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CS 4487/9587

Algorithms for Image Analysis

- Web page: www.csd.uwo.ca/courses/CS4487a/
  - Announcements, assignments, code samples/libraries, syllabus
  - Lecture notes
  - Useful links (e.g. papers, other lecture notes, code)
- Text-book:
  - Sonka, Hlavac, Boyle. **Image Processing, Analysis, and Machine Vision**. Thomson Learning; 3 edition (2007)
  - Recommended texts:
    - Richard Szeliski (Microsoft Research). **Computer Vision: Algorithms and Applications** *http://www.research.microsoft.com/~szeliski/Book*
    - Kleinberg and Tardos. **Algorithm Design**, Addison Wesley, 2006
    - Gonzalez and Woods. **Digital Image Processing**, Prentice Hall, 2002
    - Stan Z. Li. **Markov Random Field Modeling in Image Analysis**, Springer, 2009
  - Extra reading (texts, journal/conference papers)

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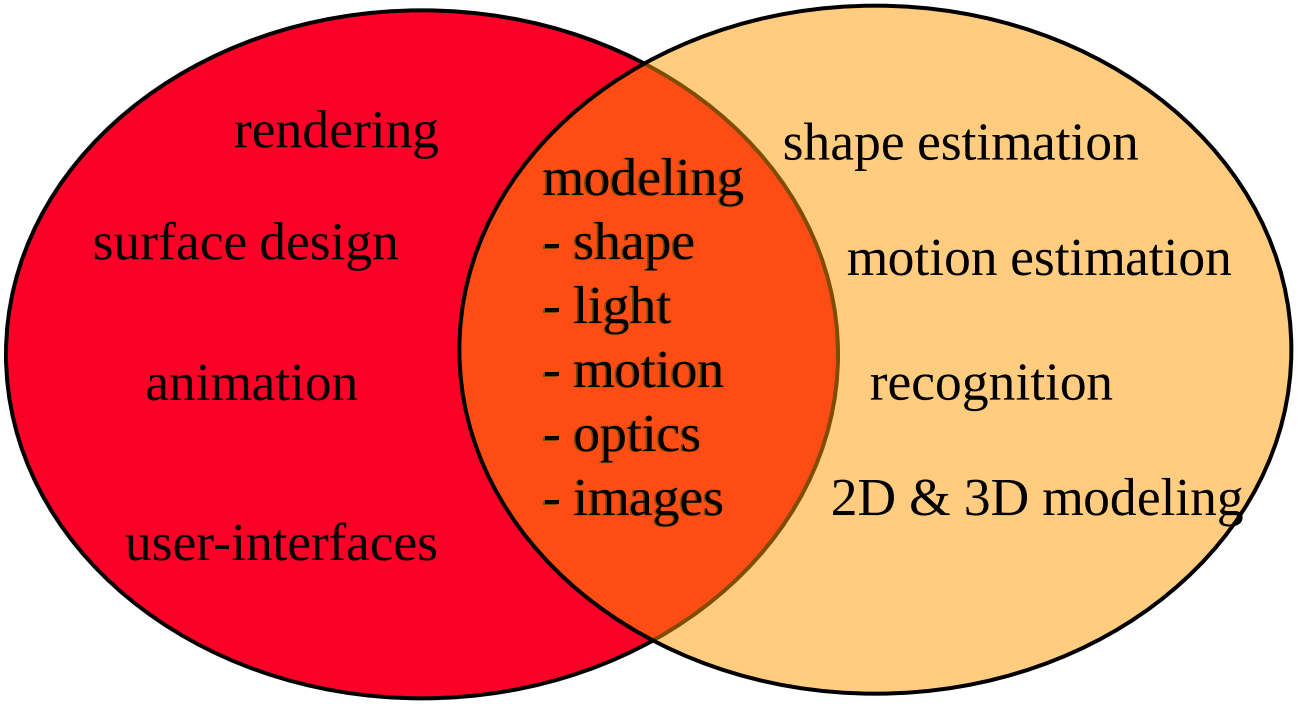
Algorithms for Image Analysis

- Today
  - Overview of Image Analysis
  - Overview of Course
  - Image Formation

