

Testing document 1.0

SQUID

Helsinki 29th April 2005
Software Engineering Project
UNIVERSITY OF HELSINKI
Department of Computer Science

Course

581260 Software Engineering Project (6 cr)

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Change Log

Version	Date	Modifications
0.1	31.3.2005	First version (Aki Korpua)
0.2	5.4.2005	Corrections, Use Case sample (Aki Korpua, Mikko Jormalainen)
0.3	12.4.2005	Use case split and now look (Aki Korpua)
0.4	13.4.2005	Integrity test cases (Aki Korpua)
0.5	13.4.2005	Some fixes (Aki Korpua, Mikko Jormalainen)
0.6	15.4.2005	Macros and fixes to layout (Aki Korpua)
0.7	18.4.2005	Some fixes and whacking latex (Samuli Kaipiainen) Project Explorer, Calibration and Measurement Controls test cases (Samuli Kaipiainen)
0.8	20.4.2005	Ikayaki/MainViewPanel test cases (Samuli Kaipiainen)
0.9	22.4.2005	Measurement Sequence (Mikko Jormalainen)
0.91	28.4.2005	Sequence and Details test cases (Samuli Kaipiainen)
1.0	29.4.2005	AF, Thel, Manual, Calib and SettingsP test cases (Mikko Jormalainen)

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1 Introduction

This document describes how this software (Ikayaki) is planned to be tested properly. Mainly this document concentrates on describing methods used for testing and test cases. It is important that all members of team to make tests in same way. This lowers possibility of testing conflicts and helps on integration test phase.

2 Overview of testing the system

Because program will be used to control a magnetometer, testing will be more important than in normal software engineering student projects. We will do unit testing for each class, integrate testing to program and use separate squid emulator to test squid interface system.

In unit testing each class is tested independently. Unit testing will be done by using JUnit. Every programmer will test his own classes. Class should be tested when it is finished and corrected before integration test begins.

Integration testing tests interfaces between classes. It will be done by going through all user interface protos and checking that all sections in requirements document can be done. Some critical sequences which are done many times with program should be done too.

Squid interface integration testing is done simulating real system with emulator. It will be done using Squid-emulator before testing it with real magnetometer. Squid-emulator runs in different machine and is connected by few (2-3) Serial I/O cables. Squid-emulator will be tested with old program (2G) same way before testing Ikayaki-system so that it will have all same tested properties which old program have and both systems have same results with squid emulator.

To verify that old program and new program works same way, we will do critical measurement with old program and emulator, save emulators log file and then use emulator with that log file and do same critical measurement with new program and see that both have same results.

If Rita testing utility is easy enough to use it will be used in testing. Tests will be constructed in such way that every line of code is visited at least once.

3 Testing

3.1 Unit Testing

Unit Testing is done for each class separately. Classes tested with JUnit have it's own ClassNameTest.java class in test-directory and gui-components are tested manually. They should be done before and during coding class. All test cases must be executable after classes are ready. Every class should be tested succesfully before integration tests.

All test cases are listed in sections 4 and 5.

3.2 Integration Testing

Integration testing is mostly done after unit tests are passed for all classes. Testing is done using squid emulator at first and finally with real Squid system. Graphical User Interface is mainly tested in Unit testing and is only looked that all components work together as Squid Interface is tested.

Integration testing for GUI-components is done using top-down method. Testing is done partly during implementation phase, when new components are added to program. After adding component to program it is tested to work properly with other components.

Graphical User Interface is tested using all use cases from 6. If one fails, it is corrected immediately and all use cases must be done again. When all use cases are done without errors this phase is ready.

Squid Interface testing is done with Emulator. Use cases are Automatic Measurement, Thellier Measurement and Manual Measurement with all variations (see 6). In first phase we use old program with emulator, save its log file and take results. After that we run it with new program and compare results. If they are not same, corrections are made immediately to new program and test is run again. This is done until results are same for all use cases.

3.3 Squid Emulator

Squid emulator is tested with old program. Use cases are Automatic Measurement, Thellier Measurement and Manual Measurement with all variations (see Requirements Document). When all use cases can be done with emulator it is ready enough for integration testing.

This should be done so that Old Program has same results with SQUID-system and emulator for all use cases. But we don't have resources for this. So this test only tells us that Old and New program works same way with squid emulator.

