

BLUEPRINT MODELER



LENS DISTORTION CORRECTION MODULE

DOCUMENTATION

LENS DISTORTION MEASUREMENT

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1. CALIBRATION PATTERN PREPARATION

Before measurement the proper calibration pattern must be prepared. The pattern is placed in the file **BPM Lens Calibration Pattern.pdf** and contains a grid of calibration points used in the automatic pattern recognition process. The pattern is prepared to printing in resolution of 1200 DPI and should be printed with possible high quality with color.

2. MEASUREMENT

With printed pattern one can pass the survey procedure. The sample measurement position is visible on the figure 1.



Figure 1. Sample measurement position (with use of the tripod)

The target axis of the camera should point center of the pattern (defined by the red square with black diamond). Only the part of the pattern that is enclosed by the red rectangle (like on the figure 1) should be photographed. Red lines on the plane are used to facilitate positioning camera relative to the pattern – especially when one use viewfinder of LCD viewer. Name of the pattern might be photographed but it isn't recommended.

When on the image is visible not only calibration pattern but also background elements then recognition procedure may fail. In this case it might be necessary to cut (to whiten) some background before the recognition procedure starts.

Another significant question is illumination – it should be uniform. All reflections caused by the camera's flash (eg. considerable brighten of the central part of the image) also make impossible to pass the automatic recognition process. If obtained pattern isn't good lighted and the measurement can't be repeated then one have to process image in the proper application for raster processing.

Principles and hints that might be useful during measurement process:

- the pattern can't be photographed from the side – camera's image plan should be parallel to the calibration pattern plane. The photo might be taken „by the hand“ (freely) but it is recommended to use tripod – it increase the precision of the targeting,
- the pattern should be properly mounted and the paper can't be additionally distorted – the calibration plane have to be a flat as possible,
- lens calibration profile concern distortion level with various focal lengths, so if user want to full (complete) profile he/she must take as much photos as the focal range will be covered respectively,
- if the given camera can't write focal lengths (often when one use the analog camera) then particular lengths should be written separately,
- for every focal length it should be taken 3-5 photographs (it isn't required, but from more photographs one can selected the best ones),
- the photos should be taken in high resolution that isn't interpolated by the camera (for digital cameras), recommended resolutions might be found in the range of 1600x1200 ÷ 3200x2400 (low resolution increase measurement

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errors, too high resolution extends time of pattern recognition without increasing of the precision),

- if the pattern is printed on the special paper the reflexes from the flash might appear. For eliminate them it is recommended to use external light sources or disable flash (and set long time of exposure).