Slide from Steve Seitz

Overview of Image Analysis



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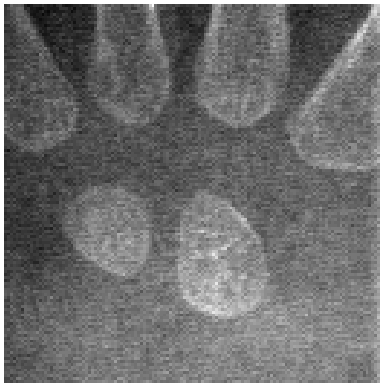
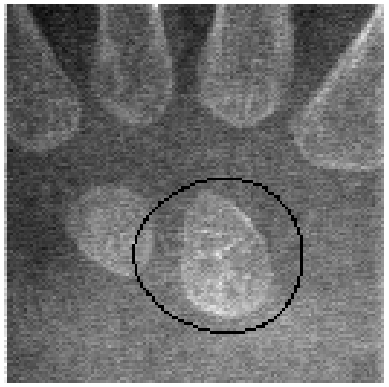
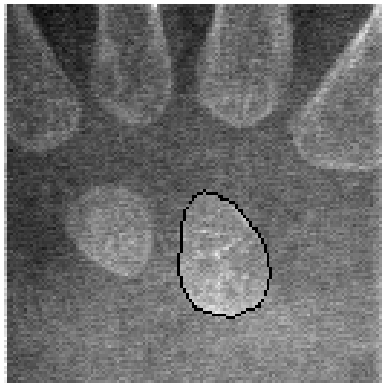
Overview of Image Analysis

Segmentation in Medical Imaging:







2D segmentation
(snakes)

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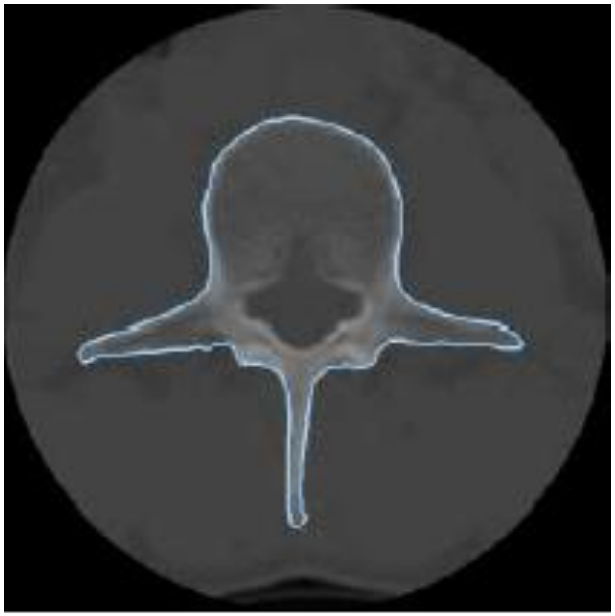
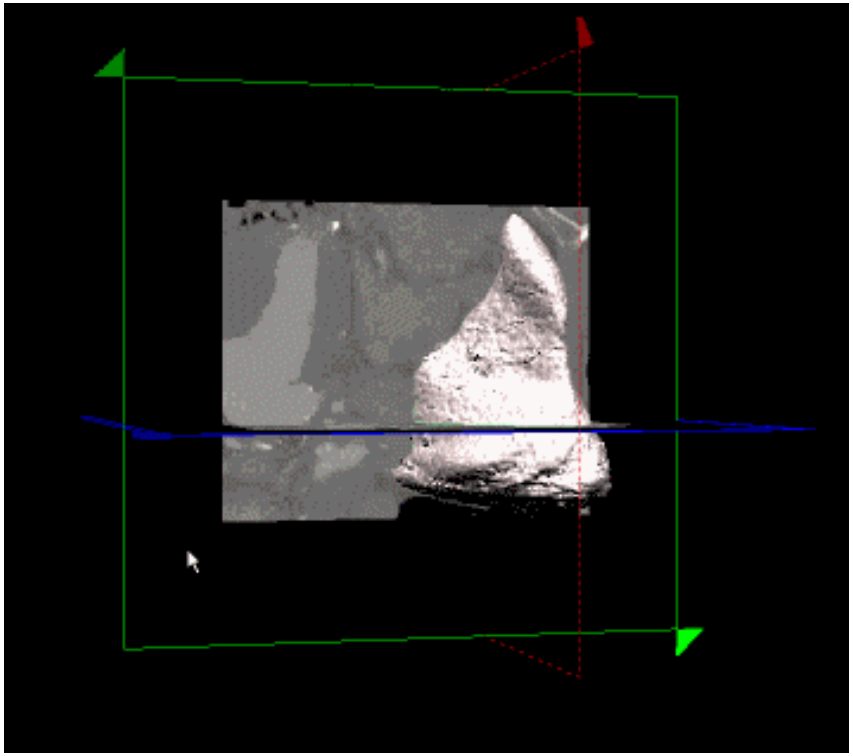
Overview of Image Analysis

Segmentation in Medical Imaging:



2D model



3D Model of a liver from Medical Data

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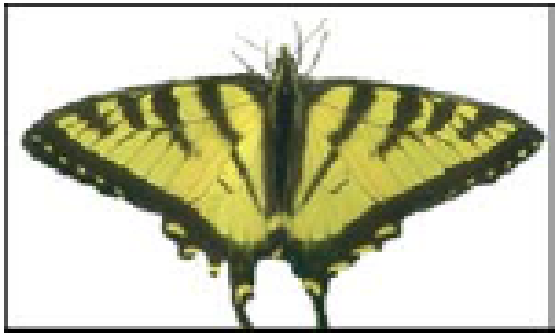
Segmentation in photo editing:

livewire



"Grab cuts"

