15EEE337 Digital Image Processing

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Why so much fuss about DIP??

- Improve pictorial information for human interpretation.
- Processing of image data for tasks(storage, transmission and extraction).

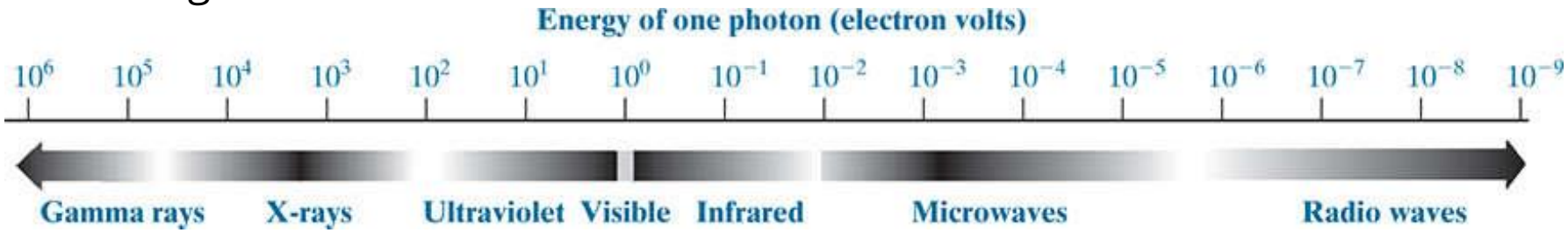
What is DIP?

But what is an Image??

- Two dimensional function *f(x,y)*
- *x,y* plane /spatial coordinates
- Value/Amplitude of f @ *x,y* is the intensity or gray level of that image at those points.
- Digital image- *x,y* and intensity values of f are finite and discrete values.
- DI has a finite number of elements ,each has a particular value and location – **picture elements** ,**image elements** ,**pel** and **pixels**(the most widely used term)
- Processing digital images by means of a digital computer.

- Human perception-Vision sense.
- Only a part of the electromagnetic spectrum is visible for humans.
- Imaging machines – gamma to radio waves -- Entire EM spectrum(almost).

- Confusion with other related areas– image analysis, computer vision.
  - No general agreement on this ☹
- One way, but its limits the applications- both input and output of a process are images.



Three Types of computerized processes

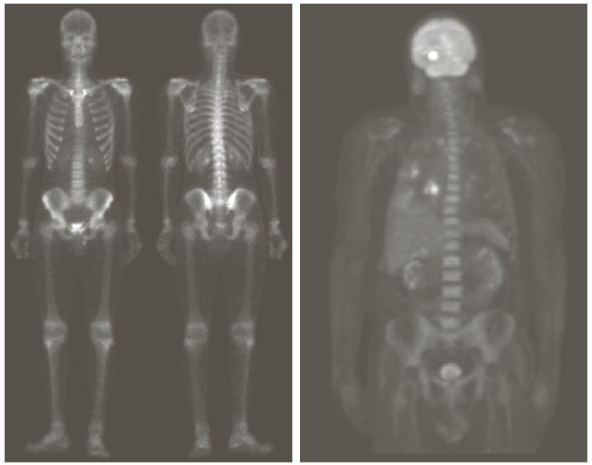
High	•“making” sense –image analysis, performing cognitive functions normally associated with human vision.
Mid	•Tasks like segmentation, reduce features to a suitable form for computer processing, recognition of objects. •Input are images, but output are attributes extracted from these images
Low	•Primitive operations-image preprocessing. Reduce noise, contrast enhancement and image sharpening. •Input and output are images.

