The Continuous Fourier Transform

Image Processing
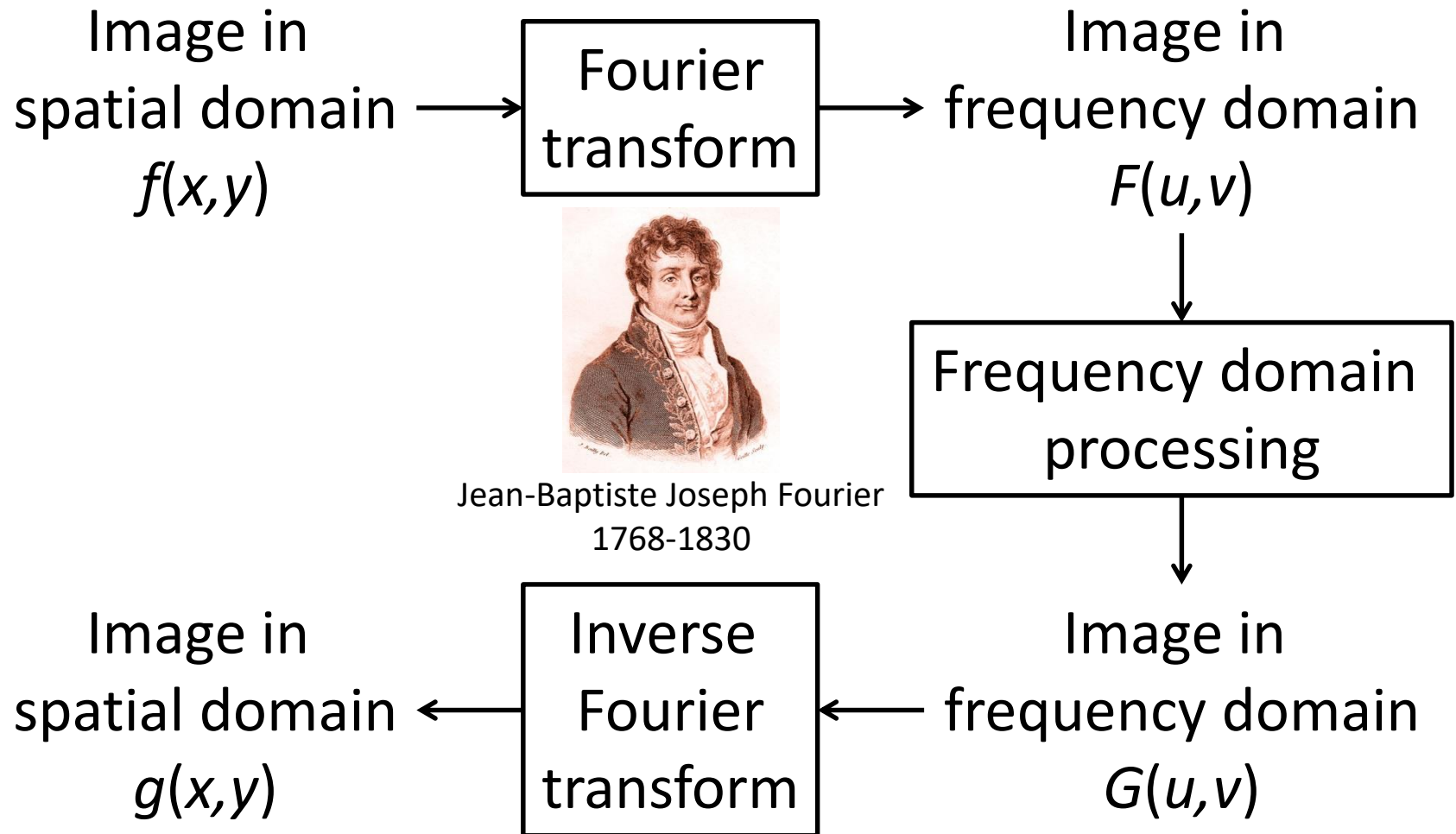
CSE 166

Lecture 5

Announcements

