ODS, Proc GMAP and SAS/Intrnet:
MAP Your Own Response Data

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Abstract:
In recent years, there has been added interest in geographic information analysis and there are several commercially available products, which can provide means and tools to do spatial data analysis, but most of these products have learning curves and also come at great expense. However, Proc GMAP combined with ODS and SAS/Intrnet provides one of the best and easiest way to analyze and visualize spatial data and render output to end-users web browser without having SAS or any other software installed on client computer and also end-users do not need to know any technical details. In this paper, we will demonstrate how to build the dynamic web pages where users can enter or cut and paste their own response geo-data to be mapped. Furthermore, it will allow users to drill down to lower geography to bring some of the census information.

Key Words: SAS/BASE, SAS/GRAPH: Proc GMAP and Annotation, SAS Macro Language, Data Statements, SAS/Intrnet ODS and HTML.
URL: http://atlantacensus2000.gsu.edu

Introduction:
Recently, people have realized that geo-spatial data analysis and visualization is more important than data itself, which provides a much better understanding and give data an added dimension. A map along with bars and charts will speak volume compared to just the tables and numbers. But, very often people think that adding geographic component to report or analysis may be very expensive, moreover, one might need to acquire help of experts who provide such services. On the other hand, with new tools, which are available in SAS V8 and V9, it is very easy and convenient for some one to create maps of their own data at any geography levels without having to know how GIS. In the following, we will provide details of how one can cut and paste response geo-spatial data and create maps and display in web browser.

HTML Code:
Consider following HTML statements, which give instructions on how to arrange response data set, selection of a geographic region and provide TextArea for users to cut and paste their geo-spatial data:

```html
<HTML>
<!-- Generated by SAS Software -->
<!-- Http://www.sas.com -->
<HEAD>
<TITLE>AtlantaCensus2000</TITLE>
<META http-equiv="Content-type" content="text/html; charset=windows-1252">
<HEAD>
<body bgcolor="#ffffff" topmargin="0px" leftmargin="0px"
marginheight="0" marginwidth="0">
<SCRIPT LANGUAGE="JavaScript">
// This script is to load all object onLoad() functions
function startup(){
```
Instructions about entering data:
- Leading zeros of state FIPS should be coded.
- Counties are uniquely defined as concatenation of state, county FIPS.
- Tracts are uniquely defined as concatenation of state, county and tract FIPS.
- Block Groups are uniquely defined as concatenation of state, county, and tract Block Groups FIPS.
- For example, tract 201 of DeKalb County and tracts 55.01 and 55.02 of Fulton County should be entered as 13089020100, 13121005501 and 13121005502, respectively.
- Tracts and data should be separated by a comma.

Following is an example of creating a map of 15 tracts in DeKalb and Fulton counties of State of Georgia:

```
13089020100,0
13121000100,0.75
13089022401,0.79
13089021502,1.23
13121000200,1.35
13121009200,1.46
13089021501,1.52
13089020200,1.67
13121001500,1.68
13121009402,1.89
13121001400,1.89
13121009202,1.95
13089022400,2.06
13089022403,2.09
13121001600,2.28
```

```
<TABLE CELLPADDING="8" BGCOLOR="#BCD9C5">

```
</TABLE>
```
This HTML code was included in the SAS macro by `put` statement and result of this code looks as follows:

**Maps of User Supplied Geo-Data**

**Instructions about entering data:**
- Counties are uniquely defined as concatenation of state and county FIPS.
- Blocks are uniquely defined as concatenation of state, county, tract and block FIPS.

**Map of User Supplied Geo-Data**

**Instructions about entering data:**
- Blocks and data should be separated by a comma.
- Limit 50 or less blocks.
SAS Program to Select Map and Response Data:

Following is the structure of SAS program used to subset map file for PROC GMAP and also sub-setting maps and response data for drill down maps:

