Procesamiento Digital de Imágenes

Pablo Roncagliolo B.
Nº1

Curso

- Web
  - http://www.elo.utfsm.cl/~elo328
- Horario:
  - Lunes , 17:20-18:50
  - Miércoles, 17:20-18:50
- Libro Referencia:
  - Digital Image Processing (Gonzalez&Wood) 2ed.

Curso

- Pruebas:
  - Prueba Nº1 30%
  - Tareas o Interrogaciones: Nº1 10% y Nº2 10%
  - Prueba Nº2 50%

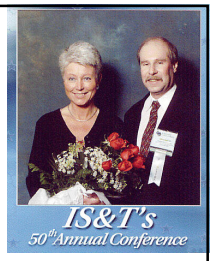
Lenna y el procesamiento digital de imágenes...

En noviembre de 1972 el póster central de la revista Playboy fue “escaneado” por investigadores de la Universidad de California, donde se realizaban las primeras transmisiones de imágenes sobre Arpanet (luego Internet).

Por más de 37 años!, la imagen de Lenna ha sido el estándar para evaluar algoritmos de compresión de imágenes y ha sido publicada en cientos de papers científicos y libros de procesamiento de imágenes

Lenna y el procesamiento digital de imágenes...

Lenna Soderberg



50th Anniversary IS&T (Society for Imaging Science and Technology) conference in Boston (May 1997)

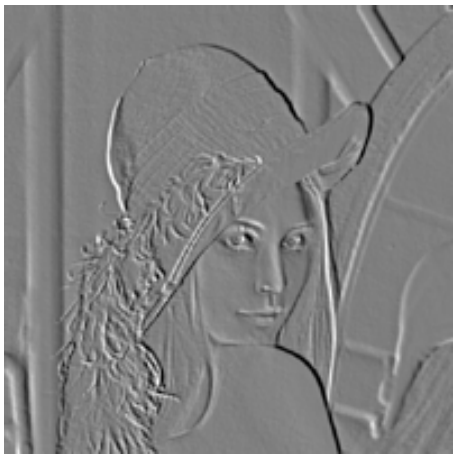
Brillo / Contraste

Filtros...

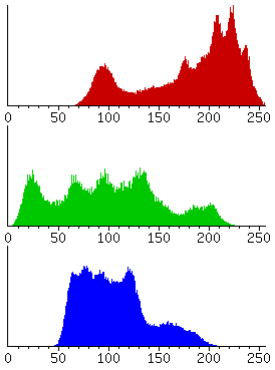
Filtros...

Filtros...

Filtros...



El color...



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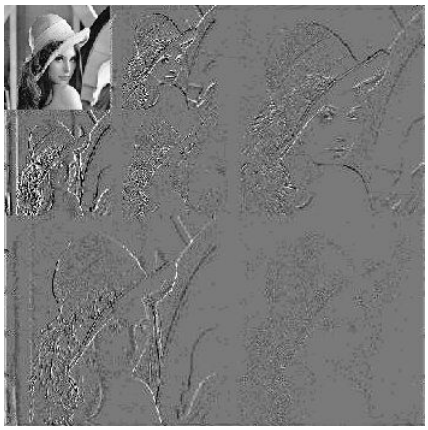
Transformadas...



[PRB] 12

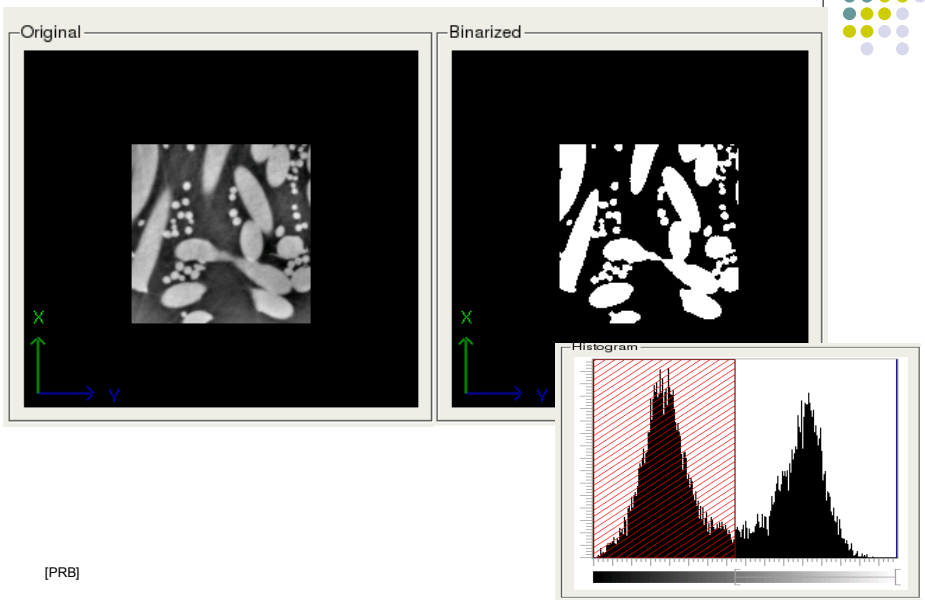
El ruido... y SNR..

