Determining the Camera Response Function

Short Presentation

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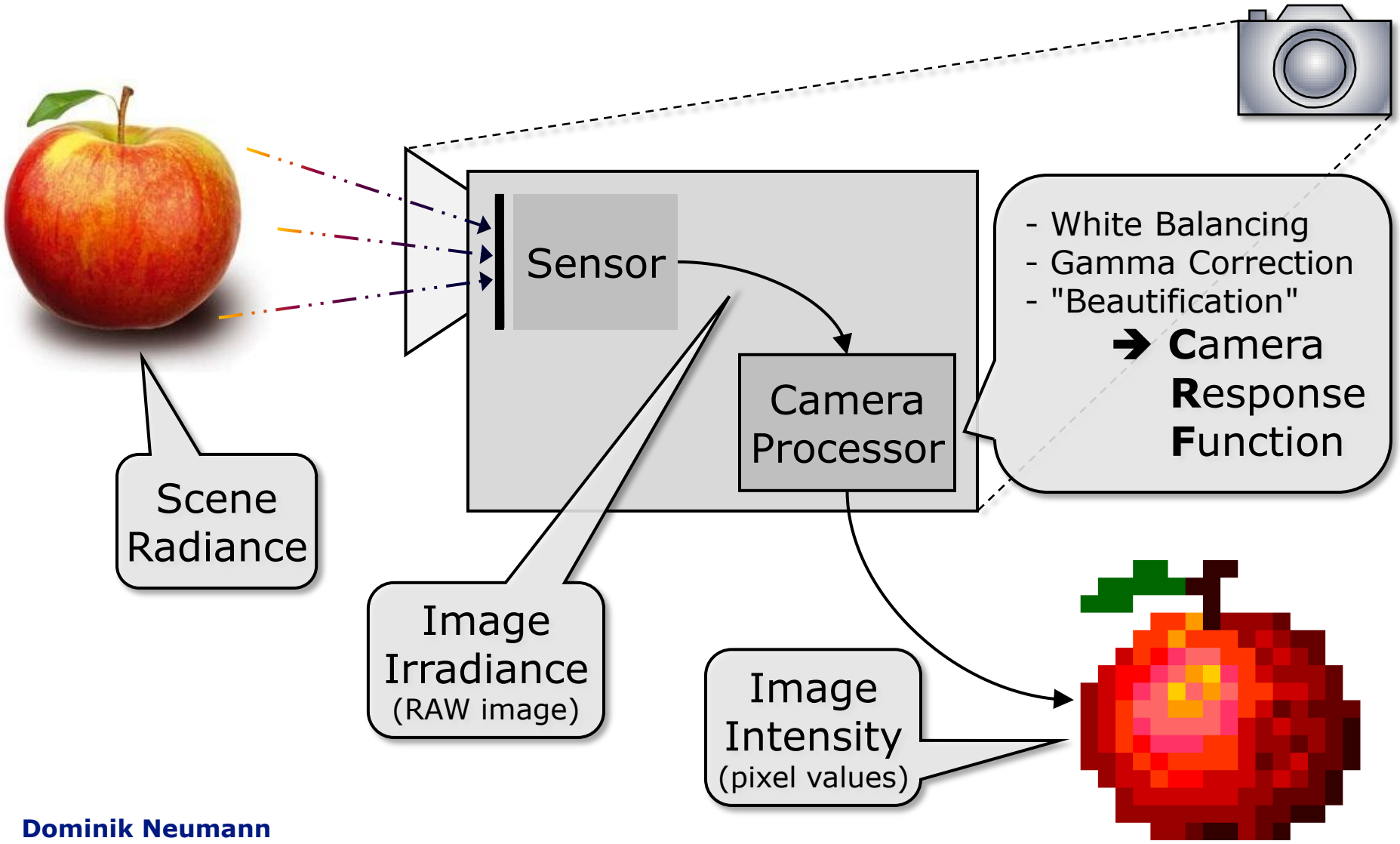
The Camera Response



