Focus LP, a PlugIn for "ImageJ"

Version 1.0.x Bureau H. Glünder 2015-2020

WHAT FOR

Focus LP is an "ImageJ"-PlugIn that is "ImageJ Macro"-recordable.
Focus LP determines the best focused slice of a stack that represents a focus series.
Focus LP requires a 16bit image-stack with a square-sized selection.

INSTALL

Download "FocusLP_1-0-x.zip" and unzip it.
Launch "ImageJ" and install the file **Focus_LP.class** per menu item "Plugins ▷ Install..." or move it to the "plugins"-folder of your "ImageJ"-installation.
Quit and re-launch "ImageJ".

HOW TO

Open a 16bit image-stack that represents a focus series.
Focus analysis can be spatially restricted to an arbitrary rectangular selection (ROI).
Choose the item "Focus LP" from the "ImageJ-Plugins"-menu.
Dialog:

- Set the focus criterion. ("Criterion Standard" will do in most cases.)
- Set the kernel size (see Details). ("Size 9" will do in most cases.)
- Click "OK" to determine the relative in-focus slice.

Results:

- The results are written to the "Log"-window.
- Listed are *n* numbered focus measures, where *n* is the total number of stack slices.
- The slice showing the maximum measure is regarded as best focused. Its slice number is listed at the end.
- **Important note:**
  The best focused slice needs not be perfectly in focus because it is merely the *relatively* best focused slice of a focus series according to a kind of spatial *majority decision* regarding the focus of the slice or selection. Consequently, the results will strongly depend on the depth-resolution of the focus series and on the image content.
- Especially for imaged 3D-objects, regional focus analyses (using small ROIs) provide more meaningful results than global ones.

Details:

- A prominent class of focus measures is based on the evaluation of highpass-filtered slices of a focus series. Corresponding approaches mainly differ in the kind of the filter, i.e. the kind and size of the operator. Commonly, the evaluation of a filtered slice consists in a global energy measure.
- The "Standard"-criterion is based on a Laplace-like filtering. As a focus measure it uses the summed absolute values of a filtered slice.
- While the 3x3 operator (Size 3) approximates the Laplace-operator, the larger ones are **not** the commonly applied "Laplacian of Gaussians", but are specially designed and allow for improved results and very fast execution of the filtering.
- The "Diagonal"-criterion is based on operators that are turned by 45°.
  With the modified criteria, the results from two partial operators are non-linearly combined.

Macro operation:

- Macro code for running "Focus LP":

```
crit = "Standard"; sz = 9; // example settings
run( "Focus LP", "criterion=" + crit + " size=" + sz );
```

- Macro code for accessing the result:

```
returnStr = split( call( "Focus_LP.macroReturn" ), " " );
focusedSlice = parseInt( returnStr[0] );
```

TERMS OF USE

Focus LP may be used without a license.

Focus LP is NOT in the public domain.

Focus LP may NOT be sold.

Focus LP is provided AS IS and you use it entirely at your own risk.

- "Focus LP" is copyright-protected 2015-2020 by Bureau H. Glünder.
- "Focus LP" may be used without acquiring a license and it is definitely not allowed to sell it..
- "Focus LP" is given away AS IS. It is solely the responsibility of the user to determine the software's suitability for a particular purpose or use.
- Although "Focus LP" has been developed with great care, you use it at your own risk.
- Bureau H. Glünder cannot be hold responsible for any kind of direct or indirect damage or loss—including but not limited to, any interruption of service, loss of business, loss of profits or good will, legal action, or any other consequential damages—that may be caused by installing, configuring or using "Focus LP".
- By using "Focus LP" the user agrees to the generally accepted fact that to date flawless software cannot be guaranteed. Hence, imperfect software is not faulty in the legal sense. "Focus LP" may contain "bugs" that limit its use or even make its use impossible.