Restauración... ?

Restauración... ?

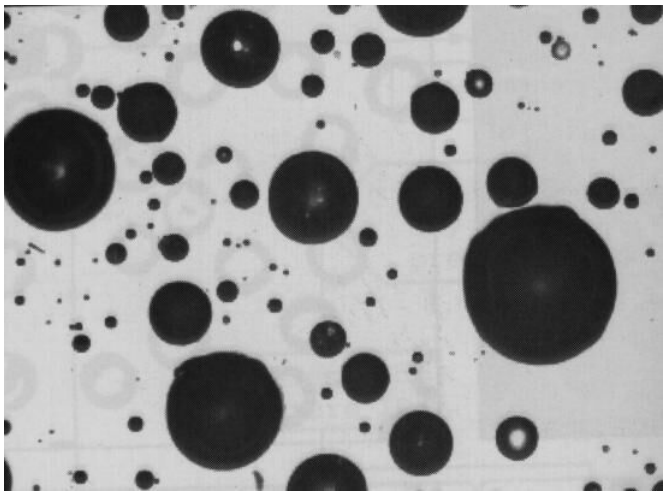
[PRB] 15

“Binarización”



[PRB]

Operaciones Morfológicas...



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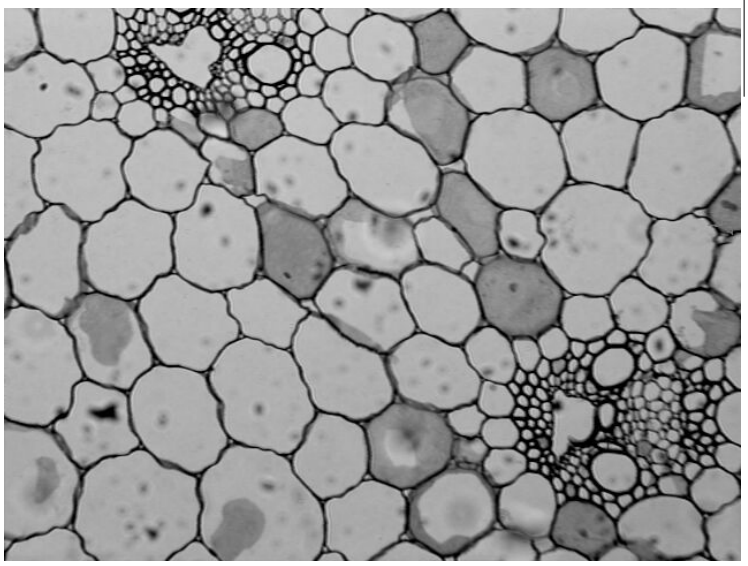
Segmentación



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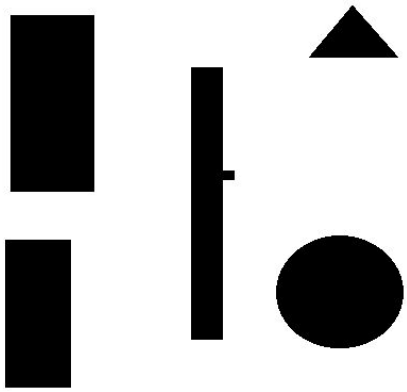
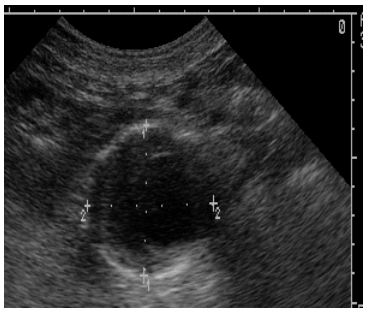
Patrones...



[PRB] 19

Aplicaciones...

