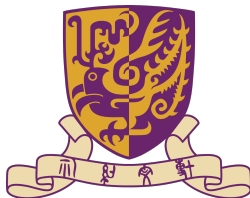# EIE4512 - Digital Image Processing

Totorial-Matlab

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January 17, 2019

Agenda

Thresholding
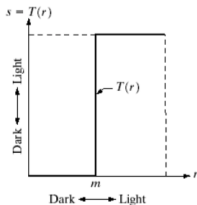
Transforms

Intensity Windowing

Computing Histograms

Binned Histogram

Histogram Equalization

Thresholding

- Input values below threshold a_{th} set to a_0
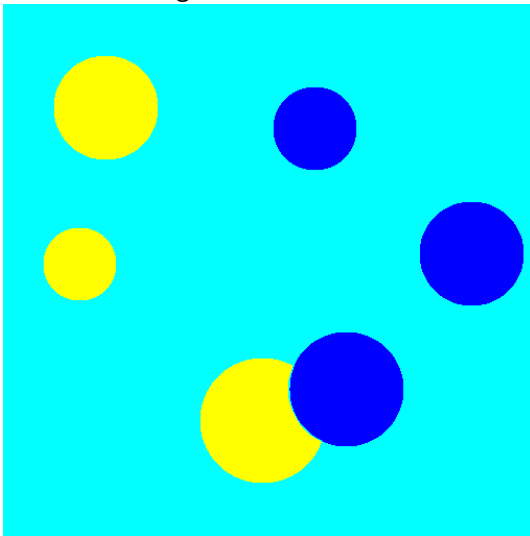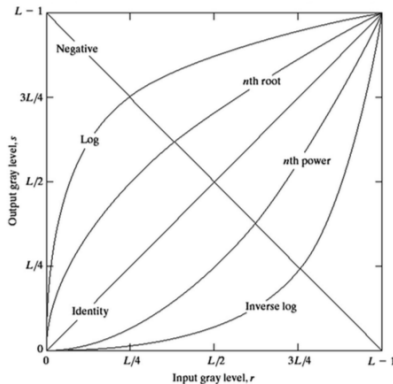- Input values above threshold a_{th} set to a_1

Thresholding

Thresholding

▶ Multilevel image thresholds

Transforms

- Linear
  - Negative/Identity
- Logarithmic
    Log/Inverse log
- Power Law
  - n^{th} power / n^{th} root

▶ To window an image in $[a, b]$ with max intensity M

$$f(p) = \begin{cases} 0 & \text{if } p < a \\ M \times \frac{p-a}{b-a} & \text{if } a \leq p \leq b \\ M & \text{if } p > b \end{cases}$$

Computing Histograms

- Two for loops method
- One loop, parallel method

▶ To create 256 bins from 14bit image

$$
\begin{aligned}
\mathsf{h}(0) &\leftarrow & 0 \leq I(u,v) &< & 64 \\
\mathsf{h}(1) &\leftarrow & 64 \leq I(u,v) &< & 128 \\
\mathsf{h}(2) &\leftarrow & 128 \leq I(u,v) &< & 192 \\
&\vdots & \vdots \quad \vdots & & \vdots \\
\mathsf{h}(j) &\leftarrow & a_j \leq I(u,v) &< & a_{j+1} \\
&\vdots & \vdots \quad \vdots & & \vdots \\
\mathsf{h}(255) &\leftarrow & 16320 \leq I(u,v) &< & 16384
\end{aligned}
$$

Histogram Equalization

- $histeq(I, n)$