A Menu-Driven SAS/QC® Software Application

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PURPOSE

This paper describes components of a prototype for a SAS/QC® application that tailor PROC SHEWHART with information from the user and annotate the output. Rather than describe the whole application, this presentation focuses on the tasks:
1) to annotate Shewhart charts with a customized title and labels provided by the user, and
2) to calculate a summary statistic based on user input.

METHODS

SAS/AF® software allows the development of interactive windowing applications. Screen Control Language (SCL), a component of SAS/AF, is a language designed for use in the development of such applications. The components of this application that accomplish the tasks (see purpose) are SAS/AF windows associated with an SCL program, SHEWHART.PROGRAM. The SAS/AF BUILD procedure was used to edit all windows shown in the following discussion.

Following is a description of individual windows that interact with the user to achieve the tasks. The only window the user sees is the DISPLAY window. Other windows are used by the developer.

Catalog Directory Window

The QC application consists of catalog entries shown in Figure 1. The entry that performs the tasks is SHEWHART.PROGRAM. Four help entries provide on-line help when requested by the user. SHEWHART.HELP is a window containing general instructions on how to obtain help, and it appears when the user presses F1. Other HELP windows contain information about specific blanks the user must fill in.

<table>
<thead>
<tr>
<th>Catalog Directory Window</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name Type</td>
</tr>
<tr>
<td>SYMLABEL HELP</td>
</tr>
<tr>
<td>TITLE HELP</td>
</tr>
<tr>
<td>SHEWHART HELP</td>
</tr>
<tr>
<td>VLABEL HELP</td>
</tr>
<tr>
<td>ANALYSISENTRY</td>
</tr>
<tr>
<td>DATA</td>
</tr>
<tr>
<td>CAT</td>
</tr>
<tr>
<td>HELP</td>
</tr>
<tr>
<td>NEXTTASK</td>
</tr>
<tr>
<td>SHEWHART</td>
</tr>
</tbody>
</table>

The transfer of control topology is achieved by branching from one catalog entry to another. When the user makes a selection or completes filling in a screen, the current window becomes inactive, and control is transferred to new catalog entry. To perform the tasks, the user branches from MAIN.PROGRAM to ANALYSIS.MENU to SHEWHART.PROGRAM.
When SHEWHART.PROGRAM executes, the entry's DISPLAY window opens, the user supplies values for user fields, the field values are validated according to the attributes specified for the fields, and then the field values are available for manipulation by the program.

SOURCE Window

The SOURCE window of SHEWHART.PROGRAM entry contains source code for the program that enables the developer to control the entry's action. Screen Control Language in SHEWHART.PROGRAM generates SAS® source code statements based on user input and submits them to the SAS Supervisor for execution. Code from this window is described below and presented in the appendix.

The SCL program contains three phases:
- INIT section contains a "submit block" that submits SAS code to:
  1) route contents of OUTPUT window to the file RESULTS.SUMMARY,
  2) set system options, and
  3) set graphics options.
INIT executes only once for each invocation of SHEWHART.PROGRAM.
- MAIN section takes action each time the user modifies a user field. MAIN verifies that all REQUIRED user fields have values and validates the values according to information in ATTR windows.
- TERM section constructs SAS code with values of the user fields and submits it for execution.

DISPLAY Window

DISPLAY window prompts the user for information to tailor the chart with a customized title (Study Number), block variable label (Nominal Concentration), and y-axis label (Name of Compound). The value of the block variable label (Nominal Concentration) is also used to calculate a summary statistic. If the user tries to submit the chart for execution before supplying required information, he will get the message: "ERROR: Please enter the required field(s).", and the user field(s) will be highlighted in red.

![Figure 3 DISPLAY window as seen by user](image)

Text typed in by the user is stored in the user fields &DTITLE, &BVLABEL, and &YLABEL. Two underscores were appended to &DTITLE to increase

![Figure 4 DISPLAY window seen by developer](image)

Figure 5 GENERAL ATTRIBUTE window (GATTR)
its length to nine characters. The developer created this window and the three user fields by typing in the text as shown in Figure 4.

**GENERAL ATTRIBUTE Window**

GATTR window assigns a help window (SHEWHART.HELP) to supply general instructions, assigns function key definitions the developer mapped (BUILD.KEYS), and assigns NEXTTASK.PROGRAM as the parent to achieve the desired transfer-of-control topology. The END or CANCEL command from the DISPLAY window cause the NEXTTASK.PROGRAM window to be displayed.

