# CS 3570 多媒體技術概論
# Introduction to Multimedia

- **Class Meeting:** M7M8R6 資電館 132
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# Course Objective

- This course will introduce fundamental techniques for digital image/audio/video representation, compression, and processing.
- Students will learn the knowledge of the multimedia signal processing techniques, and practical implementations of various multimedia applications.

# Course Contents

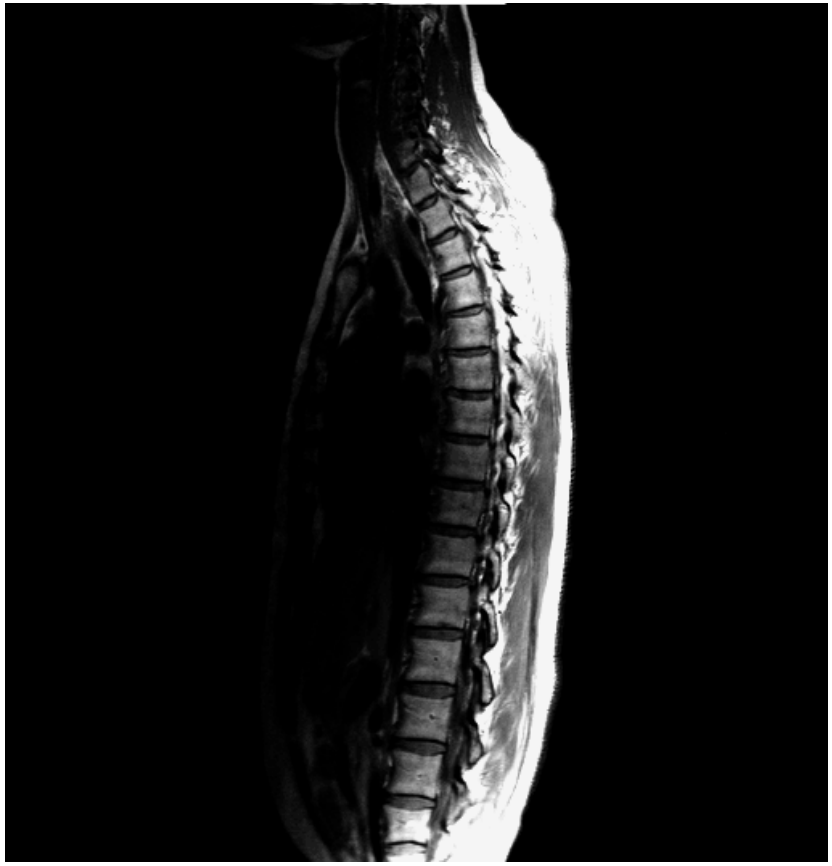
- Digital Data Representation and Communication
- Digital Image Representation
- Digital Image Processing
- Digital Audio Representation
- Digital Audio Processing
- Digital Video Representation and Communication
- Digital Video Processing
- Multimedia Authoring
- 3D Video + Augmented Reality

# Image Enhancement Example



Adjusting the image histogram to improve image contrast

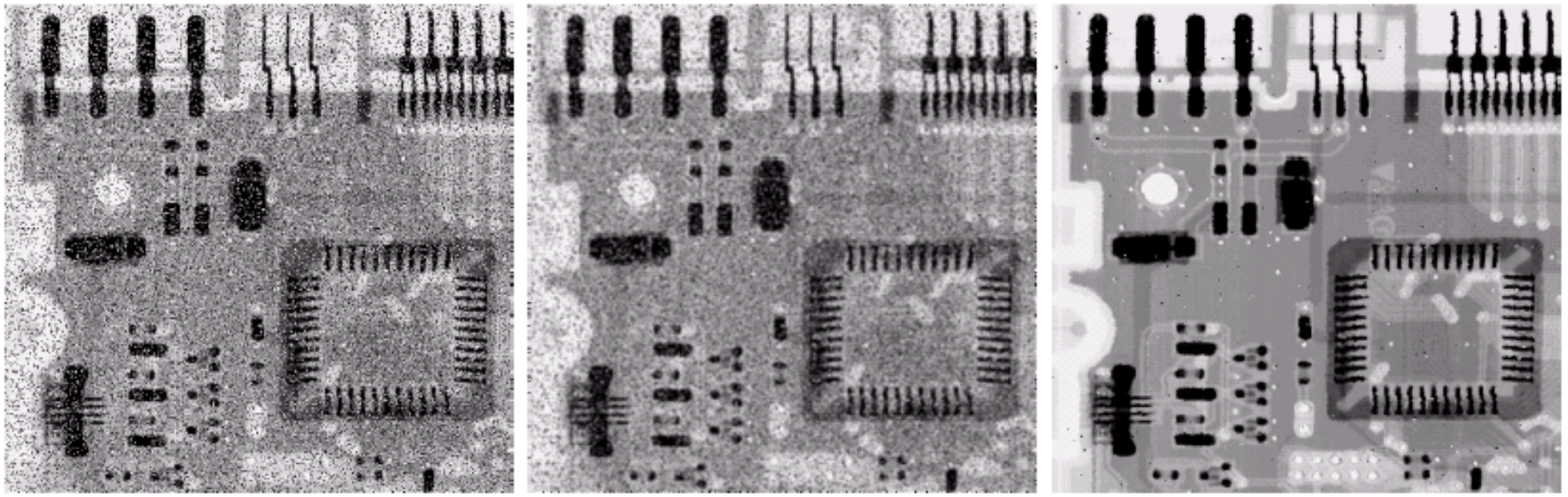
# Bias Field Correction for Medical Images



