CENTRE : DDU KAUSHAL KENDRA

NAME OF THE PROGRAMME : B.VOC AUTOMOBILE TECHNOLOGY

PROGRAM CODE :3UAB.VOCAT

COURSE CODE :AT17202

COURSE NAME :INDUSTRIAL SAFETY AND INSPECTION

FACULTY NAME :A.MANIKANDAN M.E

DESIGNATION : GUEST FACULTY

TOPIC :MODERN CONCEPTS IN INDUSTRY SAFETY

Administration

- Pre-requisites / prior knowledge
- Course Home Page:
  - http://www1.idc.ac.il/toky/ImageProc-10
  - “What’s new”
  - Lecture slides and handouts
  - Matlab guides
  - Homework, grades
- Exercises:
  - ~5-6 assignments (in Matlab).
  - Final exam

Administration (Cont.)

- Matlab software:
  - Available in PC labs
  - Student version
  - For next week: Run Matlab “demo” and read Matlab primer until section 13.

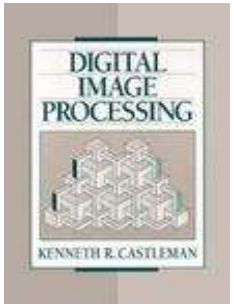
- Grading policy:
  - Final Grade will be based on: Exercises (40%) , Final exam (60%)
  - Exercises will be weighted
  - Exercises may be submitted in pairs

- Office Hours: by email appointment to toky@idc.ac.il

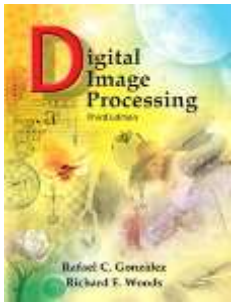
Planned Schedule

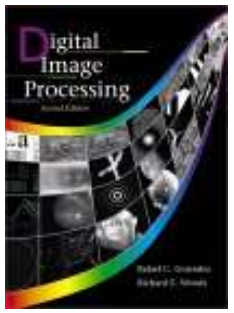
	Date	Topic
1	25.02.10	Intro and image formation
2	04.03.10	Image Acquisition
3	11.03.10	Point Operations and the Histogram
4	18.03.10	Geometric Operations
	25.03.10	**Passover Holiday**
	02.04.10	**Passover Holiday**
5	08.04.10	Spatial Operations
6	15.04.10	Edge and feature detection
7	22.04.10	FFT – part 1
8	29.04.10	FFT – part 2
9	06.05.10	FFT – part 3
10	13.05.10	Operations in frequency domain
11	20.05.10	Image restoration
	27.05.10	**Graduation**
12	03.06.10	Multi-resolution representation and Wavelets

Textbooks



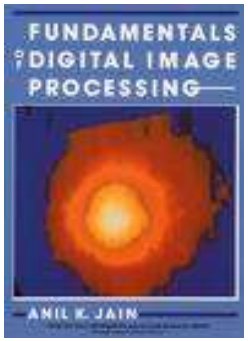
Digital Image Processing
Kenneth R. Castelman
Prentice Hall





Digital Image Processing
Rafael C. Gonzalez and Richards E. Woods,
Addison Wesley

Digital Image Processing
Rafael Gonzalez and Paul Wintz
Addison Wesley



Fundamentals of Digital Image Processing
Anil K. Jain
Prentice Hall, 1989.

About the course

Goals of this course:

- **Introductory course**: basic concepts, classical methods, fundamental theorems
- Getting acquainted with basic properties of images
- Getting acquainted with various representations of image data
- Acquire fundamental knowledge in processing and analysis digital images

Pre-requisites:

- Algebra A+B
- Calculus A+B

Introduction

- Introduction to Image Processing
- Image Processing Applications
- Examples
- Course Plan