4 JUnit test cases

Here are listed JUnit test cases for classes.

JUnit is simple java-based framework for testing your java classes. We use it in this project for Unit Testing. For more information visit <http://junit.sourceforge.net/>.

First you need to download JUnit from http://sourceforge.net/project/showfiles.php?group_id=15278 and extract it to directory (different than java directory) and set classpath for it.

Then you must write test class for every class to be tested. Test classes extend TestCase. They will have test methods, one for each Test Case. Test class also need suite()-method and Main for run. Sample test class:

```
import java.util.*;
import junit.framework.*;

public class SimpleTest extends TestCase {

    //Simple Test Case

    public void testEmptySimple() {
        Simple simple = new Simple();
        //New Simple must be empty
        assertTrue(simple.isEmpty());
    }

    public static Test suite() {
        return new TestSuite(SimpleTest.class);
    }

    public static void main(String args[]) {
        junit.textui.TestRunner.run(suite());
    }
}
```

Type "java junit.swingui.TestRunner SimpleTest" to run test cases for Simple.

5 GUI-component test cases

Here are listed test cases for gui-classes, these are done manually just clicking and changing values.

5.1 Ikayaki/MainViewPanel

1. Starting the program

These have been tested with `test-ikayaki.bat`.

- Starts up correctly, everything works as supposed
Test: No parameters...
Result: OK
- Test: Parameter "*/*?" (which doesn't exist)...
Result: OK

Test: Parameter "projects/test.ika" (which exists, should open it)...

Result: OK

Test: No parameters and without config file...

Result: OK

Test: No parameters, with config file left from previous...

Result: OK

Test: Parameter "projects/test.ika" (which exists, should open it), and without config file...

Result: OK

Test results for Ikayaki/MainViewPanel: 6/6

5.2 ProjectExplorerPanel

1. Directory text field

- Shows autocomplete popup when typing and typed text matches to one or more directory
 Test: Typed different letters, worked fine. Funny results with '.' and it searched subdirectories with '..'
 Result: OK
- Shows directory history on down-arrow click
 Test: Works fine, only down-arrow fires this when no autocomplete pop-up is active
 Result: OK
- Too long lines in popup are shortened
 Test: Tried both pop-ups
 Result: OK
- Tries to change directory when on enter press or mouse-click to popupmenu (UC21)
 Test: Mouse click on autocomplete pop-up didnt work, history ok
 Result: **FAILED!**
- Only allows correct and existing directories (flashes red on change-attempt if invalid)
 Test: Tried existing and non-existing directories, ok. But with '.' and '..' it tries to open those. Strange.
 Result: OK

2. Browse-button

- Opens a dir chooser dialog
 Test: Tried with different values on Directory text field. Opened last good directory in dialog.
 Result: OK

- Changes to chosen directory if "Open" selected; updates text field (UC21)
Test: Opens only if directory exists
Result: OK

3. Project file table

- Shows project files in current directory
Test: Updates on the fly while changing directories
Result: OK
- Only shows project files (.ika and Calibration/AF/Thellier/Thermal)
Test: Tried various directories
Result: OK
- Highlights open project
Test: Changed project with mouse and keyboard
Result: OK
- Highlights (with different color) currently measuring project
Test: Colors work fine combined with open-measure, multiple selections.
Result: OK
- Loads project on project file mouseclick (UC20)
Test: Opens on left-mouse click only
Result: OK
- Show export menu for clicked file on right-click
Test: Works both single and multiple selections and dont open if no selections
Result: OK
- Export to selected file if any chosen (UC13-UC15)
Test: Single and multiple exports fine, only dat is supported?
Result: OK
- Sorts data on header click
Test: Tested all three choices in all combinations
Result: OK
- Updates data if changed (modifield-column, that is)
Test: Tested changing between two directories
Result: OK

4. "Create New" -components

- Only allows correct, non-existing files; flashes red if invalid
Test: \ don't work. Checks name for all differend projects, cannot have same named project in AF and Thellier for example
Result: **FAILED!**
- If valid filename, creates it, updates table with created file selected (UC19)
Test: Tested with various new Projects, AF, Thellier and Thermal
Result: OK