```sas
let plotopt=device=gif;
onlines fmtsearch=(hsql.formats);
%macro datacr;
%if %sysfunc(exist(apswork.map&dummy)) %then;
%else %do;
   data _null_;
   call symput('plotvar','dis');
   data _null_;
   length response $ 5000;
   file 'c:\inetpub\wwwroot\sasweb\comm.txt' lrecl=5000;
   response=symget('response');
   put response;
   data tr; infile 'c: \inetpub\wwwroot\sasweb\comm.txt' dlm=','
   truncover;
   length stcntract $ 11;
   input stcntract dis;
   if stcntract ne ' ';
   proc sort nodupkey; by stcntract;
   proc means data=tr sum n noprint; var dis;
   output out=temp(keep=sdis nobs) sum=sdis n=nobs;
   data t0(keep=nn); set temp;
   if nobs=1 then nn=1;
   else nn=int(nobs/2);
   data _null_; set tr;
   if _n_=1 then set t0;
   if _n_=nn then call symput('stcntract',trim(stcntract));
   run;
   data apswork.tr&stcntract;set tr; if _n_=1 then set
   temp(keep=sdis);
   if sdis>0 then pdis=int(10000*dis/sdis)/100;
   data temp(keep=stcnt); set apswork.tr&stcntract;
   by stcntract;
   length stcnt $ 5;
   stcnt=substr(stcntract,1,5);
   proc sort nodupkey; by stcnt;
   data _null_; set temp;
   call symput('t'||left(_n_),trim(stcnt));
   data apswork.map&stcntract;merge
   apswork.tr&stcntract(keep=stcntract in=j) tract.tr&t1
   tract.tr&t2 tract.tr&t3 tract.tr&t4
   tract.tr&t5 tract.tr&t6 tract.tr&t7 tract.tr&t8 tract.tr&t9
   tract.tr&t10; by stcntract; if j;
   data area; merge apswork.tr&stcntract(keep=stcntract in=j)
   tract.ar&t1 tract.ar&t2 tract.ar&t3 tract.ar&t4
   tract.ar&t5 tract.ar&t6 tract.ar&t7 tract.ar&t8 tract.ar&t9
   tract.ar&t10; by stcntract; if j;
   proc means data=area sum noprint; var area; output
   out=apswork.map&stcntract(keep=area) sum=;
   data tr1(keep=state county tract stcntract); set
   apswork.tr&stcntract;
   length state county tract 8;
   state=substr(stcntract,1,2);
   county=substr(stcntract,3,3);
   tract=substr(stcntract,6,6)/100;
   data apswork.ann&stcntract;set apswork.tr&stcntract;
   annot.c%eval(&t1+0) annot.c%eval(&t2+0)
   annot.c%eval(&t3+0) annot.c%eval(&t4+0)
   annot.c%eval(&t5+0)
   annot.c%eval(&t6+0) annot.c%eval(&t7+0)
   annot.c%eval(&t8+0) annot.c%eval(&t9+0)
   annot.c%eval(&t10+0); by state county tract; if j;
   data apswork.cnt&stcntract;set apswork.tr&stcntract;
   if &annind=0 then do;
   if area<=12 then do;
   call symput('annmv','annotate=apswork.ann&stcntract');
   call symput('annind','1');
   end;
   else do;
   call symput('annmv','annotate=apswork.cnt&stcntract');
   call symput('annind','2');
   end;
   if &annind=2 then do;
   call symput('annmv','annotate=apswork.cnt&stcntract');
   call symput('annind','2');
   end;
   if &annind=1 then do;
```
call symput('annmv','annotate=apswork.ann&stcntract');
call symput('annind','1');
end;
run;
option nocenter ls=100;
/* Enable ODS HTML output for the App Dispatcher environment. */
%include "c:\inetpub\wwwroot\sasweb\census\programs\headern.sas";
data _null_; file_webout;
%header;
put '<font color="#993300" size="4" face="Verdana"><b>'
"&title" '</b></font><br> run;
legend1 across=2 label=none value=(font='Verdana' height=1 color=CX4B74C3);
goptions &plotopt xpixels=650 ypixels=500 transparency; /* Create the map. */
proc gmap map=apswork.map&stcntract data=tr;
id stcntract; format &plotvar ptsfmt.;