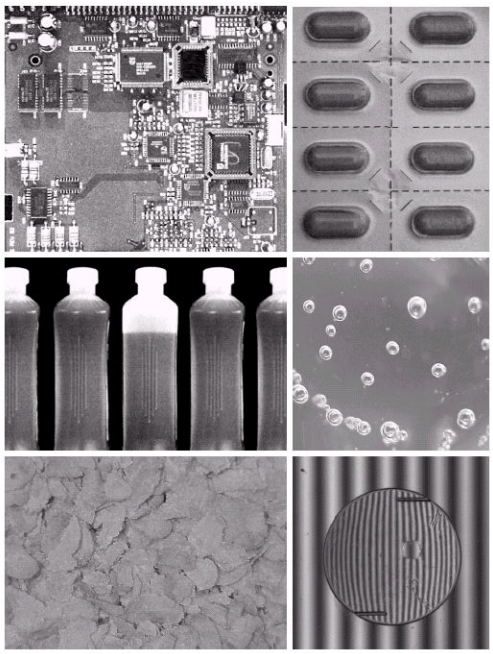


[PRB] 20

Aplicaciones...

Aplicaciones...

Aplicaciones...



a b
c d
e f

FIGURE 1.14
Some examples of manufactured goods often checked using digital image processing. (a) A circuit board controller. (b) Packaged pills. (c) Bottles. (d) Bubbles in clear-plastic product. (e) Cereal. (f) Image of intraocular implant. (Fig. (f) courtesy of Mr. Pete Sites, Perceptics Corporation.)

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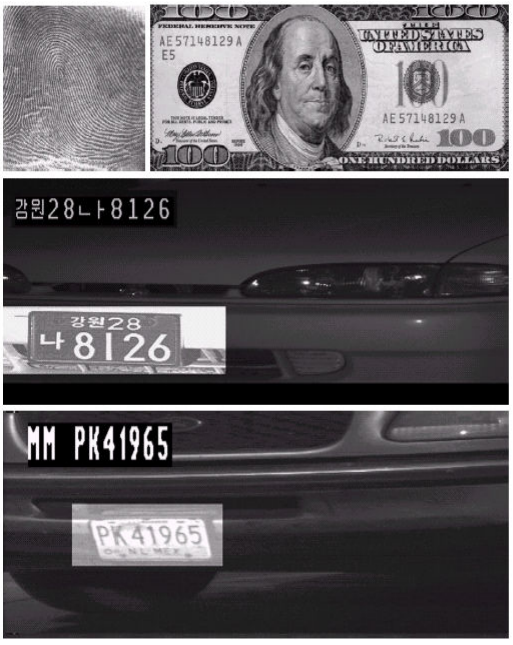
Aplicaciones...



a b
c
d

FIGURE 1.15
Some additional examples of imaging in the visual spectrum. (a) Thumb print. (b) Paper currency. (c) and (d). Automated license plate reading. (Figure (a) courtesy of the National Institute of Standards and Technology. Figures (c) and (d) courtesy of Dr. Juan Herrera, Perceptics Corporation.)

[PRB]

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Aplicaciones...

[PRB]

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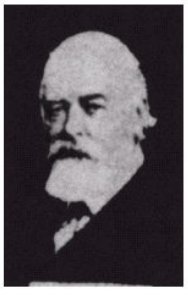
Primeras imágenes “digitalizadas”...

FIGURE 1.1 A digital picture produced in 1921 from a coded tape by a telegraph printer with special type faces. (McFarlane.)

FIGURE 1.2 A digital picture made in 1922 from a tape punched after the signals had crossed the Atlantic twice. Some errors are visible. (McFarlane.)



[PR

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Primeras imágenes ...

FIGURE 1.3
Unretouched cable picture of Generals Pershing and Foch, transmitted in 1929 from London to New York by 15-tone equipment. (McFarlane.)

[PRB] 27

Primeras imágenes ...

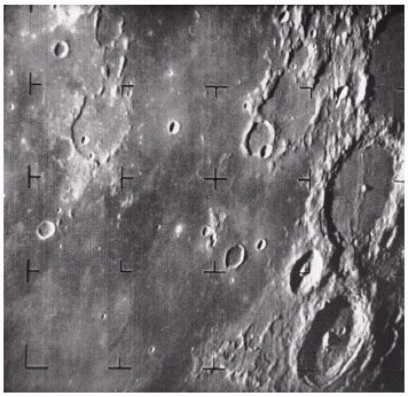

FIGURE 1.4 The first picture of the moon by a U.S. spacecraft. *Ranger 7* took this image on July 31, 1964 at 9:09 A.M. EDT, about 17 minutes before impacting the lunar surface. (Courtesy of NASA.)

