User Interface of System SMPSL

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Abstract: - The paper describes draft user interface of System SMPSL. System SMPSL is a measurement system using a computer in the school laboratory. The presented system is very cheap to hardware assembling. Software is available for free. SMPSL user interface is used to control the measurement itself, setup, operation and management of inputs and outputs. The paper presents the method of selecting the best version of software.

Key-Words: - user interface, DAQ, measurement system, computer aided experiment, measurement, datacollection

1 Introduction

User interface for computer measurement in a school laboratory [1, 2, 3, 4] is an environment with which users control their own measurements, setup, operation and management of the system itself in the school laboratory. Several versions of the interfaces have been created to increase acceptability for final user. One of the versions has been selected based on opinion research between respondents – final user. The selected interface has been then developed based on other comments of the respondents.

2 Versions

Testing version are labeled A, B and C.

2.1 Version A

This version is designed as a number of separate windows. For each measured or controlled element is shown separate window. The basis is the part from which individual programs are executed – see figure 1.

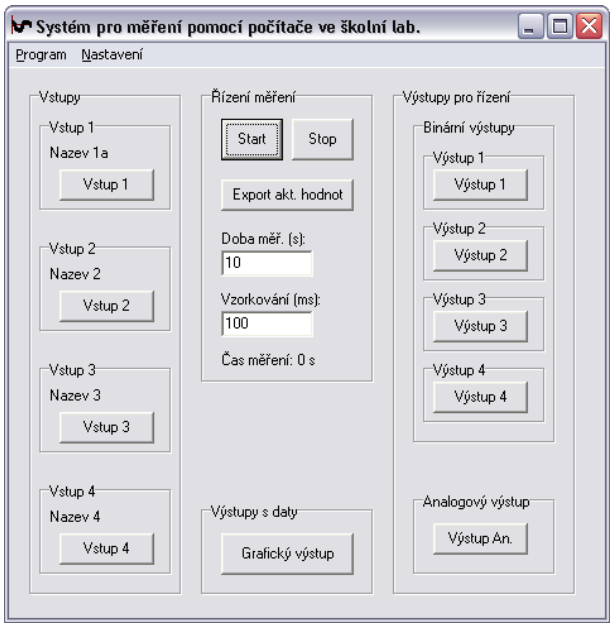
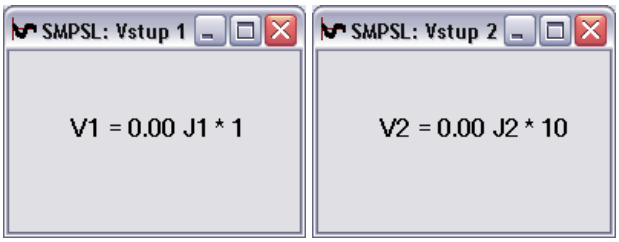


Fig. 1 – Main part – main window

Four separate windows are used for measurement of four analog inputs – see figure 2.



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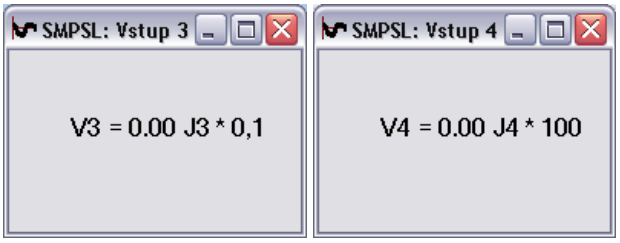

Fig. 2 – Four analog inputs

Four separate windows are also used for control the four binary outputs - see figure 3.

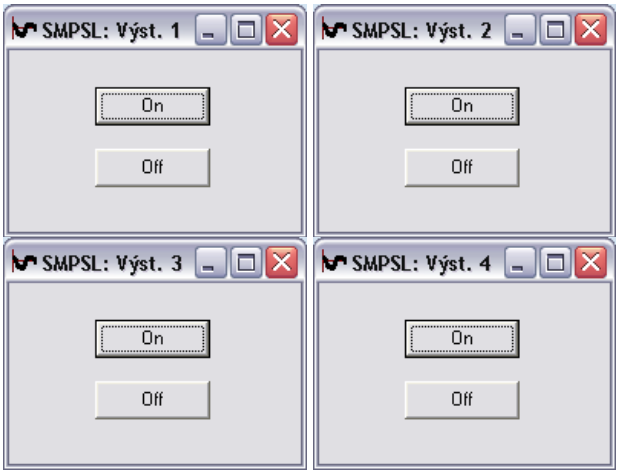

Fig. 3 – Four binary outputs

One separate window is used for control of the analog output (figure 4). In this program, you can use the scroll bar to set the output value.