choro &plotvar/discrete legend=legend1 COUTLINE=BLACK &annmv html=ATLVAR;
run; quit;
/* Add a trailer that allows the user to replot the map with different statistics or different output drivers. The first data step uses put statements to generate data that varies. */
%macro htmloption(var,value,label);
%local sel;
%if %UPCASE(&var) eq %UPCASE(&value) %then
%let sel=%str(SELECTED);
%else
%let sel=;
put '  <OPTION VALUE="&value"' 
"&sel>&label</OPTION>";
%mend htmloption;
data _null_;set apswork.area&stcntract;
file_webout;
put '<FORM METHOD="GET" ACTION="" &url">';
put '  <INPUT NAME="_PROGRAM" VALUE="" 
"&_program" " TYPE="HIDDEN">';
put '  <INPUT NAME="dummy" VALUE="" 
"&stcntract" " TYPE="HIDDEN">';
put '  <INPUT NAME="annind" VALUE="" 
"&annind" " TYPE="HIDDEN">';
put '  <INPUT NAME="stcntract" VALUE="" 
"&stcntract" " TYPE="HIDDEN">';
put '  <INPUT NAME="_SERVICE" VALUE="" 
"&_service" " TYPE="HIDDEN">';
put '  <INPUT NAME="_DEBUG" VALUE="" 
"&debug" " TYPE="HIDDEN">';
put '<TABLE BORDER="0">';
put '<TR><TD>Select data to map:</TD>
<TD><SELECT NAME="PLOTVAR">';
%htmloption(&PLOTVAR,dis, Supplied Value);
%htmloption(&PLOTVAR,pdis,Percent of Total);
put '</SELECT>';
put '</TD> <TD><INPUT TYPE="SUBMIT" VALUE="Map It"></TD>';;
put '</TR>';;
put '</TABLE>';;
if &annind=2 then
put 'Map covers ' area ' square miles area.&nbsp;&nbsp;<a href=http://atlantacensus2000.gsu.edu/scripts/broker.exe?&_service=default&_debug=0&_program=""&_pgmlib..trentry.sas""&dummy=""&stcntract "&_PLOTVAR=""&_plotvar"&"&_stcntract=""&_annind=1>Click here</a>&nbsp;to display street layer<br>';
if &annind=1 then
put 'Map covers ' area ' square miles area.&nbsp;&nbsp;<a href=http://atlantacensus2000.gsu.edu/scripts/broker.exe?&_service=default&_debug=0&_program=""&_pgmlib..trentry.sas""&dummy=""&stcntract "&_PLOTVAR=""&_plotvar"&"&_stcntract=""&_annind=2>Click here</a>&nbsp;to remove street layer<br>';
put 'Street layer is automatically displayed for map area less than 12 square miles unless removed<br>';
put '<a href=http://atlantacensus2000.gsu.edu/scripts/broker.exe?&_service=default&_debug=0&_program=""&_pgmlib..trentry_block.sas""&dummy=0&numleg=4&annind=0&stcntract="&_stcntract"">Block Map of Census 2000 Information</a> >';
run;
ods html close;
Following is a map of distance to block centroids from a centroid of a block.

Map of User Supplied Block Level Geo-Data
Select Map Type:

Map of Census 2000 Information

Click any where on the map to create block map of census information.
And drill down map of these user-supplied blocks brings census data as

In this paper, we demonstrated that how one can set up a macro to read user provided data and create maps and provide maps of census data for user supplied geography as well. This paper is a continuation of the work presented at SUGI 28 at Seattle, WA (http://www2.sas.com/proceedings/sugi28/138-28.pdf) which was also presented at SESUG 2003 help at St. Pete Beach, FL. Atlantacensus2000 is a web site which is continuously being updated and some of the new features, such as allowing users to perform statistical analysis and run regressions on the web, are forth coming.

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**Contact Information**

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