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Además de las luz visible...

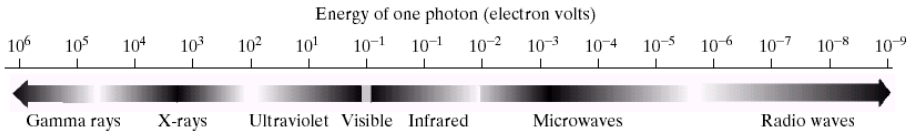
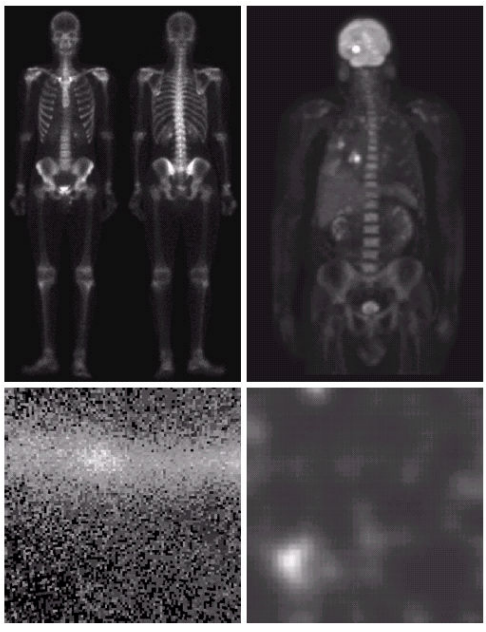


FIGURE 1.5 The electromagnetic spectrum arranged according to energy per photon.

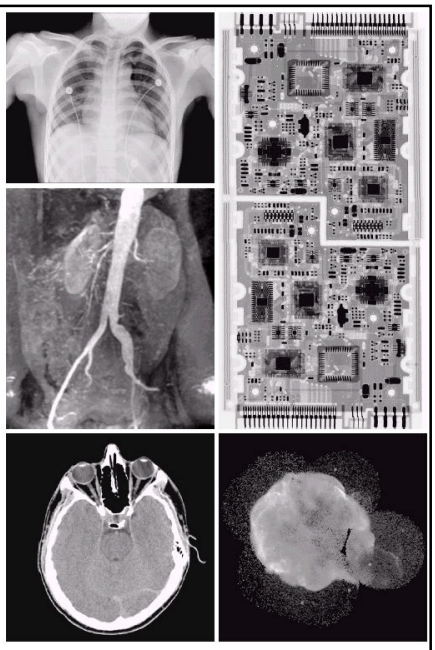
Imágenes con Rayos Gamma



a b
c d

FIGURE 1.6 Examples of gamma-ray imaging. (a) Bone scan. (b) PET image. (c) Cygnus Loop. (d) Gamma radiation (bright spot) from a reactor valve. (Images courtesy of (a) G.E. Medical Systems, (b) Dr. Michael E. Casey, CTI PET Systems, (c) NASA, (d) Professors Zhong He and David K. Wehe, University of Michigan.)

Imágenes con Rayos X

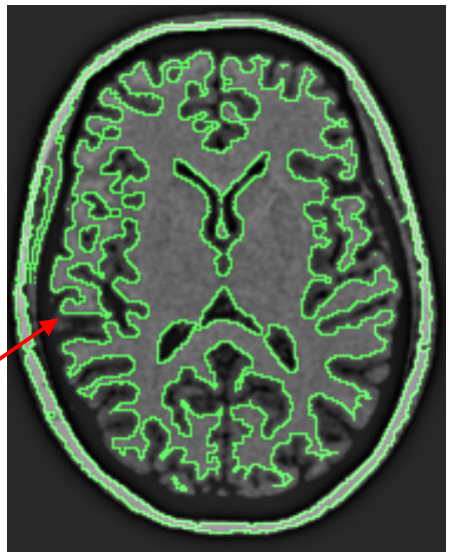


a b c d e

FIGURE 1.7 Examples of X-ray imaging. (a) Chest X-ray. (b) Aortic angiogram. (c) Head CT. (d) Circuit boards. (e) Cygnus Loop. (Images courtesy of (a) and (c) Dr. David R. Pickens, Dept. of Radiology & Radiological Sciences, Vanderbilt University Medical Center, (b) Dr. Thomas R. Gest, Division of Anatomical Sciences, University of Michigan Medical School, (d) Mr. Joseph E. Pascente, Lixi, Inc., and (e) NASA.)

