

Digital Image Processing

Lecture One

Introduction to Digital Image Processing

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Reference

Digital Image Processing, Rafael C. by Gonzalez Richard E. Woods, Addison-Wesley, 2002



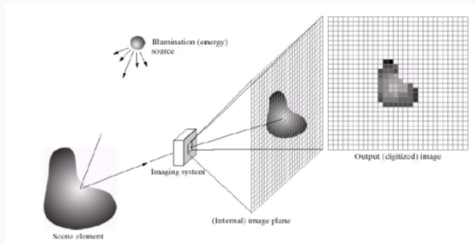
This Lecture Includes:

- What is digital image?
- What is digital image processing?
- History of digital image processing
- Stat of the art examples of digital image processing
- Key stages in digital image processing



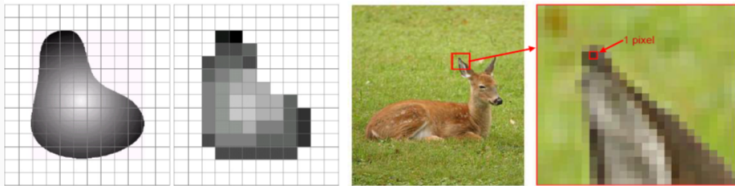
What is a Digital Image?

- A digital image is a representation of a two-dimensional image as a finite set of digital values, called picture elements or pixels.



What is Digital Image?

- Pixel values typically represent gray levels, colors, heights, opacities etc.
- Remember digitization implies that a digital image is an approximation of a real scene.



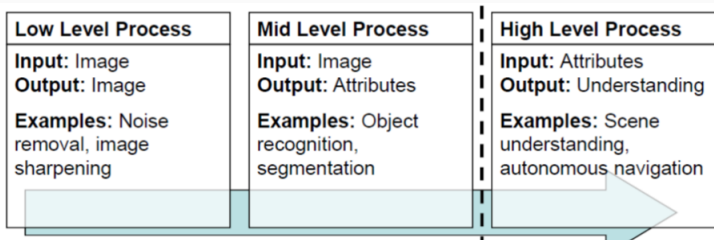
What is Digital Image?

- Digital image processing focuses on two major tasks:
 - Improvement of pictorial information for human interpretation
 - Processing of image data for storage, transmission and representation for autonomous machine perception
- Some argument about where image processing ends and fields such as image analysis and computer vision start



What is Digital Image?

- The continuum from image processing to computer vision can be broken up into low-, mid- and high-level processes



History of Digital Image Processing

- Early 1920s: One of the first applications of digital imaging was in the newspaper industry
 - The Bartlane cable picture transmission service
 - Images were transferred by submarine cable between London and New York
 - Pictures were coded for cable transfer and reconstructed at the receiving end on a telegraph printer

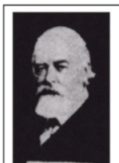


Early digital image



History of Digital Image Processing

- Mid to late 1920s: Improvements to the Bartlane system resulted in higher quality images
 - New reproduction processes based on photographic techniques
 - Increased number of tones in reproduced images



Improved
digital image



Early 15 tone digital
image



History of Digital Image Processing

- 1960s: Improvements in computing technology and the onset of the space race led to a surge of work in digital image processing
 - 1964: Computers used to improve the quality of images of the moon taken by the Ranger 7 probe
 - Such techniques were used in other space missions including the Apollo landings

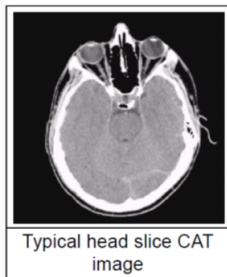


A picture of the moon taken by the Ranger 7 probe minutes before landing



History of Digital Image Processing

- 1970s: Digital image processing begins to be used in medical applications
 - 1979: Sir Godfrey N. Hounsfield Prof. Allan M. Cormack share the Nobel Prize in medicine for the invention of tomography, the technology behind Computerised Axial Tomography (CAT) scans

