Paper 220-2011

Fit-to-a-T: Using SAS® to Create a SAS® Global Forum 2011 T-Shirt
Ted Conway, Chicago, IL

ABSTRACT

To celebrate the anniversary of the SAS Global Forum 2010 T-Shirt Contest, here's a short SAS program that creates a design for a SAS Global Forum 2011 T-Shirt to commemorate the conference's 36 years of Eureka! moments. And don't worry if you're Photoshop-challenged – the design is generated entirely with Base SAS® and SAS/GRAPH®!

INTRODUCTION

Like many, I *thought* about entering the SAS Global Forum T-Shirt Contest sponsored last year by sasCommunity.org, but never quite got around to it. I did have an excuse of sorts – my digital art efforts have been confined to bad MS-Paintbrush hacks, including the one to the right from a SUGI 30 poster effort – *Make Bill Gates and Dr. Goodnight Run Your SAS Code: Using VBA, ADO and IOM to Make Excel and SAS Play Nice* – that earned me a puzzled how-could-you-possibly-be-my-father look from my art-loving daughter when she spotted my creation hanging in the Pennsylvania Convention Center. And even though I missed last year's contest, I still wondered: Could a Photoshop-challenged programmer like me possibly create a reasonable-looking SAS Global Forum T-Shirt design using nothing but SAS code? Read on, and we'll see!

SO WHAT'S THE BIG IDEA?

SAS Global Forum 2011 marks the 36th annual gathering of SAS fans to network, share their knowledge, and perhaps come up their next Big Idea.

In a nice coincidence, my initial proposed t-shirt design, which was inspired by SAS/GRAPH examples found at *robslink.com* (see Zazzle mockup below) called for a grid of SAS/GRAPH maps of the United States showing the locations and attendance of the SUGI/SGF Conferences.

And when it comes to grids, 36 is – as they say on Schoolhouse Rock – a magic number!
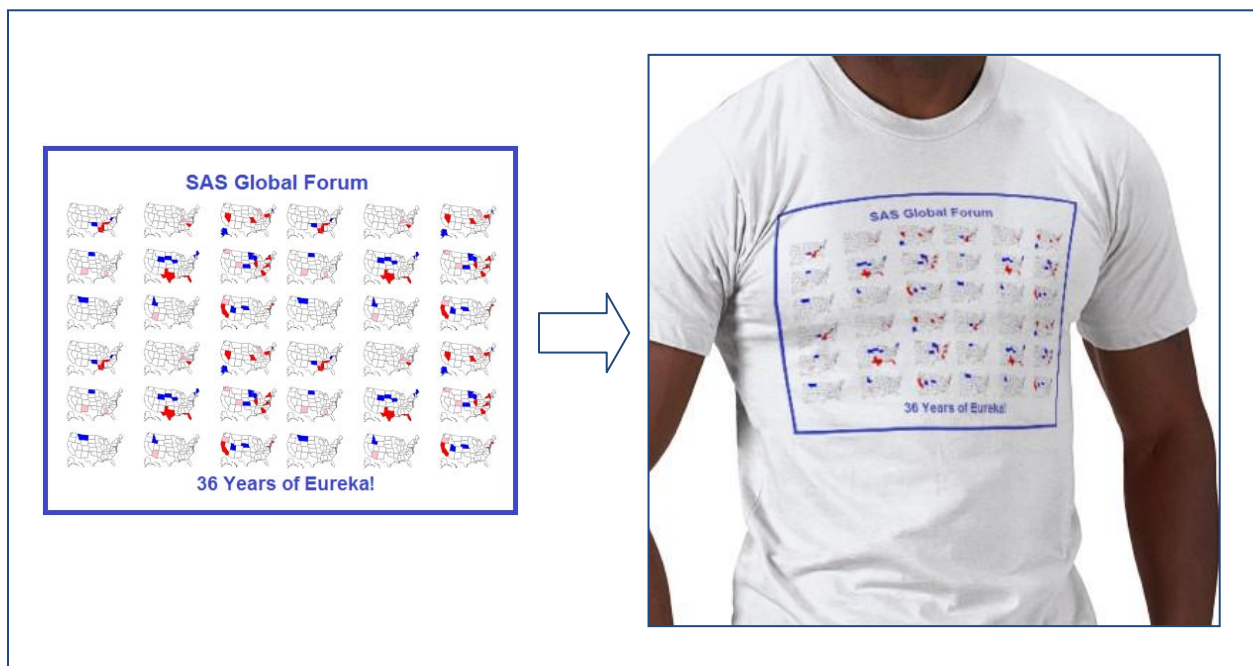

PROPOSED T-SHIRT DESIGN – ZAZZLE MOCKUP

Now that we've got a proposed T-shirt design, which we'll refine as we go along to add dates, locations, attendance, etc., let's see what kind of data and SAS code we need to implement it!