[PRB]

Aplicaciones médicas...



segmentación

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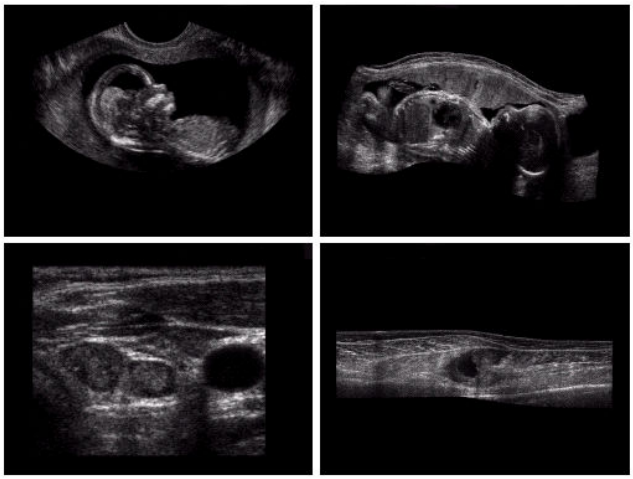
Imágenes por Ultrasonido



a b
c d

FIGURE 1.20
Examples of ultrasound imaging. (a) Baby. (2) Another view of baby. (c) Thyroids. (d) Muscle layers showing lesion. (Courtesy of Siemens Medical Systems, Inc., Ultrasound Group.)

[PRB]

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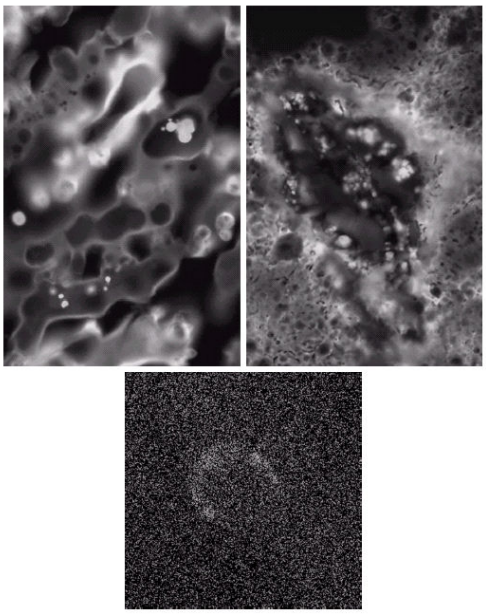
Imágenes en Espectro Ultravioleta

a b
c

FIGURE 1.8
Examples of ultraviolet imaging. (a) Normal corn. (b) Smut corn. (c) Cygnus Loop. (Images courtesy of (a) and (b) Dr. Michael W. Davidson, Florida State University, (c) NASA.)



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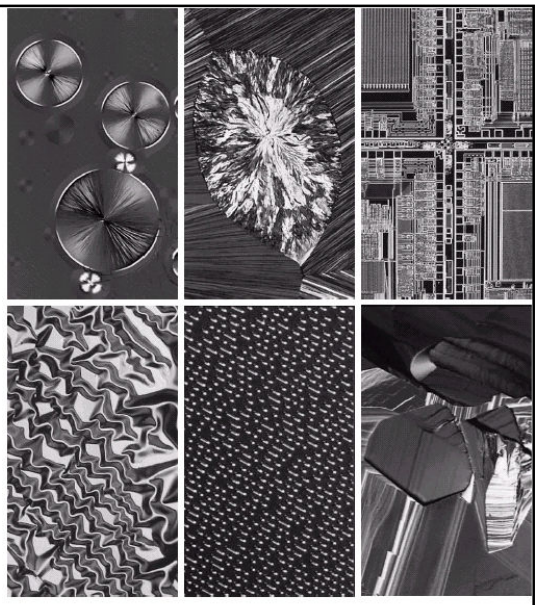
Imágenes con Microscopios



a b c
d e f

FIGURE 1.9 Examples of light microscopy images. (a) Taxol (anticancer agent), magnified 250×. (b) Cholesterol—40×. (c) Microprocessor—60×. (d) Nickel oxide thin film—600×. (e) Surface of audio CD—1750×. (f) Organic superconductor—450×. (Images courtesy of Dr. Michael W. Davidson, Florida State University.)

