



2D Fourier Theory for Image Analysis

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Roadmap

- 2D image basis
- Fourier basis
- Scale-space representation
 - Gaussian pyramid
 - Laplacian pyramid
- Image mosaicing
- Gabor filters

Different basis representation

- Recall our discussion of basis vectors for coordinate systems:
 - Describe point as linear combination of orthogonal basis vectors: $\mathbf{x} = a_1\mathbf{v}_1 + \dots + a_n\mathbf{v}_n$
- The standard basis for images is the set of unit vectors corresponding to each pixel.

A toy example:

$$\mathbf{I} = \begin{pmatrix} 2 & 1 \\ 6 & 1 \end{pmatrix} = 2 \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} + 1 \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix} + 6 \begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix} + 1 \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}$$