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Ministry of
Education

Intensity Transformation

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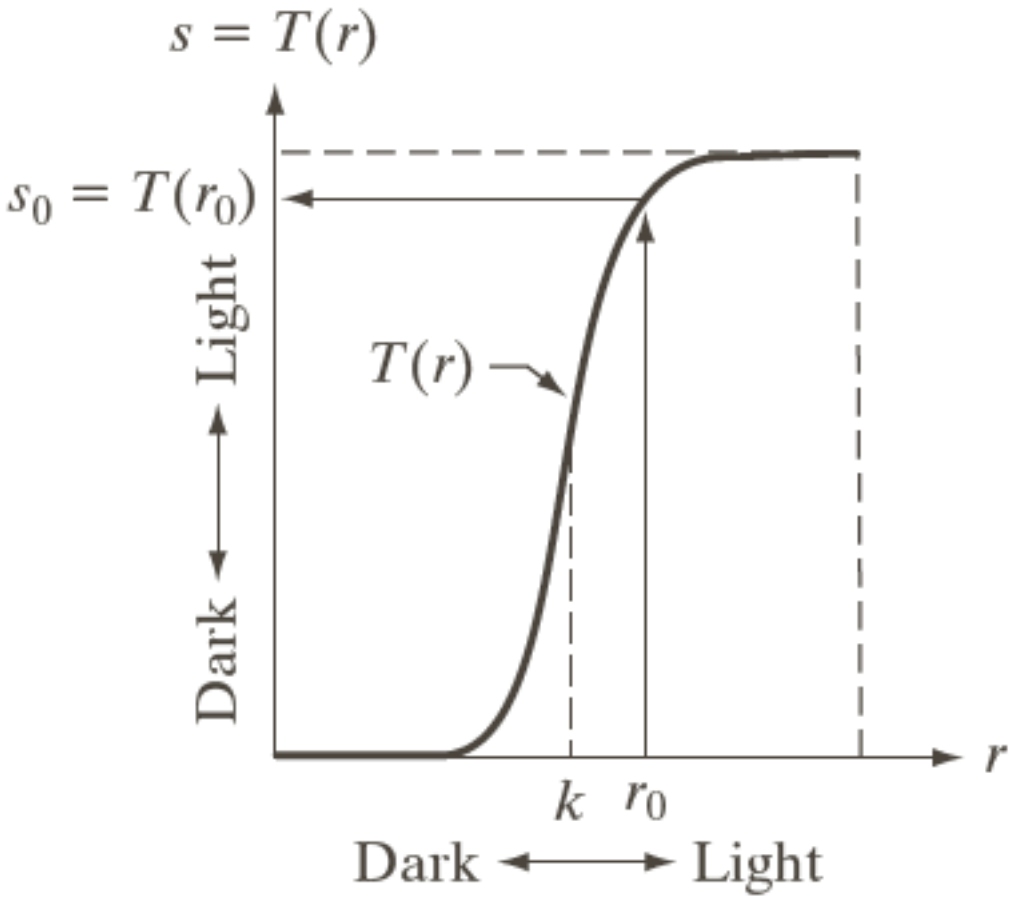
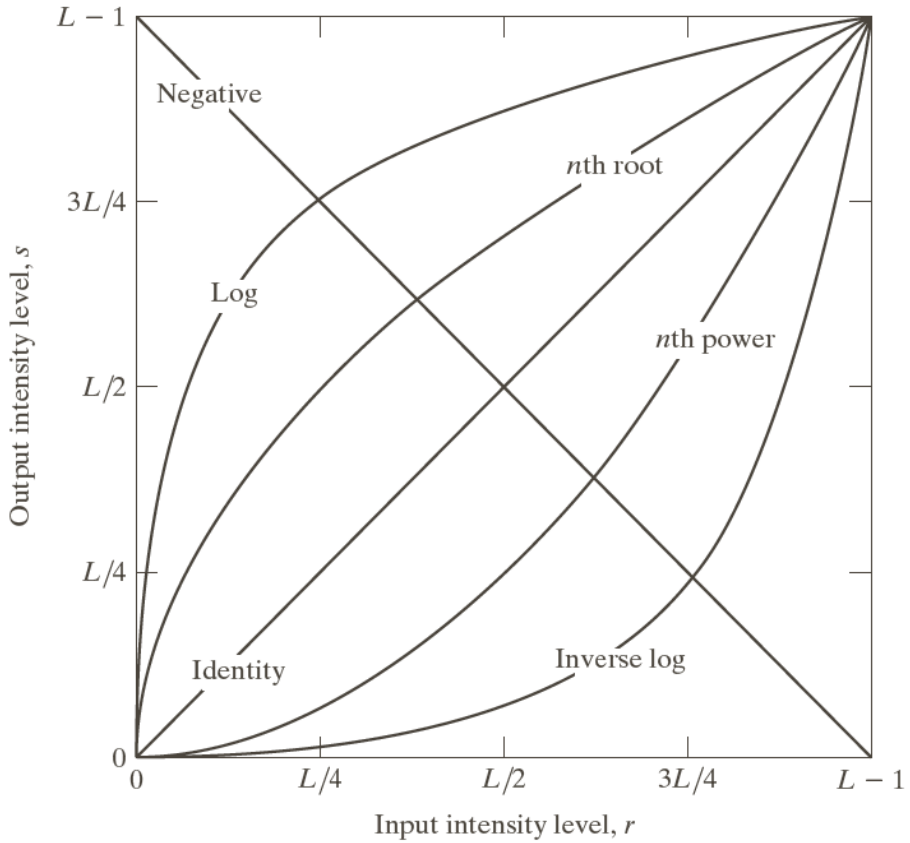
Intensity transformation

