Flatness, Deviation and Symmetry Macro for ImageJ Notes for User

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This ImageJ macro calculates flatness, symmetry and deviation for an image of a radiation field. It is provided for educational purposes only; it has not been tested for clinical use. Please feel free to edit and re-distribute and email any bugs or comments to michael.robert.hughes@gmail.com .

Installation

1. Copy **flatsymm.txt** to the **macros** folder of your ImageJ installation.
2. Start **ImageJ,** select **Plugins -> Macros -> Install**.
3. Select **flatsymm.txt.**
4. The macro can be run by selecting **Plugins -> Macros -> flatsymm**.

Use

Load in the image you wish to analyse before running the macro. The radiation field must be centered in the image, with its edges parallel to the image edges. If the image dimensions are not calibrated (i.e. there is no physical scale) you can calibrate it using Analyse -> Set Scale (see the ImageJ documentation for more details). If the image scale is not calibrated, you will need to know the field size in pixels.

When the macro is launched you will be presented with a dialog box with several options and parameters:

Auto-Calibrate Pixel Values : If checked, sets brightest pixel to 0 and darkest pixel to 100 prior to calculating the parameters. If this is not selected and the image has a pixel value offset offset, the calculated values will be incorrect.

Use current physical dimensions instead of pixels : If checked, values entered for field size will be assumed to be in units of scale calibration rather than in pixels.

Field Size (Horizontal and Vertical) : Size of the radiation field in units as chosen above.

Flattened Field % (Horizontal and Vertical) : Percentage of the radiation field to analyse. Choose 80% for closest approximation to IEC standard for field sizes 10 x 10 to 30 x 30 cm.

Calculations

The definitions of flatness, symmetry and deviation used are given below. They are calculated along 1D vertical and horizontal profiles which pass through the centre of the image and extend to the edge of the flattened field (as defined by the user):

$$\text{Symmetry} = \max\left\{\frac{P_i}{P_{-i}}, \frac{P_{-i}}{P_i}\right\},$$

$$\text{Flatness} = \frac{\max\{P_i\}}{\min\{P_i\}},$$

$$\text{Deviation} = \frac{\max\{P_i\}}{P_0},$$

where P_i is the value of pixel i along the profile and P_0 is the pixel value at the centre of the profile (i.e. the central axis, CAX). P_i and P_{-i} represent points an equal distance either side of CAX (i.e. the points which should be symmetrical).

Results

The results are printed to the Log window.