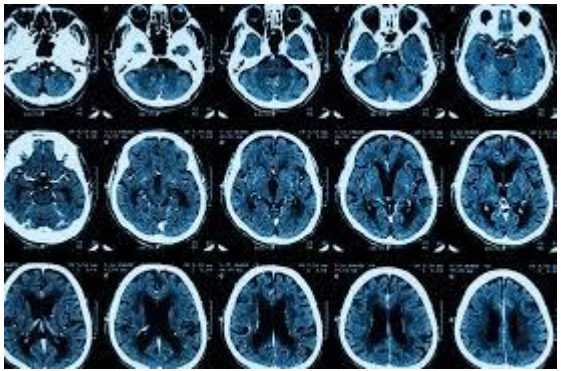
Verticals in DIP

- Image sharpening and restoration
- Medical Field
  - Gamma-ray imaging
  - PET scan
  - X-Ray Imaging
  - Medical CT scan
  - UV imaging
- Robot vision
- Pattern recognition
- Filters on Editing Apps and Social Media

ABRAHAM LINCOLN

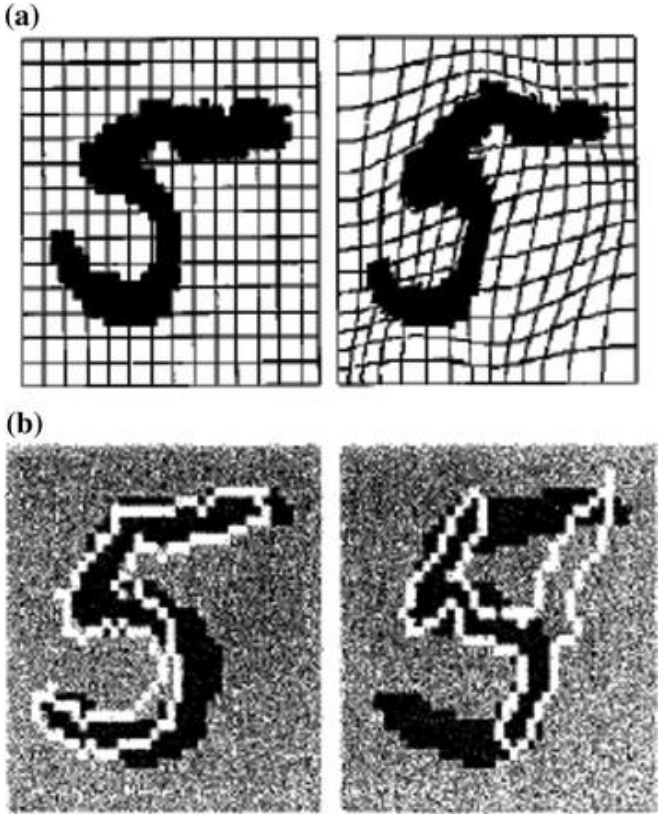
Medical field