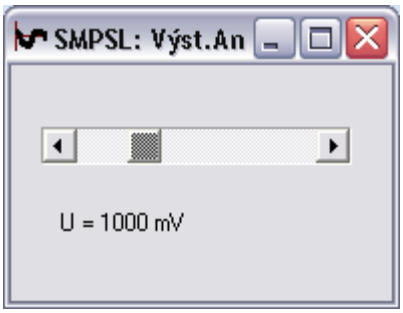

Fig. 4 – Analog output

Separate window is also created for graphical representation of the measured values in graph as well as for text output and for export to a text file,. Graphical output is presented in a graph that shows the set input values. List of the measured values can be exported to a text file (Figure 5).

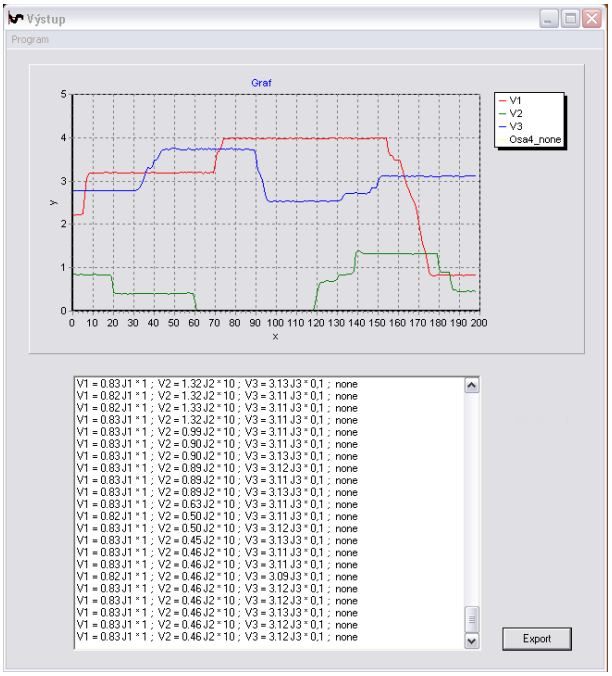

Fig. 5 – Graphical representation and text output

Setting runs in two levels. The first, it is set the display of items of inputs and outputs executed from the program menu. The second setting is for the configuration of inputs. There is possibility to specify the names of inputs, name of quantity, name of unit and its conversion to the input 0 ... 5. The third is setting the axes of the graph. Finally it is possible to calibrate *x* axis according to the settings of axis or by time.

2.2 Version B

This concept is created as one single window. All four analogue inputs at once, all four digital outputs at once and one analog output are displayed in this window. There is also displayed graphical output in the form of a graph and text output with export to text file with the settings is displayed values - see. Figure 5.

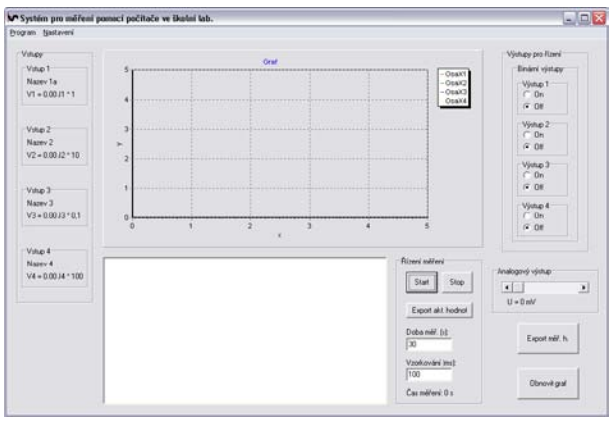

Fig. 5 – SMPSL – version B

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The settings are the same as in the previous version - version A.

2.3 Version C

This interface represents a system in which the main part shows a set of measured values, setup of binary outputs for controlling, setup for display of analog output and basic setup for measurements with the possibility to display graphical output – see figure 6.

