Color Coding Schemes Using SAS/GRAPH® Software

Leslie Worf, National Demographics & Lifestyles Inc.

Introduction

Many business graphics must show several shades of one or more colors on the same graph. The SAS® HLS, RGB and Gray Color Coding Schemes are powerful tools for creating such graphics. Colors of the same hue need to be discernable from each other while at the same time having a balance between them that is maintained for each color change.

Using the color coding schemes to find the right colors can become a lengthy guessing game. The best way to choose colors is to have a list previously printed on your own graphics printer of the available colors (or at least some of them). The following macros produce these color charts.

Description

Three macros are used, one each for the HLS, RGB and Gray color coding schemes. These macros are for creating charts of from 176 (for the RGB charts) to 252 (for the HLS and Gray charts) colors on one graph. The charts are labeled with the hexadecimal numbers necessary to name the colors in SAS/GRAPH. The HLS and RGB macros have parameters passed for determining which range of colors is to be created. By changing the macro parameters it is possible to create a complete reference book of colors to choose from making graphics development much faster and simpler.

Every graphics color chart must be in a separate catalog because SAS limits the number of colors in a catalog color list to 256. A new name for the catalog is created for each graph produced. This unique name is created from the parameters passed to the macro.

HLS Color Scheme

For the HLS color scheme, parameters passed are for the hue, lightness and saturation. Hue, which appears across the horizontal axis, can be either a 0, in which case the chart will show colors for hues in the 0-170 degree range, or a 180 for the second half of the HLS color coordinate system. In either case, the degrees increase by 10 for each column. Eighteen hues will be represented on each chart.

Lightness is represented on the vertical axis. The lightness parameter can be any number from 0 to 86 representing the percent on the HLS color coordinate system. This will be increased by one percent for each color square. Fourteen levels of lightness will be represented on each chart.

The saturation parameter will remain constant throughout the chart and is passed as any value from 1 to 100.

The color bars will be labeled across the top with the corresponding hue and down the side with the corresponding lightness and saturation. The values that appear here will be presented in hexadecimal numbers so the user can create a color name without having to do any conversions.

RGB Color Coding Scheme

The procedure is similar for the RGB color coding system except that additional parameters are required in order that the user may choose which color (red, green or blue) should remain constant for the two dimensional color chart and which colors appear on the horizontal and vertical axes.

The first two parameters are the name of the color, which is to remain constant, and its value. The second two parameters are for the row color and its starting value. The row color will be incremented by eight for each row for a total of 11 rows (be sure this value will not be incremented to over 255 (Hex FF).

The last two parameters are for the column color name and its starting value. The column color will also be incremented by eight for each column for a total of 16 columns. Again, be sure to use starting numbers that will not be incremented to greater than 255.

In this way, a full scale of color values can be represented in three graphs for the vertical axis and in two graphs for the horizontal graphics.

Gray Scales Color Coding Scheme

No parameters are necessary for the Gray scales coding system program as there are only 256 gray shades and must fit on one color chart. Hex values are printed right on the color bar itself. One graph is produced.

Following is the code for the three macros followed by a sample color chart (shown here in black and white).
**HUE Color Scheme Program Code**