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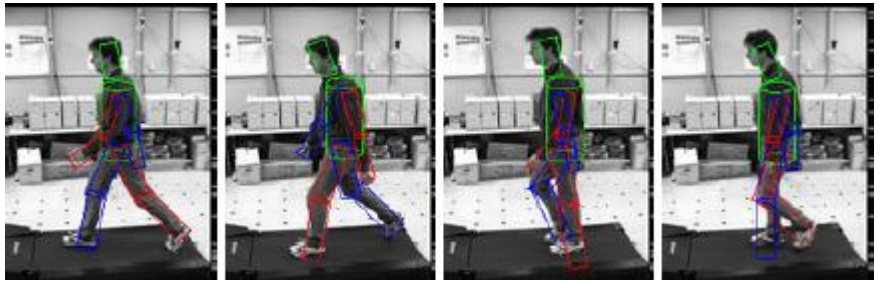
Object Recognition and tracking:

pictorial structures



tracking pictorial structures

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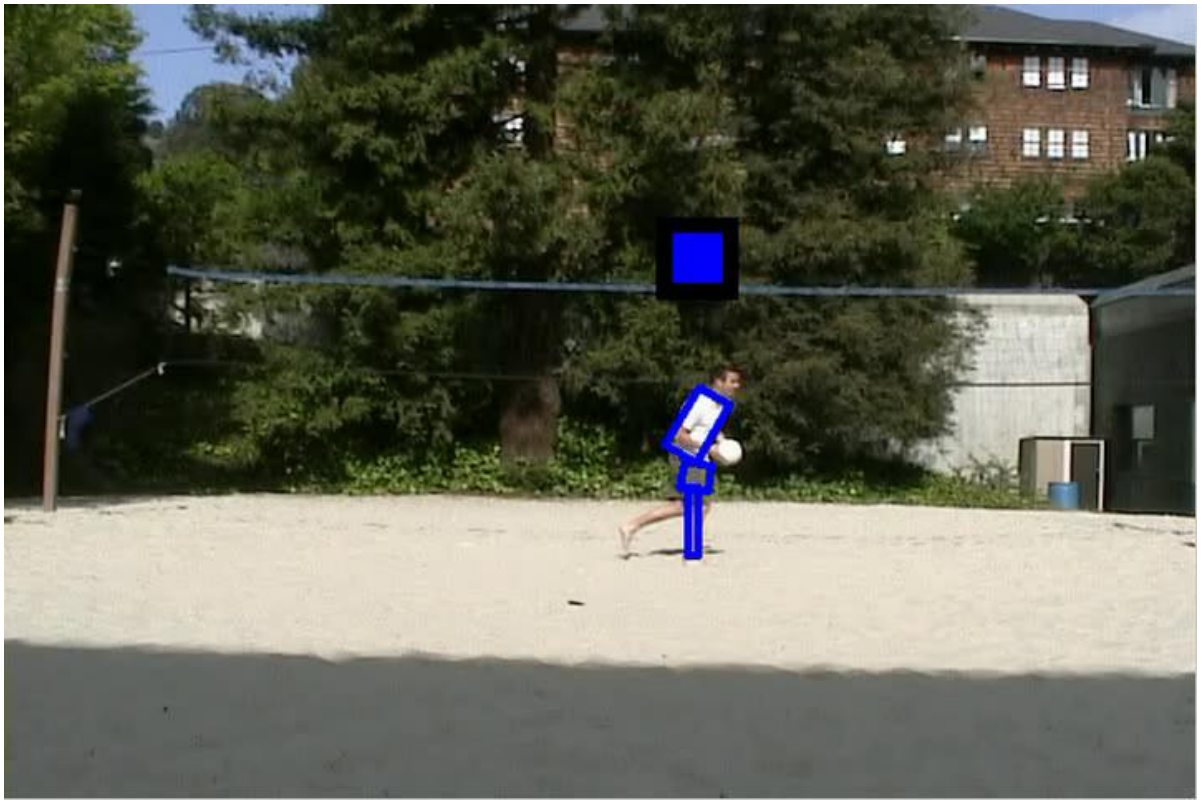
Object Recognition and tracking:



Bottom-up tracker

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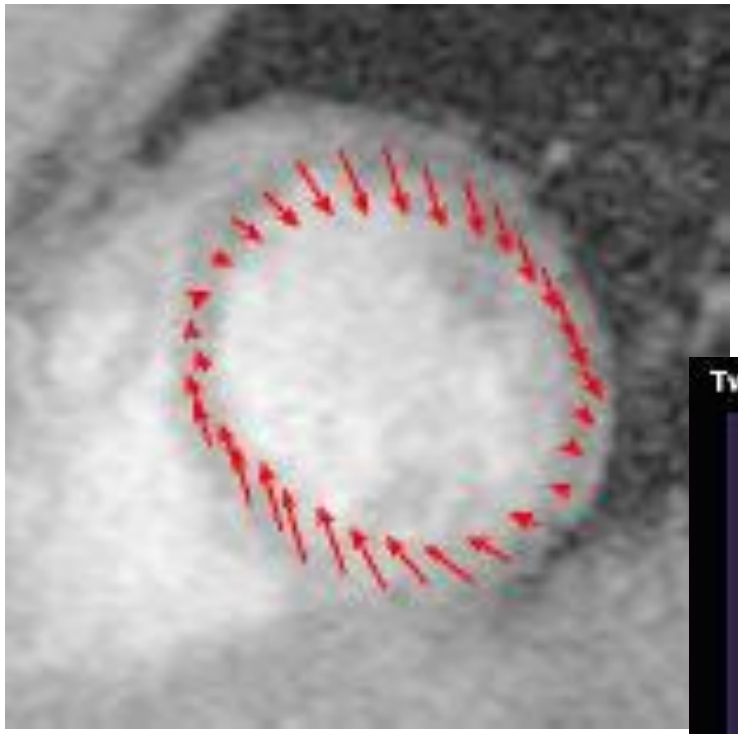
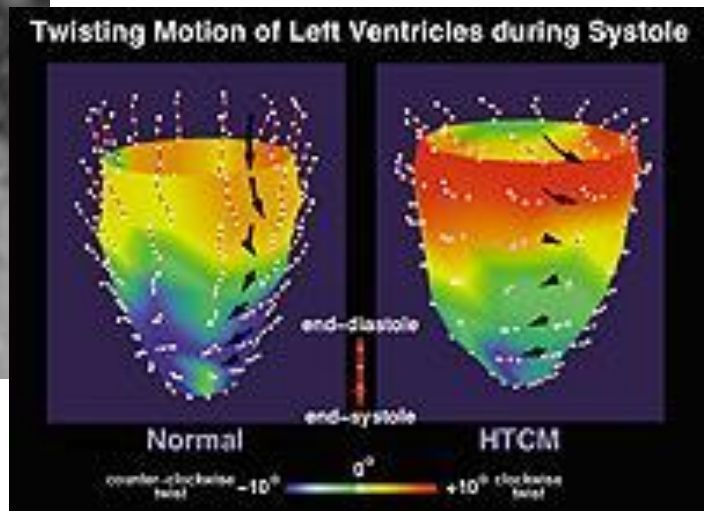
Motion and tracking in medical imaging:



beating heart



Slide by Aleosha Effros

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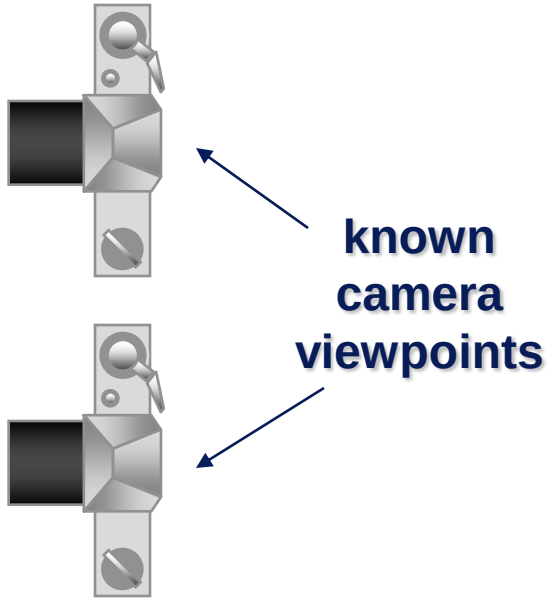
- Stereo Reconstruction from Photo Images
  - Shape from two (or more) images
  - Biological motivation



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(state of the art) stereo depth map

Ground truth

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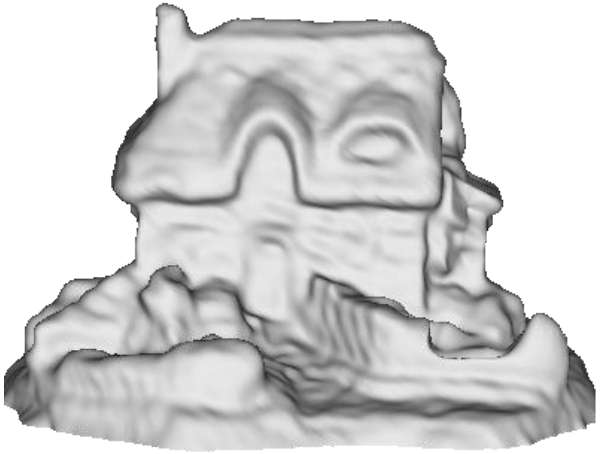
More then 2 images