- Assignment 2 is due Apr 17, 11:59 PM
- Assignment 3 will be released Apr 22
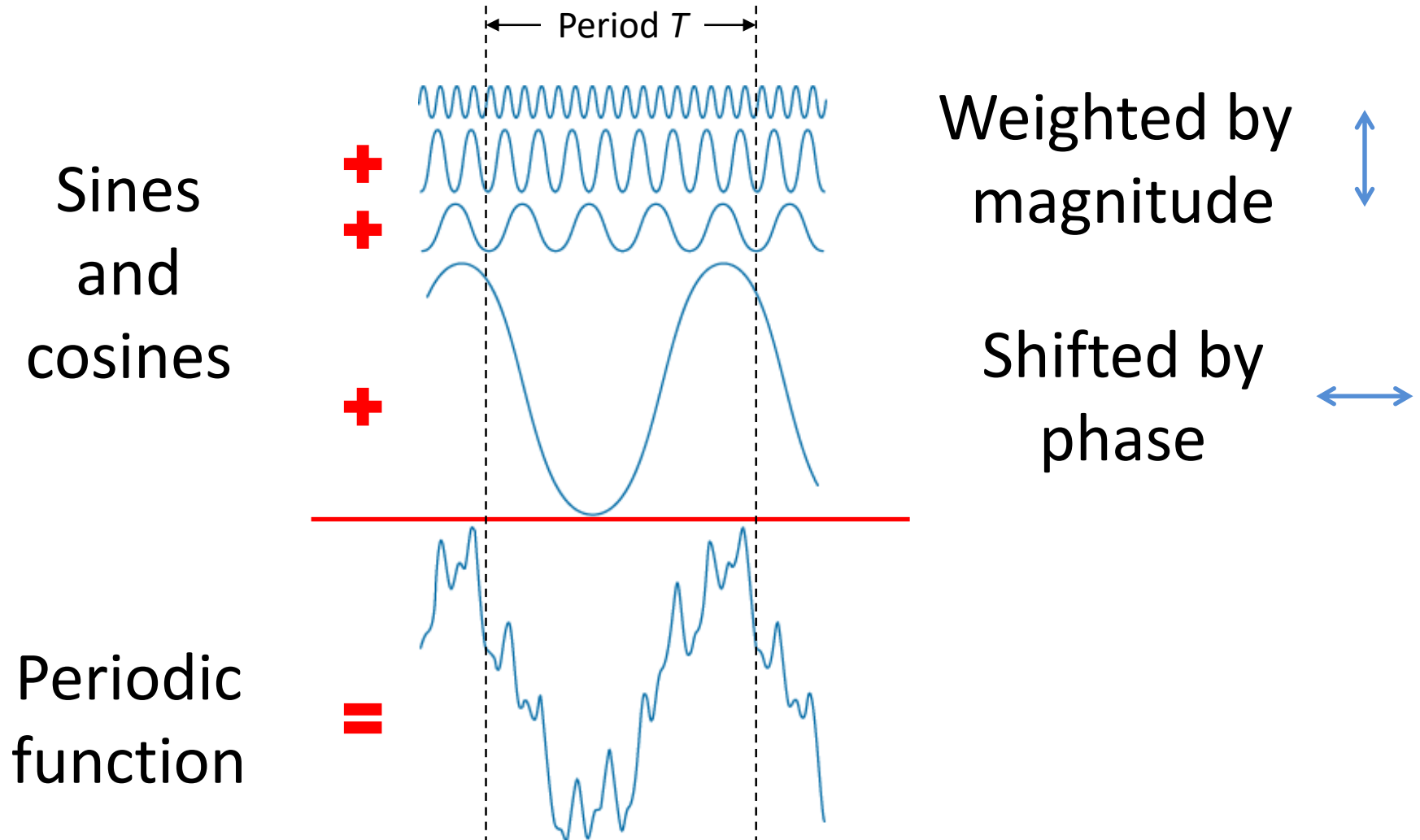- Reading