[PRB]

Imágenes satelitales...

TABLE 1.1 Thematic bands in NASA's LANDSAT satellite.

Band No.	Name	Wavelength (μm)	Characteristics and Uses
1	Visible blue	0.45–0.52	Maximum water penetration
2	Visible green	0.52–0.60	Good for measuring plant vigor
3	Visible red	0.63–0.69	Vegetation discrimination
4	Near infrared	0.76–0.90	Biomass and shoreline mapping
5	Middle infrared	1.55–1.75	Moisture content of soil and vegetation
6	Thermal infrared	10.4–12.5	Soil moisture; thermal mapping
7	Middle infrared	2.08–2.35	Mineral mapping

Soil moisture: humedad del suelo
Shoreline: litoral

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Imágenes satelitales...

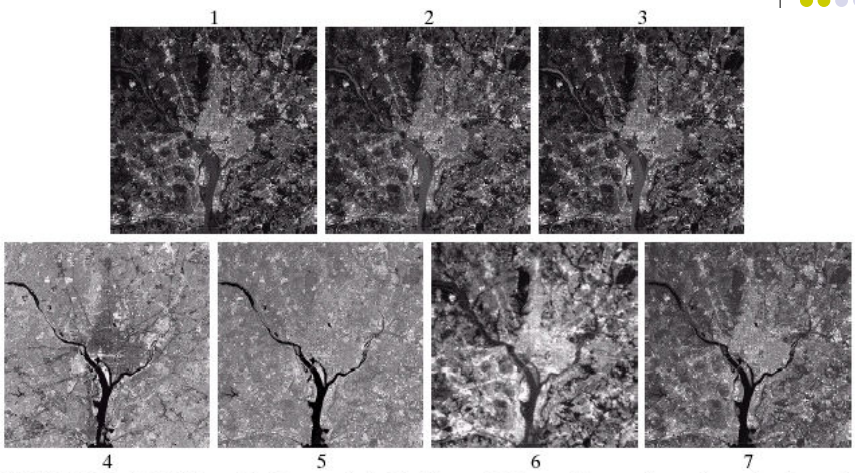

FIGURE 1.10 LANDSAT satellite images of the Washington, D.C. area. The numbers refer to the thematic bands in Table 1.1. (Images courtesy of NASA.)

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Imágenes satelitales...

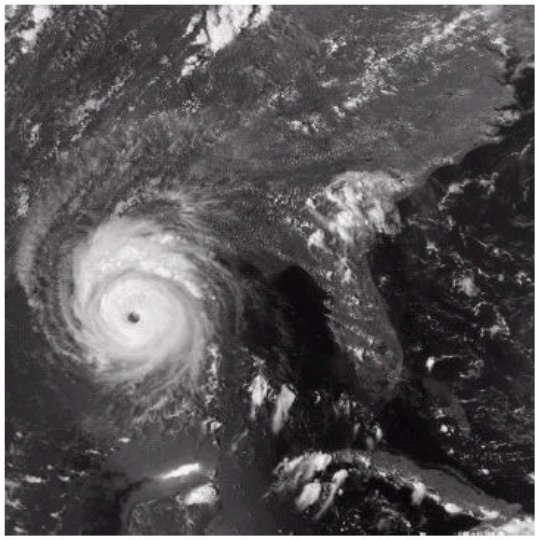

FIGURE 1.11 Multispectral image of Hurricane Andrew taken by NOAA GEOS (Geostationary Environmental Operational Satellite) sensors. (Courtesy of NOAA.)

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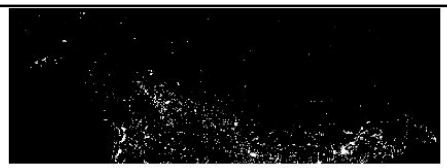
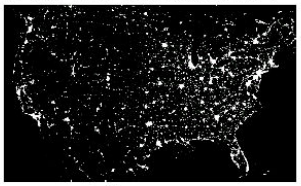
FIGURE 1.12
Infrared satellite images of the Americas. The small gray map is provided for reference. (Courtesy of NOAA.)





Imágenes en Espectro Infrarrojo

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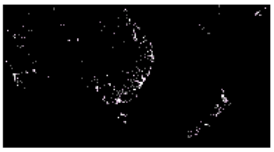
Imágenes en Espectro Infrarrojo



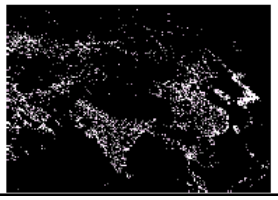


FIGURE 1.13
Infrared satellite images of the remaining populated part of the world. The small gray map is provided for reference. (Courtesy of NOAA.)