- Definition
  - Process of mapping each intensity value of an input image into the corresponding output intensity value through mathematical expression



Intensity transformation

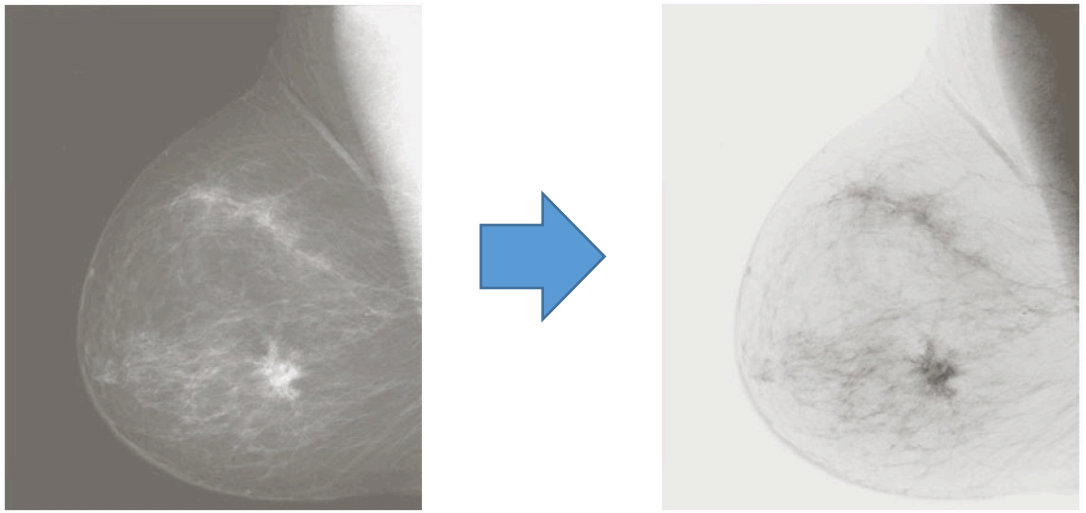
- Example of intensity transformation



Intensity transformation

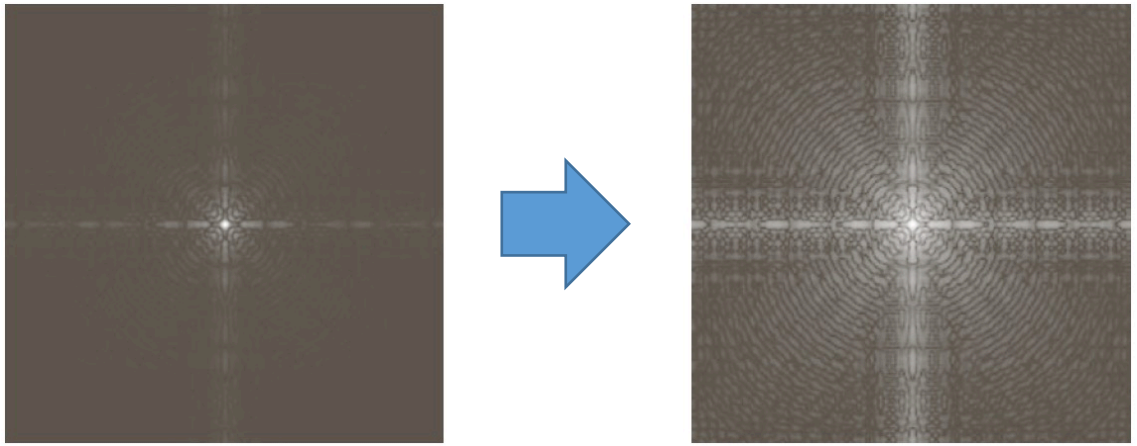
- Image negatives
  - When the range of intensity of an image is [0,L-1], the negative of the image is