The Visual Sciences

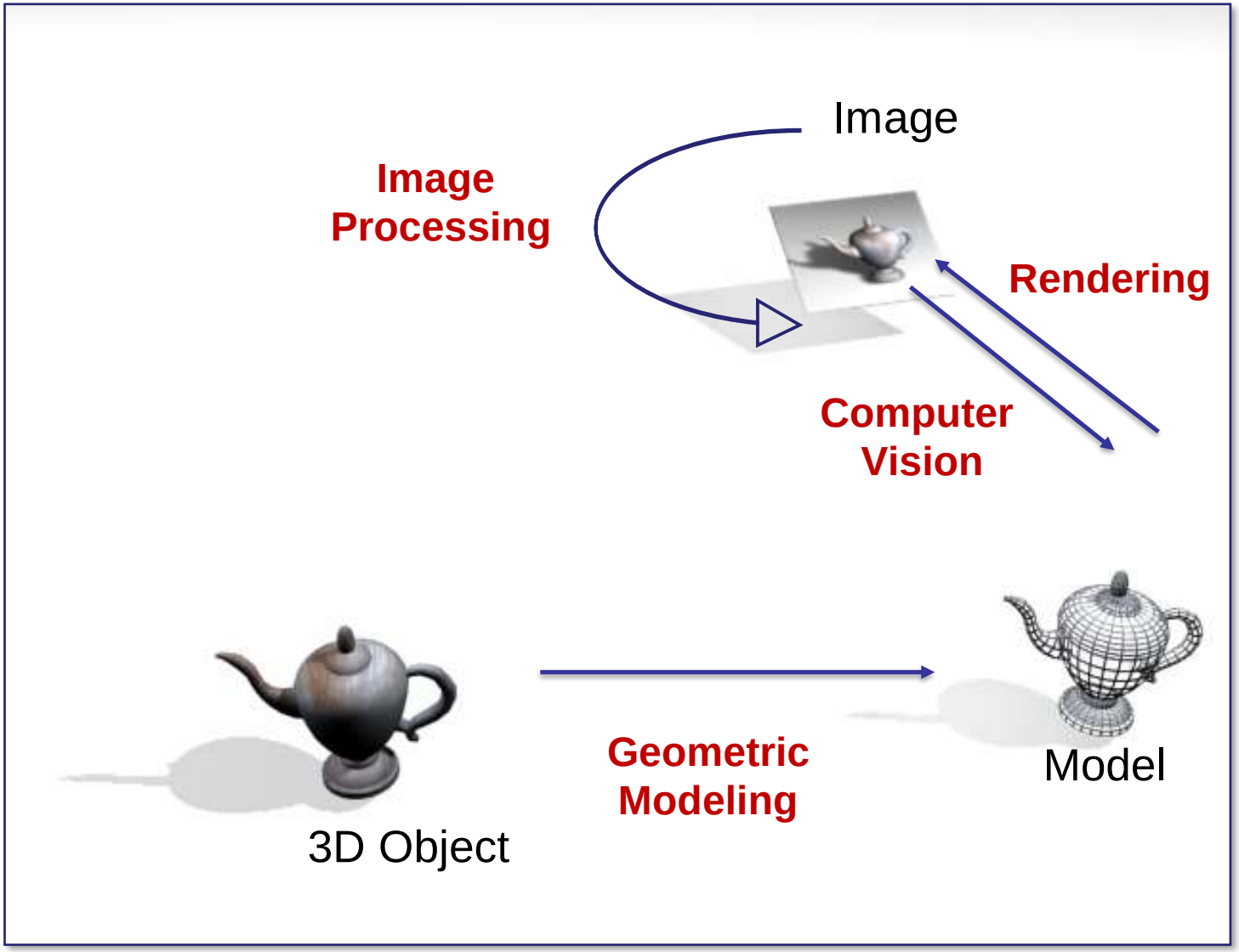
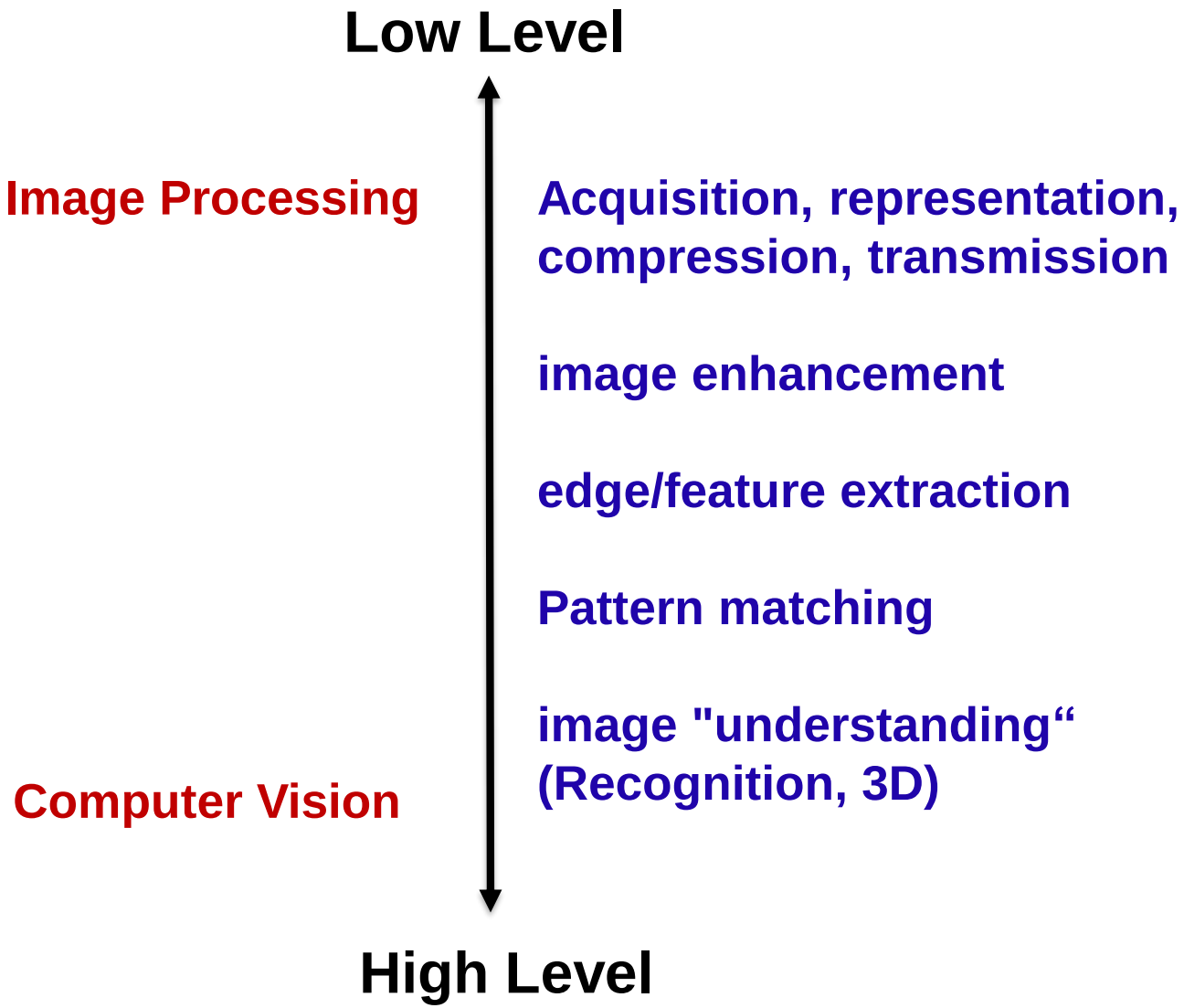
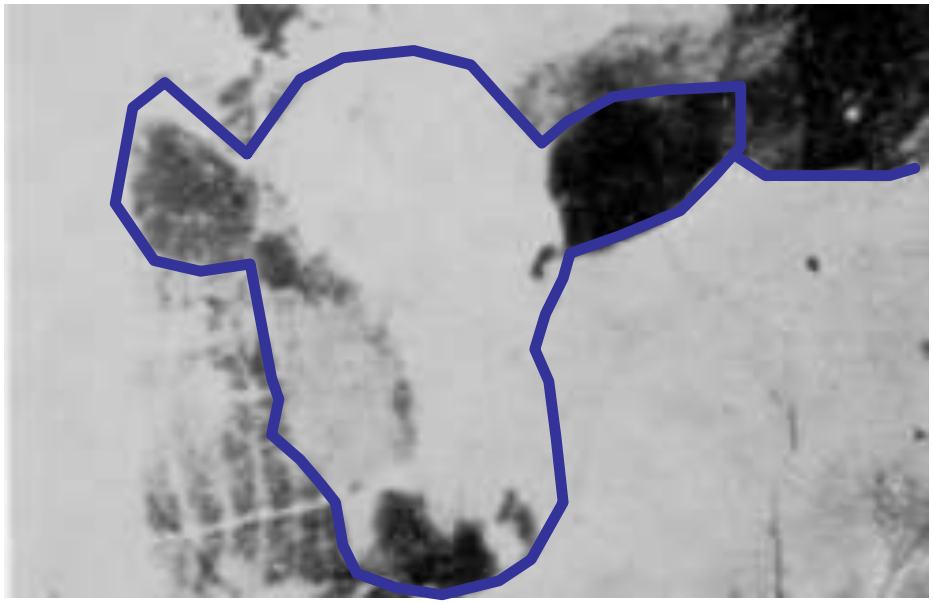