Imágenes con Radar (microondas)

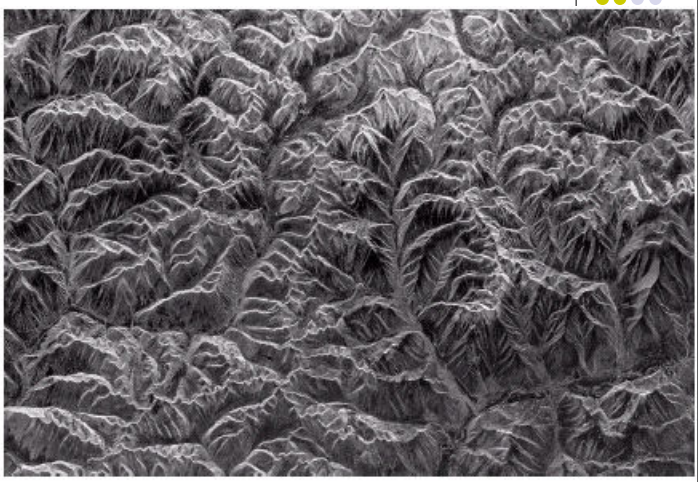


FIGURE 1.16
Spaceborne radar image of mountains in southeast Tibet. (Courtesy of NASA.)

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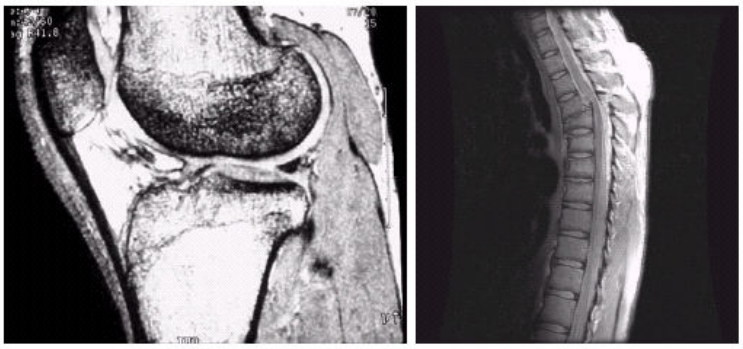
Imágenes por Resonancia Magnética (ondas de radio)



a b

FIGURE 1.17 MRI images of a human (a) knee, and (b) spine. (Image (a) courtesy of Dr. Thomas R. Gest, Division of Anatomical Sciences, University of Michigan Medical School, and (b) Dr. David R. Pickens, Department of Radiology and Radiological Sciences, Vanderbilt University Medical Center.)

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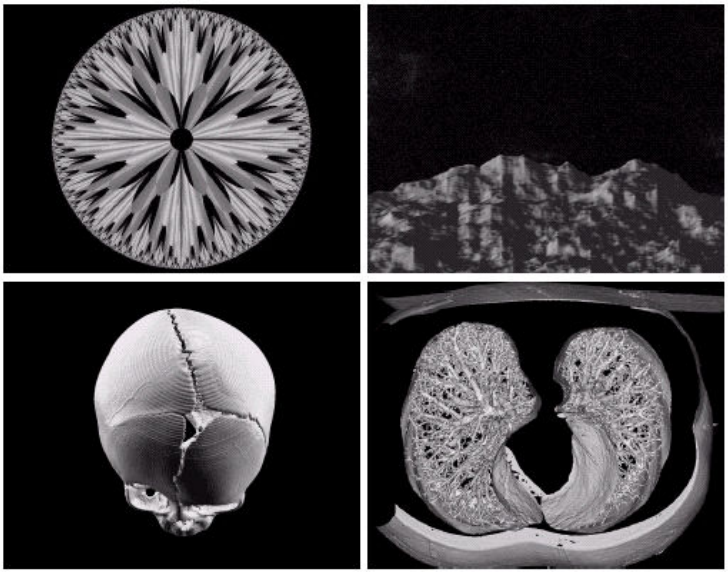
Imágenes sintetizadas...



a b
c d

FIGURE 1.22
(a) and (b) Fractal images. (c) and (d) Images generated from 3-D computer models of the objects shown. (Figures (a) and (b) courtesy of Ms. Melissa D. Binde, Swarthmore College, (c) and (d) courtesy of NASA.)