  - Chapter 4: Filtering in the Frequency Domain
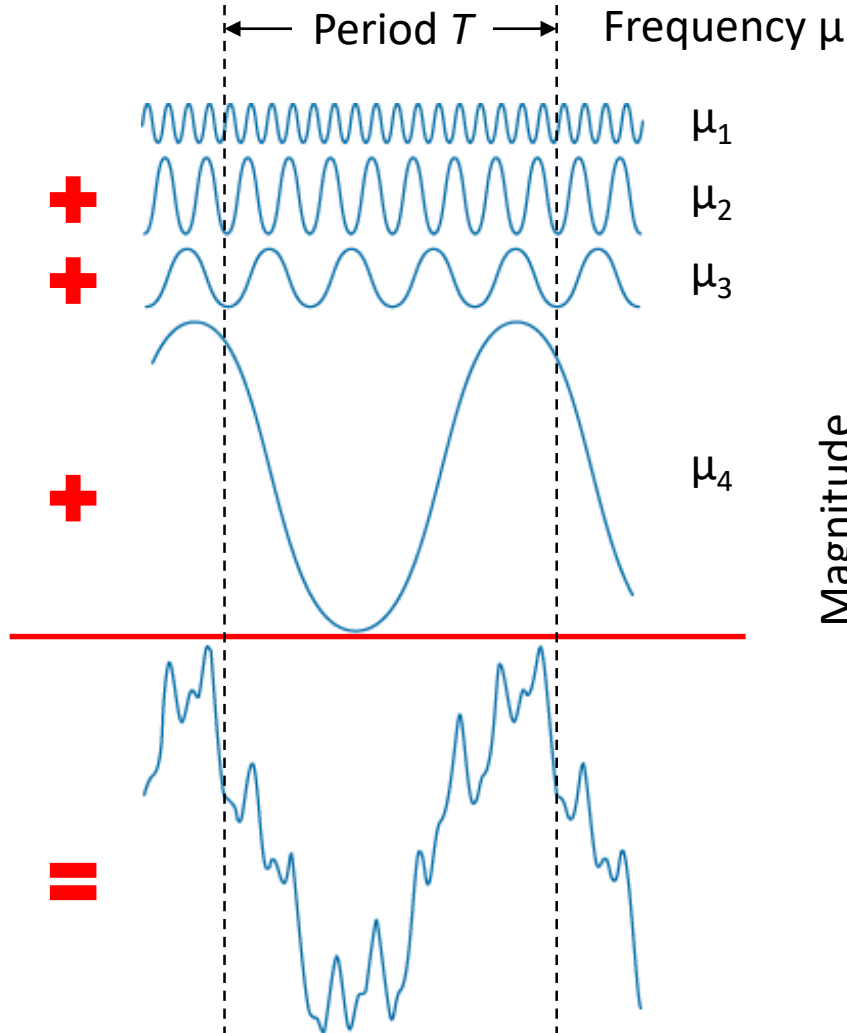
Overview: Image processing in the frequency domain

Image in
spatial domain
$f(x,y)$ →

Fourier transform

→ Image in
frequency domain
$F(u,v)$

Jean-Baptiste Joseph Fourier
1768-1830

Frequency domain processing

Image in
spatial domain
$g(x,y)$ ←

Inverse Fourier transform

← Image in
frequency domain
$G(u,v)$

Review

- Complex numbers

1D Fourier series

Sines and cosines

+
+
+

Period *T*

Weighted by magnitude

Shifted by phase
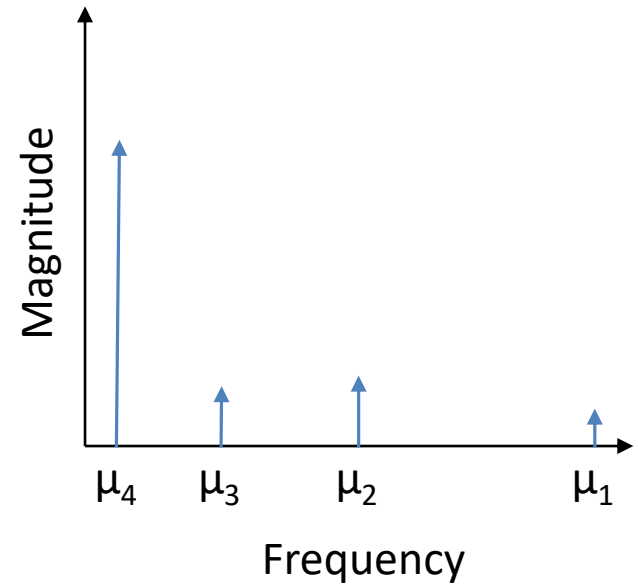
Periodic function
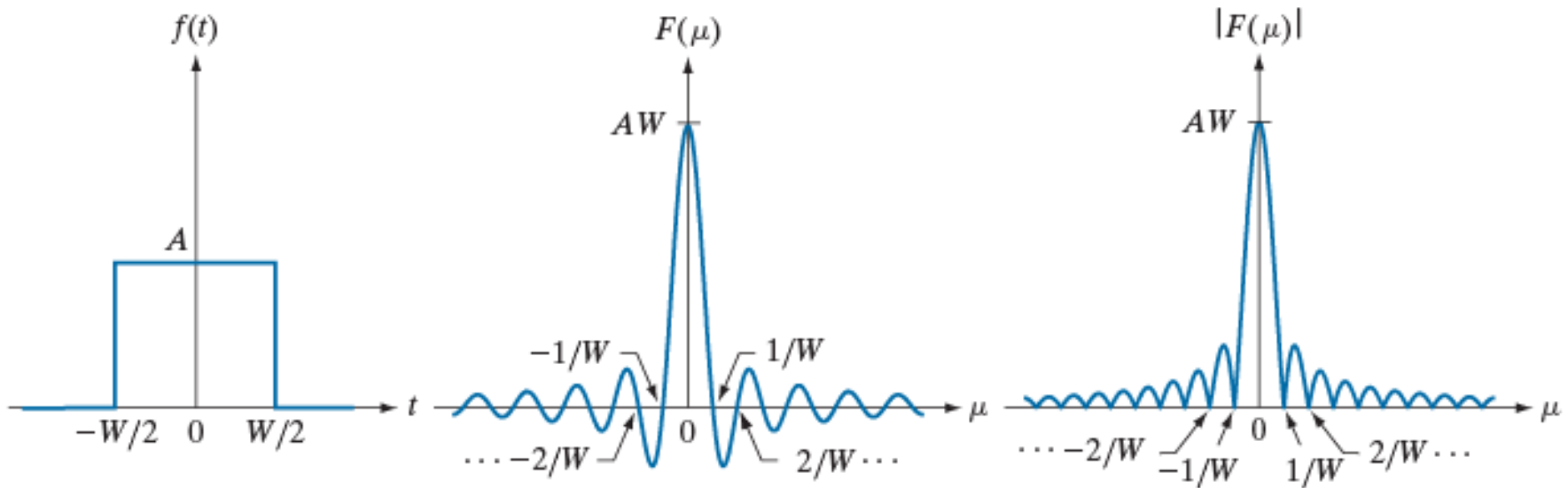
=

1D Fourier transform

Sines and cosines

Periodic function

1D continuous Fourier transform

- Example: box function

a b c

FIGURE 4.4 (a) A box function, (b) its Fourier transform, and (c) its spectrum. All functions extend to infinity in both directions. Note the inverse relationship between the width, W, of the function and the zeros of the transform.

Next Lecture

- Sampling and aliasing, and the discrete Fourier transform

- Reading

  – Chapter 4: Filtering in the Frequency Domain