* This macro, called HUECHRT, produces a list of colors in the HUE color coordinate system.

```sas
%INCLUDE SAMPGPR(ANNOCMS); /* SAS supplied annotation macro */
GOPTIONS NODISPLAY N0TVESSEL; /* GOPTIONS */
%SYSTBM(J,3,4); /* SYSTBM */
%MACRO HUECHRT(HUEIN1T,LITEINIT); /* MACRO */

DATA COLORRAW; /* DATA */
    LENGTH TEXT 5; /* LENGTH */
    %DCLANNO; /* DCLANNO */

GOPTIONS NODISPLAY; /* GOPTIONS */
%INCLUDBSAMPORP(ANNOCMS); /* INCLUDE */

DEVICE=TCX4107 /* DEVICE */

COLOR="HEX"; /* COLOR */

HUE = &HUEIN1T; /* HUE */
X1 = 10; /* X1 */
XTXT = X1 - 4; /* XTXT */
HUE = &HUEINIT; /* HUE */
DO l=l TO 16; /* DO */
    >> do for each column; /* >> */
    X2 = X1 + 4; /* X2 */
    Y2 = 5; /* Y2 */
    LITE = &LITEINIT; /* LITE */
    >> initialize lightness variable; /* >> */
    DO j=1 TO 14; /* DO */
        >> do for each row; /* >> */
        X1 = Y2 + 1; /* X1 */
        Y2 = X1 + 24; /* Y2 */
        LITNESS = 25*(LITE/100); /* LITNESS */
        IF l=1 THEN DO; /* IF */
            >> label first column (lightness,lightness); /* >> */
            YTXT = Y1 + 24; /* YTXT */
            LITNESS = PUT(LITNESS,HEX2.); /* LITNESS */
            %LABEL(XTXT,YTXT,WHITE,0,0,6,XSWISS,5); /* %LABEL */
            END; /* END */
        IF l=1 THEN DO; /* IF */
            >> label row; /* >> */
            XTXT = X1 + 5; /* XTXT */
            ROWTXT = PUT(ROWTXT,HEX2.); /* ROWTXT */
            %LABEL(XTXT,YTXT,WHITE,0,0,6,XSWISS,5); /* %LABEL */
            END; /* END */
        END; /* END */
    END; /* END */

X1 = 80; /* X1 */
XTXT = X1 - 6; /* XTXT */
ACOL.COLOR = &C; /* ACOL.COLOR */
DO l=l TO 16; /* DO */
    >> do for each column; /* >> */
    X2 = X1 + 4; /* X2 */
    Y2 = 5; /* Y2 */
    ARCol.COLOR = &E; /* ARCol.COLOR */
    >> initialize row color; /* >> */
    DO j=1 TO 11; /* DO */
        >> do for each row; /* >> */
        Y1 = X2 + 6; /* Y1 */
        Y2 = Y1 + 4; /* Y2 */
        IF l=1 THEN DO; /* IF */
            >> label row; /* >> */
            XTXT = X1 + 5; /* XTXT */
            TRIM(LEFT(PUT(BLUE,HEX2.))); /* TRIM */
            %LABEL(XTXT,YTXT,WHITE,0,0,6,XSWISS,5); /* %LABEL */
            END; /* END */
        END; /* END */
    END; /* END */

Y2 = 53; /* Y2 */
IF l=1 THEN DO; /* IF */
    >> label first color (saturation,luminance); /* >> */
    X1 = 30; /* X1 */
    XTXT = X1 - 4; /* XTXT */
    TRIM(LEFT(PUT(RED,HEX2.))); /* TRIM */
    %LABEL(XTXT,YTXT,WHITE,0,0,6,XSWISS,5); /* %LABEL */
    END; /* END */
    Y1 = Y2 + 8; /* Y1 */
    Y2 = Y1 + 2; /* Y2 */
    IF l=1 THEN DO; /* IF */
        >> initialize luminance variable; /* >> */
        X1 = 45; /* X1 */
        XTXT = X1 - 4; /* XTXT */
        TRIM(LEFT(PUT(WHITE,HEX2.))); /* TRIM */
        %LABEL(XTXT,YTXT,WHITE,0,0,6,XSWISS,5); /* %LABEL */
        END; /* END */
DO l=1 TO 16; /* DO */
    >> do for each column; /* >> */
    X2 = X1 + 4; /* X2 */
    Y2 = 5; /* Y2 */
    ARCol.COLOR = &C; /* ARCol.COLOR */
    >> initialize column color; /* >> */
    DO j=1 TO 11; /* DO */
        >> do for each row; /* >> */
        Y1 = X2 + 6; /* Y1 */
        Y2 = Y1 + 4; /* Y2 */
        IF l=1 THEN DO; /* IF */
            >> label row; /* >> */
            XTXT = X1 + 5; /* XTXT */
            TRIM(LEFT(PUT(GREEN,HEX2.))); /* TRIM */
            %LABEL(XTXT,YTXT,WHITE,0,0,6,XSWISS,5); /* %LABEL */
            END; /* END */
        END; /* END */
    END; /* END */

Y1 = Y2 - 2; /* Y1 */
Y2 = Y1 - 8; /* Y2 */

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**RED/GREEN/BLUE Color Scheme Program Code**

* This macro, called RGBCHRT, produces a list of colors in the RED/GREEN/BLUE color coordinate system.

