Changes in ThunderSTORM with Phasor added

Based on latest release version – sept. 10, 2016 (31f2df7)

**Changed files**

**Pom.xml**

Changed version, name, description and FIJI path (which was my personal path).

Added **provided** dependency to SLF4j, which is required for the help files if loaded on a bare-bones FIJI installation. It should not be present when compiling for ImageJ (!). Now, the Help files give a one-time error, after which they work.

**BiPlaneCalibrationPlugin.java**

Zzeropos is added as input, but doesn’t have any influence on the calculations (see CylindricalLensCalibrationPlugin).

**CylindricalLensCalibrationPlugin.java**

Previously, ThunderSTORM was only capable of setting the zero of astigmatic calibration to the middle of the stack of calibration data. I have added an option to set the zero of the astigmatic calibration either in the middle of the stack, or at the point where the two curves cross.

This effects on the files **AstigmaticCalibrationProcess** and **AstigmatismCalibrationDialog, and BiPlaneCalibrationPlugin**.

Next to this, there is a part added if phasor is selected while doing the calibration. This is set in an if…else clausule, with doing the default AstigmaticCalibrationProcess if something else than phasor (which can only be Gauss) is selected. The active estimator is found via a dialog.getActiveEstimatorUI, which caused List<IEstimatorUI> estimators array (line 57) to be changed to encompass both Gauss and phasor (via **phasorCalibrationEstimatorUI**).

**ImportExportPlugIn.java**

Change implemented from jan. 2017 version of ThunderSTORM.

**calibration/AbstractCalibrationProcess.java**

Changed to encompass the change of zero position in astigmatic calibration files as indicated by the changes in **CylindricalLensCalibrationPlugin.java** above. In short, information about the image (imp) and the boolean zzeropos have to be given as arguments to the function. If zzeropos==1, then the middle of the stack should be used – im.getStack()/2. Lines 347-351 have been changed for this.

**calibration/AstigmaticBiplaneCalibrationProcess.java**

Changes result from change in zero-pos-choice (see CylindricalLensCalibrationPlugin or AbstractCalibrationProcess).

**calibration/AstigmaticCalibrationProcess.java**

Changes result from change in zero-pos-choice (see CylindricalLensCalibrationPlugin or AbstractCalibrationProcess).

**calibration/AstigmatismCalibrationDialog.java**

Changes result from change in zero-pos-choice (see CylindricalLensCalibrationPlugin or AbstractCalibrationProcess).

**Calibration/BiplaneCalibrationProcess.java**

Changes result from change in zero-pos-choice (see CylindricalLensCalibrationPlugin or AbstractCalibrationProcess).

**calibration/CalibrationProcessFactory.java**

Changes result from change in zero-pos-choice (see CylindricalLensCalibrationPlugin or AbstractCalibrationProcess).

**calibration/IterativeFitting.java**

Added only a check for catching negative numbers – this was used for debugging purposes.

**UI/AstigmatismCalibrationDialog**

Added option for zeropos at center of calibrationstack or at crossing of defocus curves. For this, a new JRadioButton was added (intersectionRadioButton and middleStackRadioButton) (see CylindricalLensCalibrationPlugin or AbstractCalibrationProcess).

**UI/HelpButton.java**

Tried to make Help Buttons work (at least partially). Small change which shouldn’t have any real effect.

**resources/META-INF/services/IEstimatorUI**

Line 6 is added to encorporate PhasorFitterUI as valid fitting option in the UI.

**resources/resources/help/…/estimators/ui/CalibrationEstimatorUI.html/lyx**

Added reference to Phasor localization.

**resources/resources/help/…/estimators/ui/Estimators.html/lyx**

Added reference to Phasor localization.

**Added files**

**calibration/PhasorAbstractCalibrationProcess.java**

Calibration of phasor localization – based on AbstractCalibrationProcess.java. It still determines the PSF’s angle, which is unnecessary for phasor. However, it has no detrimental effect on results.

It also doesn’t try to get intensity of the PSF, as phasor cannot do this. The rest of the code is the same or very similar.

**calibration/PhasorAstigmaticCalibrationProcess.java**

Calibration of phasor localization – based on AstigmaticCalibrationProcess.java. In fact, it’s completely the same except for the name usage.

**calibration/PhasorCalibrationProcessFactory.java**

Calibration of phasor localization – based on CalibrationProcessFactory.java. In fact, it’s completely the same except for name usages.

**estimators/PhasorFitter.java**

The main phasor fitting function. See <https://doi.org/10.1101/191957> for complete elucidation.

In short, Lines 50-63 are run once in the complete sub-pixel calculation, and it calculates sines and cosines for a Fourier transform later on. By placing this outside the main loop, they are not re-calculated for each PSF, since they remain constant anyhow.

Lines 67-153 is the fitting itself. It calculates the partial Fourier transform on line 88, then calculates the X,Y positions, and calculates the z-position if astigmatism is enabled.

Lines 154-214 contain a partial Fourier transform, with imaginary and real parts separated to enable a Fourier transformation in JAVA.

**estimators/UI/PhasorAstigmatismCalibrationEstimatorUI.java**

UI interface for phasor astigmatism during calibration – based on AstigmatismCalibrationEstimatorUI.java. Almost identical, but only a fitradius is required for phasor, so the method and sigma boxes are removed.

**estimators/UI/PhasorEstimatorUI.java**

UI interface for phasor estimator. Based on SymmetricGaussianEstimatorUI.java. Only requires a single option – fitradius. Linked to from PhasorAstigmatismCalibrationEstimatorUI.java.

**estimators/UI/PhasorFitterUI.java**

Main UI interface for the Phasor. Loosely based on EllipticGaussianEstimatorUI.java. Requires fitradius, a checkbox for astigmatism, and a path for the calibration file if the astigmatism checkbox is enabled.

**\resources\resources\help\cz\cuni\lf1\lge\ThunderSTORM\estimators\ui\PhasorFitterUI.html/lyx**

Help file for phasor localization.