Before Correction

After Correction

# Image Denoising Example



a b c

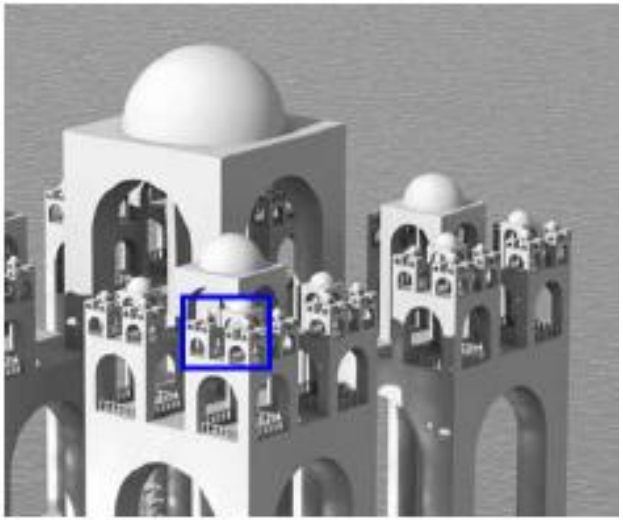
**FIGURE 3.37** (a) X-ray image of circuit board corrupted by salt-and-pepper noise. (b) Noise reduction with a $3 \times 3$ averaging mask. (c) Noise reduction with a $3 \times 3$ median filter. (Original image courtesy of Mr. Joseph E. Pascente, Lixi, Inc.)

Application of the median filter

# Bilateral Filtering

From B. Weiss, Fast Median and Bilateral Filtering, SIGGRAPH'2006

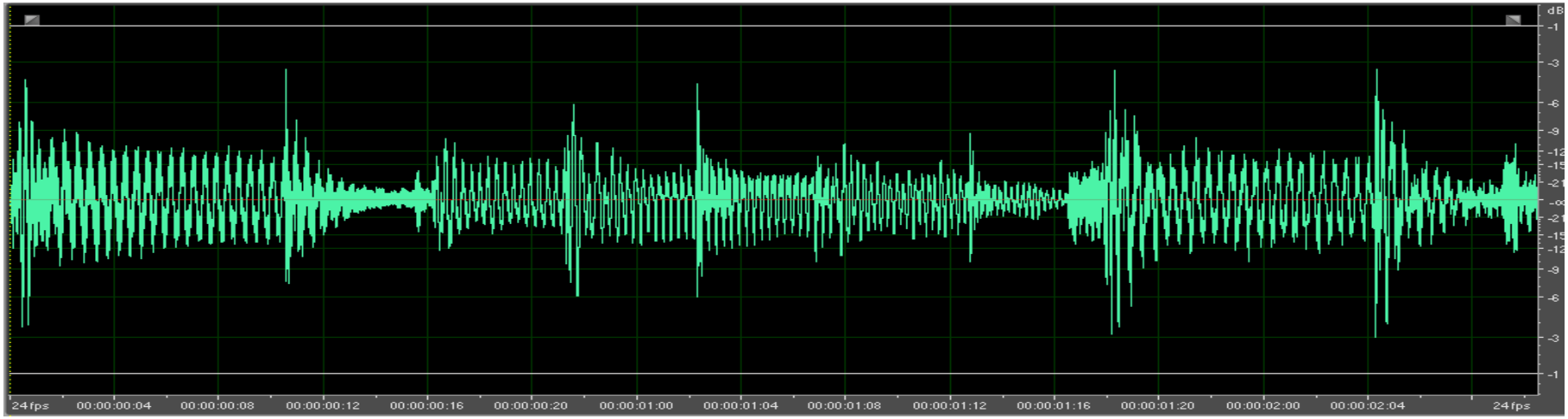
# Image Super-Resolution



(b) Bicubic interpolation ($\times 2$).

