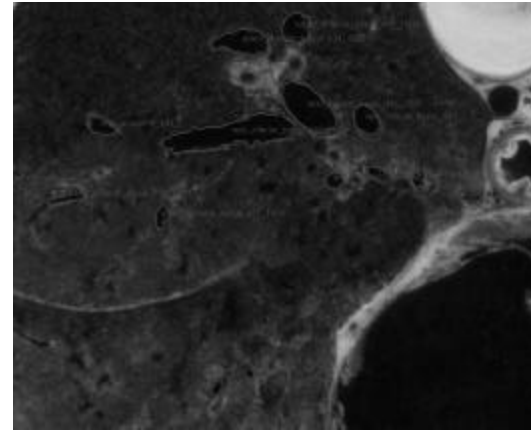


Introduction

- What IS computer vision?
the analysis of digital images by a computer
- Where do images come from?

1

Visible Man Slice Through Lung



3

Applications

- Medical Imaging

CT image of a patient's abdomen



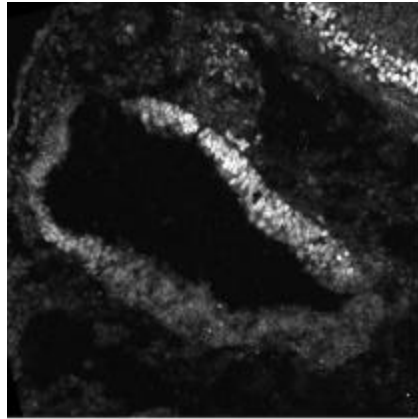
2

3D Reconstruction of the Blood Vessel Tree



4

Slice of a Chicken Embryo's Inner Ear



5

Image Databases:

Images from my Ground-Truth collection.



What categories of real image databases exist today?

7

Robotics

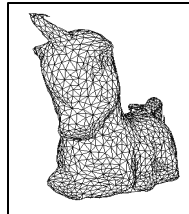
- 2D Gray-tone or Color Images

"Mars" rover



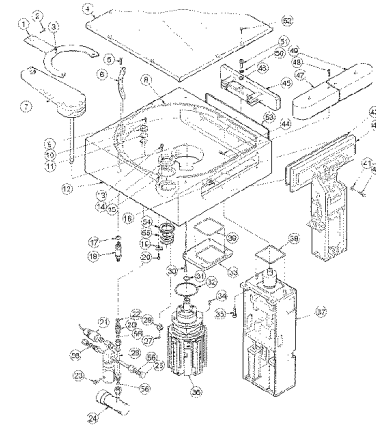
- 3D Range Images

What am I?

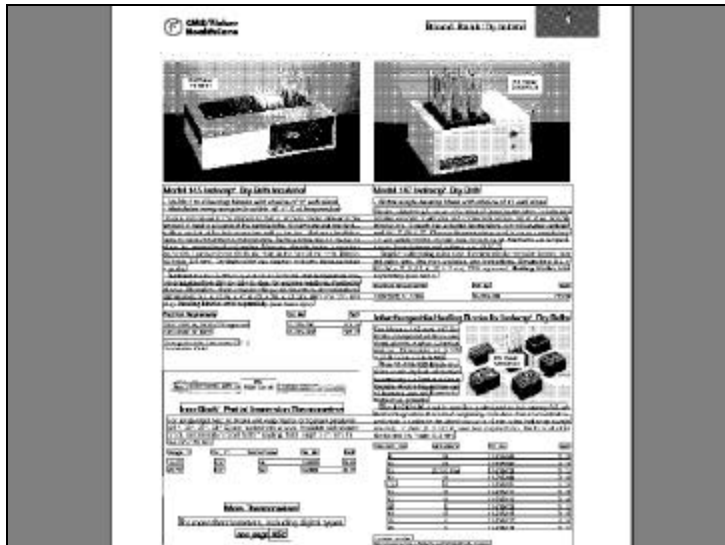


6

Documents:



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Goals of Image Analysis



- Segment the image into useful regions
- Perform measurements on certain areas
- Determine what object(s) are in the scene
- Calculate the precise location(s) of objects
- Visually inspect a manufactured object
- Construct a 3D model of the imaged object

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Digital Image Terminology:

0	0	0	0	1	0	0
0	0	1	1	1	0	0
0	1	95	96	94	93	92
0	0	92	93	93	92	92
0	0	93	93	94	92	93
0	1	92	93	93	93	93
0	0	94	95	95	96	95

pixel (with value 94)
 its 3x3 neighborhood
 region of medium intensity
 resolution (7x7)

- binary image
- gray-scale (or gray-tone) image
- color image
- multi-spectral image
- range image
- labeled image

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The Three Stages of Computer Vision

- low-level
image → image
- mid-level
image → features
- high-level
features → analysis

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Low-Level

sharpening →

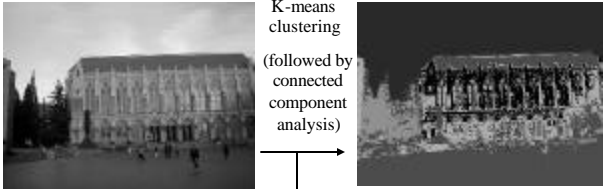


← blurring

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Mid-level

K-means clustering
(followed by connected component analysis)




original color image → regions of homogeneous color

↓ data structure


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Low-Level




original image

Canny →



edge image


Mid-Level



edge image


ORT ↓

data structure

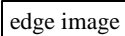


circular arcs and line segments 14

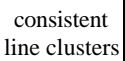
Low- to High-Level



low-level → edge image

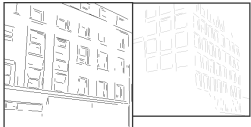


mid-level ↓



consistent line clusters

high-level ←



Building Recognition

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Difficulty of Computer Vision

- Computer vision is far from completely solved.
- There have been many successful systems used in real applications.
Like what?
- There are lots of things that humans can do for which vision programs don't come close to success.

Can you name some?