The CAMEX (CAMera EXplorer) software

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Description:

The purpose of the CAMEX is to calibrate the images and analyze them visually. The CAMEX tool enables to launch a folder with a raw image sequence as a video. A raw image selected from the video can be further analyzed (via debayerization, thresholding, roi (region of interest) selection, histogram of the roi). The software tool allows to work with a digital camera. For the moment, the drivers are compatible with cameras of the Ximea brand.

Nevertheless, the main utilization of the CAMEX is in image calibration and correction using a procedure presented in Lonhus et al. *Sci. Rep.* **10**, 18346, 2020. As a first input, there is a set of spectra of light (e.g., of microscope light source) collected with the change of the (microscope) camera exposure. The shape of the primary light spectrum was snapped by an optic fibre spectrophotometer. The second input is a set of images of light depending on the (microscope) camera exposure. The light spectra and relevant images are numbered successively in ascending order. Then, the algorithm constructs a calibration curve (light energy vs. pixel intensity) for each pixel. In other words, at the position of each camera pixel, one will obtain a combined response of the whole optical path and the camera pixel sensitivity. The last algorithm input is a (microscope) raw image data sequence. In this way, as an output, one will obtain a set of images (in a raw format) where the optical vignetting, other optical path imperfections (e.g., dust), and camera electric noise are suppressed and, thus, the image background is more homogenous. The algorithm outputs (in the format of raw image) can be saved in the original double precision floating point format (in Matlab .mat files). If any image format is selected (from the toolbar options) as an output, the output image signal is recommended to have a higher (14 or 16) bit depth than the input signal (mostly 12 bits).