Main features of the new software control system for the YuMO instrument

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Abstract. During the last years the new software instrumental complex Sonix+ has been developed at FLNP JINR to replace the former Sonix control system [1]. This complex has been tested at a number of IBR-2 instruments (REMUR, NERA-PR) and on instruments at other centers - KIA, Moscow (MOND), etc. We plan to install the new complex at the YuMO instrument as well. The Sonix+ is implemented on the PC/Windows XP platform, whereas the Sonix is based on the VME/Os-9 obsolete platform. The Sonix+ [1] has been designed considering the experience of long-term operation of the predecessor and recent trends. The paper is devoted to the main features of the new software and the comparison with the former one.

1. Introduction
Since 2006 the YuMO instrument control system has been radically changed. This paper deals with the most important changes from the user’s point of view.

First of all the hardware and software platforms have been changed. Please have a look at the table 1.

Table 1. Comparison of the platforms for the YuMO control systems.

|                           | 2006               | 2011               |
|---------------------------|--------------------|--------------------|
| Hardware platform         | VME                | PC                 |
| Processor                 | Motorola 68010 (486 100MHz) | Intel Core i3 (3.07GHz) |
| RAM                       | 32 MB              | 4.096 MB           |
| Disk space                | 6 GB               | 1000 GB            |
| Network speed             | 10 Mb/sec          | 100 (1000) Mb/sec  |
| Software platform         | Os-9 (Unix-like OS) | Windows XP         |
| Instrument software       | Sonix              | Sonix+             |
| + PC computer for 2D PSD  |                    |                    |

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The Sonix+ was created at FLNP on the basis of the experience obtained with Sonix and in accordance with the recent trends in the field. It inherited some basic solutions from the older system and provides new features to simplify the instrument control.

We will consider:

- changes in the structure of the user interface;
- script comparison;
- data visualization;
- remote access via web;
- fields of possible user activity.

2. Changes in the structure of the user interface

The former interface was actually an interface to the available devices (controllers) — a separate window for each controller. So, an interface for a comprehensive instrument usually consists of too many windows, which is not good.

![Figure 1](image.png)

**Figure 1.** The former interface was actually an interface to the available devices.

The new interface is organized according to another structural principle – each main user need has its own window. There are three main needs to watch: current state, measurement history (log file), picture of spectrum. The fourth need is to control the measurement being performed. Thus, four
programs (windows) are sufficient to conduct experiments generally. There are some additional programs as well.

**Table 2.** Basic user interface components.

| Main Programs | Function                              |
|---------------|---------------------------------------|
| Reflector     | Watch current values of parameters    |
| LogViewer     | Watch history of an experiment         |
| Is_client     | Script interpretation control         |
| SpectraViewer | Spectra visualization                  |

**Important note.** All parameters of the instrument controlled by the software are accessible. In addition, the user can select any subset of them to watch in the special list.

**Figure 2.** The new interface is organized according to another structural principle – each main user need has its own window.
3. Script comparison
Whereas the script language in the Sonix system was custom-made and has rather poor functionality, the Python language [2] is used as a script language in the Sonix+ and all nice features and packages of Python are available to control experiments and for preliminary data processing.

Python is an open-source widespread powerful interpretative programming language that allows you to work more quickly and integrate your systems more effectively.

Figure 3. An example of a script for the old system.

To simplify the creation of the experiment program, the operation library dedicated to the YuMO specific features was created. In accordance with the wishes of the people in the YuMO group the old list of functions was preserved in the new library.

Important note. Using the Python as a script language opens a wide door for the user to program experiments and to include preliminary data processing components without the obligatory assistance of the authors of the instrument software.
4. Data visualization

At the moment there is a program (SpectraViewer) written in C++ to visualize data from point detectors and 1D PSD.

The new program tools to visualize data from all kinds of detectors including 2D PSD are developed in the PyQt environment using mathplotlib [3] as a graphical library.

Matplotlib is a python 2D plotting library, which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms. Matplotlib can be used in python scripts. Matplotlib tries to make things easy and hard things possible. You can generate plots, histograms, power spectra, bar charts, errorcharts, scatterplots, etc, with just a few lines of code.

Figure 4. An example of a Python script for the new system.
**Figure 5.** Visualization of data from 2D PSD with SpectraViewer 3D.

**Figure 6.** The start page for the Sonix+ Web Remote System.
5. Remote access via web
The WebSonix site is now available for remote supervising and controlling experiments at the IBR-2M instruments, in particular at the YuMO instrument. The site is organized in the same manner as the new user interface. There is also the Sonix+ help page implemented as a wiki.

6. Fields of possible user activity
The new YuMO control system could be a field of possible cooperation of programmers and instrument users to make this system more useful and easy to use. This user’s activity could be in the form of proposal inclusion of existing programs or creating new ones. We expect possible activity of the YuMO users in the following directions:

- more convenient operation library (proposal);
- script generator, which simplifies preparation of scripts for experiments specific to YuMO (proposal);
- software components for preliminary data processing, if necessary (proposal and/or participation);
- spectra visualization methods, especially for 2D PSD (proposal and/or participation).

Figure 7. One of the Sonix+ help pages.

References
[1] http://sonix.jinr.ru/
[2] http://www.python.org/
[3] http://matplotlib.sourceforge.net/users/intro.html