GOT DATA?

Don't have the dates and locations of the past conferences memorized? Nor did I. But that's no problem!

Click your way over to support.sas.com, and you'll find the good folks at SAS have made all of the conference information available – from SUGI '76 (Kissimmee, FL, 206 attendees!) to SAS Global Forum 2010 (Seattle, WA).
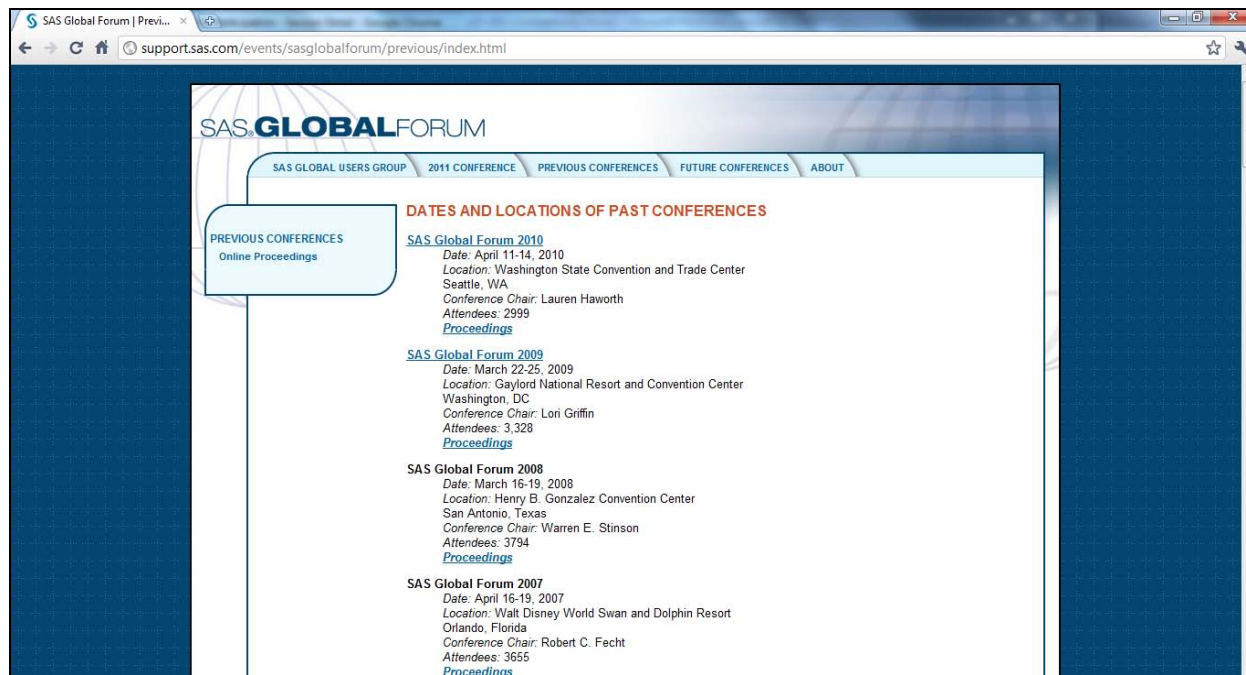
SAS GLOBAL FORUM – PAST CONFERENCES

GOT CODE?

We could start from scratch, but as is the case with most programming efforts, it's always easier if we can ~~steal~~ borrow some suitable code to get started.

And if you're going to ~~steal~~ borrow some code, you might as well ~~steal~~ borrow from an expert, and for SAS/GRAPH that means someone like Dr. Robert Allison, whose *robslink.com* website is chock full of useful SAS/GRAPH tips and tricks.

As usual, a visit to *robslink.com* didn't disappoint – I found not one, but two nice examples to jumpstart our little T-shirt project, the first of which you'll note I used to mock-up the T-shirt design on the previous page.