**ATTRIBUTE Window for User Field &DTITLE**

ATTR window for &DTITLE shows the maximum number of characters the user can enter, makes the field REQUIRED so that the chart will not be submitted for execution until the user supplies information, and assigns a help window (DTITLE.HELP) with specific help for that field. User fields &BVLABEL and &YLABEL have similar ATTR windows.

**RESULTS**

The tasks were performed on the data in Table 1, and the output are shown in Figure 7 and Table 2. The user supplied "1234-A1" for the title, "Super Drug" for the y-axis label, and "2.00" for the block variable label and to use in calculating % difference.

<table>
<thead>
<tr>
<th>Process</th>
<th>Block</th>
<th>Subgroup</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESULTS</td>
<td>BATCH</td>
<td>SUBGROUP</td>
</tr>
<tr>
<td>1.69</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>1.71</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>1.61</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>2.65</td>
<td>A</td>
<td>2</td>
</tr>
<tr>
<td>2.43</td>
<td>A</td>
<td>2</td>
</tr>
<tr>
<td>2.54</td>
<td>A</td>
<td>2</td>
</tr>
<tr>
<td>2.85</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>2.74</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>2.93</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>2.10</td>
<td>B</td>
<td>4</td>
</tr>
<tr>
<td>2.10</td>
<td>B</td>
<td>4</td>
</tr>
<tr>
<td>2.03</td>
<td>B</td>
<td>4</td>
</tr>
<tr>
<td>2.38</td>
<td>B</td>
<td>5</td>
</tr>
<tr>
<td>2.34</td>
<td>B</td>
<td>5</td>
</tr>
<tr>
<td>2.36</td>
<td>B</td>
<td>5</td>
</tr>
<tr>
<td>2.38</td>
<td>C</td>
<td>6</td>
</tr>
<tr>
<td>2.59</td>
<td>C</td>
<td>6</td>
</tr>
<tr>
<td>2.49</td>
<td>C</td>
<td>6</td>
</tr>
<tr>
<td>1.64</td>
<td>C</td>
<td>7</td>
</tr>
<tr>
<td>1.77</td>
<td>C</td>
<td>7</td>
</tr>
<tr>
<td>1.80</td>
<td>C</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 1 Input data

% Difference is calculated based on Nominal Concentration = 2.00 ng/ml as supplied by user.

**Output : Summary Data**

Summary Data for RESULTS

\[
\text{% Difference} = \left(\frac{\text{Average RESULT} - \text{Nominal Value}}{\text{Nominal Value}}\right) \times 100
\]

<table>
<thead>
<tr>
<th>Std Dev</th>
<th>Std Dev(RESULT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.21</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Table 2
CONCLUSION

The windowing techniques described in this poster can be utilized in a variety of applications. SAS/AF and SCL are powerful facilities that allow a developer to create applications that satisfy users.

APPENDIX: SCL Code

ENTRY: SHEWART.PROGRAM
Produce Customized Shewhart Chart

**** SOURCE ******

INIT:
SUBMIT;
FILENAME OUTLIST DISK 'RESULTS SUMMARY A';
PROC PRINTTO PRINT = OUTLIST NEW;
OPTIONS NODATE NONUMBER;
OPTIONS DEVICE=GDDM792;
ENDSUBMIT;
RETURN;
MAIN:
RETURN;
TERM:
SUBMIT IMMEDIATE;
PROC SHEWHART DATA=DDATA GRAPHICS;
XCHART RESULTS=SUBGROUP (BATCH) /
XSYMBOL= HU
RSYMBOL= RO
COUTFILL= GRAY4C;
LABEL BATCH = "Control Samples at &[BVLABEL]
ng/ml. Batch #:";
LABEL RESULTS = "&YLABEL";
LABEL SUBGROUP = "Run #";
TITLE1 ' ';
TITLE2 "Shewhart Chart for Study &TITLE";
TITLE3 ' ';
RUN;
PROC MEANS DATA=DDATA NOPRINT;
VAR RESULTS;
OUTPUT OUT=DMMEAN M=N MEAN=MEAN STD=STD;
DATA PRECISE; SET DMMEAN;
LABEL PCTDIFF = '% Difference';
LABEL STD = 'Std Dev';
PCTDIFF = ((MEAN - &[BVLABEL]) / &[BVLABEL] * 100;
TITLE1 ' ';
TITLE2 'Summary Data for Results';
TITLE3 ' ';
TITLE4 ' ';
TITLE5 '% Difference = ((Average Result -
Nominal Value)/Nominal Value)*100';
TITLE6 ' ';
TITLE7 'Std Dev = Std Dev(Result)';
PROC PRINT NOOBS LABEL; VAR PCTDIFF STD;
RUN;
ENDSUBMIT;
RETURN;

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