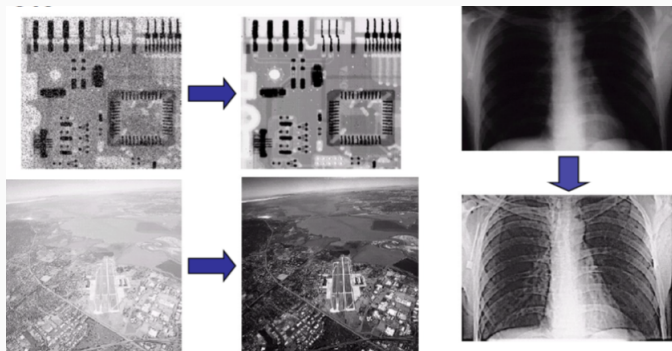


- 1980s - Today: The use of digital image processing techniques has exploded and they are now used for all kinds of tasks in all kinds of areas
 - Image enhancement/restoration
 - Artistic effects
 - Medical Visualisation + Diagnostics + Treatment Planning
 - Industrial inspection
 - Law enforcement
 - Human computer interfaces

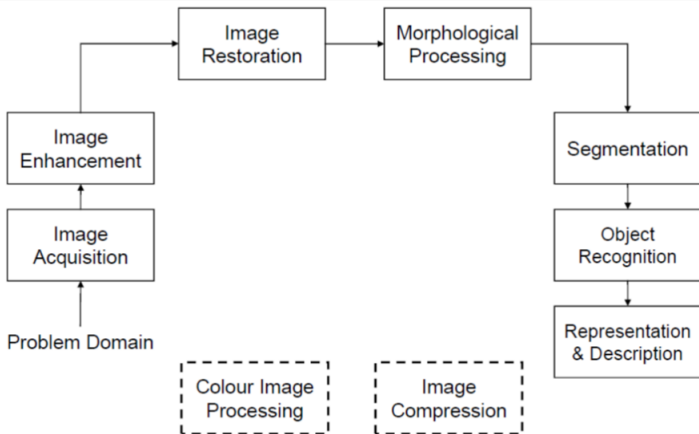


History of Digital Image Processing

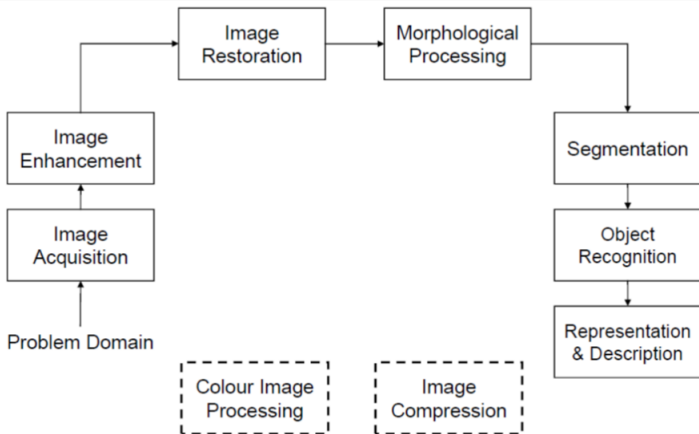
- One of the most common uses of DIP techniques: improve quality, remove noise etc



