

Design Concept - "FRAP Tool" - project MRI Cell Image Analyzer	Montpellier RIO Imaging	
Contact: Volker Bäcker / 04 34 35 95 19 / volker.baecker@mri.cnrs.fr	Version 0.2 / 22/06/11	

Design Concept - "FRAP Tool" - project MRI Cell Image Analyzer

Montpellier RIO Imaging

22/06/11

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Changes

Version 0.1	22/06/11	first version
Version 0.2	22/06/11	First complete version

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1 Goal of the design-concept

The goal of the design-concept is to describe the addition of the possibility to use multiple selections per cell in the FRAP-Tool, as described in the document "Requirement Analysis - FRAP Tool - project MRI Cell Image Analyzer". The usage of multiple selections is necessary when the cell moves and other bright spots are present.

1.1 Aims, tasks and success criteria

1.1.1 Allow multiple selections per cell

1.1.1.1 Aims

1. The user must be able to specify multiple selections per cell. Between two selections the last selection is valid. Users that do not want to use multiple selections can continue to work as before.
2. Multiple selections must be stored and loaded. The tool must be able to use selections in the ImageJ .sel format and in the ImageJ .zip format.
3. When the processing is started the current selection must be changed whenever a new selection exists for the current time-point.

1.1.1.2 Switch to multi-selection mode

Context:

The application is in single-selection-mode.

Task:

The user uses the checkbox to switch to "multiple selection mode". This will activate the button *edit selections* and change the text on the button *save selection* to *save selections*.

Success Criteria:

- ➔ the *edit selections* button is active. When it is pressed it transfers the saved selection to the roi-manager.
- ➔ The button to save selection(s) has now the label "save selections".

1.1.1.3 Switch to single-selection mode

Context:

The application is in multi-selection-mode.

Task:

The user uses the checkbox to switch to "single selection mode". This will deactivate the button

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edit selections and change the text on the button *save selections* to *save selection*.

Success Criteria:

- ➔ The *edit selections* button is deactivated. It cannot be pressed.
- ➔ The button to save selection(s) has now the label "save selection".

1.1.1.4 Multi-selection mode

In single-selection mode the application works as before. The behavior in multi-selection mode is described in this section.

1.1.1.4.1 Save selections

Context:

The roi manager is open and contains a number of selections. Rois are associated with slices and there is one roi for the first slice.

Task:

The selections in the roi manager are saved into the folder of the selected cell in the form of a .zip file containing .sel files. The text in the column *selection* is updated to display the number of selections. If only one selection is defined, it is treated as in single selection mode.

Success Criteria:

- ➔ a .zip file containing the selections exists in the folder of the cell
- ➔ the column selection is updated to show the number of selections

1.1.1.4.2 Edit Selections

Context:

The cell has one or more selections stored.

Task:

Pressing the *edit selections* button opens the selections of the cell in the roi-manager. If there is no selection the roi-manager is opened without rois. If there is a single selection, it is opened in the roi-manager as well.

Success Criteria:

- ➔ the roi manager is open
- ➔ it contains the selections of the cell and rois are associated with slices
- ➔ if the projections stack is open the rois are displayed on it

1.1.1.4.3 Opening a cell with a multi-selection

Context:

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The user switches to a new cell or opens one by double-clicking that already has a multi-selection associated.

Task:

The rois are displayed in the roi manager and they are associated with slices. They are displayed on the projections stack.

Success Criteria:

- ➔ the roi manager is open
- ➔ it contains the selections of the cell and rois are associated with slices

1.1.1.4.4 Processing multiple-selections

Context:

The user has pressed the run button and a cell that has a multi-selection associated is processed.

Task:

For the first stack the first roi of the list of rois is set. Whenever the roi changes the corresponding roi is set on the corresponding stack.

Success Criteria:

- ➔ the brightest cube is searched in different regions on different time-points corresponding to the list of rois.

1.2 Project parties

contractee		INTRACELLULAR RNA TRAFFICKING, IGMM, CNRS
	Project manager	Edouard Bertrand
	Expert user	Stephanie BOIREAU
contractor		Montpellier RIO Imaging
	Project manager	Volker Bäcker
	Development	Volker Bäcker
	Development	Stephanie Vaudescal

1.3 Constraints

- The project must be delivered before the 17/06/2011, since the image analysis must be done
- Other user that do not have to use multi-selections must not be affected by the changes

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2 IT- and project context

The version of ImageJ must at least be 1.45e. Java 1.6 must be installed. The Frap-Tool is integrated in the MRI Cell Image Analyzer. The library Excel_Writer.jar must be in the classpath.

3 Functional requirements

3.1 Systematic listing of atomic requirements

Table 1: functional requirements for multiple selections in the FRAP-tool

ID	Name	Requirement	Section	page
ms-1	multi-selection-mode	Switch the tool to the multi-selection-mode	1.1.1.2	4
ms-2	single-selection-mode	Switch the tool to the single-selection-mode	1.1.1.3	4
ms-3	save-selections	Save the selections from the roi manager	1.1.1.4.1	5
ms-4	edit-selections	Open the selections in the roi-manager	1.1.1.4.2	5
ms-5	display-selections	Display selections in roi manager and on projections stack	1.1.1.4.3	5
ms-6	process-selections	Take the selections into account in the processing	1.1.1.4.4	6

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4 Documentation of the complete requirement coverage