Test results for ProjectExplorerPanel: 16/18

5.3 CalibrationPanel

1. Calibration project table

- Shows (and only shows) calibration project files in current directory
Result: OK
- Highlights open project
Result: OK
- Highlights (with different color) currently measuring project
Result: OK
- Loads project on project file mouseclick (UC20)
Result: OK
- Doesn't show export menu for clicked file on right-click
Result: **FAILED!**
- Sorts data on header click
Result: OK would be better if always in same order
- Updates data if changed (measured- and elapsed-columns, that is)
Result: OK

2. "Calibrate" -button

- Does whatever "Single Step" -button does (see MeasurementControlsPanel) (UC8-UC10)
Result: OK

Test results for CalibrationPanel: 7/8

5.4 MeasurementControlsPanel

1. Measuring buttons

- All of them are enabled/disabled by good manners
Result: OK
- On click, all of them execute their measuring command without unjustified complaints (UC1-UC7)
Result: OK
- Flash red on click if action can't be done
Result: OK

2. +Z/-Z info/radiobuttons

- Shows correct orientation for current project
Result: OK

- Changes orientation on +z or -z radiobutton click
Result: OK
3. Magnetometer status picture
 - Always shows handler position and rotation as supposed...
Result: OK
 - Updates smoothly ^^
Result: OK
 4. Handler manual controls (radiobuttons)
 - Disabled if "normal" measuring in action, enabled otherwise
Result: OK
 - Executes desired action (if possible; can't tell) (UC11)
Result: OK
 - Stack move-radiobuttons correctly (never on top of each other or missing)
Test: Any two handler positions are set (in Settings) to same location (number)...
Result: **FAILED!**
 5. Magnetometer/demagnetizer manual controls (buttons)
 - Disabled if "normal" measuring in action, enabled otherwise if applicable
Result: OK
 - Enable/disable and update text according to current handler position and rotation
Result: **FAILED!**
 - Executes desired action (if possible; flash red if not) (UC11)
Result: OK

Test results for MeasurementControlsPanel: 11/13

5.5 ProjectInformation

1. Textfields
 - Number fields only accept numbers
Result: OK
2. Auto save
 - Project automatically saves inputted information
Result: OK
3. Project change

- Radiobuttons and textfields display new projects data
Result: OK

Test results for ProjectInformation: 3/3

5.6 MeasurementSequence

1. Start, Step and Stop

- Textfields only accept positive numbers
Test: "0"
Result: OK
Test: "bf"
Result: OK
Test: "-1"
Result: OK
- Minimum step value is 0,1
Result: OK
- Stop value must be higher than start
Test: start "2,2", stop "2"
Result: OK
- Largest possible stop value cannot be higher than what magnetometer can handle (as set in Device Configuration)
Test: "400"
Result: OK

2. Add Sequence-button

- Sequences are added into projects
Result: OK
- Sequences cannot be added to calibration projects
Result: OK (but sequence components should be disabled)

3. Sequence selection combobox

- Combobox cannot have two or more sequences with same name
Result: OK (asks to overwrite)
- Sequences can be deleted from list
Result: OK (can be deleted from Options)

4. Sequence-table

- Unmeasured AF/Temp column values can be edited and only accept valid numbers
Test: 0

Result: OK

Test: 1

Result: OK (changes to 1,1)

Test: -1

Result: **FAILED!** -> clears textbox and moves to table first row :)

Test: "f"

Result: **FAILED!** -> NumberFormatException

- Data is displayed correctly

Result: OK

- New rows can be added to end of table

Result: OK

- Right-clicking headers brings up column selection popupmenu

Result: OK

- Right-clicking table brings up general purpose popupmenu

Result: OK

5. Column selection popupmenu

- Selected or deselected columns are displayed or hidden correctly

Test: Deselected and selected all

Result: OK

6. General purpose popupmenu

- Allows inserting rows to any place in table (except after last)

Test: Before and after first, before and after last, random in the middle

Result: OK

- Allows deleting rows (except the last one)

Test: Delete first, delete last, delete random, delete all

Result: OK

- Rows with measurement data cannot be deleted

Test: Select measured, overlap with unmeasured

Result: OK

- Allows saving rows as sequence into combobox

Test: Save first, save one-before-last, save all

Result: OK

7. Project change

- Table shows columns which were visible last time new project was closed

Result: OK

- Table shows information of the new project

Result: OK

Test results for MeasurementSequence: 23/25

5.7 MeasurementDetails

1. MeasurementDetails-table

- Shows measurement details in useful and readable form
Result: OK (but whilst measuring, rows replace each other in a weird fashion)
- Numbers are correct for measurements
Result: OK (hope so..)
- Shows right number of rows initially, defined by project
Result: OK
- Table extends as needed
Result: OK

