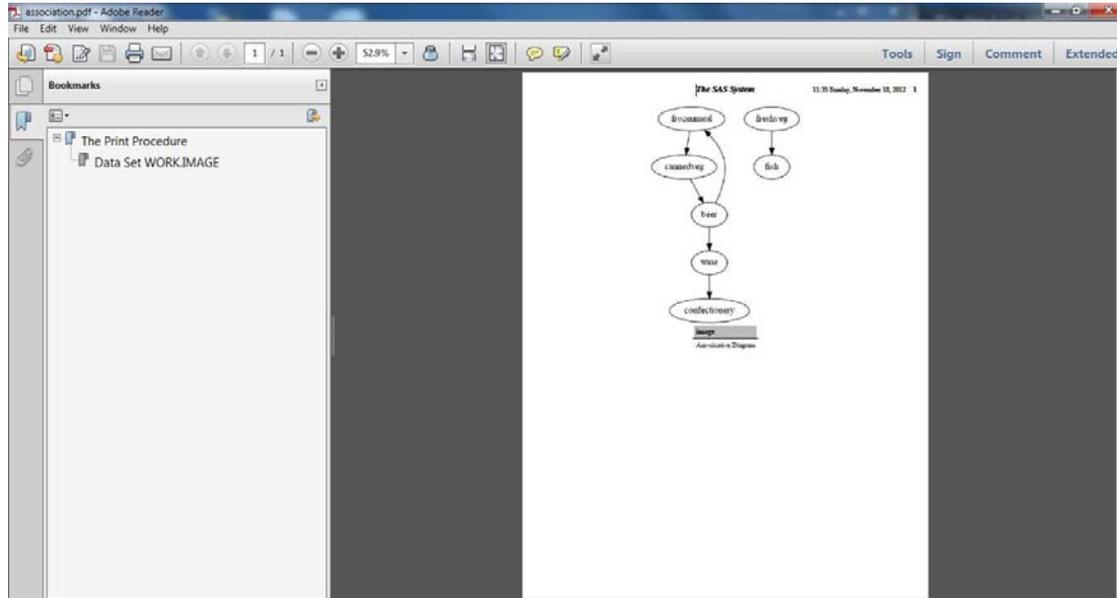
```
ods pdf file = "association.pdf";
proc print data=image noobs label style=[preimage="C:\temp\association.jpg"
frame=void];
run;
ods pdf close;
```

Using the code above, the generated association diagram is put onto the pdf file.

PREIMAGE OPTION

The added graph is defined in PREIMAGE option in PROC PRINT. The graph will be displayed before the temporary data set, image, that is used as an intermediate step to merge the graph onto the ODS output.

Display 1. Sample ODS Output in PDF

LIMITATIONS

As mentioned above, Graphviz mainly focuses on the graph visualization on networking, bioinformatics, software engineering, database, web design, and machine learning. Therefore, it may not support all graphs that a user wants to visualize.

CONCLUSION

In this paper, a BASE SAS program is introduced to add specific graph visualization onto a SAS ODS output by interacting with an open source software "Graphviz". This method provides a complement to the current SAS graph system and let SAS users have more options to visualize their results generated in SAS.

REFERENCES

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