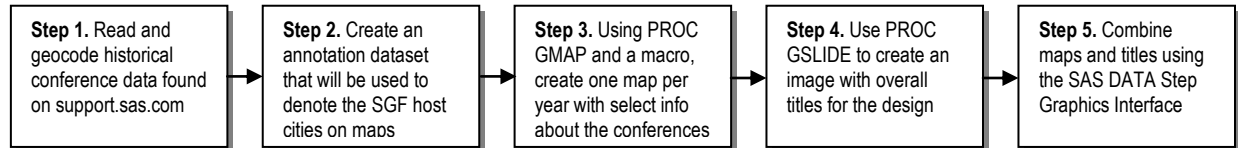http://robslink.com/SAS/democd42/mapgrid.htm   http://robslink.com/SAS/democd44/ex_12.htm

ROBSLINK.COM EXAMPLES

After a little merging-and-tweaking of this code and the maps' concepts, we should have a nice t-shirt design in no time at all!

THE BIG PICTURE

Step 1. Read and geocode historical conference data found on support.sas.com	**Step 2.** Create an annotation dataset that will be used to denote the SGF host cities on maps	**Step 3.** Using PROC GMAP and a macro, create one map per year with select info about the conferences	**Step 4.** Use PROC GSLIDE to create an image with overall titles for the design	**Step 5.** Combine maps and titles using the SAS DATA Step Graphics Interface

Before delving into the details of the code and data, let's take a quick look at the overall processing flow (see above), which uses features familiar to the SAS/GRAPH programmer – e.g., geocoding, PROC GMAP, and PROC GSLIDE – to build individual maps for each conference (using PROC GMAP) as well as titles for the t-shirt (using PROC GSLIDE), all of which are combined into a single image using SAS's Data Step Graphics Interface (DSGI).

STEP 1 – READ CONFERENCE DATA AND GEOCODE CITIES

```
data conferences(keep=year conference city st fromto attendance state);
infile cards dlm=',' missover;
input year conference : $20. city : $20. st : $10. fromto : $20.
      attendance : 4.;
if city='Hollywood Beach' then city='Hollywood';/* Hollywood Beach, aka Hollywood */
if city='Montreal' then do;    /* Montreal not on US map, but above Champlain, NY */
  city='Champlain'; st='NY';
  end;
state=stfips(st);
cards;
2011, SGF 2011, Las Vegas, NV, APR 4-7, TBD
...<snipped>...
1977, SUGI '77, New Orleans, LA, JAN 3-5, 200
;
proc sql;                              * Merge conference info & SAS map data;
create table sgf as         /* Flip city names back (kludge, but it works) */
select s.*, c.x, c.y
from conferences s left join maps.uscity c on s.city=c.city & s.state=c.state;
update sgf set city='Montreal' where city='Champlain';
update sgf set city='Hollywood Beach' where city='Hollywood';
```

READ/GEOCODE CONFERENCE DATA

Because the conference data was simply cut-and-pasted into inline CARDS data, getting the data into a format suitable for graphing is a pretty straightforward affair (see above).

States are converted to FIPS codes prior to the match against the SAS-provided MAPS.USCITY dataset, which provides the X and Y coordinates that will be needed to position markers that call out the host cities.

A minor coding kludge addresses challenges posed by two of the cities – 1. Hollywood Beach is known simply as "Hollywood" on the USCITY dataset, and 2. Montreal is not on the USCITY map, so the location coordinates of Champlain, NY are used as a starting point to help position the marker for Montreal (more on this trick later).

STEP 2 – CREATE MAP ANNOTATION DATASET WITH MARKERS FOR SGF HOST CITIES

```
data labels;                  * In windings font, 'a4'x is a dot-filled circle;
retain function 'label' xsys ysys '2' hsys '3' when 'a'
      text 'a4'X style '"wingdings"' color 'black' size 16 position '5';
set sgf;
if city='Montreal' then     /* Marker above for Montreal, others centered */
  position='B';
else
  position='5';
```

CREATE MAP ANNOTATION DATASET

The next step is to create an annotation dataset indicating the dotted-circle marker – ⊙ (wingdings font, character 'a4'X) – that will be used to identify each of the SAS Global Forum host cities on the maps.

In all but the case of Montreal, the markers will be centered on the X and Y coordinates that were obtained from the MAPS.USCITY dataset in the prior step. For Montreal, which does not appear on the USCITY map, the marker will actually be positioned above the X and Y coordinates for Champlain, NY.

