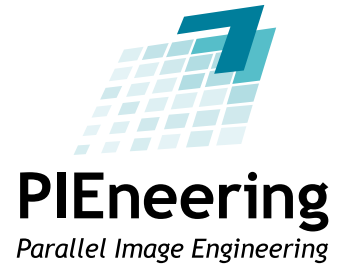**At PIEneering**, we are specialized in photogrammetry. For people who fly UAVs and aircraft for aerial mapping, we offer the best solutions with our innovative software and services.
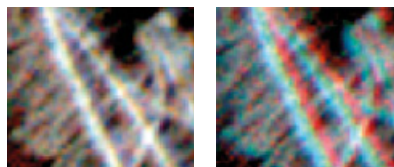
PIEneering
Parallel Image Engineering

RapidToolbox

Image Processing Software

RapidToolbox is a powerful image processing software tool for professional photogrammetry, designed to enhance the digital images when top quality orthophoto mosaics are being produced. Both the characteristics of digital cameras and natural atmospheric conditions during image acquisition cause distortions to the captured images. RapidToolbox offers multiple tools to improve both the geometric and radiometric quality of the images, regardless of the frame size of the digital camera being used.

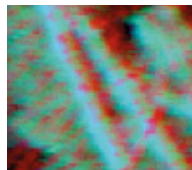## Transformation of image RGB channels into the same coordinate system

Colour images captured with digital cameras normally consist of three channels (RGB). The channels should be aligned so that any object seen in the image has the same image coordinates in all channels. Unfortunately, this is seldom the case as different wavelengths of the incoming light (specific for each channel) bend differently in the camera optics. RapidToolbox eliminates the channel shift and transforms all channels into one coordinate system. ▸

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Conversion of raw images into Tiff files with Bayer treatment

Most digital cameras have sensors which do not have an equal number of pixels for the three channels (RGB). However, when the captured image is saved to a memory card, the file formats (e.g. tiff, jpg) store all three channels with an equal number of bytes. This means that the missing colours have to be interpolated for every pixel during the file save. Unfortunately, the standard interpolation methods normally make the result blurred. RapidToolbox uses a sophisticated interpolation method for the raw image conversion to avoid the blurring effect.

Adaptive modeling of lens vignette and hot-spot effects

Image mosaics look more pleasant and are more useful for image interpretation if the colour scheme of the individual images are homogenous and the seam lines between individual frames in the mosaic are not visible. To achieve this, two major physical effects caused by the sunlight and camera optics should be compensated for: hot spots and lens vignette (light fall-off).
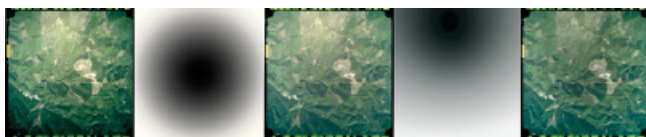
RapidToolbox uses adaptive modeling techniques for the physical effect compensation. Each image is treated individually using the information of its neighbouring images.

Normalizing images captured with a modified near infrared (NIR) camera

An average colour RGB camera can be modified to store near infrared (NIR) images by replacing the optical filters of the sensor. The result, however, is not directly comparable with conventional (film-based) NIR-images. Using the known characteristics of the filters, RapidToolbox produces normalized NIR-images from the captured, filtered images.

Image conversion to 8-bit images using logarithmic transformation

In order to increase the dynamics of the images and to obtain more detailed image mosaics, it is better to store the original images in a raw format, for instance, 12 bits per pixel. The vignette and hot spot effect compensation produce better results and the image aberration can be removed properly.

However, most image processing software at present can work efficiently only with 8-bit data. Transforming 12-bit or 16-bit data to 8-bit data may sound trivial, but the reality is more complicated. RapidToolbox uses a logarithmic transformation for the image conversion to 8-bits. The transformation method simulates the behaviour of film, which is pleasing to the human eye and maintains the relevant information.

Generation of ideal images

Ideal images are digital images where the distortions caused by camera optics are eliminated. The use of ideal images saves computing power and processing time in large projects as the camera optics distortions does not have to be eliminated repeatedly on the fly. Ideal images have an additional advantage in that they can be directly imported to any stereo plotter. ∎

Features

Powerful image enhancement tools for professional photogrammetry

- Transformation of image RGB channels into the same coordinate system
- Conversion of raw images into Tiff files with Bayer treatment
- Adaptive modeling of lens vignette and hot-spot effects
- Normalization of images captured with a modified near infrared (NIR) camera
- Image conversion to 8-bit images
- Ideal image generation
- Batch processing capability
- Full parameter control for fine tuning the processes and results

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