Robot Vision

Pattern



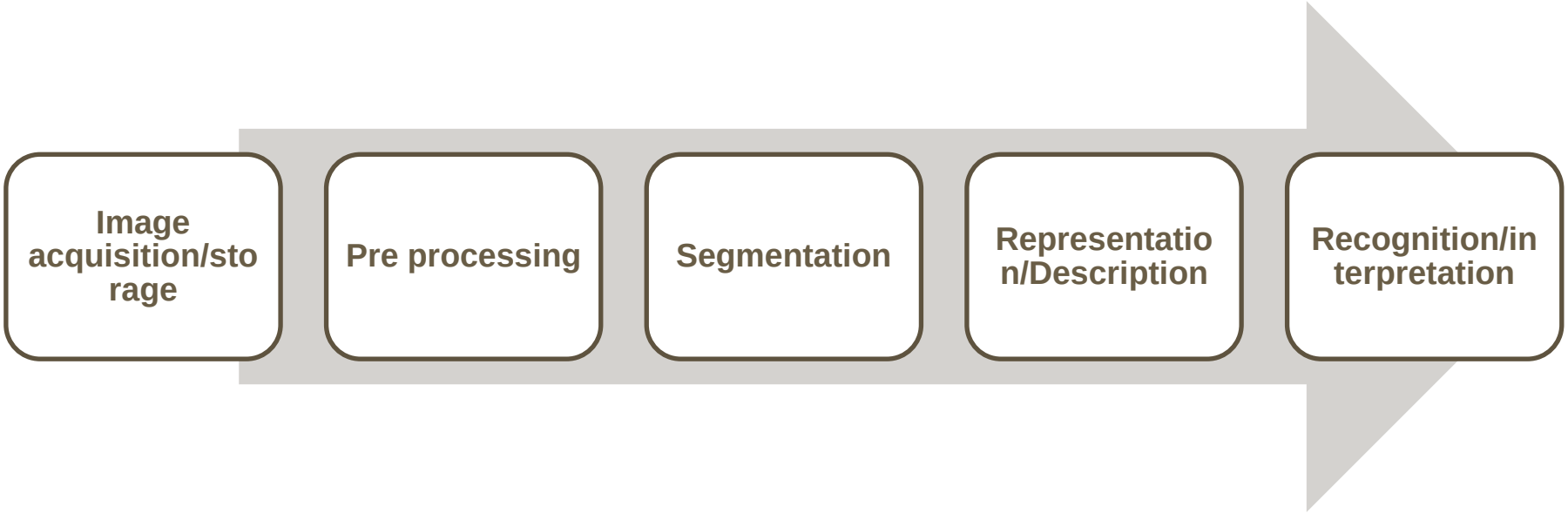
Social Media

Original Image

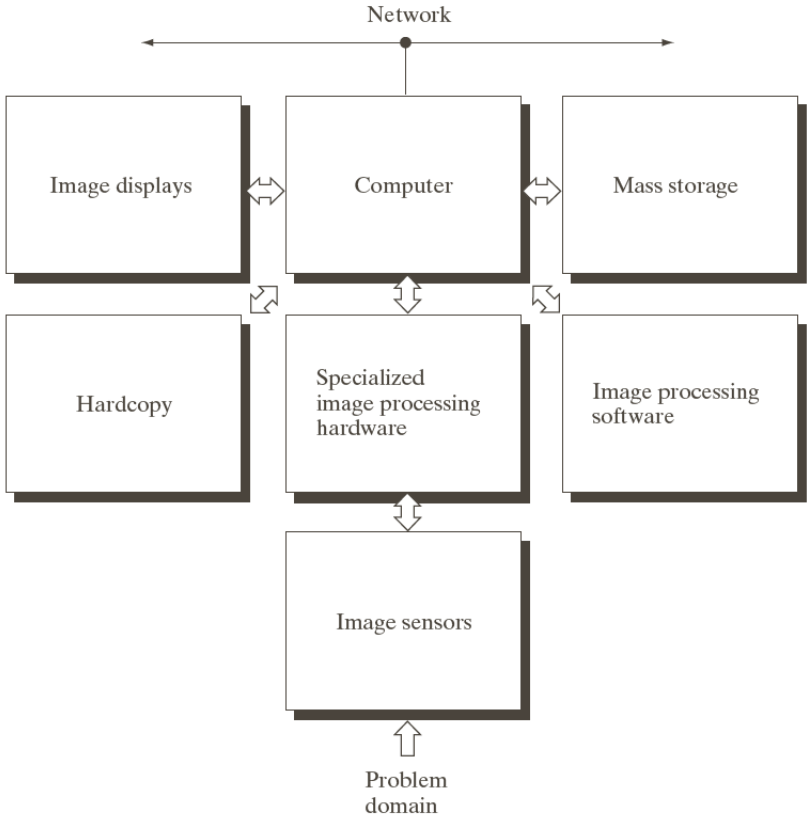
Filtered Image

Steps in Digital Image Processing

- Acquisition and storage
- Load into memory and save to disk
- Manipulation, enhancement, and restoration
- Segmentation
- Information extraction/representation