Now on to the heart of this project – creating individual maps for each year that an SGF Conference has been held!

STEP 3 – CREATE INDIVIDUAL MAPS FOR EACH YEAR

```
%macro genMaps;
%do year=1976 %to 2011;
proc sql print;
select upcase(city), fromto, attendance,
scan("powderblue aquamarine palegreen tan lightsalmon lightpink
      thistle bisque silver", floor(1+9*ranuni(&year)))
into :city, :fromto, :attendance, :rndcolor
from sgf where year=&year;

goptions reset=(global goptions); * zpng is the new png (9.1 look-alike);
goptions device=zpng targetdevice=zpng xmax=2.3333in ymax=1.75in
         xpixels=700 ypixels=525 gunit=pct noborder cback=white
         gsfname=out gsfmode=replace;
filename out "c:\sgf2011\sgf&year..png";           * Individual year maps;
pattern1 value=msolid color=&rndcolor;   * Assigned 1 of 9 random colors;

proc gmap data=maps.us map=maps.us;
note justify=left font='arial narrow/bold' height=.11in " %trim(&city)"
     justify=center font='arial/bold' height=.25in "&year"
     justify=right font='arial narrow/bold' height=.11in "%trim(&fromto) ";
id state;
choro state / levels=1 nolegend coutline=black xsize=95 pct
              annotate=labels(where=(year=&year)) des='';
%if &year=2011 %then %do;                           /* # of 2011 attendees unknown */
  note lspace=1.30in justify=center height=.15in font='arial/bold' 'TBD'
       move=(84,+0) height=.15in font='webdings' '94'X
       font='arial narrow/bold' height=.11in '=300' %str(;);
  %end;
%else              /* One marker = 300 attendees or portion thereof, cap at 4200 */
  note lspace=1.30in justify=center height=.15in font='webdings'
       %sysfunc(REPEAT('94'X,%SYSFUNC(min(%SYSFUNC(floor(&attendance/300)),13))));;
run;
quit;
%end;
%mend;
%genmaps;
```
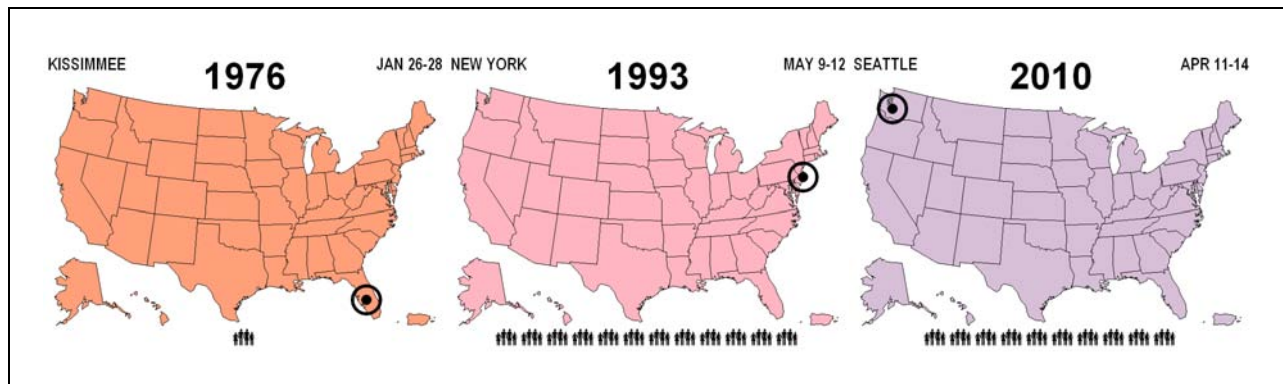
GENERATE CONFERENCE MAPS

The above code uses macro processing and SAS/GRAPH to generate one map for each conference year.

Each of the 36 individual maps presents some basic information about the conference – the **year** the conference was held, the name of the **host city**, the **dates** on which the conference fell, and the **number of attendees**, e.g.,

SAMPLE CONFERENCE MAPS

Taking a page again from *robslink.com*, the number of conference attendees is conveyed at the bottom of each map as a micrographic of sorts, in which one symbol – ⋔ (wingdings font, character '94'X) – represents 300 attendees or a portion thereof (capped at 4,200). Since the number of attendees for the 2011 conference is to be determined, the available space at the bottom right corner of the 2011 map is used to convey the scale (⋔=300).

