

UNIVERSITÄT DES SAARLANDES
LEHRSTUHL FÜR COMPUTER GRAPHIK
PROF. DR.-ING. PHILIPP SLUSALLEK,
PROF. DR. HAB. INŻ. KAROL MYSZKOWSKI (MPII) AND
DR. GURPRIT SINGH (MPII)
ASSISTANTS: PASCAL GRITTMANN AND
UĞUR ÇOĞALAN (MPII)



MAY 14TH, 2020

REALISTIC IMAGE SYNTHESIS (SS 2020) ASSIGNMENT 2

Submission deadline: May 28th, 2020

Required Software

To complete the assignments, you will need to download and compile the following software:

pfstools <http://pfstools.sourceforge.net/>
pfstmo <http://pfstools.sourceforge.net/pfstmo.html>
pfscalibration <http://pfstools.sourceforge.net/pfscalibration.html>

2.1 Two HDR Images (40 points)

Create an HDR image from photographs of:

1. a scene captured during the night (may contain artificial light sources)
2. a scene captured during the day (preferably under the sunlight)

using the multi-exposure technique. *pfscalibration* allows to recover the camera response curve and merge individual exposures to an HDR image. Verify the color reproduction between the HDR and source exposures. Incorrect colors may appear if the calibration is not successful.

The scenes must contain sufficiently dark and bright regions so that it is not possible to capture the full dynamic range with a single exposure. Your HDR images must capture the full dynamic range of each scene. It is desirable to have a moderate amount of noise in the night scenes so please feel free to use high ISO settings of your camera during the capture process. But do not use extremely large ISO values because the resulting noise may interfere with a correct calibration.

It is possible to use native camera application of Android and iPhone devices to change the exposure time of each image. In addition to this feature, there are other applications that support the exposure bracketing mode. If you have Canon DSLR, you can install Magic Lantern to be able to use exposure bracketing mode which helps you to capture all necessary exposures with one press of button. It is important to note that you need to fix your device during the capture of exposures to prevent possible artifacts in the resulting HDR images.

2.2 Experiment with Different Tone Mapping Methods (60 points)

Using software from *pfstmo* package, tone map your two HDR images with at least 4 different tone mapping algorithms and experiment with various parameter settings. For details on software usage and parameters, consult the manual pages and examples on *pfstmo* webpage.

Understand the behavior of different tone mapping methods in particular in view of color appearance, contrast, brightness, visibility of texture details and foreground/background separation. Refer to the lecture notes to get an idea what should be expected from each one of these methods.

Experiment with the tone mapping parameters to understand which ones control the properties mentioned above and if sufficient adjustment range is available. Investigate whether extreme values of parameters lead to any artifacts and if yes, explain which artifacts are typical to which methods. Observe the interaction between detail preservation and noise level in the results.

Note that the amount of gamma correction is not a tone mapping parameter, but a correction which should be adjusted for given display device. While it is important to know if given tone mapping requires gamma correction or not, the analysis of tone mapping results with different gamma settings are irrelevant here.

Think what are the requirements for a good tone mapping method for HDR scenes with bright (day) and dim (night) lighting conditions. In your written report, summarize your observations and decide which method is, according to you, the most suitable one for tone mapping of each scene type. Justify your choice.

Submission

Your solution should be submitted as a compressed archive containing your written report and images of your most interesting tone mapping results (at least 2 results per tone mapping method), as well as your original HDR files in '.exr' or '.hdr' format. In your report, refer uniquely to the images (via filenames) and provide parameter settings. Submit your solutions by e-mail to course assistant Uğur Çoğalan (ucogalan@mpi-inf.mpg.de) until May 28th, 2020. You can work in groups of two for this assignment. If your submission archive is too large to be sent as an email attachment, upload the archive to a website (e.g. Google Drive, Dropbox, your personal webpage) and send the MD5 hash of the archive in your email together with the download link before the submission deadline.

Late Submission

You can submit up to 3 days late. Late submission grades will be multiplied by 0.8 as a penalty for this assignment. The submissions between May 28th 23.59 and May 31st 23.59 will be regarded as late.