Components of DIP system



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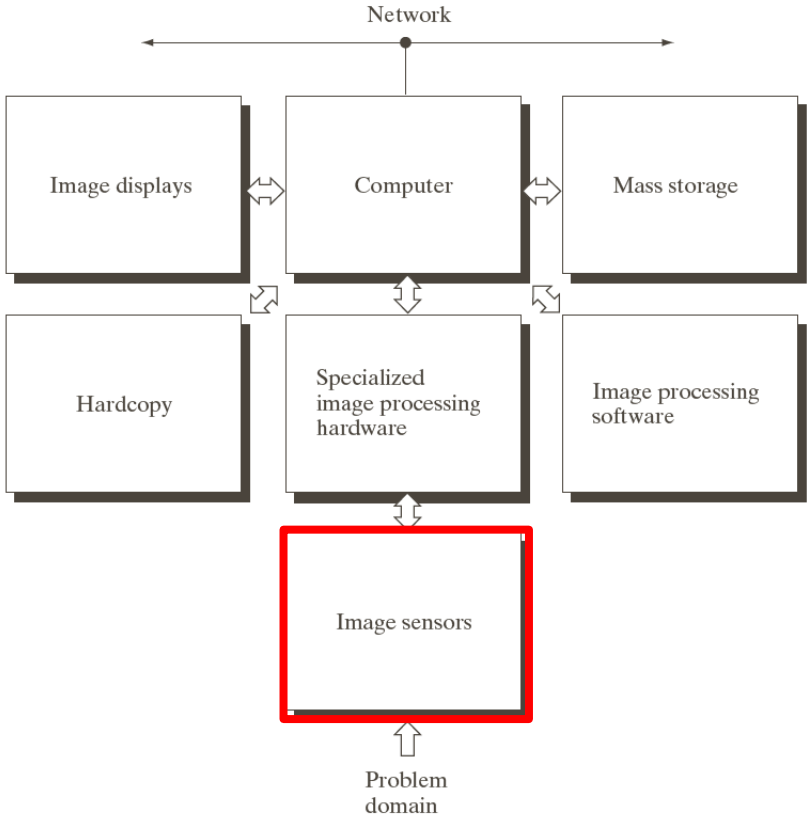

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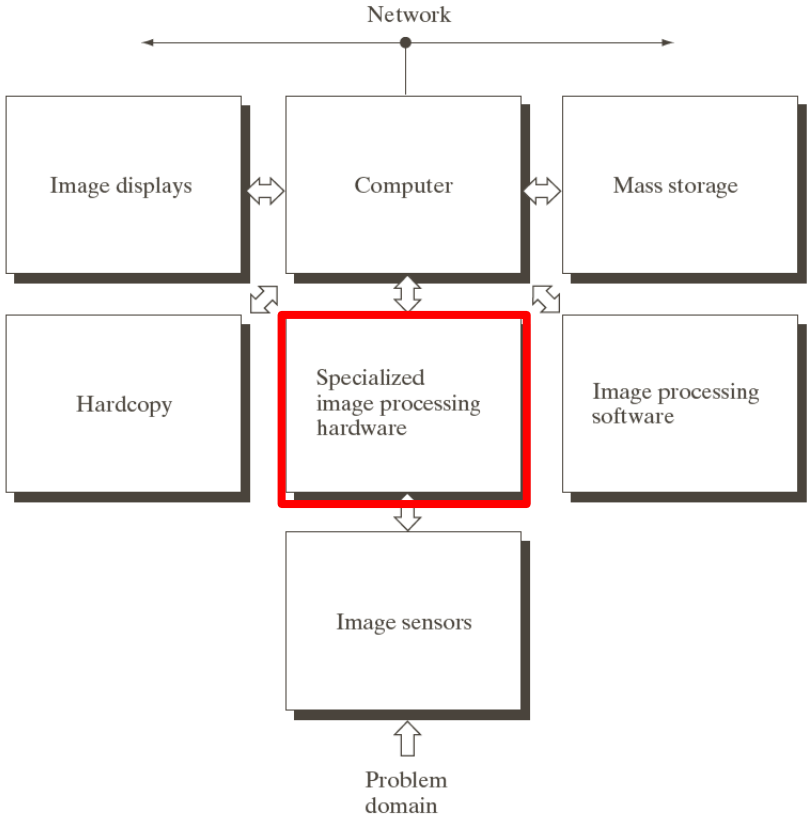