Specifying the annotation dataset created in the last step causes a dotted-circle marker – ⊙ (wingdings font, character 'a4'X) – to be displayed on the maps at the locations of each of the SAS Global Forum host cities.

To liven things up, one of nine colors is "randomly" selected and assigned as the color of each map.

Finally, for the purposes of this project, a PNG image with an output resolution of 300 DPI was chosen, since it's compatible with the requirements of custom online t-shirt printer zazzle.com. SAS/GRAPH makes a wealth of image formats, fonts and output resolutions available for other projects of all kinds.

STEP 4 – CREATE TITLES

```
*==> 4. Use PROC GSLIDE to create overall titles;

goptions reset=(global goptions);
goptions device=zpng targetdevice=zpng gunit=pct xmax=14in ymax=1.5in
         xpixels=4200 ypixels=450 noborder cback=white
         gsfname=out gsfmode=replace;
filename out "c:\sgf2011\title.png";
proc gslide;
note justify=center font='arial/bold' height=.3in "WHERE DO IDEAS COME FROM?";
note justify=center font='arial/bold' height=.1in;
note justify=center font='arial/bold' height=1in "SAS GLOBAL FORUM";
run;
quit;
```

GENERATE TITLES

The above code uses PROC GSLIDE to generate the overall titles shown below that will appear above the combined maps in the final t-shirt design.

WHERE DO IDEAS COME FROM?

SAS GLOBAL FORUM

TITLES

Nothing really new here to explain, so let's move right along to the final step!

STEP 5 – COMBINE TITLES AND MAPS INTO A SINGLE IMAGE

```
*==> 5. Use DSGI to combine titles & maps into one image
        12.5% of page reserved for titles, 87.5% for grid of maps;

goptions reset=(global goptions);
goptions device=zpng target=zpng xmax=14in ymax=12in xpixels=4200 ypixels=3600
         noborder cback=white gunit=pct gsfname=out gsfmode=replace;
filename out "c:\sgf2011\sgf19762011.png";

data _null_;
dsgi=ginit();
dsgi=graph("clear");
dsgi=gdraw("image","c:\sgf2011\title.png",0,87.5,100,100,"fit");     * Titles;
do r=1 to 6;                           * Present the 36 conference maps as 6x6 grid;
  do c=1 to 6;
    year=1976+(r-1)*6+c-1;
    rc=gdraw("image","c:\sgf2011\sgf"||put(year,4.)||".png",         /* Maps */
             100/6*(c-1),87.5-87.5/6*(r-1),100/6*c,87.5-87.5/6*r,"fit");
   end;
end;
DGSI=graph("update");
DGSI=gterm();
```

COMBINE TITLES AND MAPS

The code above uses the SAS DATA Step Graphics Interface (DSGI) to combine the maps and titles we've created into a single 14"x12" image.

In the final image, the top12.5% of the area is reserved for the titles, while the bottom 87.5% is set aside for stitching together the 36 individual conference map images into a 6x6 map grid.

The final output is shown on the following page!

5

STEP 5 – COMBINE TITLES AND MAPS INTO A SINGLE IMAGE (CONT.)