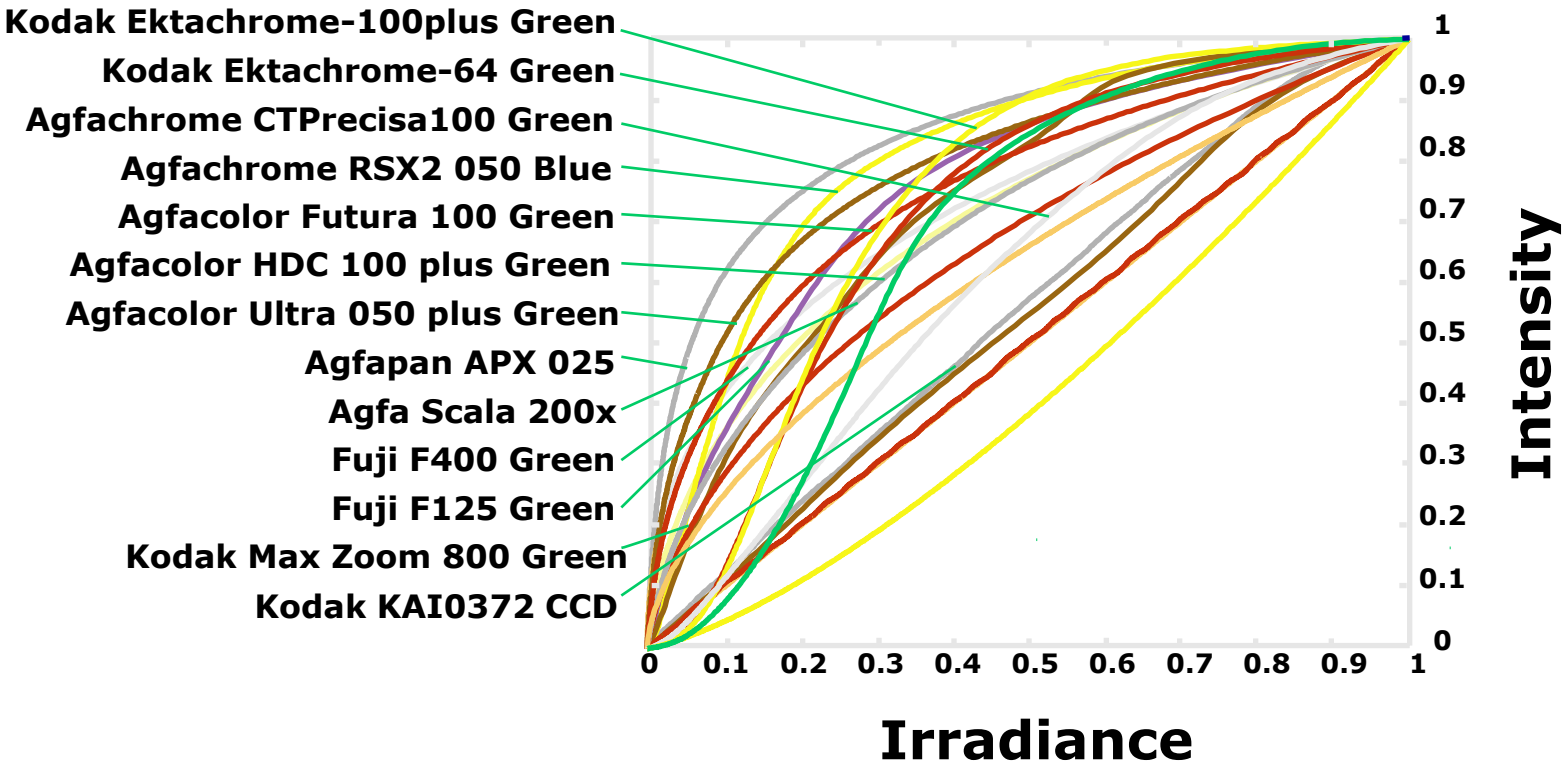
Motivation

- Various Computer Vision Algorithms require Image Irradiance
  - Color Constancy
  - Shape from Shading
  - Inverse Rendering
  - Creating accurate HDR-Images

Color Constancy: Images by Eva Eibenberger

- But: Output of a usual camera is not linear
- My task: Examination of methods for CRF Estimation
  - "Using Geometry Invariants for Camera Response Function Estimation" (Ng et al.)
  - "Radiometric Calibration from a Single Image" (Lin et al.)