```sas
%MACRO RGBCHRT(X,COLORX,ACOLORX,ROWCOLR,ACOLORL,ROWCOLOR); /* MACRO */

DATA COLORRAW; /* DATA */
    LENGTH TEXT 5; /* LENGTH */
    %DCLANNO; /* DCLANNO */

GOPTIONS NODISPLAY N0TVESSEL; /* GOPTIONS */
%INCLUDBSAMPORP(ANNOCMS); /* INCLUDE */

DEVICE=TCX4107 /* DEVICE */

COLOR="HEX"; /* COLOR */

HUE = &HUEIN1T; /* HUE */
X1 = 10; /* X1 */
XTXT = X1 - 4; /* XTXT */
HUE = &HUEINIT; /* HUE */
DO l=l TO 16; /* DO */
    >> do for each column; /* >> */
    X2 = X1 + 4; /* X2 */
    Y2 = 5; /* Y2 */
    LITE = &LITEINIT; /* LITE */
    >> initialize lightness variable; /* >> */
    DO j=1 TO 14; /* DO */
        >> do for each row; /* >> */
        X1 = Y2 + 1; /* X1 */
        Y2 = X1 + 24; /* Y2 */
        LITNESS = 25*(LITE/100); /* LITNESS */
        IF l=1 THEN DO; /* IF */
            >> label first column (lightness,lightness); /* >> */
            YTXT = Y1 + 24; /* YTXT */
            LITNESS = PUT(LITNESS,HEX2.); /* LITNESS */
            %LABEL(XTXT,YTXT,WHITE,0,0,6,XSWISS,5); /* %LABEL */
            END; /* END */
        IF l=1 THEN DO; /* IF */
            >> label row; /* >> */
            XTXT = X1 + 5; /* XTXT */
            ROWTXT = PUT(ROWTXT,HEX2.); /* ROWTXT */
            %LABEL(XTXT,YTXT,WHITE,0,0,6,XSWISS,5); /* %LABEL */
            END; /* END */
        END; /* END */
    END; /* END */

X1 = 180; /* X1 */
XTXT = X1 - 6; /* XTXT */
ACOL.COLOR = &C; /* ACOL.COLOR */
DO l=l TO 16; /* DO */
    >> do for each column; /* >> */
    X2 = X1 + 4; /* X2 */
    Y2 = 5; /* Y2 */
    ARCol.COLOR = &E; /* ARCol.COLOR */
    >> initialize row color; /* >> */
    DO j=1 TO 11; /* DO */
        >> do for each row; /* >> */
        Y1 = X2 + 6; /* Y1 */
        Y2 = Y1 + 4; /* Y2 */
        IF l=1 THEN DO; /* IF */
            >> label row; /* >> */
            XTXT = X1 + 5; /* XTXT */
            TRIM(LEFT(PUT(BLUE,HEX2.))); /* TRIM */
            %LABEL(XTXT,YTXT,WHITE,0,0,6,XSWISS,5); /* %LABEL */
            END; /* END */
        END; /* END */
    END; /* END */

Y2 = Y1 + 2; /* Y2 */
Y1 = Y2 - 2; /* Y1 */

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%END HUECHRT; /* %END */
%END RGBCHRT; /* %END */
GRAY Color Scheme Program Code

* This macro, called GRAY, produced a list of colors in the
* GRAY color coordinate system.

%INCLUDE "SAMPLEANNOCMS.SAM";
OPTIONS NODISPLAY NODTICONS DEVICE=TCR107;
GPRESULT 'GRAYSCALE COLORS = (NONE);

%MACRO GRAY:
DATA GRAYANNO;
LENGTH X1 10;
%SYSLIB('XSWISS',X1,4);
X1 = 10;
GRAY = 0;
"*" >> initialize shade of gray:
DO J=1 TO 18:
  "*" >> loop for columns:
  X1 = X1 + 4.5;
  Y1 = 5;
END;

DO J=1 TO 14:
  "*" >> loop for rows:
  Y1 = Y1 + 2.5;
  Y1 = Y1 + 2.5;
  XTXT = X1 + 2.25;
END;

GRAY = GRAY + 1;
END;

XI = XI + 3;
END;

DROP X1 Y1 XI Y2;
%LABEL (X1, "Color is:" WHITE,0.2,0.2,SWISS,3)
%LABEL (X1, "GrayTan:": WHITE,0.2,0.2,SWISS,3)

PROC GLIDE ANNOTATE=GRAYANNO;
GOUT = COLOR=GRAY;
DDES = "GRAY SCALES COLOR CHART";
SMEND GRAY;
CMS PI COLOR DISK DUMMY DUMMY L;
%GRAY;
TITLE 1 = "GRAY SCALE COLOR CHART";

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Ms. Leslie Worf
National Demographics & Lifestyles Inc.
1621 Eighteenth Street
Denver, CO 80202