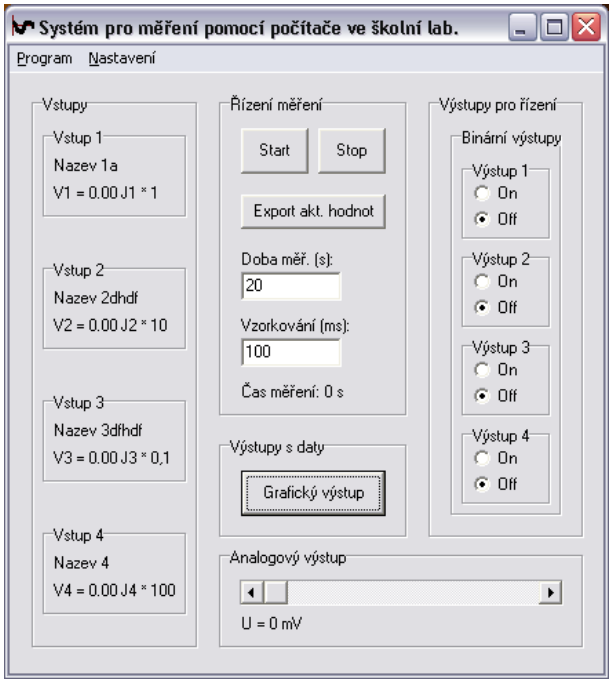

Fig. 6 – Main part of version C

Graphical output represented by graph that shows the setup of value input and list of measured values that can be exported to a text file is the same as in version A.

Setting is the as in version A.

3 Research

The research was conducted as a presentation of all three versions of the user interface (A, B and C) by projection technology. The differences of the versions and, sample of data measurement graphical representation of the data in the form of figures and graphs were shown.

Discussion was held after the presentation of each version and questionnaires were handed over.

4 Questionnaire

The questionnaire consisted of eleven questions investigating appropriate user interface. The first half of the questions was asked mainly by marshalling system with invitation to justify the sort. The second half of the questions consisted of questions with open answers.

The versions are in questionnaire briefly described for simplicity in one sentence:

A each part in a separate window;
B all the parts in one box;
C the main part in one window, graph and list of the values in the second window.

5 Evaluation of the questionnaire

The questionnaire was submitetd to the respondents who had some experience with similar systems, and can competently answer the questions. It was the students of distance learning of University of Hradec Kralove, Faculty of Education, Department of Physics, specialization of Physical measurements and technical computing.

Evaluation is done by:

- displaying of the questions
- the percentage statistics
- graphical output
- the justification of the responses and their commentary.

1. Which version is the most comprehensive? Sort by best.

Table 1 – Most, less and least transparent version

A	0%
B	31%
C	69%

A	25%
B	37%
C	38%

A	75%
B	25%
C	0%

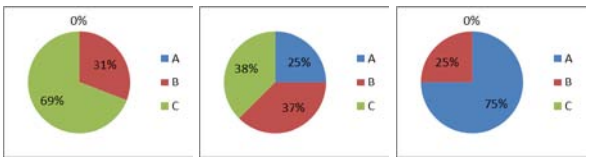

Fig. 7 – Most, less and least transparent version

Respondents seemed most clear version C. Justification is its variability, transparency, rationality and practicality. The second clearest version was the version B because during the measurement the values are display all in one window. The least clear version is version A.

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2. *Which version is more comfortable to operate? Sort by best.*

Table 2 – Most, less and least version for control

A	0%
B	54%
C	46%

A	8%
B	46%
C	46%

A	92%
B	0%
C	8%

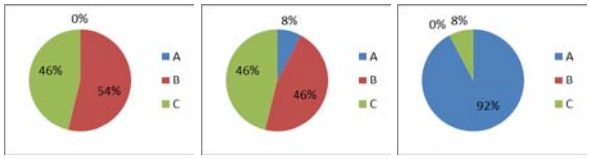

Fig. 8 – Most, less and least version for control

The best version for control was by respondent selected versions B and C because of the clarity and visibility during all measurements in one window. The least suitable version is version A.

3. *Which version is easier to understand? Sort by best.*

Table 3 – Most, less and least comprehensible version

A	8%
B	42%
C	50%

A	0%
B	50%
C	50%

A	92%
B	8%
C	0%

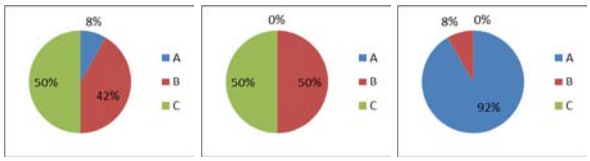

Fig 9 – Most, less and least comprehensible version

The most comprehensible versions are versions and B. The least comprehensible version is version A.