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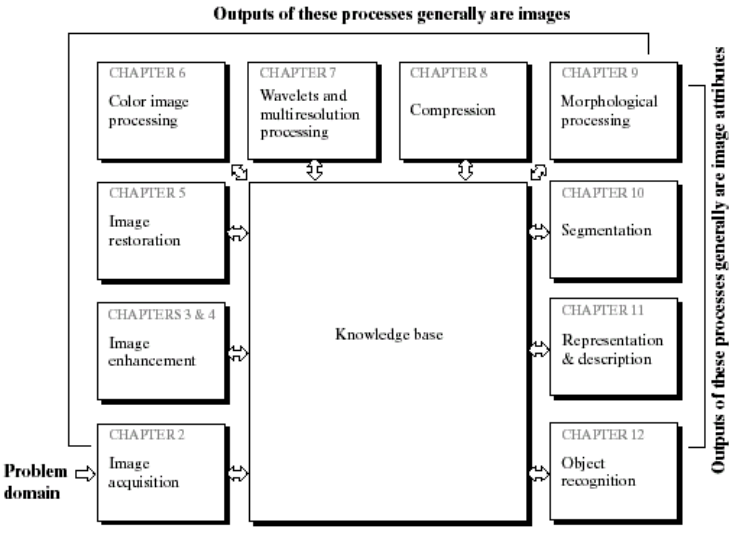
Estructura del libro...

FIGURE 1.23
Fundamental steps in digital image processing.



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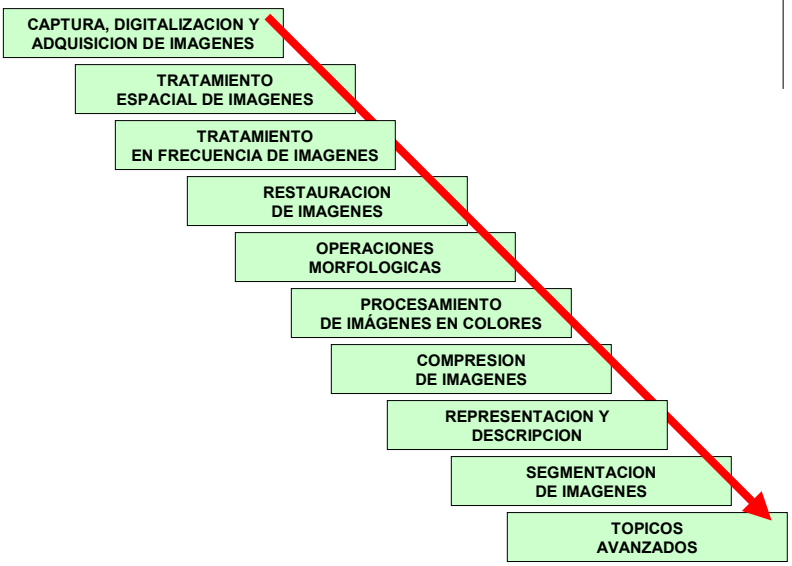
Orden de las clases...



[PRB]

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Sistema General de Captura y Procesamiento de Imágenes...

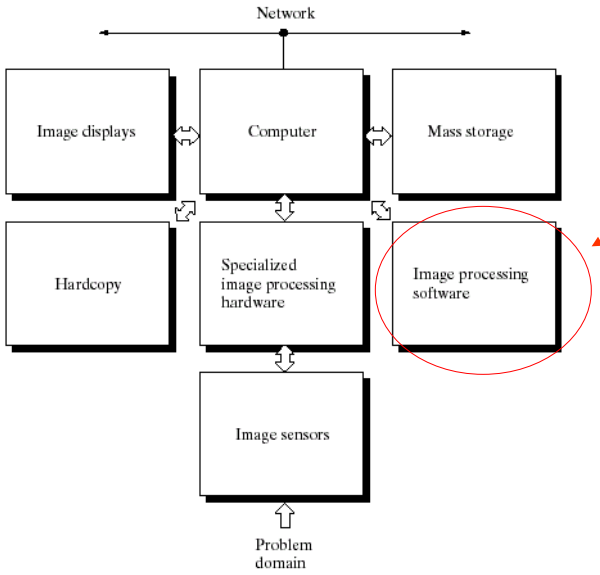

FIGURE 1.24 Components of a general-purpose image processing system.

Foco del Curso

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