Basis Vectors and Matrix-Based Transforms

Image Processing
CSE 166
Lecture 10
Announcements

• Assignment 4 is due May 4, 11:59 PM
• Midterm is May 2
• Assignment 5 will be released May 9
• Reading
  – Chapter 6: Wavelet and Other Image Transforms
    • Sections 6.1 and 6.2
Review

• Complex vectors
• Basis vectors
Matrix-based transforms

\[
T(u) = \sum_{x=0}^{N-1} f(x) r(x, u) \quad \text{Forward transform}
\]

\[
f(x) = \sum_{u=0}^{N-1} T(u) s(x, u) \quad \text{Inverse transform}
\]

where

- \(x\) is a spatial variable
- \(u\) is a transform variable
- \(T(u)\) is the transform of \(f(x)\)
- \(f(x)\) is the inverse transform of \(T(u)\)
- \(r(x, u)\) is a forward transformation kernel
- \(s(x, u)\) is an inverse transformation kernel
General inverse transform using basis vectors

\[ f(x) = T(0)s(x,0) + T(1)s(x,1) + \ldots + T(N-1)s(x,N-1) \]
Next Lecture

• Matrix-based transforms
• Reading
  – Chapter 6: Wavelet and Other Image Transforms
    • Section 6.2