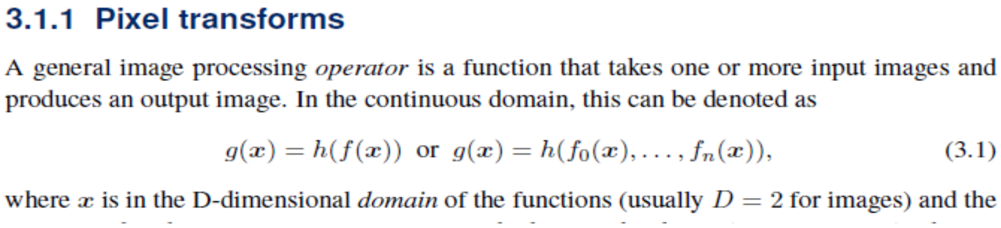
TNM087 - Image Processing and Analysis

GammaCorrection.m

Background:

Pixelwise transformations are the simplest operations. One that is almost always used is gamma correction. The sensor output values are almost linear functions of the incoming light intensity. Human vision is however non-linear and gamma correction is therefore a first processing step. It can also be used to change the contrast of images. Read Chap. 3.1.1 in Szeliski, Computer vision



3.1.1 Pixel transforms

A general image processing *operator* is a function that takes one or more input images and produces an output image. In the continuous domain, this can be denoted as

$$g(\boldsymbol{x}) = h(f(\boldsymbol{x})) \quad \text{or} \quad g(\boldsymbol{x}) = h(f_0(\boldsymbol{x}), \ldots, f_n(\boldsymbol{x})), \qquad (3.1)$$

where $\boldsymbol{x}$ is in the D-dimensional *domain* of the functions (usually $D = 2$ for images) and the

Task:

Select a gray value range and apply gamma correction to the specified gray value range

Syntax:

```
function  GImage = GammaCorrection( OImage, Gamma, Lower, Upper )
```

OImage is the input image of type uint8 or double

Gamma is the value of the exponent

Lower and Upper define the truncation rule where Lower and Upper are quantiles

Lower = 0.01 and Upper = 0.98 will ignore the lower 1% of the dark pixels and 2% of the lighter pixels

Hints:

It is sufficient if your code works for an original gray-value image OImage.

It is easiest to scale the input image to the range 0..1 since 0 and 1 are preserved by the exponential

As an option you may want to generalize the function to

```
function  [GImage, ltrunc, utrunc] = GammaCorrection( OImage, Gamma, Lower, Upper )
```

where ltrunc and utrunc are images of type logical where the pixel value is true if the pixel was truncated using the Lower and Upper thresholds

Optional: Test different settings of Gamma, Lower, Upper (on the same image) to get a better understanding of how these parameters change the appearance of the image. If you do this you may submit the results and your comments as a report in a pdf file.

Also optional: how can you handle color images?