T-SHIRT DESIGN (LESS THAN ACTUAL SIZE/RESOLUTION)
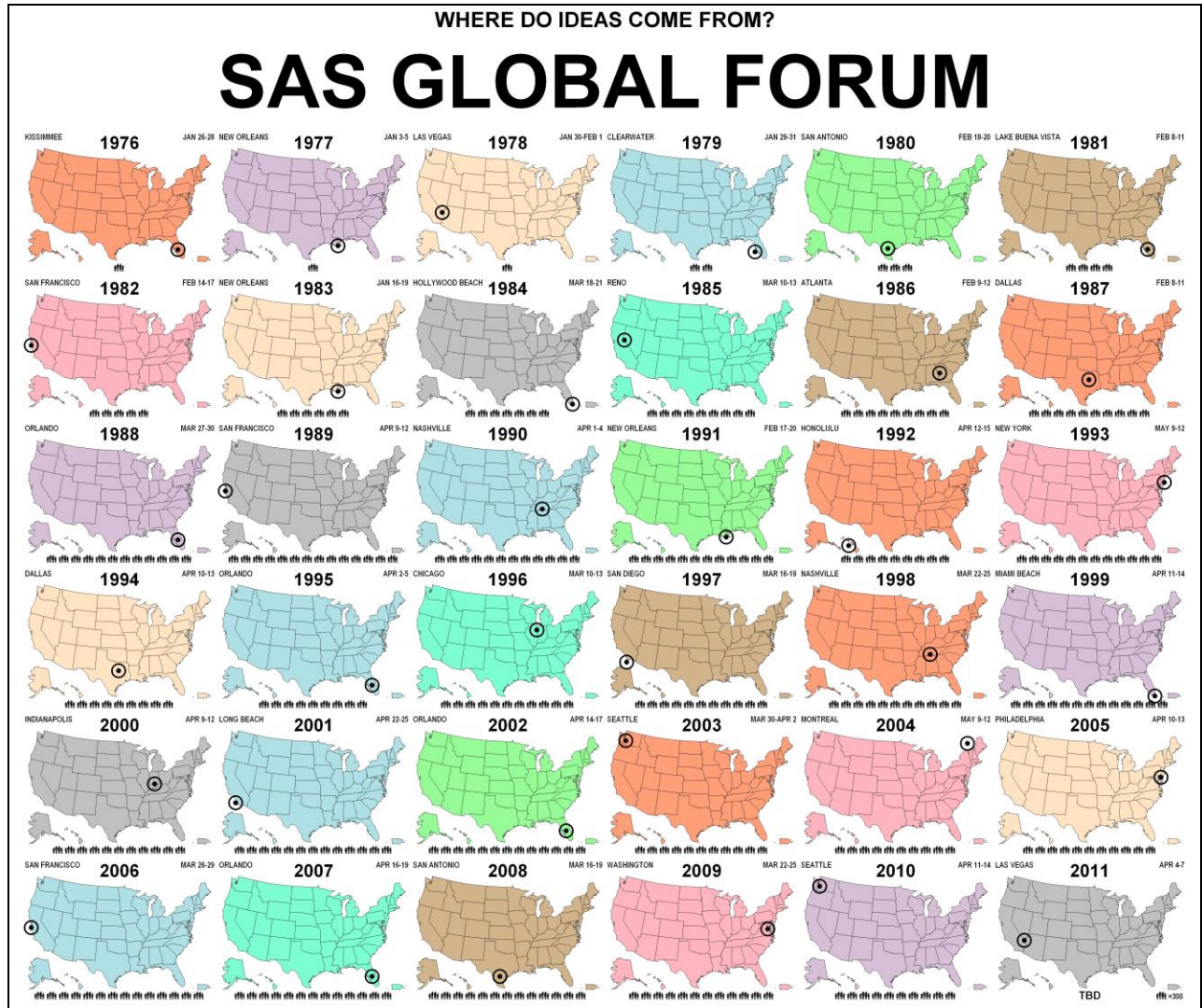
ZAZZLE.COM SCREEN PRINTS

FULL CODE

The complete code, including comments and the inline CARDS data, can be found in the following three pages.

CONCLUSION

Whether or not my design yields a decent looking <u>physical</u> t-shirt remains to be seen – an attempt will be made to print one prior to SGF – but coming up with a "reasonable" looking design solely via SAS coding was indeed possible with BASE SAS and SAS/GRAPH.

And while submitting a t-shirt design program to SAS Global Forum is admittedly somewhat akin to entering a baking soda volcano in the Westinghouse Science Fair, some of the tips and tricks on display here – SAS/GRAPH techniques, macro usage, small multiples, microcharts, et. – are also useful in more serious endeavors!

CREDITS/REFERENCE

There's certainly no shortage of freely-available information on the subject of SAS/GRAPH and its associated techniques.

For starters, you may want to take a look at the following:

- ✓ **SAS/GRAPH 9.2 Documentation** (http://support.sas.com/documentation/onlinedoc/graph/index.html)

- ✓ **SAS Data Visualization Focus Area** (http://support.sas.com/rnd/datavisualization/index.htm)

- ✓ **Robert Allison's SAS/Graph Examples!** (http://robslink.com/SAS/Home.htm)

- ✓ **Juice Analytics – Small Multiples** (http://www.juiceanalytics.com/writing/better-know-visualization-small-multiples/)

- ✓ **Juice Analytics – Repeating Character Charts** (http://www.juiceanalytics.com/writing/lightweight-data-exploration-in-excel/)

CONTACT INFORMATION

Ted Conway resides in Chicago, Illinois. Spam filters notwithstanding, he can be reached at tedconway@aol.com.