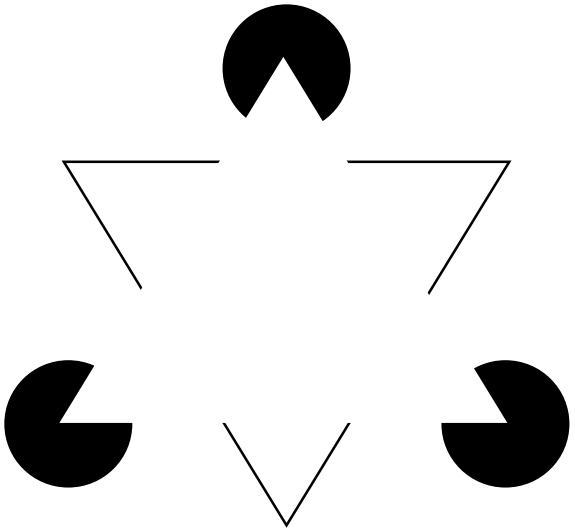
Image Processing v.s. Computer Vision

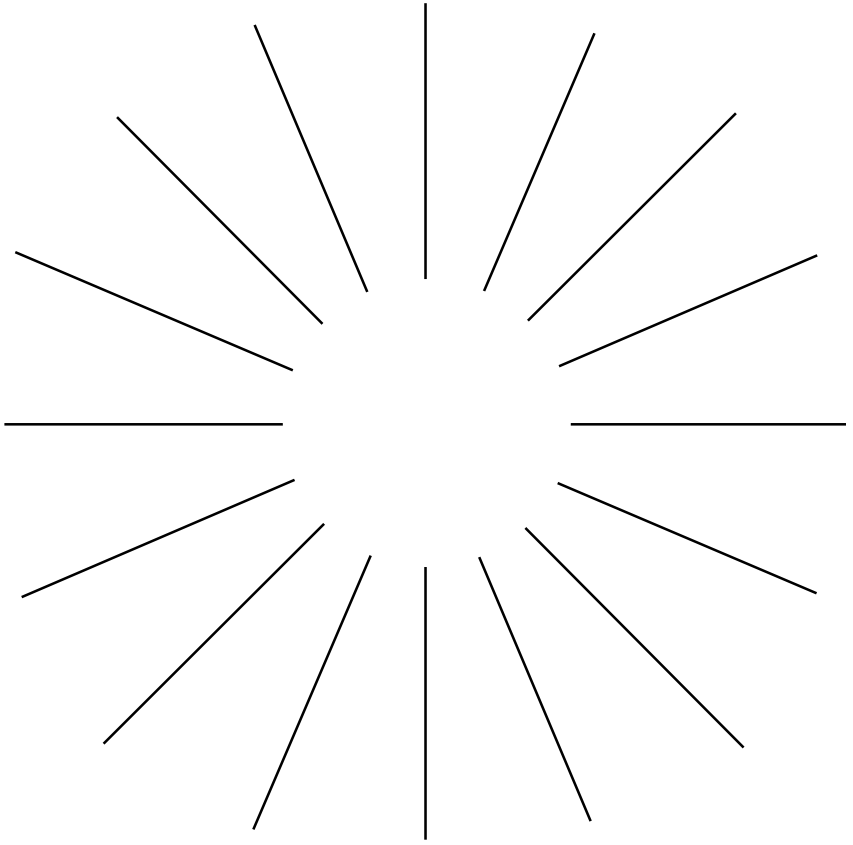


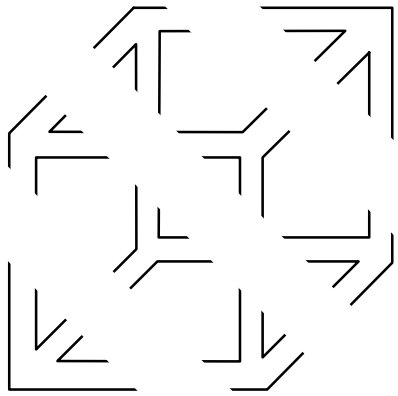
Why Computer Vision is Hard?

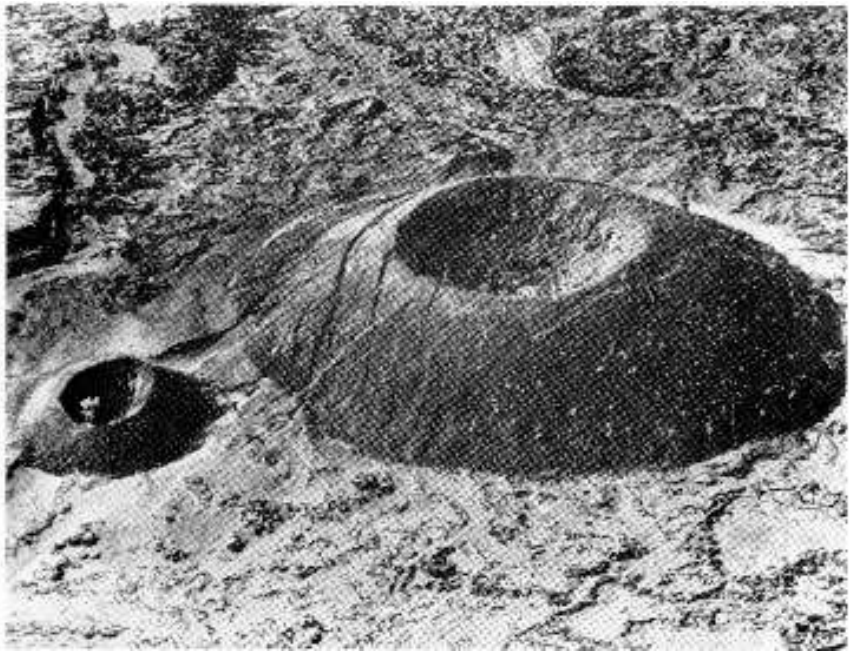
- Inverse problems
- Apriori-knowledge is required
- Complexity extensive
  - Top-Down v.s. Bottom-Up paradigm
  - Parallelism
- Non-local operations
  - Propagation of Information