Vogiatis et al. CVPR'05



3D model

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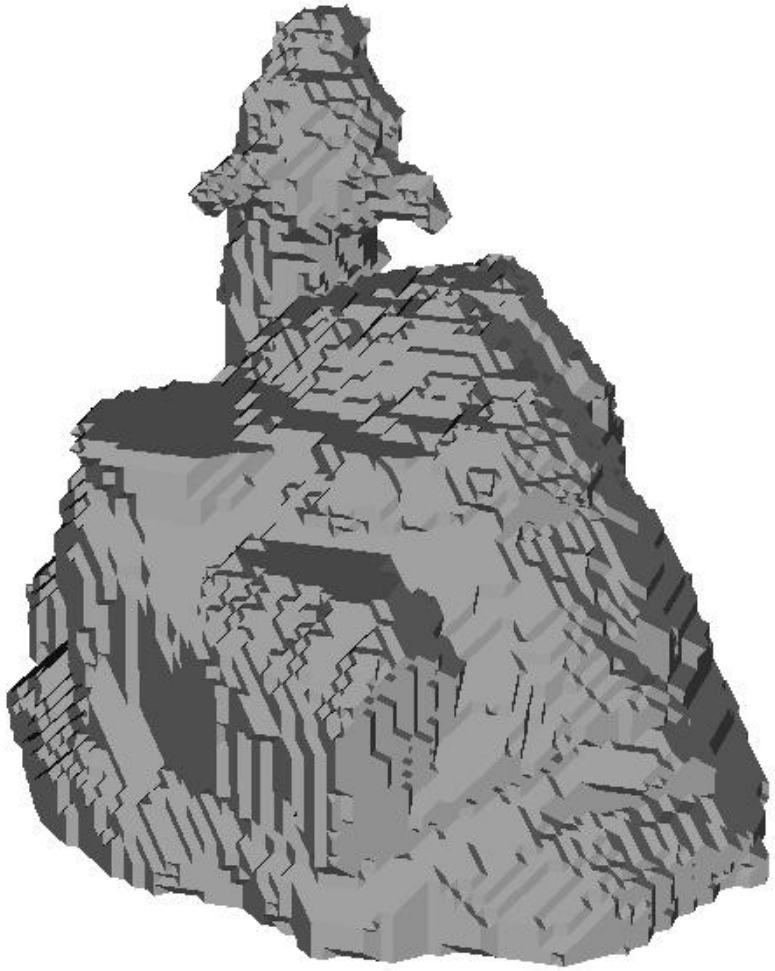
images from a **cheap** consumer-grade digital camera



Automatic 3D model reconstruction

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multi-view reconstruction set up

Furukawa&Ponce ECCV'06

3D model (texture mapped)

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Algorithms for Image Analysis

multi-view reconstruction set up

Furukawa&Ponce ECCV'06

3D model (texture mapped)

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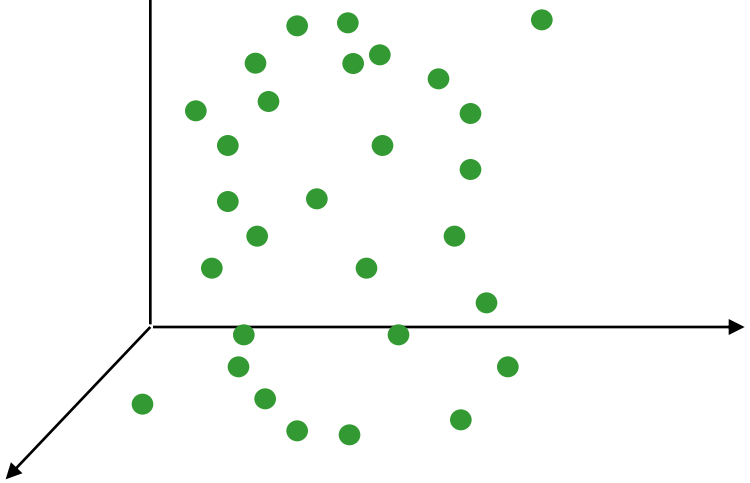
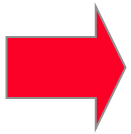
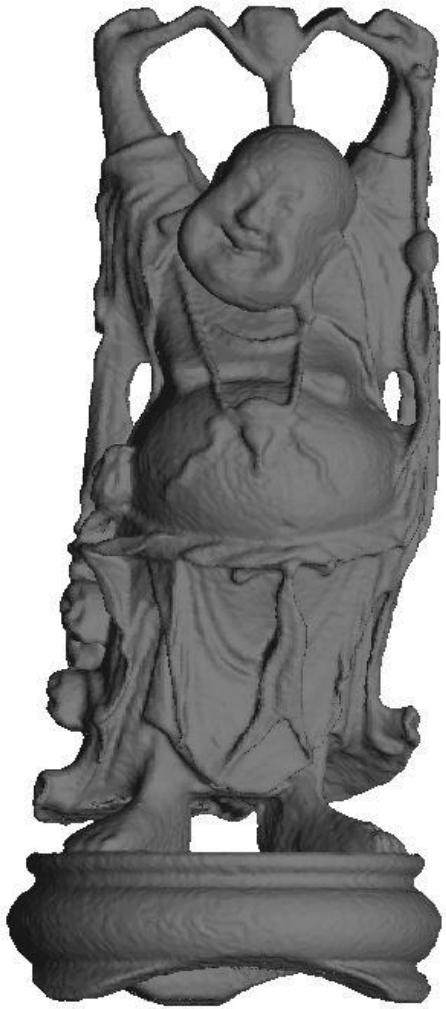
a cloud of 3D points