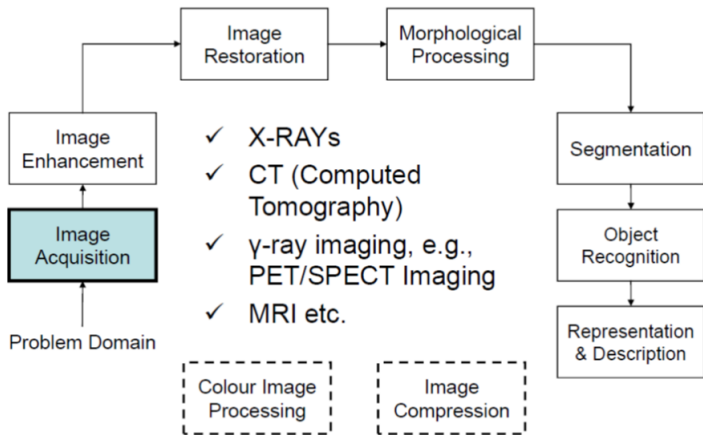
Key Stages in Image Processing



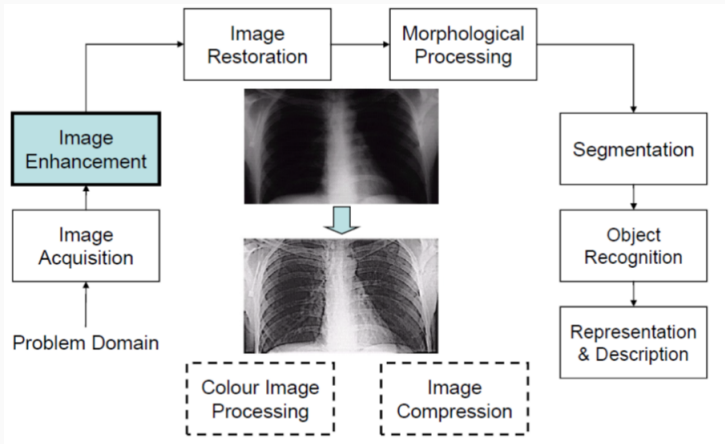
Key Stages in Image Processing



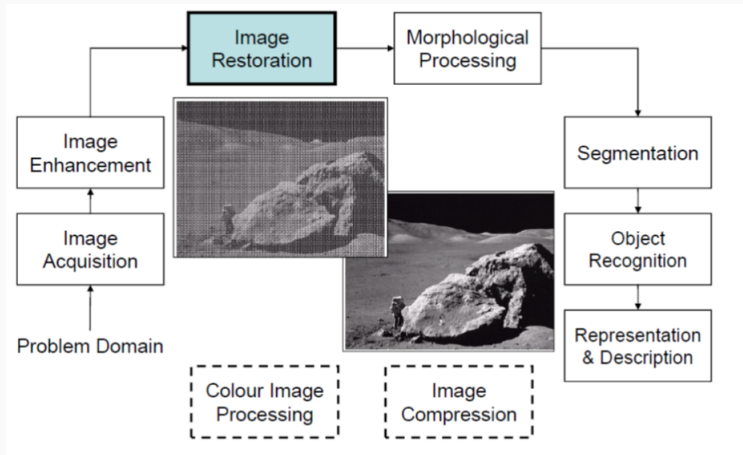
Key Stages in Image Processing



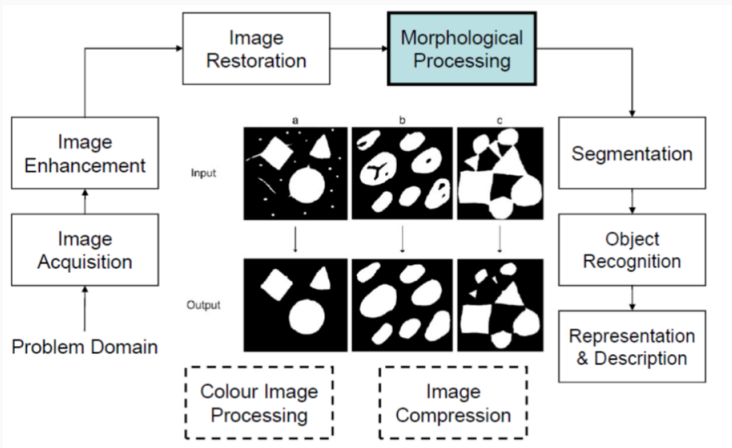
Key Stages in Image Processing