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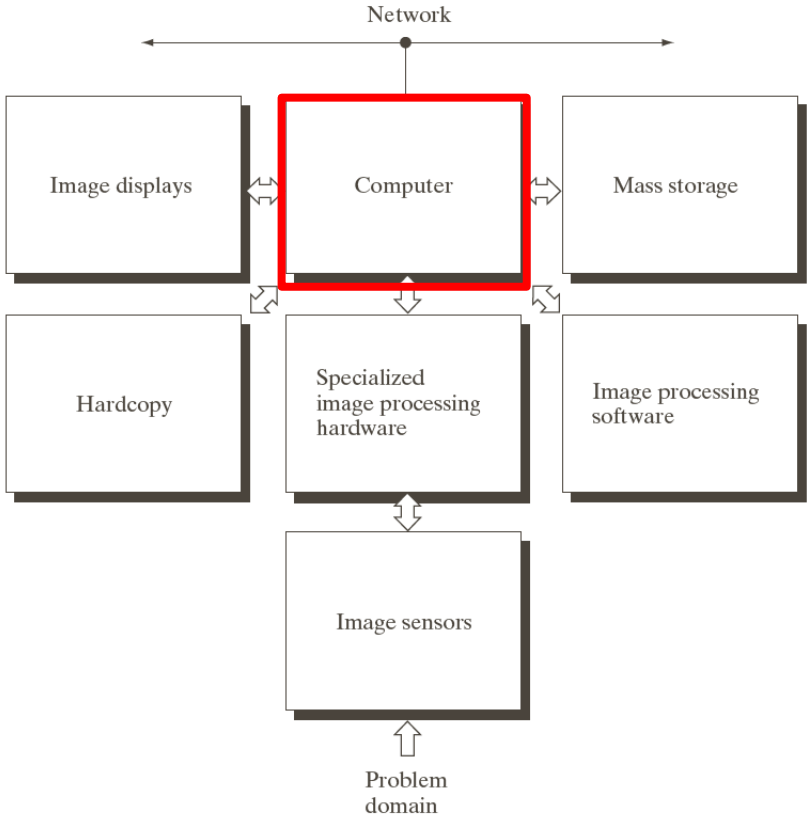

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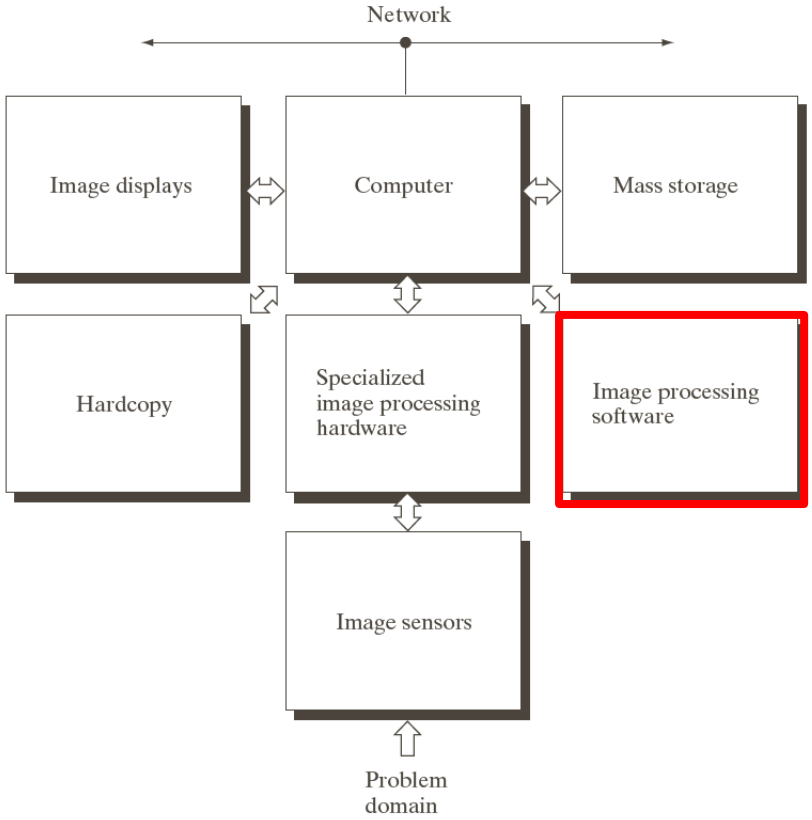