4. *Which version is more intuitive? Sort by best.*

Table 4 – Most less and least intuitive version

A	0%
B	54%
C	46%

A	8%
B	38%
C	54%

A	92%
B	8%
C	0%

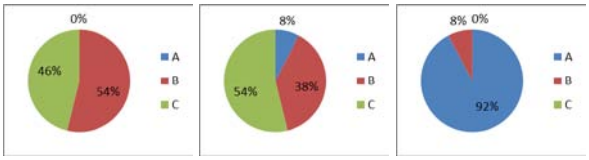

Fig.10 – Most less and least intuitive version

The most intuitive versions are again versions B and C. Version A is again the least intuitive. Result respondents justified by subjective feelings.

5. *Which version is aesthetic? Sort by best*

Table 5 – Most, less and least esthetic version

A	0%
B	38%
C	62%

A	8%
B	54%
C	38%

A	92%
B	8%
C	0%

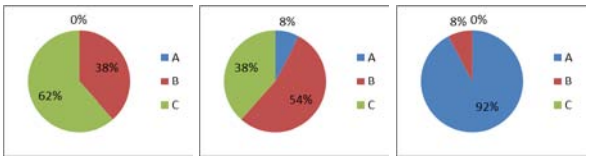

Fig. 11 – Most, less and least esthetic version

The most esthetic is version C due to the logical and comprehensible arrangement. Less esthetic is version B. The least esthetic is version A.

6. *Is the layout of the controls user-friendly? Mark as at school.*

Table 6 – Marking of the layout of button

A	2,62
B	1,92
C	1,46

Fig. 12 – Marking of the layout of button

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The best version is version C with a final average mark 1,46, followed by version B with average mark of 1,92 and the worst version is version A with an average mark of 2.62.

7. ***What functional improvements would you suggest?***

Respondents mostly answered:

- No objections;
- Greater variability;
- Resolution of the START and STOP buttons;
- More options of settings of control;

Based on these observations the resolution of START and STOP buttons and options of configuration control have been changed.

8. ***Which control improvements would you suggest?***

Respondents mostly answered:

- No objections;
- Greater variability;
- The option switch off the individual measured values in graphic display;
- Better place of button "Refresh" button in the graphical output;
- Color-distinguish control elements

Based on these observations the option switch off the individual measured values in graphic display and color-distinguish control elements have been changed.

9. ***What graphical improvements would you suggest***

Respondents mostly answered:

- No objections;
- Possibility to change the color of individual quantities;
- Color of the application;
- Color of buttons

Based on these observations we have improved only possibility to change the color of individual quantities.

10. ***What else would you improve?***

Respondents mostly answered:

- Full Czech
- Nothing

Based on these observations the English word has been fully changed to Czech.

11. ***Do you prefer to place all controls in one screen or split into multiple windows by function and why?***

Respondents mostly answered:

- according to the type and complexity of the task.

The respondents answered according to the type of measurement. They emphasized the organization into one window for clarity, but at the same time they underlined a more complex measurement arrangement in multiple windows.

6 Conclusion

The research investigated that the best version on the basis of clarity, control, intuitiveness, esthetics, layout of control elements is version C with percentage of 55% followed by the version B with percentage of 44%. The least version is version A with percentage of 1% - see table 7 and figure 12.

Table 7 – Final research result

A	1%
B	44%
C	55%

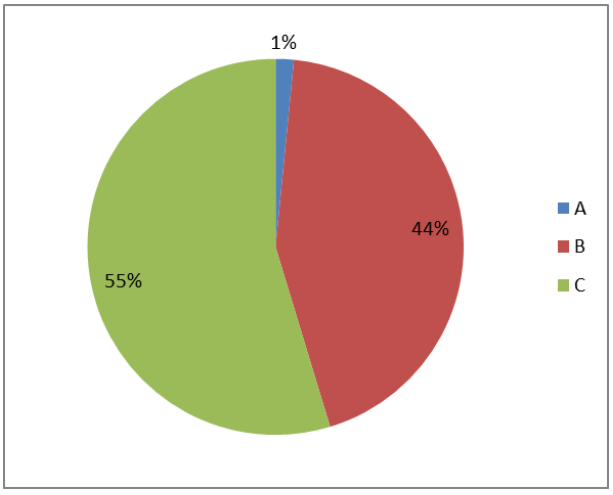

Fig. 12 –Final research result

Acknowledgement

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