    s = L-1–r s: output r: input
  - It is suited for enhancing white or gray detail embedded in dark regions of an image



Intensity transformation

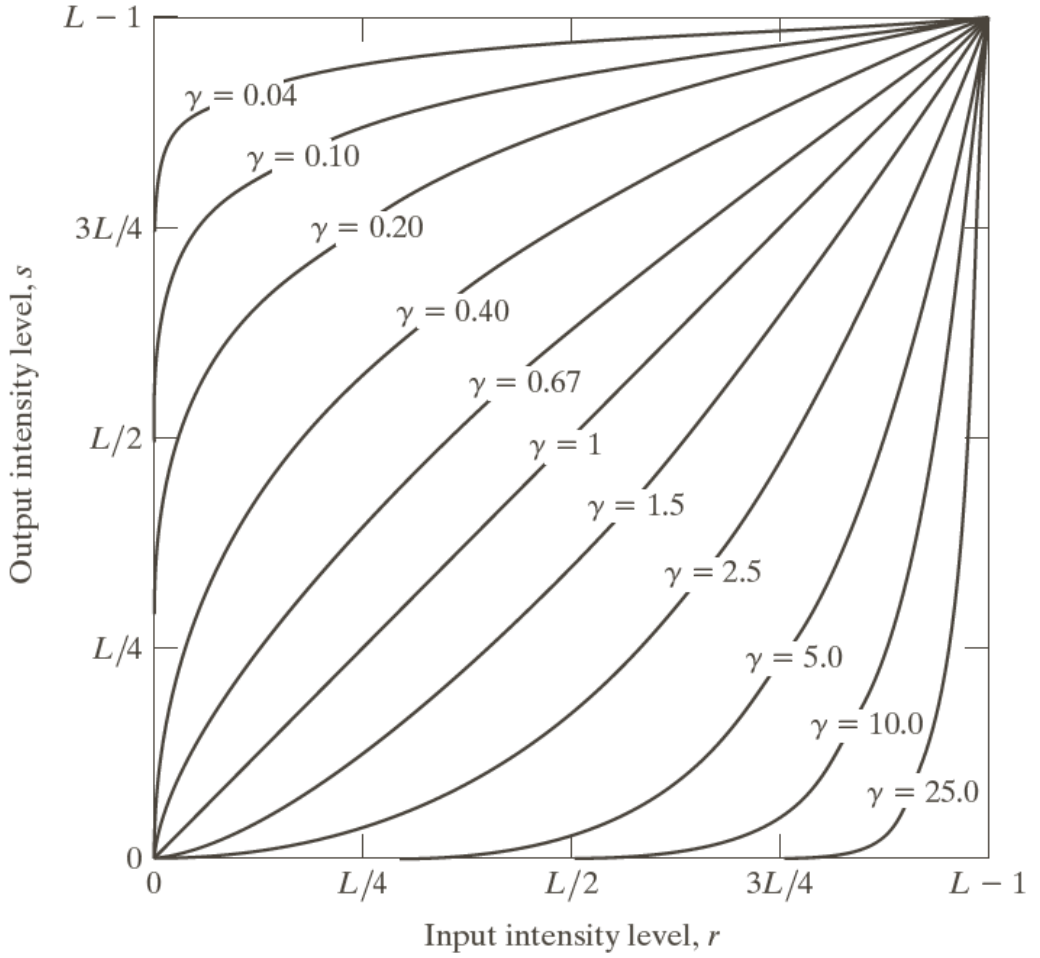
- Log transformation
  - s=c log(1+r) , c: constant, r: input, s: output
  - It maps a narrow range of low intensity values into a wider range of output levels
    - ➔ It enhances contrast of dark region
  - The opposite is true of higher values of input levels



