Potku Project

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Software Requirements Specification

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Abstract: Potku project developed an user interface for a software used in analyzing data received from a recoil spectrometer. The application receives ascii-format list data from the spectrometer. Using the data, the application can draw a time-of-flight over energy histogram (ToF-E histogram), and has further analysis tools based on selections done in the ToF-E histogram. This document describes the requirements specification of the application.
Keywords: requirement specification, functional requirements, nonfunctional requirements, constraints, physics, tof-e, visualization, analyzation, depth profile, energy spectrum, elemental losses

Version History

Version	Date	Changes	Author
0.1.0	11.3.2013	Created requirement specification based on mindmap illustration.	TK
0.2.0	18.3.2013	Updated priorities.	TK
0.3.0	12.4.2013	Updated priorities.	TK
0.4.0	22.4.2013	Updated priorities.	TK
0.5.0	2.5.2013	Updated priorities.	TK
0.6.0	21.5.2013	Updated requirement priorities to tested state.	TK
0.6.1	22.5.2013	Grammar corrected.	TK
1.0.0	22.5.2013	The document was approved.	TK

Requirement Priorities

- Mandatory
- Important
- Possible
- Idea
- Will not be implemented

Requirement States

- External module
- Approved
- Tested
- Implemented
- Partly implemented
- Not implemented

1 FUNCTIONAL REQUIREMENTS

1.1 Specifying Measurement Data

- The software reads an .evnt file (ascii) provided by a measuring unit.
- The software reads a .lst file (binary) provided by a conversion (similar to Finlandia).
- The software reads a standardized XML format.

1.2 ToF-E Histogram

- The histogram can be zoomed.
- The histogram can be dragged.
- The histogram data point count in a pixel is displayed via logarithmic coloring.
- The cursor coordinates are shown when hovering over the graph.
- The histogram axes bins can be specified by a non-negative integer.
- The histogram X-axis and/or Y-axis can be inverted.
- The histogram axes can be transposed (i.e. switch X-axis and Y-axis).
- The histogram can be saved as an imagefile.
- The histogram data point count in a pixel can be displayed via linear coloring.
- The histogram axes functions can be specified manually.
- The histogram data coloring scheme can be changed.
- A starting point of element can be automatically estimated.
- The event count in a pixel is displayed when hovering over with the cursor

1.3 Element Selection in ToF-E Histogram

- The weight factor of an element selection can be defined.
- The last node of an open selection can be cancelled.
- Element selection is shown with borders.
- Element selections are automatically saved into the selection file when selections are added, removed or modified.
- Element selections can be loaded from a selection file.
- Element selection can be removed.
- Element selections are saved in a cut file for each element that includes a type (ERD/RBS), an element mass, a weight factor and data points.
- Element selection information (change element, type or weight factor) can be modified after it has been closed.
- Element selection can be highlighted by moving the cursor over selection.
- A node in an element selection can be moved.
- An element selection can be composed from several selections utilizing Boole's operators.

1.4 Element

- The type (ERD/RBS) of an element can be selected.
- An element uses an efficiency file if such exists.
- A weighted average (default) or an isotope (stable) can be chosen.
- Colors of elements are predetermined.
- Several of commonly used elements' colors are fixed.

- The periodic table is color-coded when choosing element.
- An unstable element isotope can be chosen.

1.5 ToF Calibration

- The front edge of an element can be estimated.
- A linear fit can be done with the calibration parameters and the selected front edge fits of elements.
- The front edge of element can be chosen by clicking on the graph.
- Cut files from outside the project can be specified for the calibration.
- Additional values of calibration parameters can be saved to a calibration file.
- Other saved calibrations can be chosen to be used.
- The previous calibration can be shown in linear fit.

1.6 Elemental Losses

- Elemental losses divides a target cut file into N (user selected) partitions using a reference cut file (heavier element).
- Elemental losses saves partition count (as weight factor) into new cut files.
- Elemental losses can only be saved manually into new partitioned cut files .
- The Y-axis can be scaled as min-max or zero-max.
- Multiple target cut-files can be shown in the graph at the same time.
- An energy spectrum from a cut file can be generated.

1.7 Depth Profile Logic

- Depth profile is calculated with cut files and depth parameters.
- The Y-axis of depth profile can be normalized over selected depth.
- The Y-axis of depth profile can be scaled on every channel to 100%.
- The ratio of elements can be integrated at selected depth.
- A stopping model of depth profile can be chosen.
- The margin of error can be displayed (none / automatic / manual) in the log.
- The count of elements' data points can be shown between a selected depth.

1.8 Depth Profile Graph

- The unit of X-axis in the depth profile can be changed.
- The X-axis ticks are rounded to integers (i.e. no decimals).
- The cursor coordinates are shown when hovering over the graph.
- Depth profile can be saved as an imagefile.
- Depth distribution of depth profile is shown on the graph (but outside the grid).
- The text and font of graphs can be changed.
- The depth at which Y-axis is normalized can be specified from the graph.

1.9 Energy Spectrum

- Energy spectrum can be made from cut files.

1.10 Project Management

- By default project is saved in the users' documents directory.
- Project is saved in a logical folder structure.
- Project can include multiple measurements.
- Several measurements can be opened into the sample collection as tabs.
- User actions are saved to a log file and log window.
- Master measurement can be used to carry out analyzation on multiple measurements at the same time.
- Upon opening project, the software loads current stage from a project file.

1.11 Python Interpreter Interface

- GUI functions can be used through interpreter.
- GUI saves as a command log the process of a sample collection in a python file.
- A series of commands issued in GUI can be rerun through interpreter.

1.12 Reporting

- A report includes selected histograms in project.
- A report includes selected depth profiles in project.
- A report includes selected integrations of selected depths in depth profiles.
- A report includes the values of theparameters specified for the graphs.
- A report includes files in Gnuplot/GLE format.

1.13 Additional Functionalities

- Show elements ratio between selected cut-files.

- The software can be extended with plugins.
- The software plugin can convert data to read other formats.
- The software plugin can do Monte-Carlo simulation.

2 NON-FUNCTIONAL REQUIREMENTS

- Software works under Windows.
- Software works under Linux.
- Software works under Mac OS.