TRADEMARKS

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration.

---Other brand and product names are trademarks of their respective companies.

COMPLETE CODE/DATA – GET CONFERENCE INFO, GEOCODE CITIES (PAGE 1 OF 3)

```
options fontrendering=host_pixels nogstyle;  * Version 9.1 compatibility;

*==> tShirt.sas
     Uses SAS/Graph to design a SAS Global Forum t-shirt
     Output is 14" x 12" 300-dpi zazzle.com-compatible PNG image

*==> 1. Geocode 36 years of SAS conference locations using data at
        support.sas.com/events/sasglobalforum/previous/index.html;

data conferences(keep=year conference city st fromto attendance state);
infile cards dlm=',' missover;
input year conference : $20. city : $20. st : $10. fromto : $20.
      attendance : 4.;
if city='Hollywood Beach' then city='Hollywood';/* Hollywood Beach, aka Hollywood */
if city='Montreal' then do;    /* Montreal not on US map, but above Champlain, NY */
  city='Champlain'; st='NY';
  end;
state=stfips(st);
cards;
2011, SGF 2011, Las Vegas, NV, APR 4-7, TBD
2010, SGF 2010, Seattle, WA, APR 11-14, 2999
2009, SGF 2009, Washington, DC, MAR 22-25, 3328
2008, SGF 2008, San Antonio, TX, MAR 16-19, 3794
2007, SGF 2007, Orlando, FL, APR 16-19, 3655
2006, SUGI 31, San Francisco, CA, MAR 26-29, 4242
2005, SUGI 30, Philadelphia, PA, APR 10-13, 3258
2004, SUGI 29, Montreal, Quebec, MAY 9-12, 2987
2003, SUGI 28, Seattle, WA, MAR 30-APR 2, 3036
2002, SUGI 27, Orlando, FL, APR 14-17, 3676
2001, SUGI 26, Long Beach, CA, APR 22-25, 3720
2000, SUGI 25, Indianapolis, IN,  APR 9-12, 3000
1999, SUGI 24, Miami Beach, FL, APR 11-14, 3775
1998, SUGI 23, Nashville, TN, MAR 22-25, 3000
1997, SUGI 22, San Diego, CA, MAR 16-19, 3000
1996, SUGI 21, Chicago, IL, MAR 10-13, 3000
1995, SUGI 20, Orlando, FL, APR 2-5, 2600
1994, SUGI 19, Dallas, TX, APR 10-13, 2500
1993, SUGI 18, New York, NY, MAY 9-12, 3500
1992, SUGI 17, Honolulu, HI, APR 12-15, 2500
1991, SUGI 16, New Orleans, LA, FEB 17-20, 3500
1990, SUGI 15, Nashville, TN, APR 1-4, 3500
1989, SUGI 14, San Francisco, CA, APR 9-12, 4000
1988, SUGI 13, Orlando, FL, MAR 27-30, 3500
1987, SUGI 12, Dallas, TX, FEB 8-11, 2800
1986, SUGI 11, Atlanta, GA, FEB 9-12, 2600
1985, SUGI 10, Reno, NV, MAR 10-13, 2500
1984, SUGI '84, Hollywood Beach, FL, MAR 18-21, 2092
1983, SUGI '83, New Orleans, LA, JAN 16-19, 1656
1982, SUGI '82, San Francisco, CA, FEB 14-17, 1322
1981, SUGI '81, Lake Buena Vista, FL, FEB 8-11, 1020
1980, SUGI '80, San Antonio, TX, FEB 18-20, 600
1979, SUGI '79, Clearwater, FL, JAN 29-31, 500
1978, SUGI '78, Las Vegas, NV, JAN 30-FEB 1, 241
1977, SUGI '77, New Orleans, LA,  JAN 3-5, 200
1976, SUGI '76, Kissimmee, FL, JAN 26-28, 206
;

proc sql;                        * Merge conference info & SAS map data;
create table sgf as      /* Flip city names back (kludge, but it works) */
select s.*, c.x, c.y
from conferences s left join maps.uscity c on s.city=c.city & s.state=c.state;
update sgf set city='Montreal' where city='Champlain';
update sgf set city='Hollywood Beach' where city='Hollywood';
```