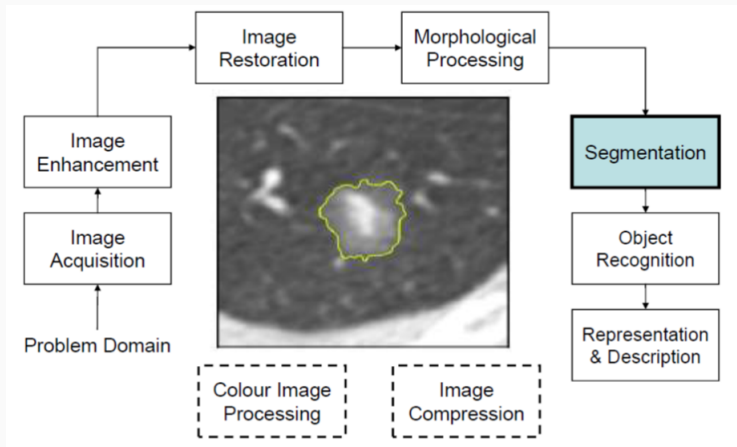
Key Stages in Image Processing



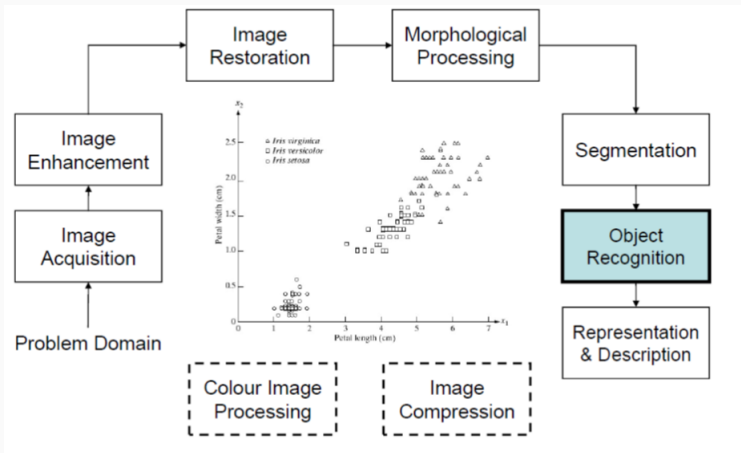
Key Stages in Image Processing



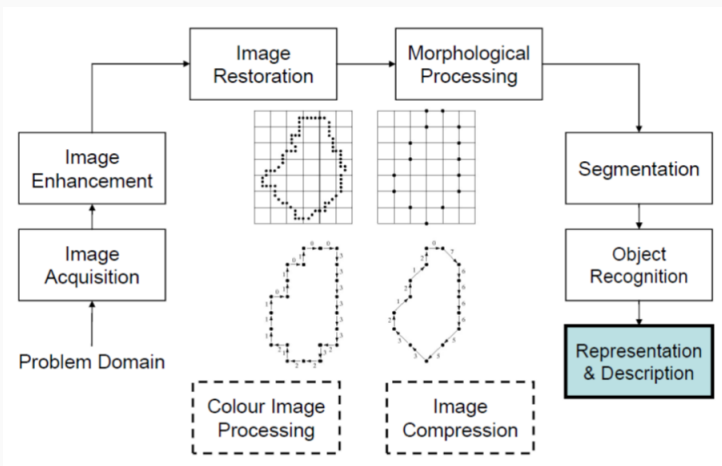
Key Stages in Image Processing



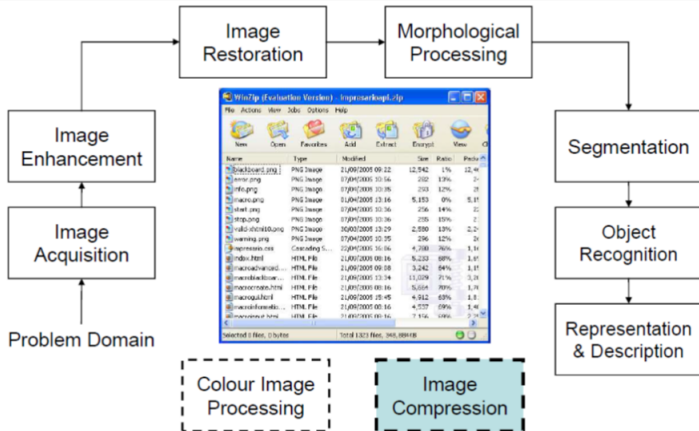
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