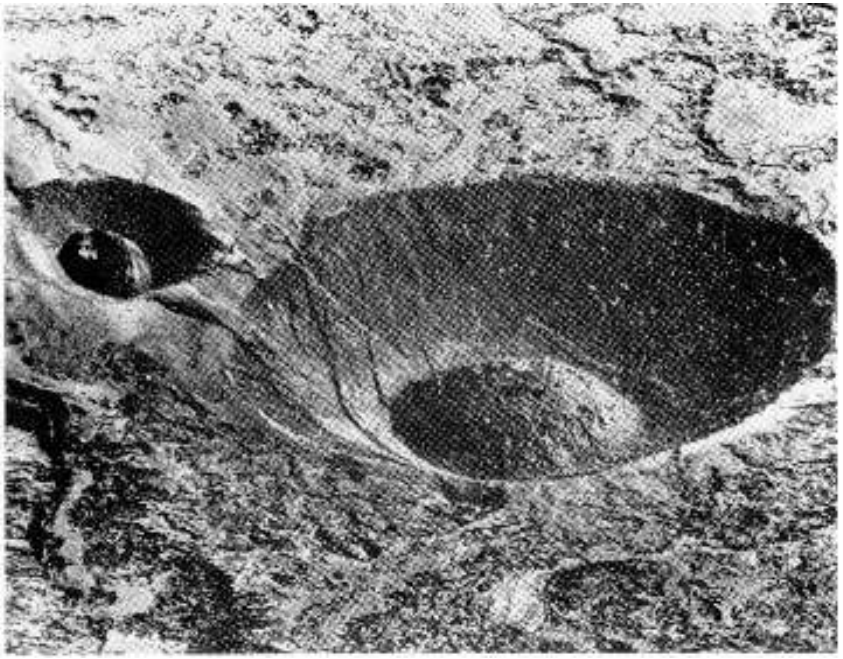
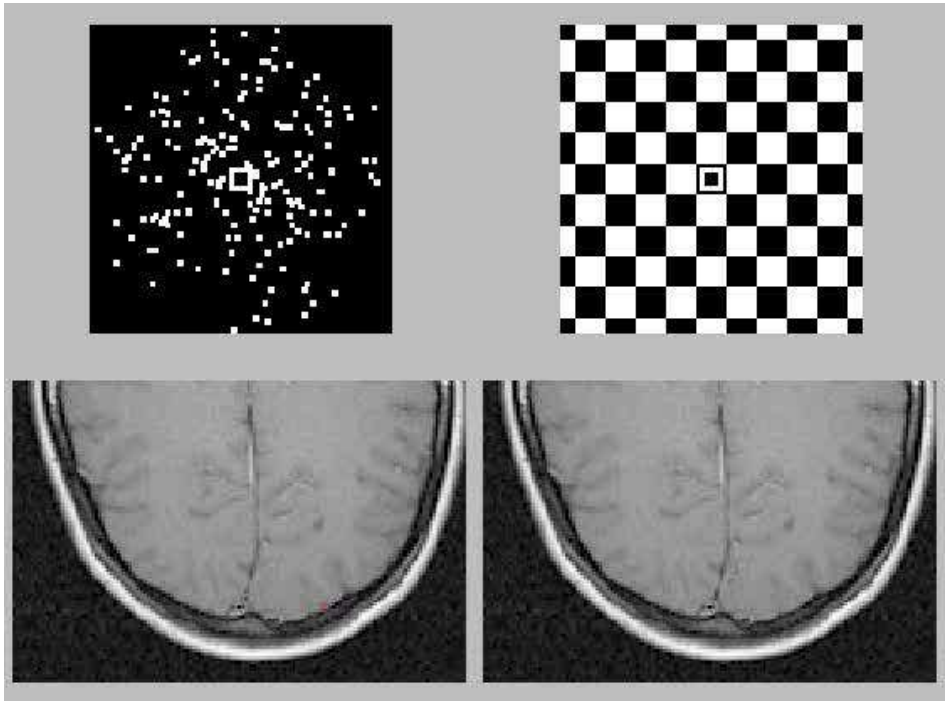


Image Processing and Computer Vision are Interdisciplinary Fields

- Mathematical Models (CS, EE, Math)
- Eye Research (Biology)
- Brain Research:
  - Psychophysics (Psychologists)
  - Electro-physiology (Biologists)
  - Functional MRI (Biologists)



Industry and Applications

- Automobile driver assistance
  - Lane departure warning
  - Adaptive cruise control
  - Obstacle warning
- Digital Photography
  - Image Enhancement
  - Compression
  - Color manipulation
  - Image editing
  - Digital cameras
- Sports analysis
  - sports refereeing and commentary
  - 3D visualization and tracking sports actions

MobilEye system

- Film and Video
  - Editing
  - Special effects
- Image Database
  - Content based image retrieval
  - visual search of products
  - Face recognition
- Industrial Automation and Inspection
  - vision-guided robotics
  - Inspection systems
- Medical and Biomedical
  - Surgical assistance
  - Sensor fusion
  - Vision based diagnosis
- Astronomy
  - Astronomical Image Enhancement
  - Chemical/Spectral Analysis

- Arial Photography
  - Image Enhancement
  - Missile Guidance
  - Geological Mapping
- Robotics
  - Autonomous Vehicles
- Security and Safety
  - Biometry verification (face, iris)
  - Surveillance (fences, swimming pools)
- Military
  - Tracking and localizing
  - Detection
  - Missile guidance
- Traffic and Road Monitoring
  - Traffic monitoring
  - Adaptive traffic lights

Cruise Missiles

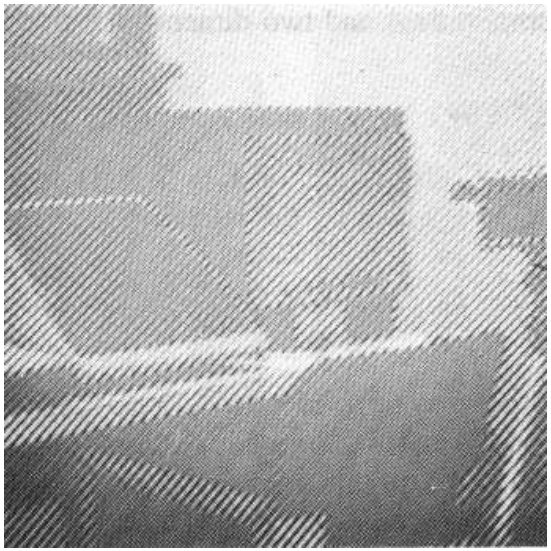
Image Denoising

Image Enhancement

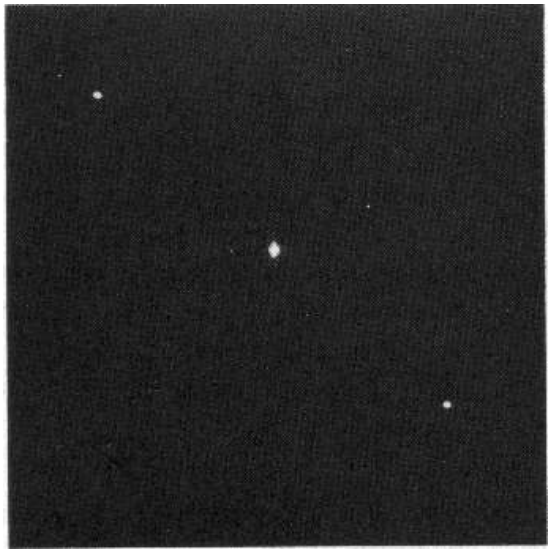
Image Deblurring

Operations in Frequency Domain

Original Noisy image



Fourier Spectrum



Filtered image

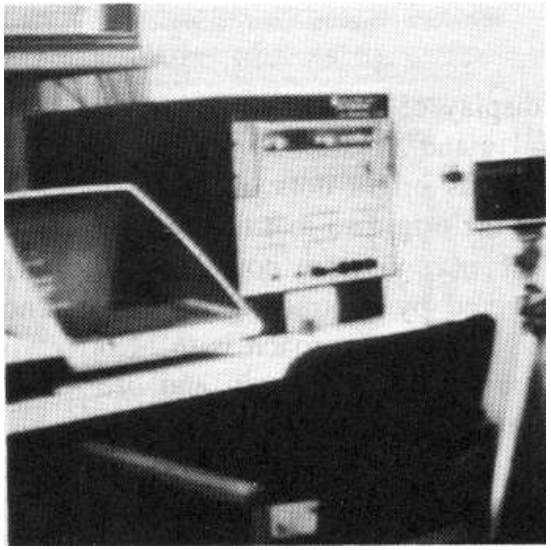
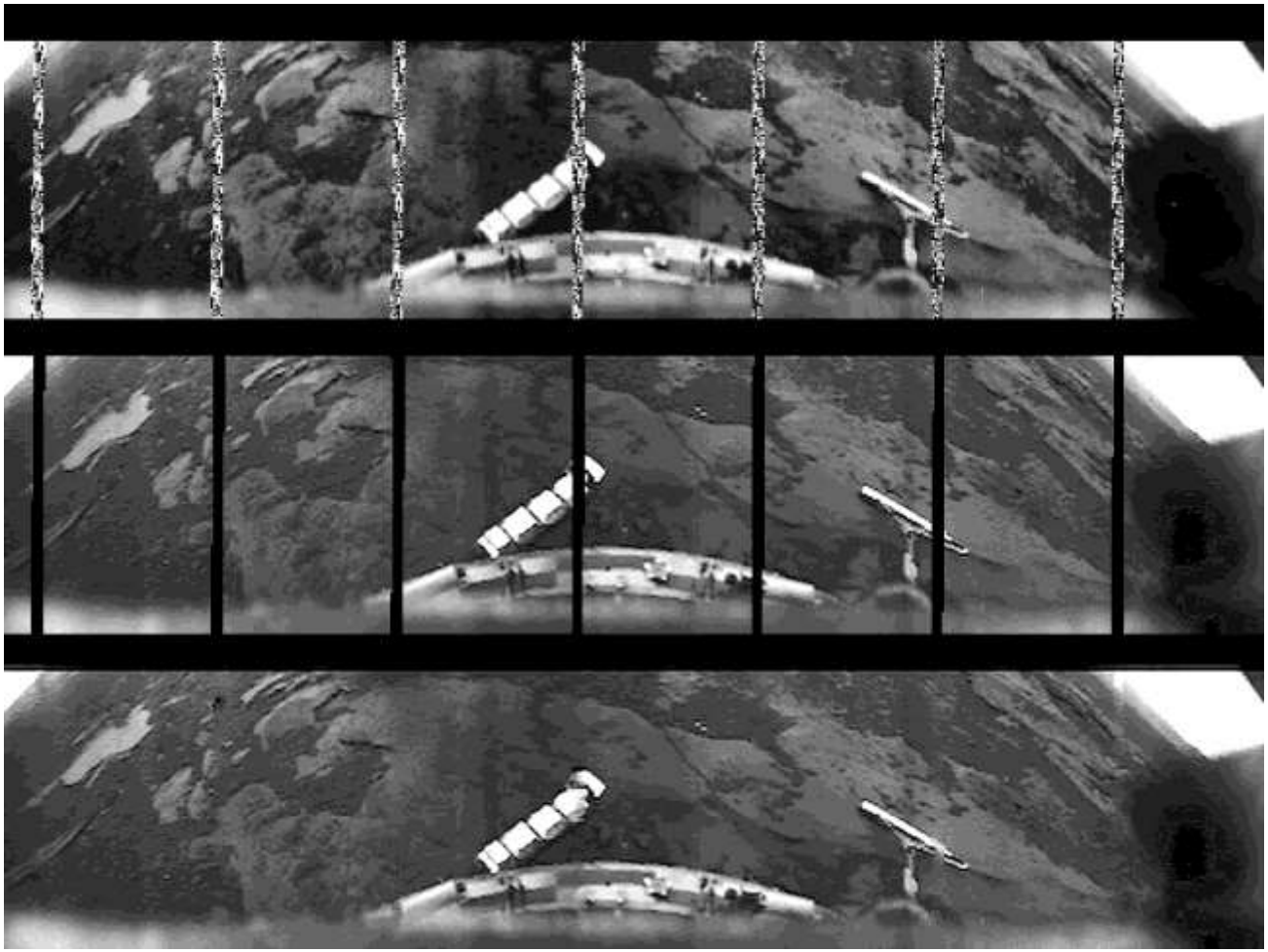


Image Inpainting 1

Image Inpainting 2



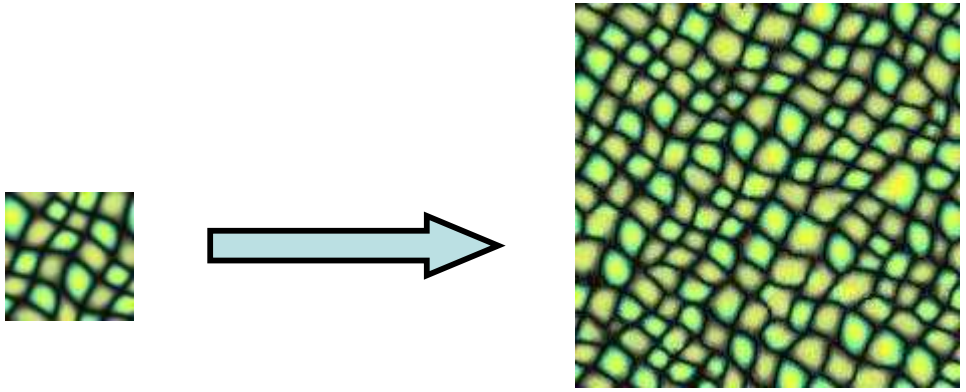
Images of Venus taken by the Russian lander Ventra-10 in 1975

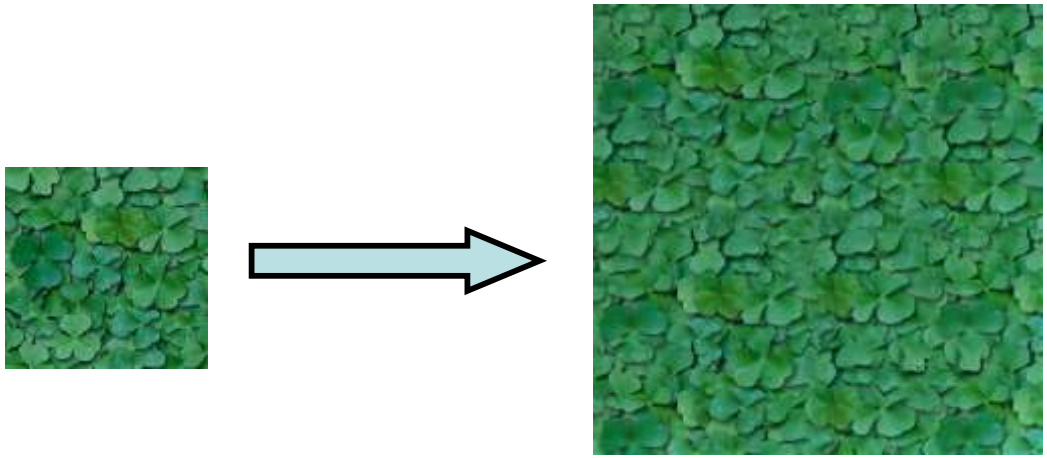
Image Inpainting 3

Video Inpainting

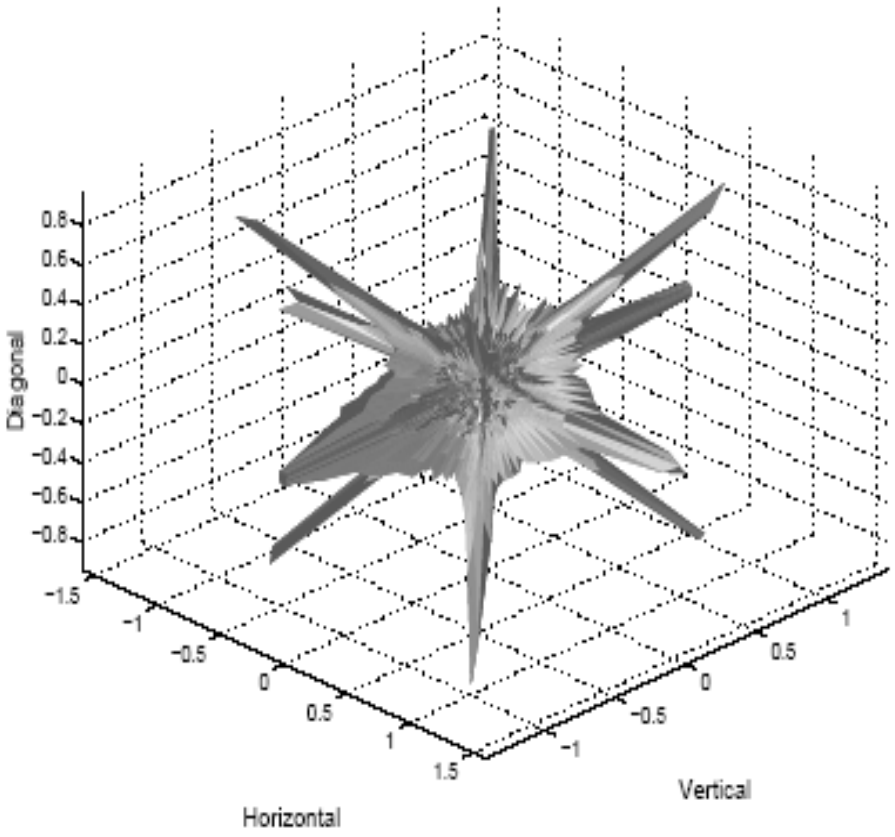
Y. Wexler, E. Shechtman and M. Irani 2004

Texture Synthesis



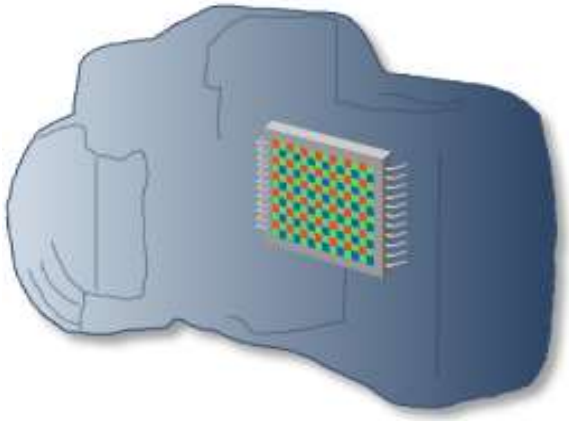


Prior Models of Images



3D prior of 2x2 image neighborhoods, From Mumford & Huang, 2000

Image Demosaicing



Syllabus

- Image Acquisition
- Point Operations
- Geometric Operations
- Spatial Operation
- Feature Extraction
- Frequency Domain and the FFT
- Image Operations in Freq. Domain
- Multi-Resolution
- Restoration

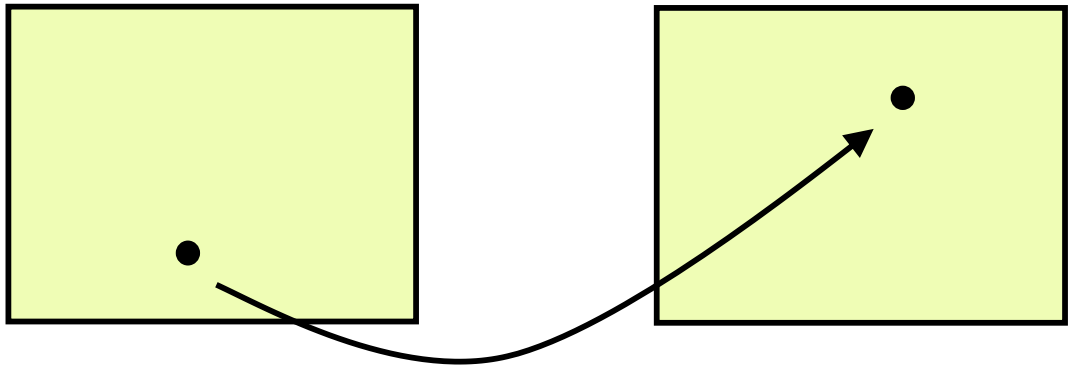
Image Acquisition

- Image Characteristics
- Image Sampling (spatial)
- Image quantization (gray level)

Image Operations

- Geometric Operations
- Point Operations
- Spatial Operations
- Global Operations (Freq. domain)
- Multi-Resolution Operations