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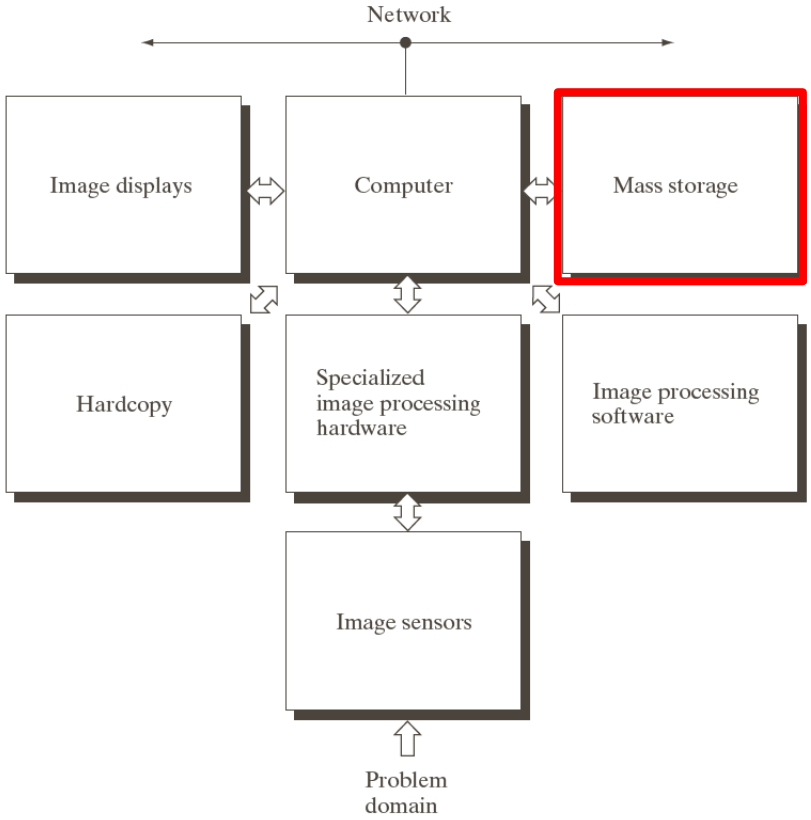

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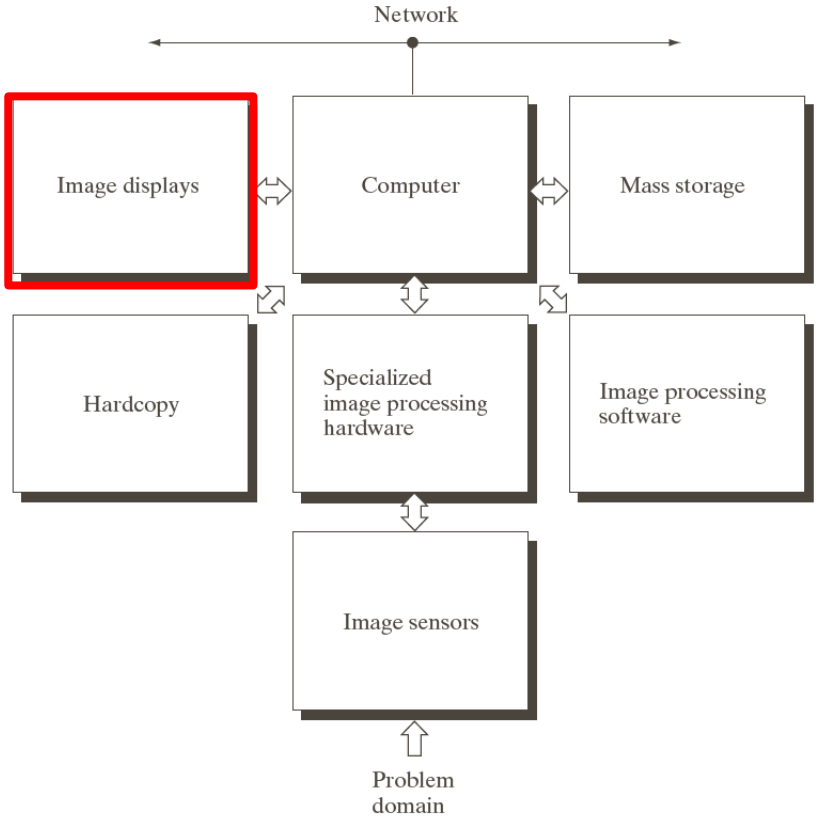

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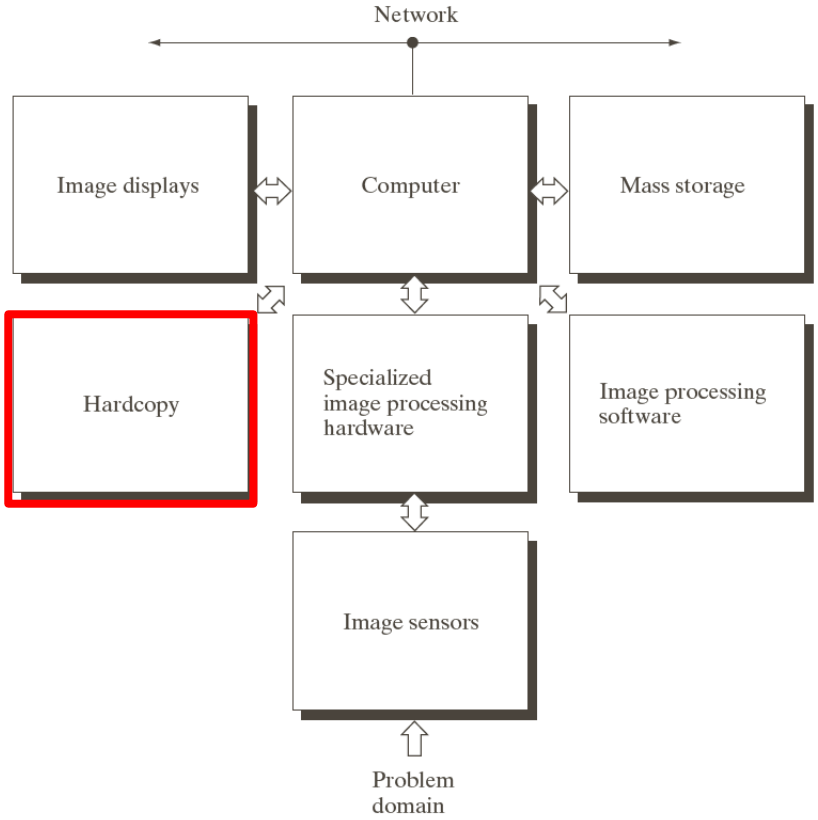

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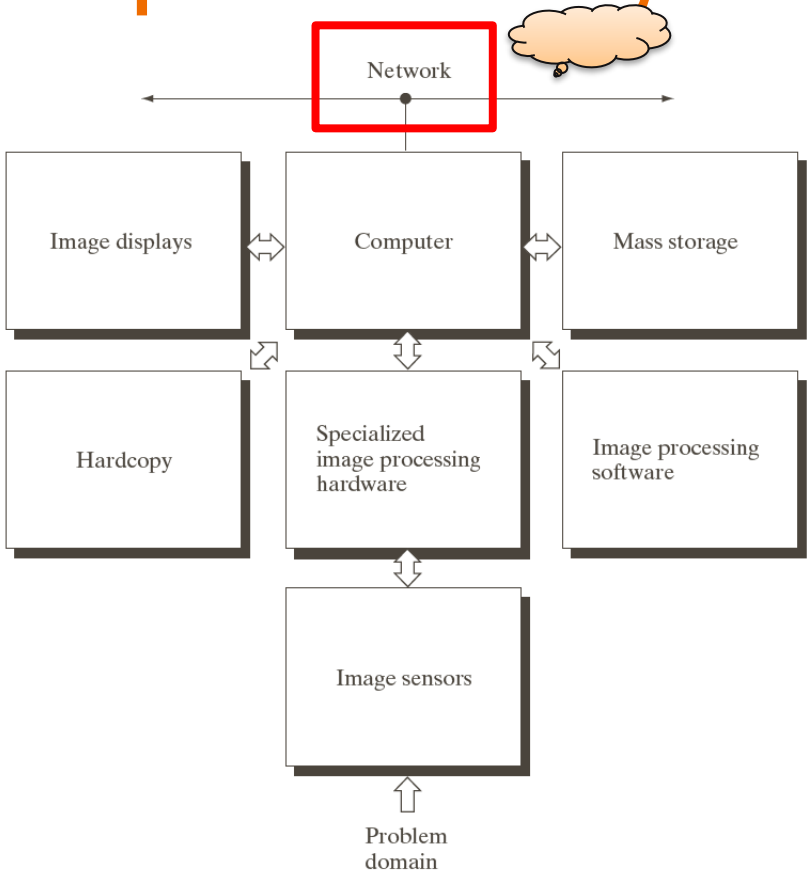
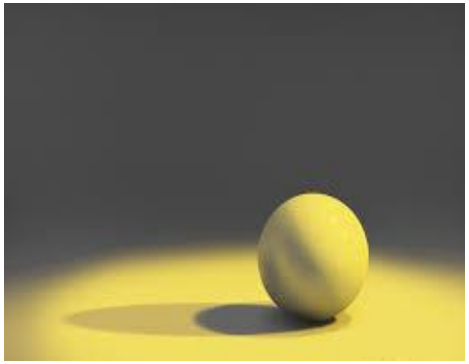
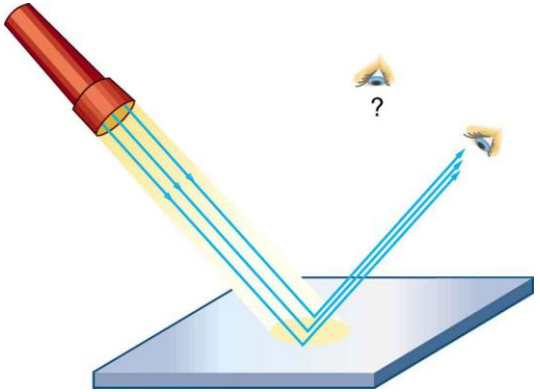
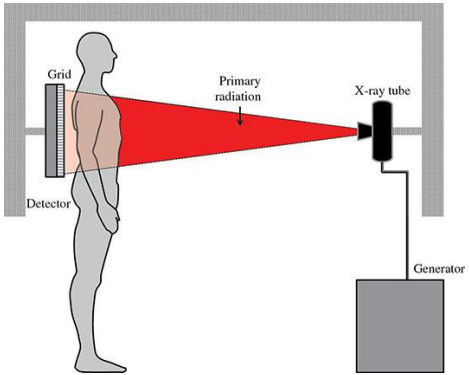


Image Sensing & Acquisition

- Generation of images-combination of " illumination" source and the absorption of energy by source by the elements of "scene" .
- Illumination source – Source of EM energy- Radar, infrared, X-Ray, Ultrasound.
- Scene –objects ,buried rock, human brain.
- Reflection – From objects
- Transmission- Through objects.







Sensor

Transform the incident energy into digital images.

- Incoming energy converted into voltage using input electrical power and sensor material.
- Sensor material- depend on type of energy being detected.
- Voltage- output of sensor.
- Digitize the response to obtain the digital quantity.

THANK
YOU