2. ErrorDetails-table

- Shows error in useful and readable form
Result: **FAILED!**
- Error is calculated correctly
Result: **FAILED!**

3. Project change

- Tables show information of the new project
Result: OK

Test results for MeasurementDetails: 5/7

5.8 SettingsPanel

1. Magnetometer, Handler and Degausser COM-port combobox

- Shows all COM-ports on system in alphabetical order
Result: OK
- Loads correct COM port from Settings
Result: OK
- Doesn't allow same value as in Handler and Magnetometer/Degausser COM-port comboboxes
Result: **FAILED!**

2. Save button

- Only available if changes are made and values are permissible
Result: **FAILED!** always available
- Unavailable on start
Result: **FAILED!**

- On click closes window and saved data correctly
Result: OK
3. Cancel button
- On click closes window and doesnt save changes
Result: OK
 - Always available
Result: OK
4. Calibration constants
- Loads data correctly from Settings
Result: OK
 - Accepts positive and negative decimal numbers
Test: -0.430002
Result: OK
5. Degausser ramp
- Loads data correctly from Settings
Result: OK
 - Has only elements: 3,5,7,9
Result: OK
6. Degausser delay
- Loads data correctly from Settings
Result: OK
 - Has only elements: 1..9
Result: OK
7. Acceleration and deceleration fields
- Loads data correctly from Settings
Result: OK
 - Accepts only values in range of Integers 0..127
Test: 1000
Result: OK
Test: -10
Result: OK
Test: -1
Result: OK
Test: 0
Result: OK
Test: 1
Result: OK

Test: 54
 Result: OK
 Test: 127
 Result: OK
 Test: 128
 Result: OK

8. Velocity and velocity in measurement fields

- Loads data correctly from Settings
 Result: OK values of over 8500 are not saved
- Accepts only values in range of Integers 50..20000
 Test: 0
 Result: OK 0 is initial value to which cannot be returned after changing to value 50..8500
 Test: 2001
 Result: OK
 Test: -1
 Result: OK
 Test: 1
 Result: OK
 Test: 8500
 Result: OK
 Test: 10000
 Result: OK
 Test: 20000
 Result: OK
 Test: 20001
 Result: OK

9. Translation positions fields

- Loads data correctly from Settings
 Result: **FAILED!** rotation velocity behaves like velocity and velocity measurement
- Tranverse T AF..Measurement accept only values in range of Integers 0..16777215
 Test: -1
 Result: OK
 Test: 0
 Result: OK
 Test: 1
 Result: OK
 Test: 16777215
 Result: OK

Test: 167772156

Result: OK

- Rotation acc. and dec. accepts values from 0..127
Result: **FAILED!** only accepts values from 0..127, but always loads with initial 127 or 54 respectively
- Rotation counts behaves correctly
Result: **FAILED!** behaves strangely with very large or small numbers (what should this accept?)

Test results for SettingsPanel: 34/40

6 Integration test cases

Here is test case which is done in integration phase to all components at same time. This is done in following order and must be repeated until done successfully. Variations can be made to ensure that all works in different situations.

6.1 Automatic AF Measurement

1. Open software
 - Last project is opened, if available.
Result: OK
 - All components are in right place
Result: OK
2. Select Holder noise calibration
 - opens Sample holder calibration project in Measurement Sequence and Information
Result: OK
 - disables Measurement Controls, except single step
Result: OK
 - enables calibrate button
Result: OK
 - disables editing sequence
Result: **FAILED!** fields/buttons not disabled, but adding sequence doesn't work
3. Click Calibration button
 - Adds new line in Sequence at bottom
Result: OK