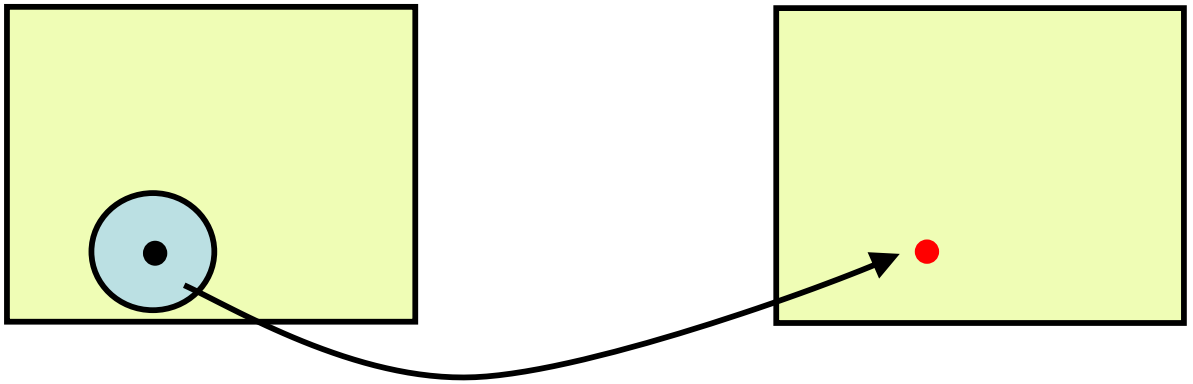
Geometric Operations



Point Operations

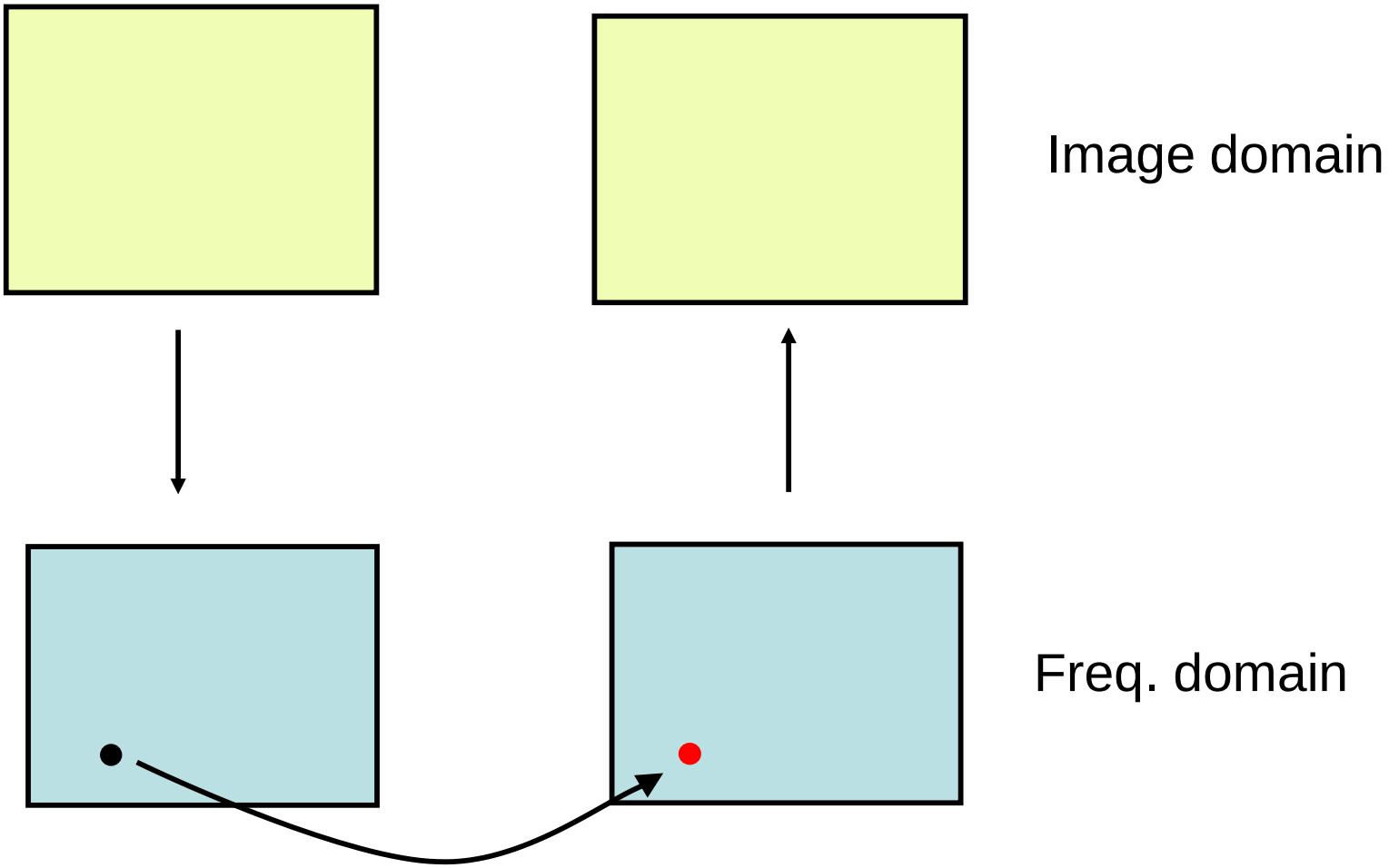
Geometric and Point Operations

Spatial Operations



Global Operations

Global Operations



The Fourier Transform

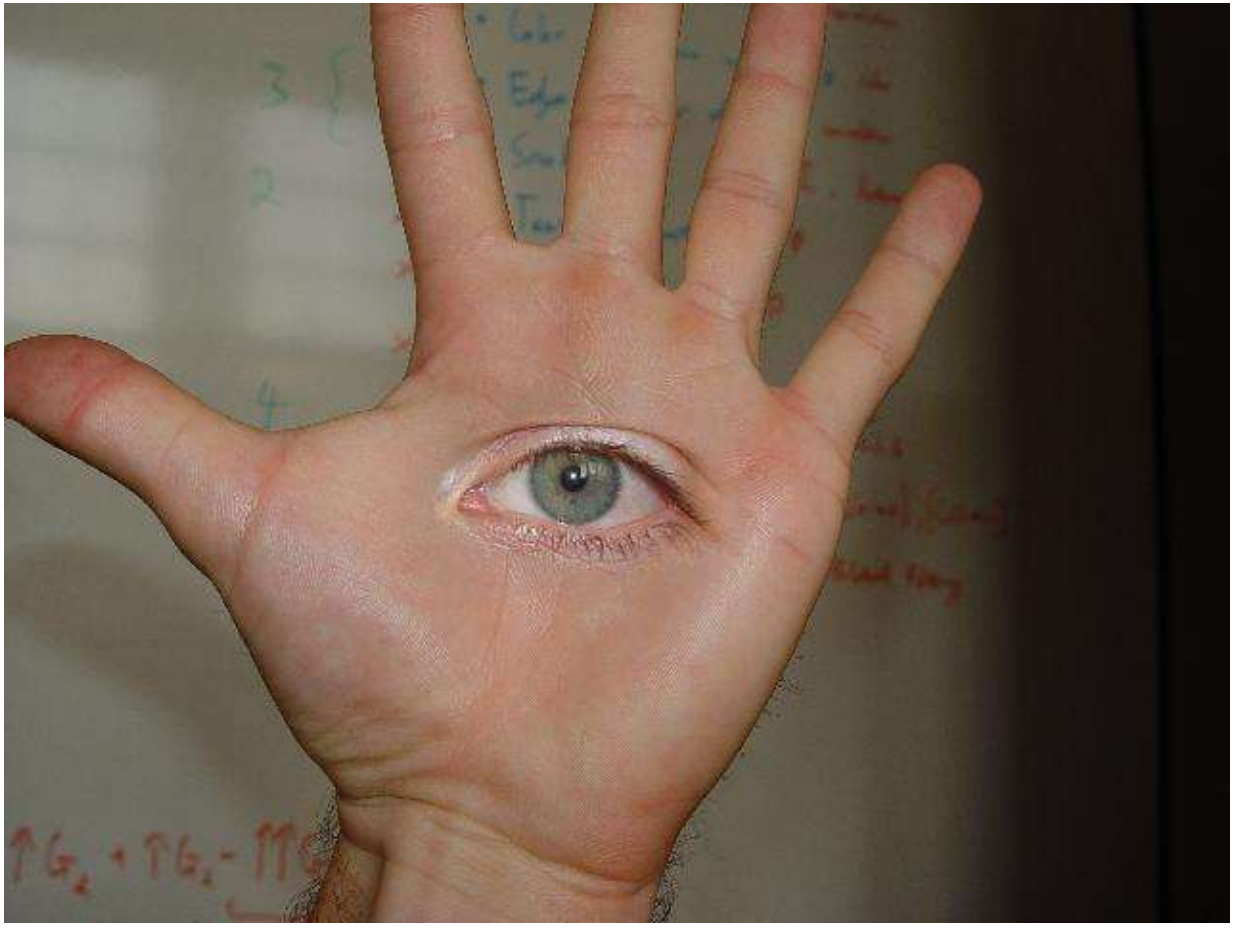
Jean Baptiste Joseph Fourier 1768-1830

Multi-Resolution

Low resolution

High resolution

Multi-Resolution Operations



T H E E N D