COMPLETE CODE/DATA – CREATE ANNOTATIONS AND MAPS (PAGE 2 OF 3)

```
*==> 2. Create annotate dataset with dotted-circle location markers;

data labels;                  * In windings font, 'a4'x is a dot-filled circle;
retain function 'label' xsys ysys '2' hsys '3' when 'a'
       text 'a4'X style '"wingdings"' color 'black' size 16 position '5';
set sgf;
if city='Montreal' then      /* Marker above for Montreal, others centered */
  position='B';
else
  position='5';
run;

*==> 3. Use PROC GMAP + macro to draw 1 randomly-colored map for each year
        with dates, city, attendance (graphic) of each conference;

%macro genMaps;
%do year=1976 %to 2011;
proc sql print;
select upcase(city), fromto, attendance,
scan("powderblue aquamarine palegreen tan lightsalmon lightpink
      thistle bisque silver", floor(1+9*ranuni(&year)))
into :city, :fromto, :attendance, :rndcolor
from sgf where year=&year;

goptions reset=(global goptions); * zpng is the new png (9.1 look-alike);
goptions device=zpng targetdevice=zpng xmax=2.3333in ymax=1.75in
         xpixels=700 ypixels=525 gunit=pct noborder cback=white
         gsfname=out gsfmode=replace;
filename out "c:\sgf2011\sgf&year..png";          * Individual year maps;
pattern1 value=msolid color=&rndcolor;   * Assigned 1 of 9 random colors;

proc gmap data=maps.us map=maps.us;
note justify=left font='arial narrow/bold' height=.11in " %trim(&city)"
     justify=center font='arial/bold' height=.25in "&year"
     justify=right font='arial narrow/bold' height=.11in "%trim(&fromto) ";
id state;
choro state / levels=1 nolegend coutline=black xsize=95 pct
              annotate=labels(where=(year=&year)) des='';
%if &year=2011 %then %do;                          /* # of 2011 attendees unknown */
  note lspace=1.30in justify=center height=.15in font='arial/bold' 'TBD'
       move=(84,+0) height=.15in font='webdings' '94'X
       font='arial narrow/bold' height=.11in '=300' %str(;);
  %end;
%else            /* One marker = 300 attendees or portion thereof, cap at 4200 */
  note lspace=1.30in justify=center height=.15in font='webdings'
       %sysfunc(REPEAT('94'X,%SYSFUNC(min(%SYSFUNC(floor(&attendance/300)),13))));;
run;
quit;
%end;
%mend;
%genmaps;
```

9

COMPLETE CODE /DATA – CREATE TITLES AND COMBINE WITH MAPS (PAGE 3 OF 3)

```
*==> 4. Use PROC GSLIDE to create overall titles;

goptions reset=(global goptions);
goptions device=zpng targetdevice=zpng gunit=pct xmax=14in ymax=1.5in
         xpixels=4200 ypixels=450 noborder cback=white
         gsfname=out gsfmode=replace;
filename out "c:\sgf2011\title.png";
proc gslide;
note justify=center font='arial/bold' height=.3in "WHERE DO IDEAS COME FROM?";
note justify=center font='arial/bold' height=.1in;
note justify=center font='arial/bold' height=1in "SAS GLOBAL FORUM";
run;
quit;


*==> 5. Use DSGI to combine titles & maps into one image
         12.5% of page reserved for titles, 87.5% for grid of maps;

goptions reset=(global goptions);
goptions device=zpng target=zpng xmax=14in ymax=12in xpixels=4200 ypixels=3600
         noborder cback=white gunit=pct gsfname=out gsfmode=replace;
filename out "c:\sgf2011\sgf19762011.png";


data _null_;
dsgi=ginit();
dsgi=graph("clear");
dsgi=gdraw("image","c:\sgf2011\title.png",0,87.5,100,100,"fit");     * Titles;
do r=1 to 6;                      * Present the 36 conference maps as 6x6 grid;
  do c=1 to 6;
    year=1976+(r-1)*6+c-1;
    rc=gdraw("image","c:\sgf2011\sgf"||put(year,4.)||".png",         /* Maps */
             100/6*(c-1),87.5-87.5/6*(r-1),100/6*c,87.5-87.5/6*r,"fit");
   end;
end;
DGSI=graph("update");
DGSI=gterm();
```