- Starts calibration, progress shown on measurement controls
Result: **FAILED!** progress is shown wrong, works otherwise
 - Data is updated correctly in Measurement Details
Result: OK
 - Stop button enabled
Result: OK
 - New data added to Measurement Sequence
Result: OK
4. Calibration finished
- Stop button is disabled
Result: OK
 - Last modified is updated Sample Holder
Result: OK
5. Select standard sample
- opens Standard Sample calibration project in Measurement Sequence
Result: OK
6. Click Calibration button
- Adds new line in Sequence at bottom
Result: OK
 - Starts calibration, progress shown on measurement controls
Result: **FAILED!** progress is shown wrong, works otherwise
 - Data is updated correctly in Measurement Details
Result: OK
 - Stop button enabled
Result: OK
 - New data added to Measurement Sequence
Result: OK
7. Calibration finished
- Stop button is disabled
Result: OK
 - Last modified is updated in Standard Sample
Result: OK
8. Create new AF project
- Calibration project is closed
Result: OK

- new AF project is opened with given name (ProjectInfo,MeasurementSequence)

Result: OK

- Measurement Controls has enabled buttons Measure,Single Step and disable Pause,Stop Now!

Result: OK

9. Add project Information

- All data is accepted

Result: OK

10. Load Set

- Loaded set is correctly added to Sequence

Result: OK

11. Click Measure

- Disables Measure,Single Step, enables Pause,Stop Now!

Result: OK

- Rows are highlighted in Explorer and Sequence

Result: OK

- Starts measuring first phase correctly (no demag now)

Result: OK

- Picture of demagnetizer is up-to-date

Result: **FAILED!**

- Plots are drawn during phase

Result: OK

- Continues on next phase and does demag first

Result: OK

- Updates Details and Sequence

Result: OK

- Measured sequence cannot be changed

Result: OK

12. Pause button

- Finish current measure and stops after that

Result: OK

- Disables Pause button

Result: OK

- When finished disables Stop Now! and enables Measure,Single Step

Result: OK

13. Sequence edit

- Steps not yet measured, can be changed
Result: OK

14. Single step button

- Performs Next phase on measure
Result: OK
- Disables Measure button and Single Step button, enables Stop Now!
Result: OK

15. Measure button

- Disables Measure, Single Step, enables Pause, Stop Now!
Result: OK
- Rows are highlighted in Explorer and Sequence
Result: OK
- Continues from Next phase
Result: OK
- Picture of demagnetizer is up-to-date
Result: OK
- Plots are drawn during phase
Result: OK
- Continues on next phase
Result: OK
- updates Details and Sequence
Result: OK

16. Stop Now! button

- Stops measurement immediately
Result: OK or as fast as machine can be stopped

Test results for Automatic AF Measurement: 44/48

6.2 Thellier Measurement

1. Open software

- Last project is opened, if available.
Result: OK
- All components are in right place
Result: OK

2. Open existing Thellier project
 - Project is opened correctly in Information and Sequence
Result: OK
 - Measure button is hidden, Single step enabled and Stop now Disabled
Result: OK
3. Add new line in sequence
 - It's inserted correctly.
Result: OK
4. Click Single Step button
 - Performs Next phase on Sequence
Result: OK
 - Disables Single Step button, enables Stop Now!
Result: OK
 - Rows are highlighted in Explorer and Sequence
Result: OK
 - Picture of demagnetizer is up-to-date
Result: **FAILED!**
 - Plots are drawn
Result: OK
 - updates Details and Sequence
Result: OK

Test results for Thellier Measurement: 10/11

6.3 Manual Measurement

1. Open software
 - Last project is opened, if available.
Result: OK
 - All components are in right place
Result: OK
2. Create new AF/Thellier project
 - new AF/thellier project is opened with given name (ProjectInfo,MeasurementSequence)

Result: OK

- Measurement Controls has enabled buttons Measure,Single Step and disables Pause,Stop Now!
Result: OK
3. Adding project data and selecting manual
 - Data is accepted correctly
Result: OK
 - Manual is enabled
Result: OK
 4. Rotate handler
 - Rotation changes on image of squid
Result: OK
 - Squid-system rotates
Result: OK
 5. Move handler to specific place
 - Image of squid animates correctly and stops on right position
Result: **FAILED!** stops in right position, but animation is wrong
 - Squid-system moves to exact place
Result: OK
 6. Demagnetize
 - Demagnetization is shown on squid image
Result: OK
 - Squid-system demagnetizes
Result: OK
 7. Measure-all
 - Measuring is shown on squid image
Result: OK
 - Data is added to Details correctly
Result: OK
 - Data is added to Sequence
Result: OK
 8. Reset measure
 - Nothing shown, Magnetometer is reseted.
Result: OK

Test results for Manual Measurement: 15/16