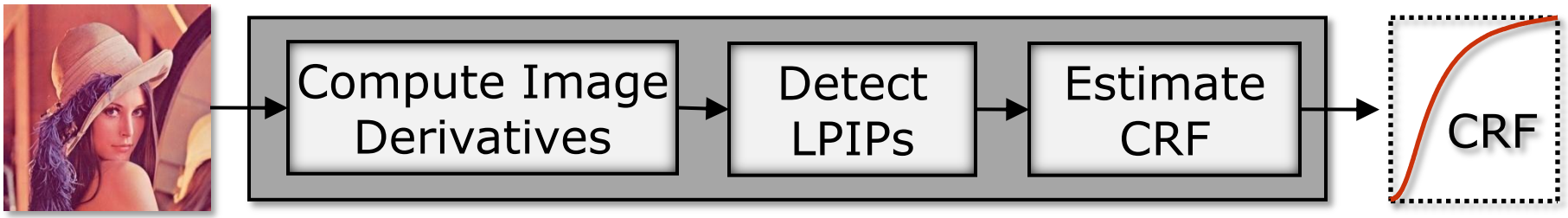
Camera Response Functions



→ Sample CRFs from **DoRF** (**D**atabase **o**f **R**esponse **F**unctions)
(compiled by Grossberg and Nayar)

CRF Estimation: Geometry Invariants

- Physics-based approch
  - → Separation of camera nonlinearities from reflectance-induced nonlinearities
- Strategy
  - Find set of "**L**ocally **P**lanar **I**rradiance **P**oints" (LPIP)
    - → no more reflectance-induced nonlinearities
  - Estimate CRF from this data
- Main Steps of the Algorithm:



CRF Estimation: Radiometric Calibration

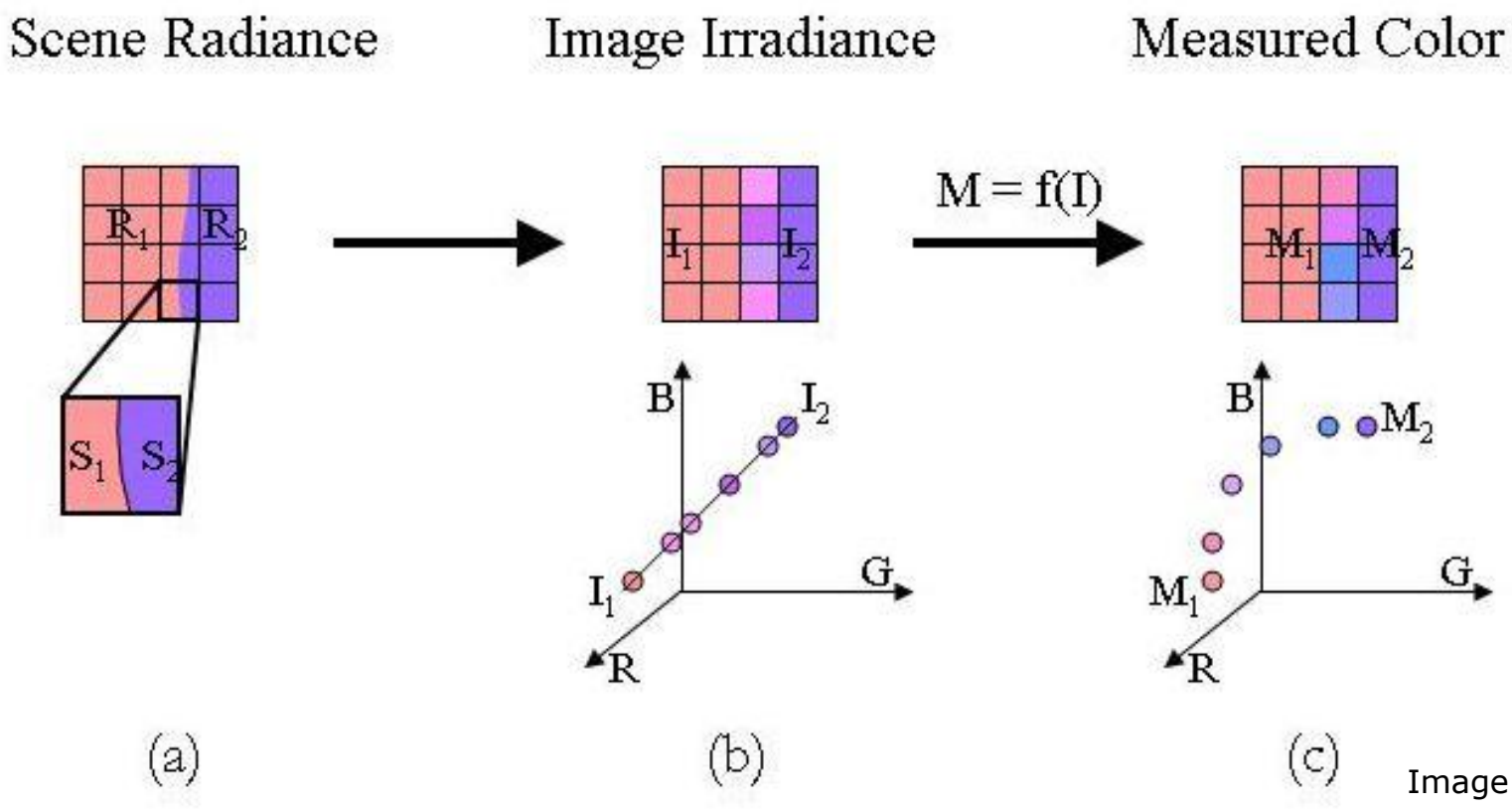
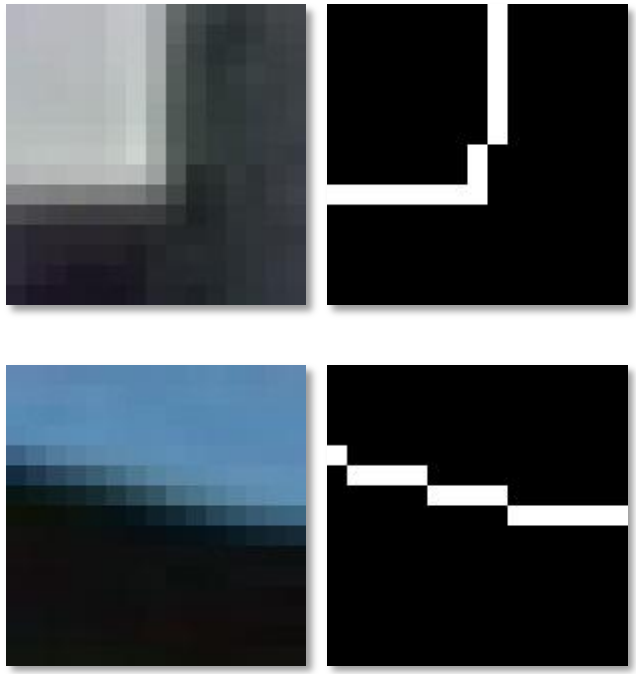


Image © Lin et al.

➔ Method is edge-based and chooses the best fitting one of the previously learned CRFs from DoRF

CRF Estimation

- What have I done so far?
  - Radiometric Calibration almost done
- Next steps
  - Completing the code on "Radiometric Calibration"
  - Start implementing the "Geometry Invariants" paper
  - Evaluation



sample patches detected by the algorithm (Radiometric Calibration)

Evaluation Methods

- Synthetically generated Images
  - Take direct output of camera sensor (supposed to be linear)
  - Manually apply a particular CRF and check if this CRF is found afterwards
- Ground Truth Evaluation
  - Use a camera with a well known CRF (extract from DoRF)
  - Check how far our computed CRFs are from the ground truth
- Stability Test
  - Obtain series of images taken by the same camera (with fixed camera settings)
  - Analyze how much the individual results vary

Determining the Camera Response Function

Thank you

for your attention!