(e.g. from a laser scanner)



surface fitting:





3D model:

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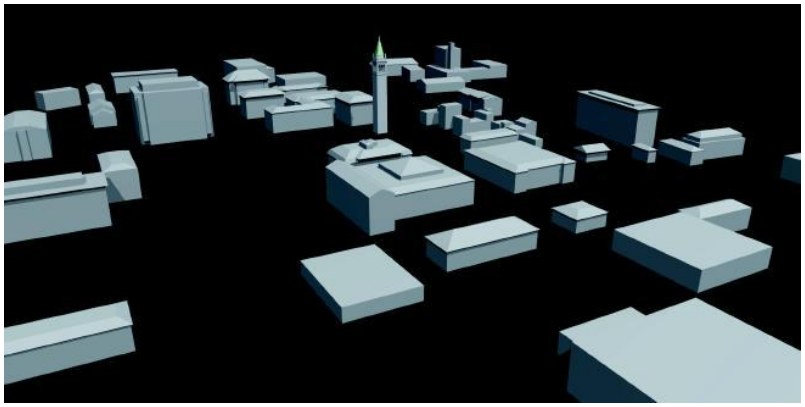
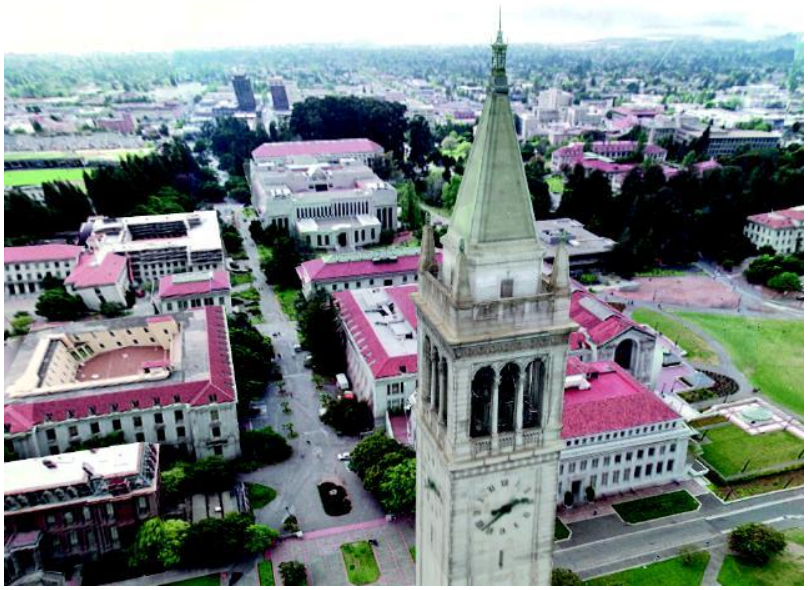


3D Scene Reconstruction:



Debevec, Taylor, and Malik, SIGGRAPH 1996

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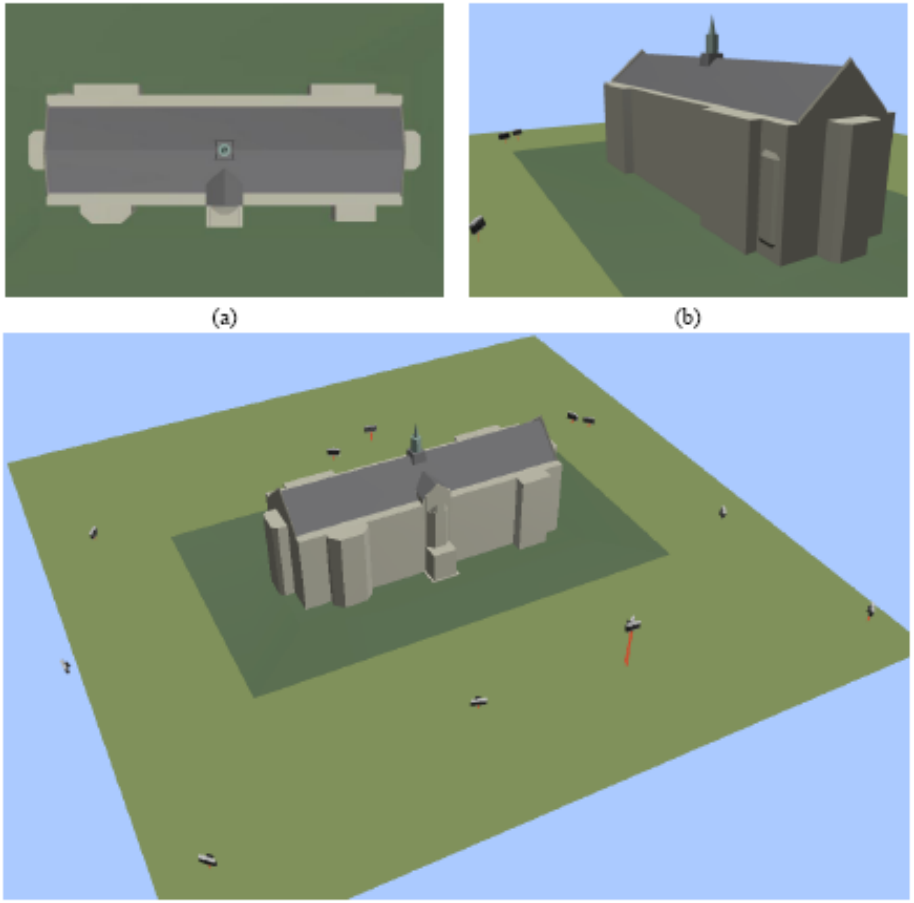

