DIGITAL IMAGE PROCESSING

Digital Image Fundamentals : Session 3

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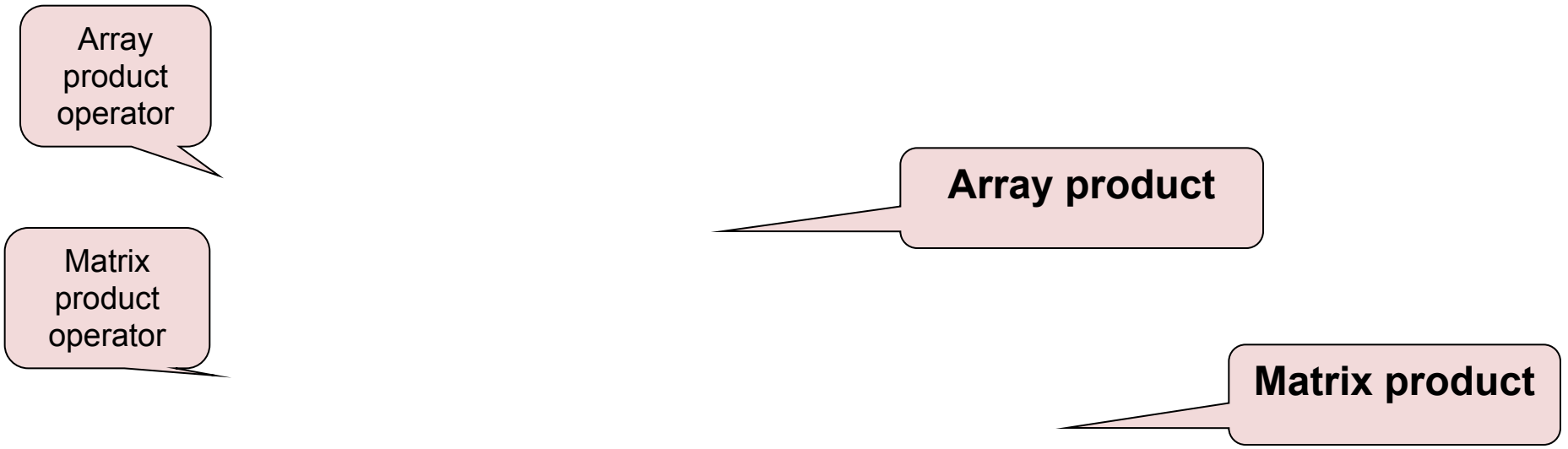
Today's Lecture

- **Digital Image Fundamentals**
  - **Mathematical Operations in DIP**

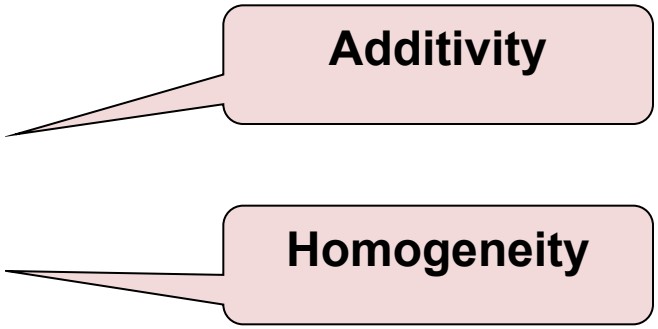
Mathematical Operations in DIP

Array vs. Matrix Operation



Mathematical Operations in DIP

Linear vs. Nonlinear Operation



- H is said to be a ***linear operator***
- H is said to be a ***nonlinear operator*** if it does not meet the above qualification.

Mathematical Operations in DIP

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Example: Addition of Noisy Images for Noise Reduction

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Example: Image Multiplication for Shading Correction

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Set and Logical Operations

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Mathematical Operations in DIP

Set and Logical Operations: Union

The union of two gray-scale images (sets) A and B is defined as the set

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Spatial Operations: Single-pixel operations

Alter the values of an image's pixels based on the intensity.

e.g.,

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Neighborhood Operations

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Geometrical Spatial Transformation

- Geometric transformation (rubber-sheet transformation)
  - A spatial transformation of coordinates
  - intensity interpolation that assigns intensity values to the spatially transformed pixels.

- Affine transform

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Image Rotation and Intensity Interpolation

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Image Registration

- Input and output images are available but the transformation function is unknown.
  Goal: estimate the transformation function and use it to register the two images.

- One of the principal approaches for image registration is to use ***tie points*** (also called ***control points***)
- The corresponding points are known precisely in the input and output (**reference**) images.

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Mathematical Operations in DIP

Image Registration

Next Class

- **Image Enhancement in Spatial Domain**
  - **Intensity Transform**
  - **Spatial Filtering**

Thank you:
Question?