Requirement	name	methods	unit-tests
ms-1	multi-selection-mode	FRAPWizard>> toggleMultiSelectionMode	FrapWizardTest>> multiSelectionModeTest
Test			
<ol style="list-style-type: none"> 1. <ol style="list-style-type: none"> 1. Select the checkbox "use multiple selections" 2. The button "edit selections" becomes active. 3. The label on the button "save selection" is changed to "save selections" 			
ms-2	single-selection-mode	FRAPWizard>> toggleMultiSelectionMode	FrapWizardTest>> multiSelectionModeTest
<ol style="list-style-type: none"> 1. <ol style="list-style-type: none"> 1. Deselect the checkbox "use multiple selections" 2. The button "edit selections" becomes inactive. 3. The label on the button "save selections" is changed to "save selection" 			
ms-3	save-selections	FRAPWizard>>saveSelection	FrapWizardTest>> saveSelectionMultiple ModeTest
			FrapWizardTest>> saveSelectionSingle ModeTest
<ol style="list-style-type: none"> 1. <ol style="list-style-type: none"> 1. Switch the tool to multi-selection mode 2. Add folders and select a cell in the list 3. double click on the selected cell to open the stack of projections. 4. Press the "edit selections" button to open the roi-manager. 5. Add a roi on a slice and a second roi on another slice (for example slice 1 and 3). 6. Press the "save selections" button 7. Delete everything from the roi-manager and load the rois saved with roi-manager. Check that they are identical to the rois that have been in the roi-manager in step 5. 8. Check in the roi-manager that under the button "more>Options..." the option "Associate rois with slice" is activated. 			
<ol style="list-style-type: none"> 2. <ol style="list-style-type: none"> 1. Switch the tool to single-selection mode 2. Add folders and select a cell in the list 3. double click on the selected cell to open the stack of projections. 4. Make a selection on the image 5. Press the "save selection" button 6. Open the roi-manager from the imagej-launcher and use it to load the .sel file from the folder of the cell 7. Compare the loaded roi with the roi from step 4. 8. Check in the roi-manager that under the button "more>Options..." the option "Associate rois with slice" is deactivated. 			
ms-4	edit-selections	FRAPWizard>>editSelections	FrapWizardTest>> editSelectionsTest ()
<ol style="list-style-type: none"> 1. <ol style="list-style-type: none"> 1. Switch the tool to multi-selection mode 			

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Requirement	name	methods	unit-tests
<ol style="list-style-type: none"> 2. Add folders and select a cell in the list that does not have a roi associated 3. double click on the selected cell to open the stack of projections. 4. Press the "edit selections" button to open the roi-manager. 5. Check that the roi manager is open and that it is empty 			
<ol style="list-style-type: none"> 2. <ol style="list-style-type: none"> 1. Add folders and select a cell in the list that have one roi associated 2. double click on the selected cell to open the stack of projections. 3. Switch the tool to multi-selection mode 4. Press the "edit selections" button to open the roi-manager. 5. Check that the roi appears in the roi-manager and is displayed on the image 6. Check in the roi-manager that under the button "more>Options..." the option "Associate rois with slice" is activated. 			
<ol style="list-style-type: none"> 3. <ol style="list-style-type: none"> 1. Add folders and select a cell in the list that has one roi associated 2. double click on the selected cell to open the stack of projections. 3. Close the roi-manager 4. Press the "edit selections" button to open the roi-manager. 5. Check that the rois appear in the roi-manager and that they are displayed on the image 6. Check in the roi-manager that under the button "more>Options..." the option "Associate rois with slice" is activated. 			
ms-5	display-selections	FrapWizard>> showImageNumber()	FrapWizardTest>> showImageNumberWithSingleSelection()
			FrapWizardTest>> showImageNumberWithMultipleSelection()
		FrapWizard>> showProjectionNumber()	FrapWizardTest>> showProjectionNumberWithSingleSelection()
			FrapWizardTest>> showProjectionNumberWithMultipleSelection()
<ol style="list-style-type: none"> 1. <ol style="list-style-type: none"> 1. Deselect "show projections" 2. Add folders and select a cell in the list that has one roi associated 3. double click on the selected cell to open the first time point. 4. Use the rights and left arrows to change the current time point 5. the roi must be visible on all time-points 			
<ol style="list-style-type: none"> 2. <ol style="list-style-type: none"> 1. Deselect "show projections" 2. Add folders and select a cell in the list that has multiple rois associated 3. double click on the selected cell to open the first time point. 4. Use the rights and left arrows to change the current time point 5. a roi must be visible on all time-points 6. the roi must change at a given timepoint 			
<ol style="list-style-type: none"> 3. <ol style="list-style-type: none"> 1. Select "show projections" 2. Add folders and select a cell in the list that has one roi associated 			

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Requirement	name	methods	unit-tests
3. double click on the selected cell to open the projection. 4. The roi must be displayed in the projection 5. changing the cell, saves the current roi for the cell.			
4. 1. Select "show projections" 2. Add folders and select a cell in the list that has multiple rois associated 3. double click on the selected cell to open the projection. 4. The rois must be displayed on the projection, each one on a specific slice 5. changing the cell does not save the rois.			
ms-6	process-selections	FRAPWizard>>run	FRAPWizardTest>> testRunMultipleSelecti ons
			FRAPWizardTest>> testRunSingleSelection
1. 1. Add a folder and select the cell in the list 2. Switch to multi selection mode 3. Click on the button "edit selections" 4. Make a selection on the first slide and add it to the roi manager 5. Make another selection that does not overlap with the selection from step 4 and add it to the roi manager 6. Click on the button "save-selections" 7. Click on the button "run" 8. In the control images, check that the cubes found for the time-points one and two are within the first selection and that the remaining cubes are in the second selection.			
2. 1. Add a folder and select the cell in the list 2. Make a selection on the image 3. Click on the button "save-selection" 4. Click on the button "run" 5. In the control images, check that the cubes found are all within the selection from step 2			