(d) Unified single-image SR ($\times 2$).

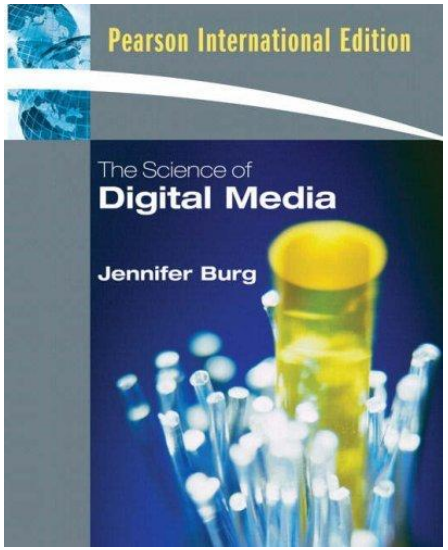
# Audio Signal Processing



# Textbook

**Required:**

**Jennifer Burg, The Science of Digital Media, Pearson Prentice Hall, Inc., 2010**




***Reference:***

***Digital Media Primer***

***Yue-Ling Wong,*** **Prentice Hall, 2009.**

# Prerequisites

- Linear Algebra
- Probability
- Basic programming skills

# Grading

| | |
|---|---|
| Midterm Exam. (May 7) | 30% |
| Homeworks (4) | 40% |
| Final Project | 20% |
| Class Participation | 10% |

# Homework Policy

- Homeworks will involve programming assignments (in Matlab, C, or C++).
- Discussion of homework is encouraged, but you have to write your own. No copying is **strictly** enforced.
- Homework should be delivered before the announced due time. The score of late homework will be reduced by 20% per day.

# Final Project

- You are required to do a final project of a topic from a list of suggested topics.
- You can form a group to do the final project. A group can consist of one, two, or three students.

# Course Webpage

- http://cv.cs.nthu.edu.tw/courses.php
- Also on iLMS system
- It will contain the course slides and basic course information.
- Important course announcement will also be posted on this webpage.

# Class Participation

- Class attendance is required and treated as the basic requirement for class participation.
- Asking questions is strongly encouraged.
- There will be simple quizzes in class randomly held during the semester.