3D model constructed form 12 images

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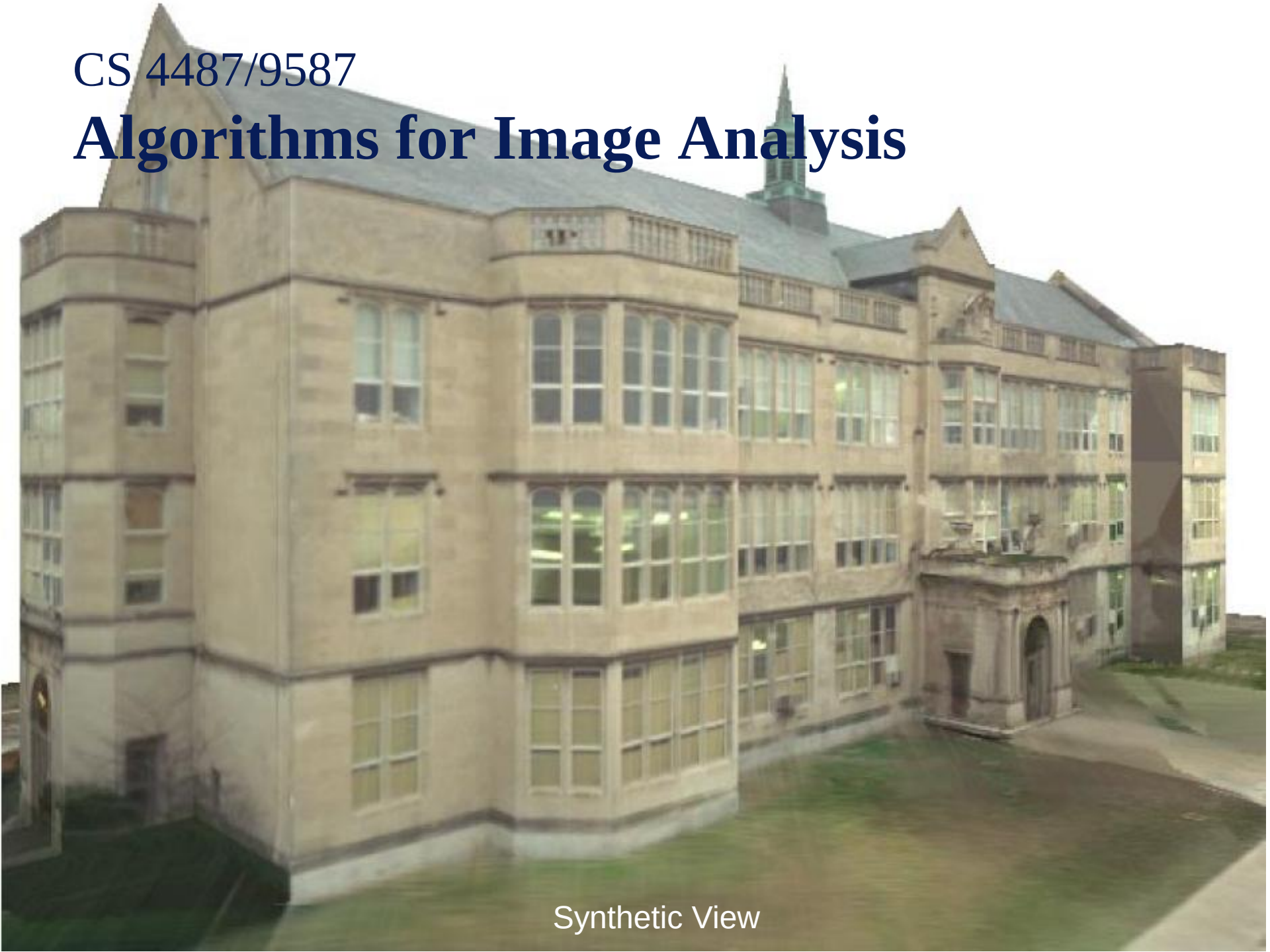

Synthetic View

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3D Scene Reconstruction:

From a single view!!!