Intensity transformation

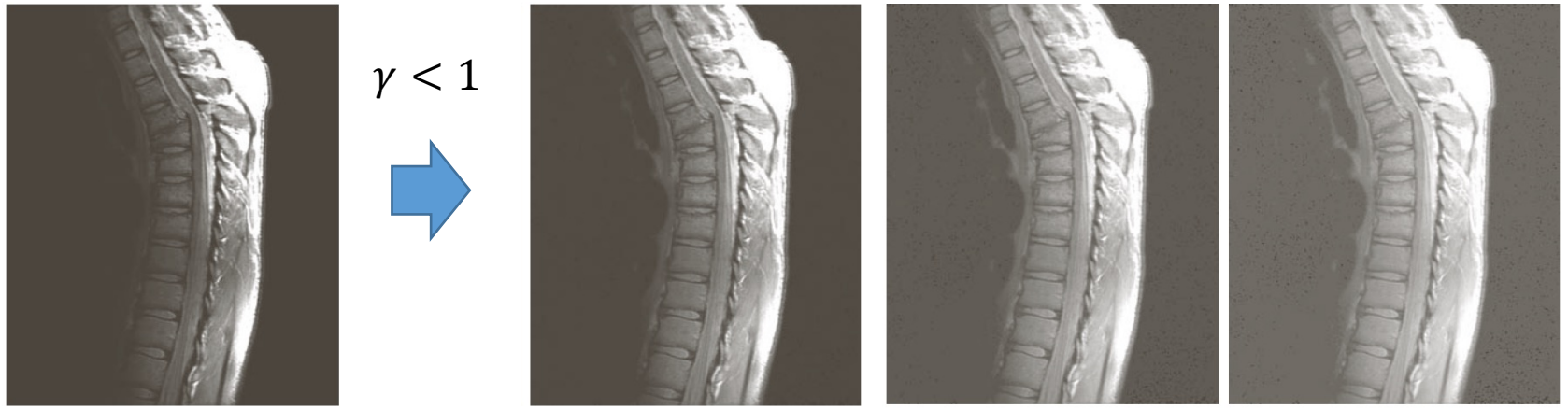
- Power-Law (Gamma) transformation
- $s = cr^{\gamma}$ c:constant, s:output, r:input

- Depending on the value of gamma, the range of darks pixels in an image would be expanded (highlights the dark pixel details) or vice versa



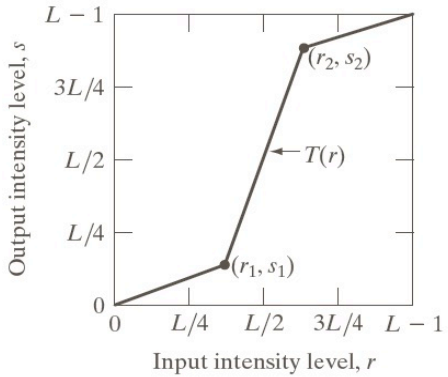
Intensity transformation

- Example



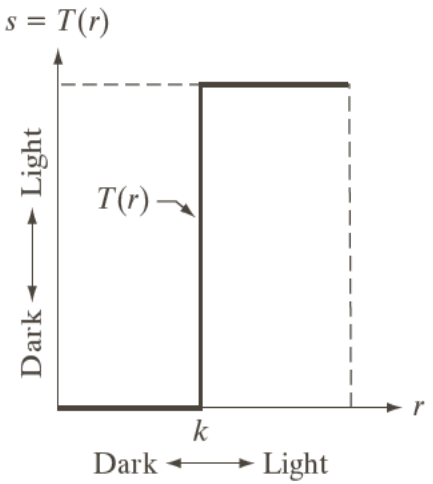
Intensity transformation

- Piecewise-linear transformation functions
  - We can form transformation function more complex



Intensity transformation

- Piecewise-linear transformation functions



Thresholding

Intensity transformation

- Results

Original

Negative transformation

Log transformation

Gamma transformation