# CS 4520 Classroom Rule

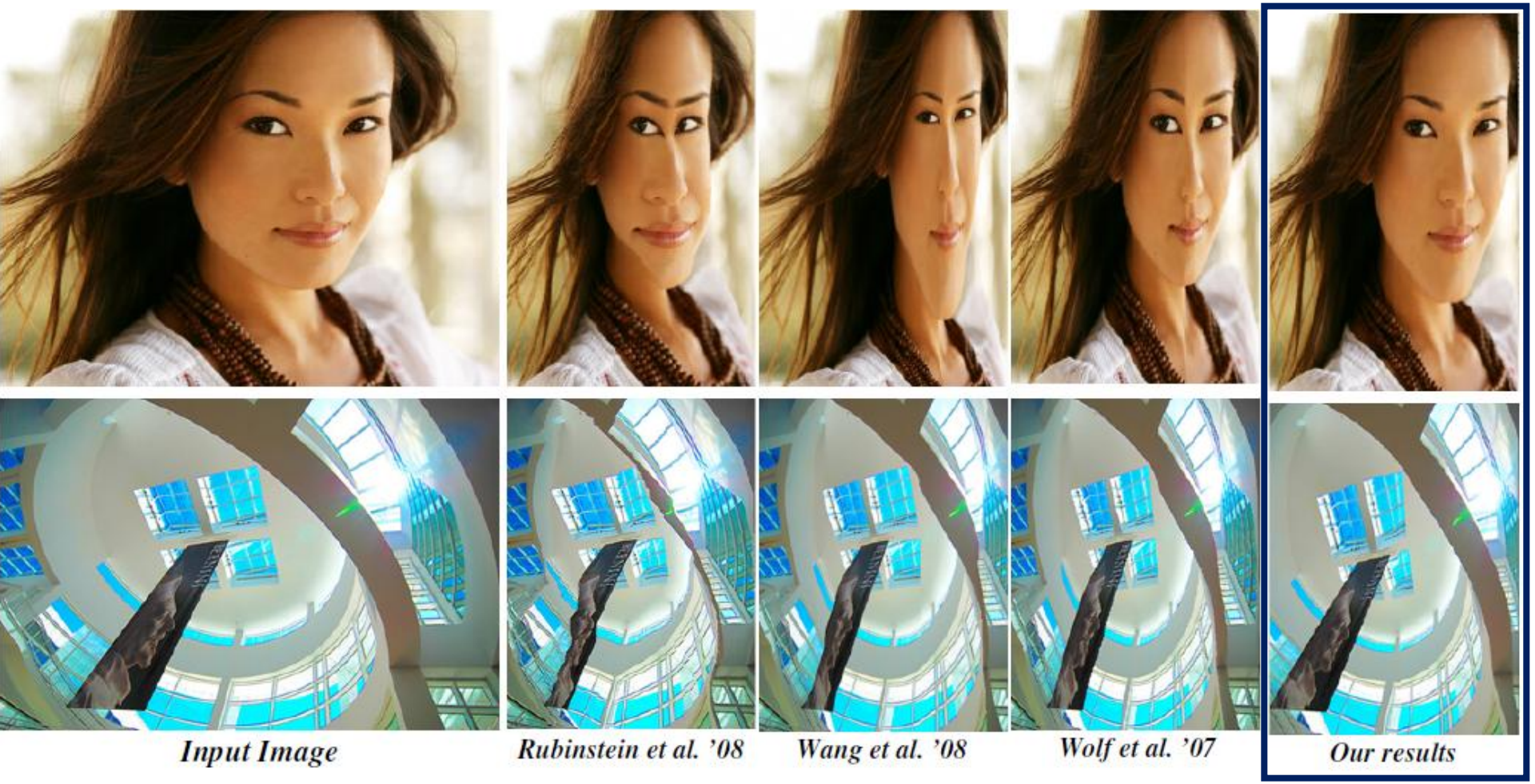
- No eating is permitted.
- No sleeping during the class.
- Disturbance to others in class should be minimized.
- Cell phone should be turned off during the class.

# Image Restoration

Motion Deblurring, Image Stabilization

# Motion Deblurring

# Structure-Preversing Image/Video Retargeting



# Facial Animation: Caricature Generation

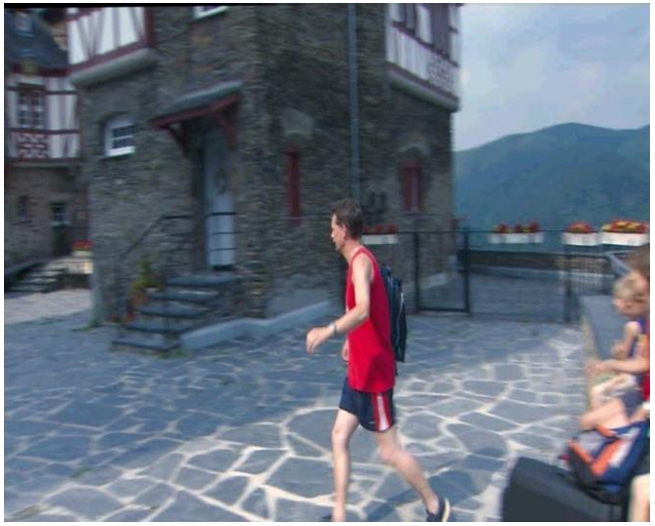
- Feature exaggeration
  - Personal shape characteristics (C)
  - Personal texture characteristics (T)
  - Expressional style (E)

# Vision-Based User Interaction

- Real-time 3D motion capture of human gestures  and body motion from 3D cameras
- Current video-based motion capture systems either need markers placed on human body or only work under very restricted conditions
- Control games with your own body motion/gesture and create immersive experiences by combining 3D personal image into the game scene


# 3D Video

- 3D cinema
  - Stereoscopic 3D, glasses-based
  - Increasing number of 3D movie production
- 3D TV - home entertainment
  - Stereoscopic
  - Autostereoscopic: multiple views
  - Various input formats and display sizes
  - Glasses may not be acceptable in the near future
- 3D mobile
  - Autostereoscopic two-view display with fixed viewing position
  - On the market



3D content creation will be the key to the emerging 3D market.

# Augmented Reality (AR)

- the concept of superimposing virtual content (such as graphics) on top of a view of the real world as seen through a camera.