Courtesy Creminisi et al.

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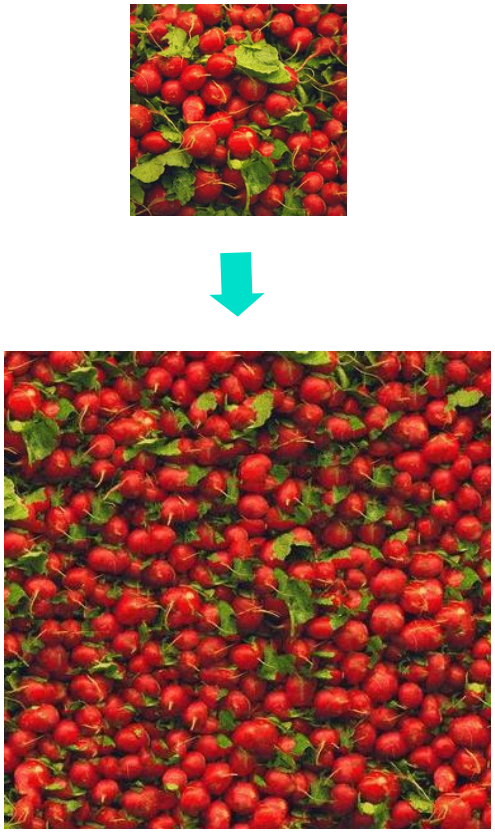
Texture Synthesis:



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Video Texture:

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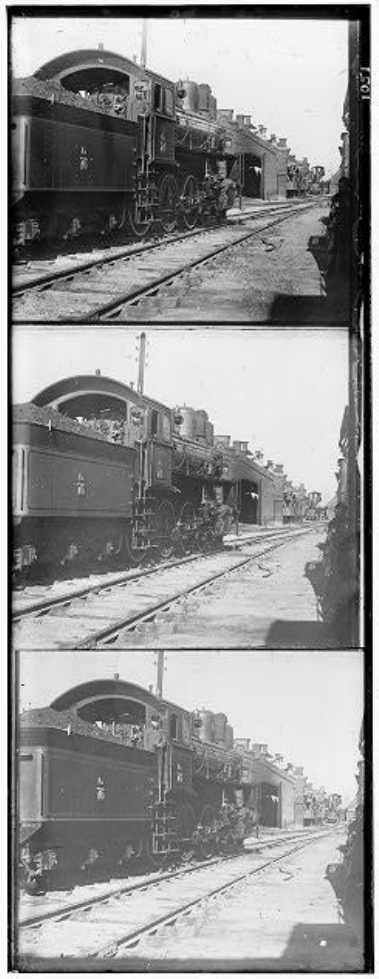
Digital scan of a slide with independent R G B acquisition of a scene (dated 1905)



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Medical Image Fusion:

MRI + CT

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Photo Image Morphing:

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Image Blending:

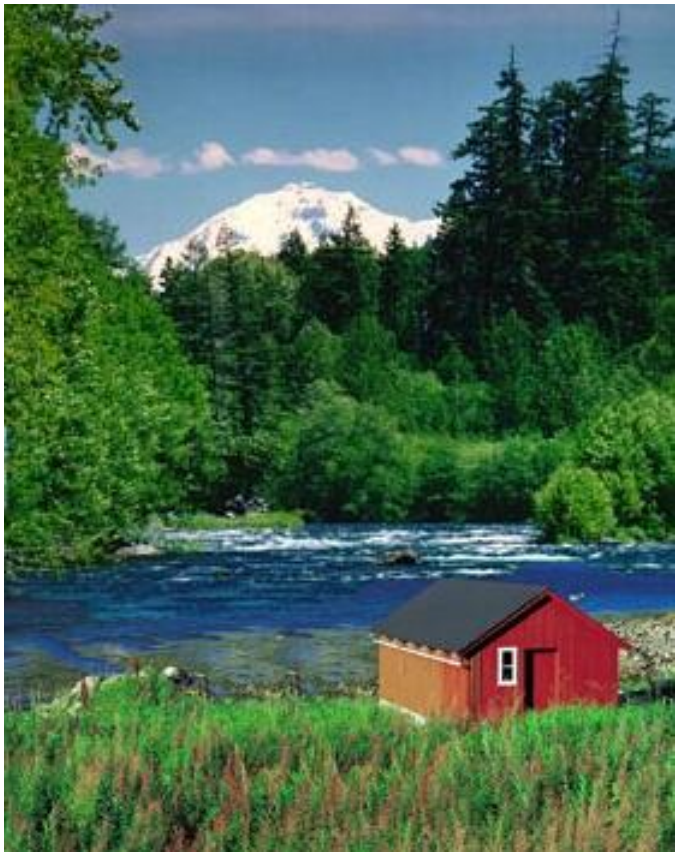

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Image Blending: