University of Al-Hamdaniya
Computer Science Department
Digital image processing

Components and Fundamental Steps of Digital Image Processing

Lec-4

By

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Components of Image Processing System

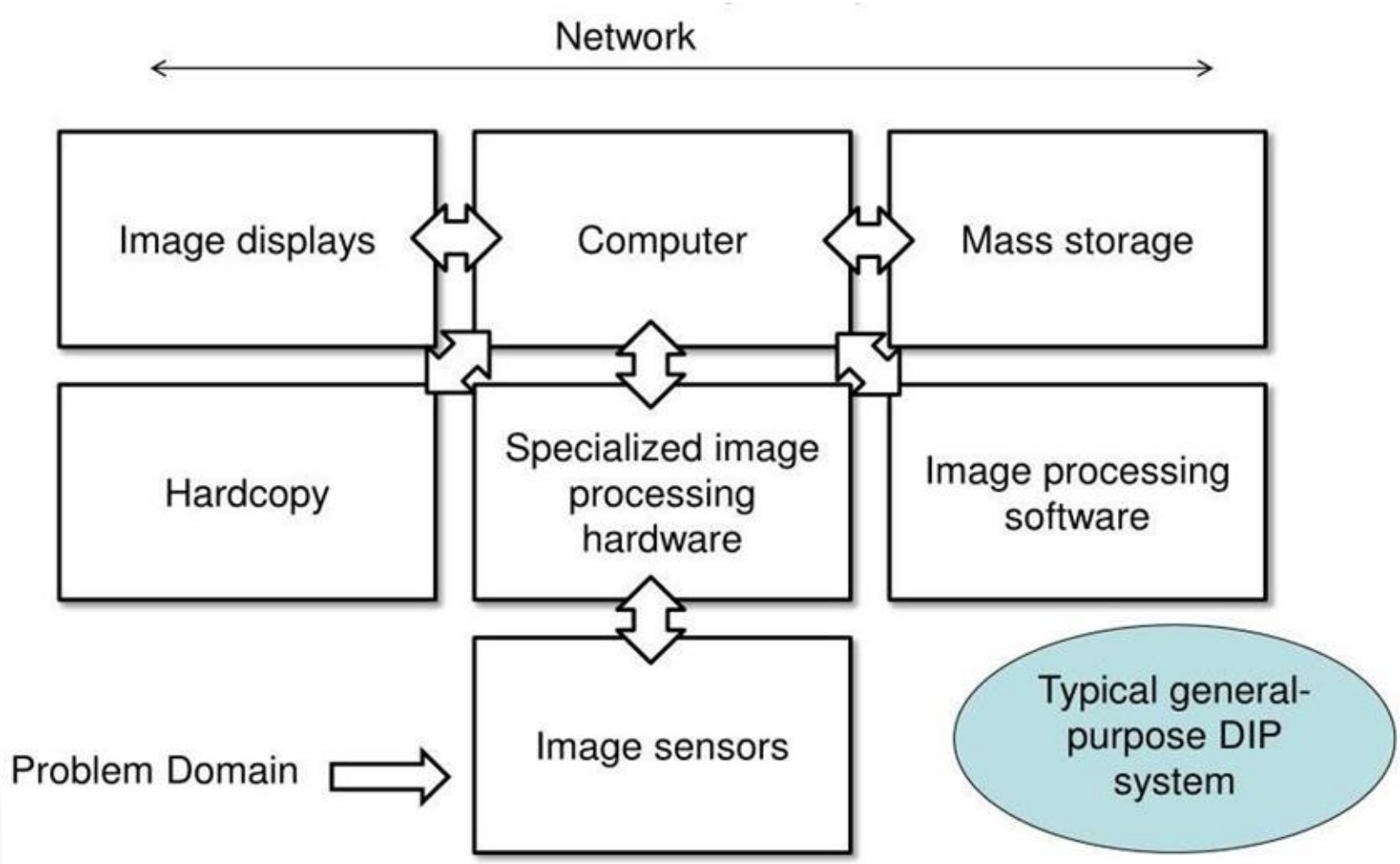


Fig: Components of Image processing System

Components of Image Processing System

- **Image Sensors:** With reference to sensing, two elements are required to acquire digital image. The first is a physical device that is sensitive to the energy radiated by the object we wish to image and second is specialized image processing hardware.

- **Specialize Image Processing Hardware:** It consists of the digitizer plus hardware that performs other primitive operations such as an arithmetic logic unit, which performs arithmetic such addition and subtraction and logical operations in parallel on images.

- **Computer:** It is a general-purpose computer and can range from a PC to a supercomputer depending on the application. In dedicated applications, sometimes specially designed computer is used to achieve a required level of performance.

Components of Image Processing System

•**Software:** It consists of specialized modules that perform specific tasks a well-designed package also includes capability for the user to write code, as a minimum, utilizes the specialized module. More sophisticated software packages allow the integration of these modules.

•**Mass Storage:** This capability is a must in image processing applications. An image of size 1024 x1024 pixels, in which the intensity of each pixel is an 8- bit quantity requires one Megabytes of storage space if the image is not compressed. Image processing applications falls into three principal categories of storage.

- Short term storage for use during processing
- On line storage for relatively fast retrieval
- Archival storage such as magnetic tapes and disks

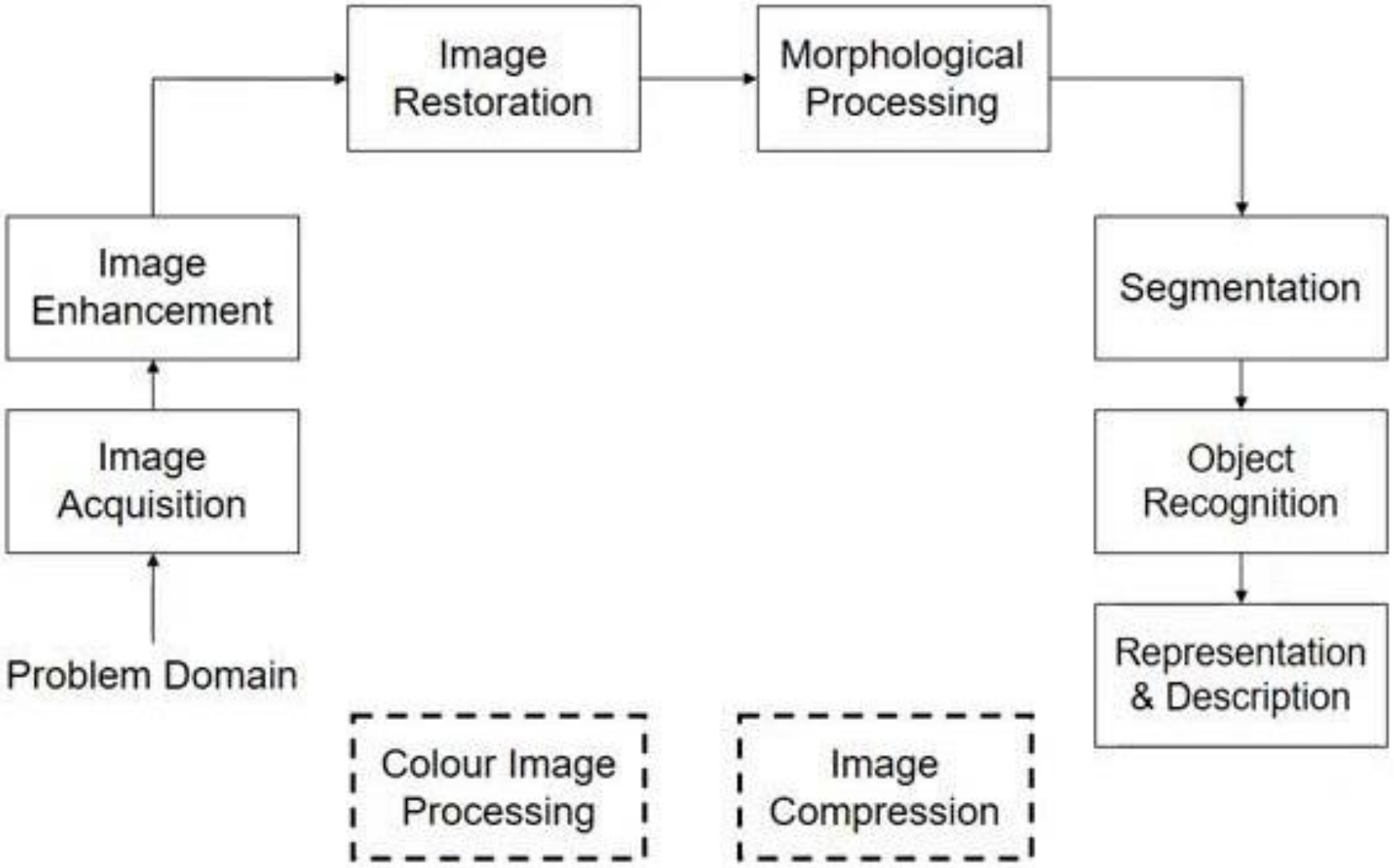
Components of Image Processing System

•**Image Display:** Image displays in use today are mainly color TV monitors. These monitors are driven by the outputs of image and graphics displays cards that are an integral part of computer system.

•**Hardcopy Devices:** The devices for recording image include laser printers, film cameras, heat sensitive devices inkjet units and digital units such as optical and CD ROM disk. Films provide the highest possible resolution, but paper is the obvious medium of choice for written applications.

•**Networking:** It is almost a default function in any computer system in use today because of the large amount of data inherent in image processing applications. The key consideration in image transmission bandwidth

Fundamental Steps of Digital Image Processing



Fundamental Steps of Digital Image Processing

Image Acquisition

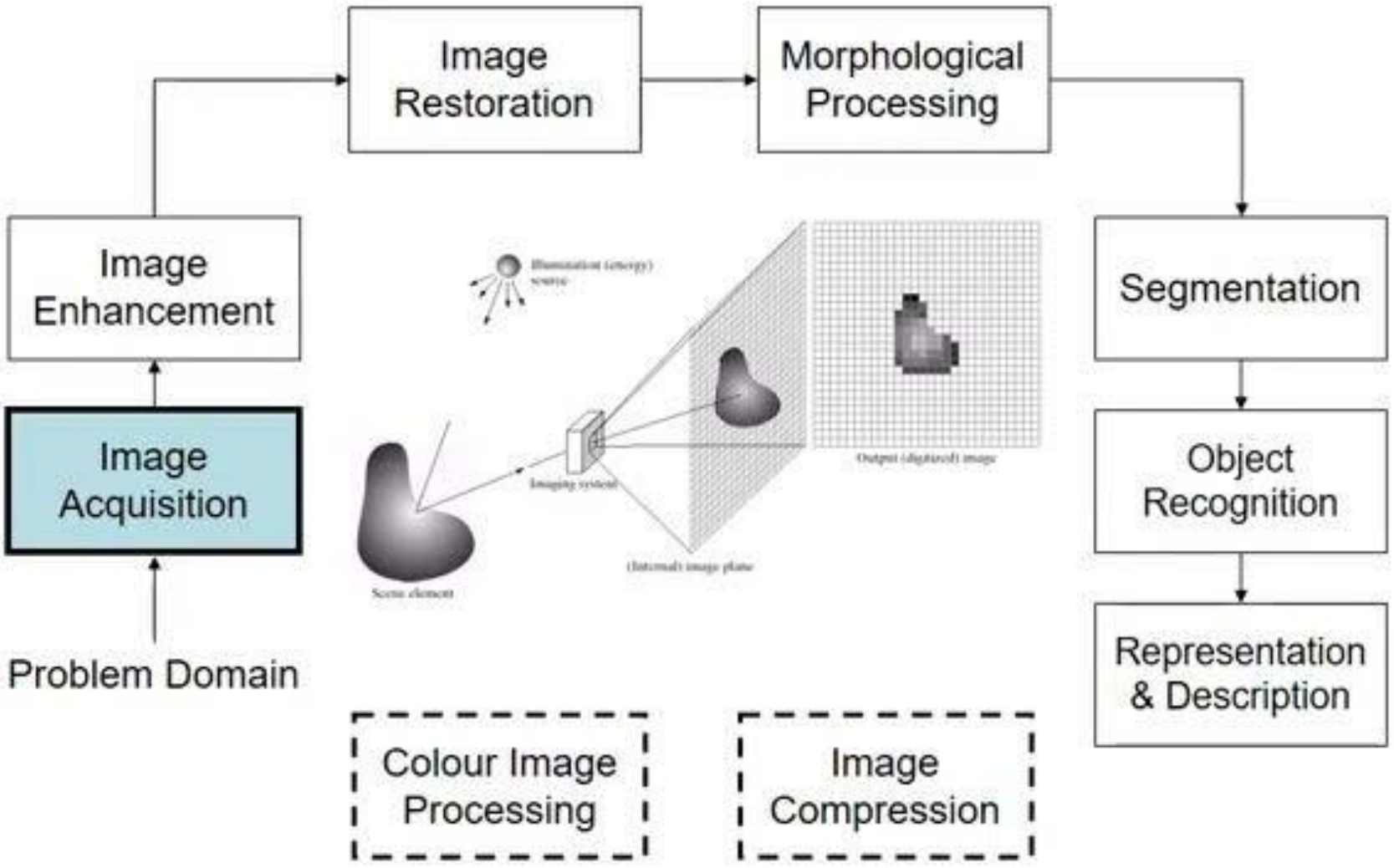


Image Acquisition

- Is the first process, generally, the image acquisition stage involves preprocessing such as scaling.

Fundamental Steps of Digital Image Processing

Image Enhancement

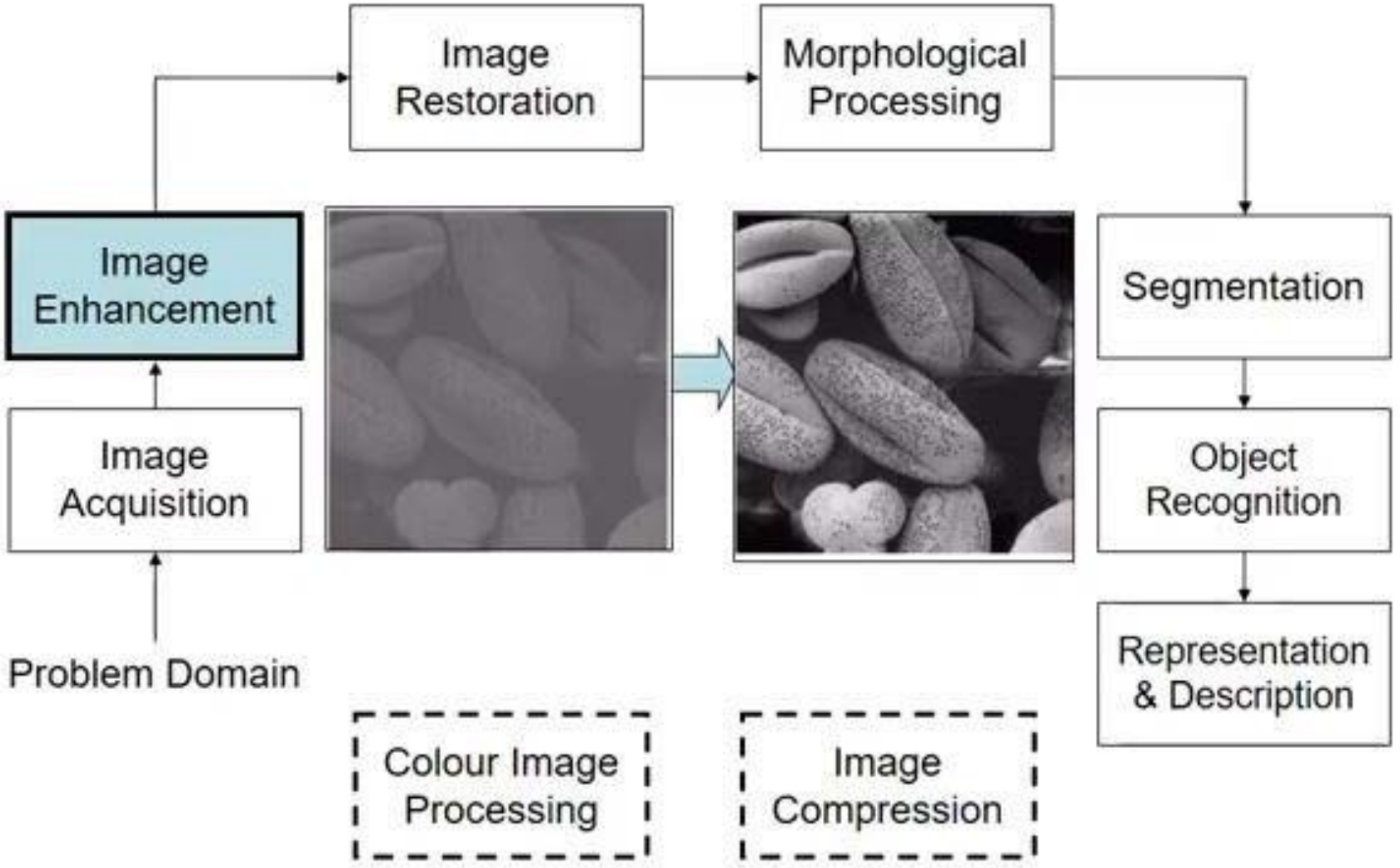


Image Enhancement

- It is the process of adjusting digital images so that the results are more suitable for display or further image analysis.

Fundamental Steps of Digital Image Processing

Image Restoration

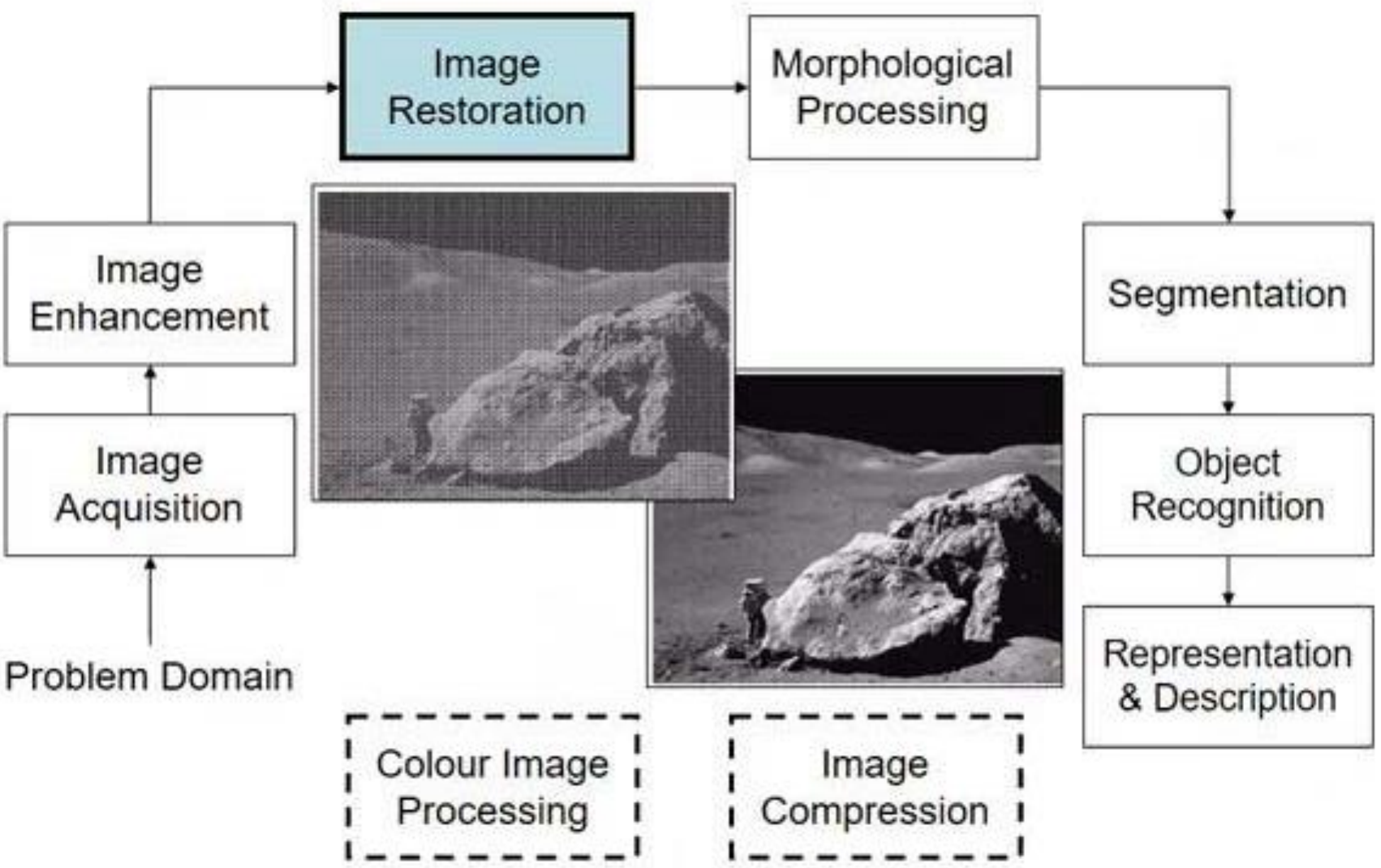


Image Restoration

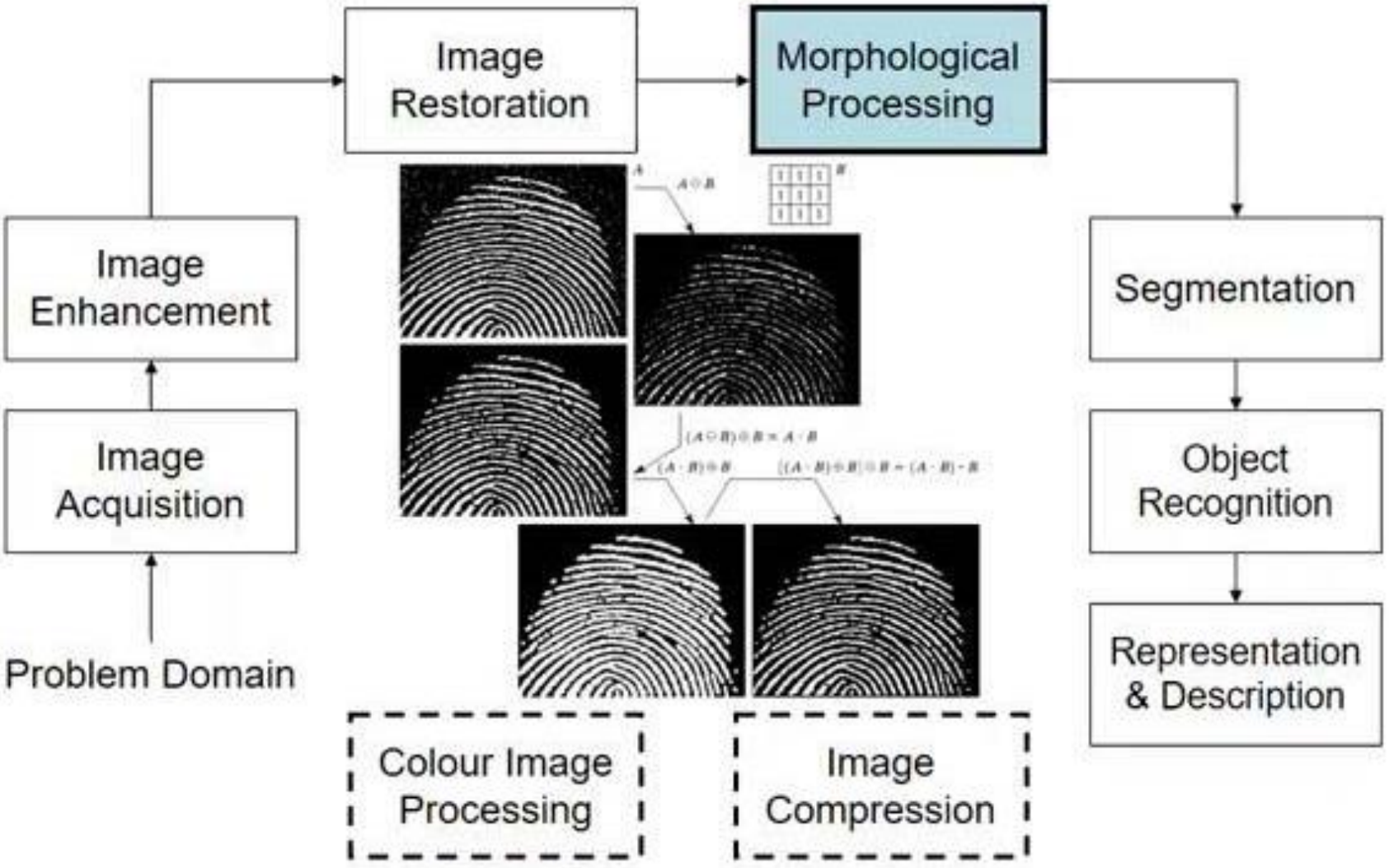
- It is an area that also deals with improving the appearance of an image. Image Restoration is the operation of taking corrupt/noisy image and estimating the clean original image.

Fig: Degraded image

Fig: Restored image

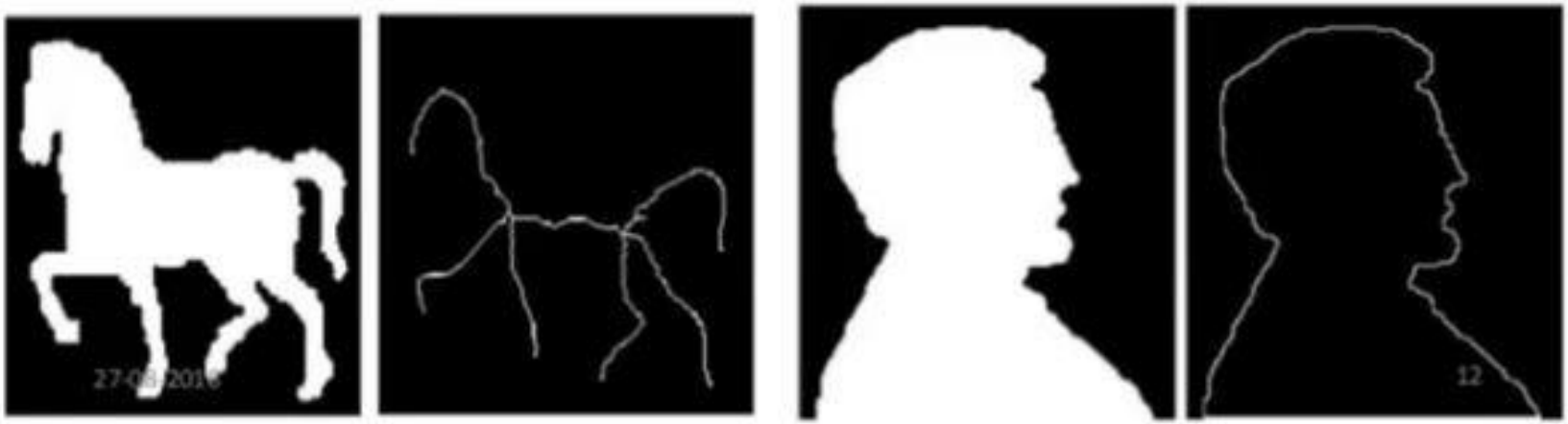
Fundamental Steps of Digital Image Processing

Morphological Processing



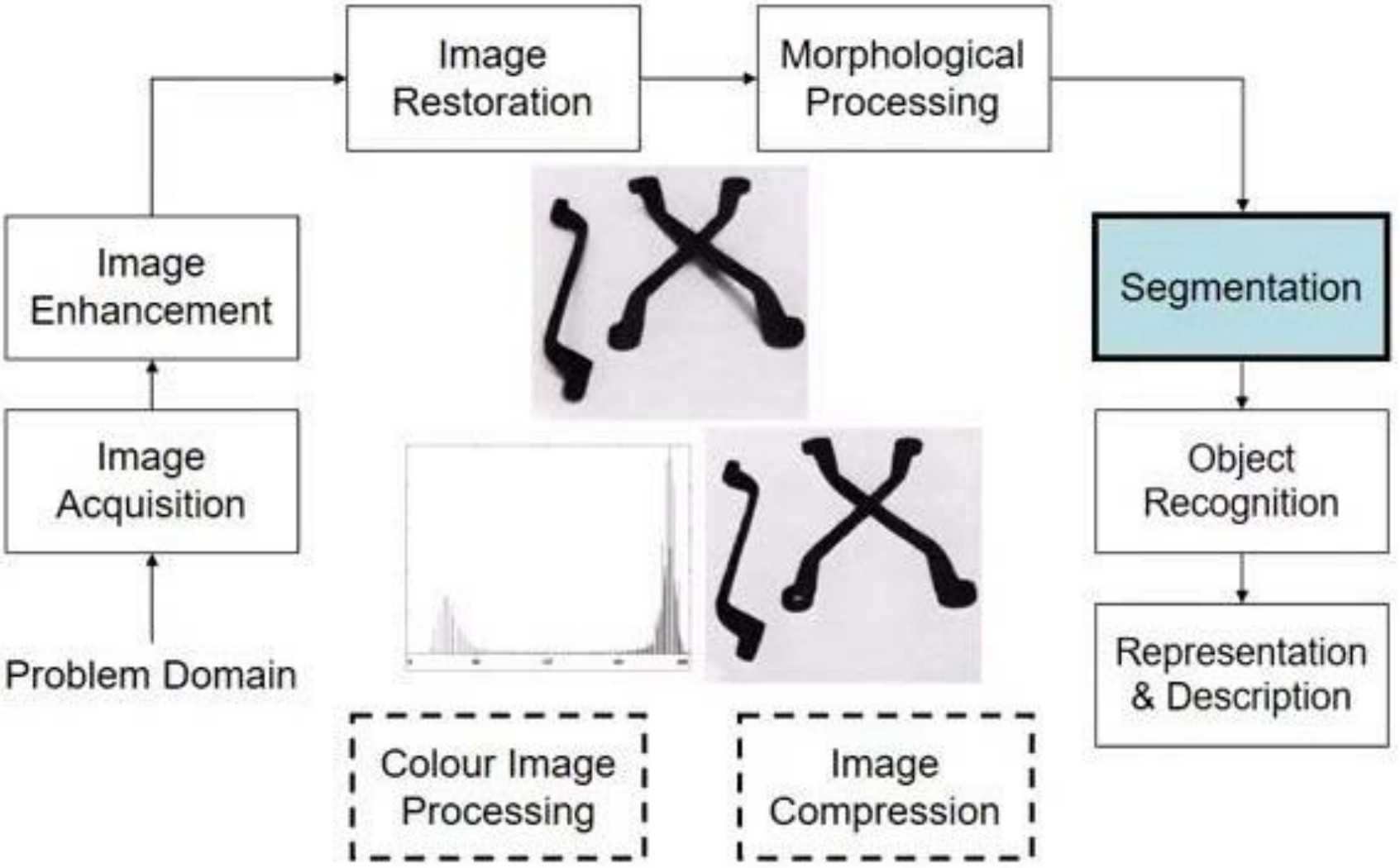
Morphological Processing

- deals with tools for extracting image components that are useful in the representation and description of shape and boundary of objects. It is majorly used in automated inspection applications.



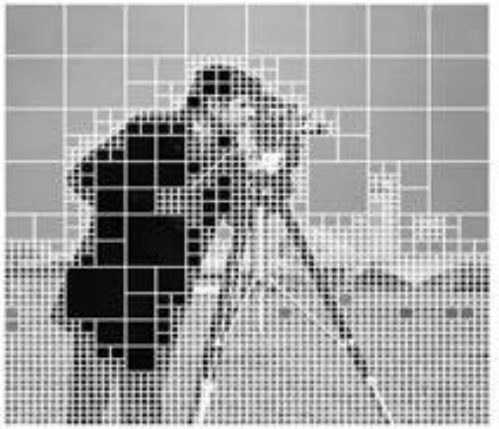
Fundamental Steps of Digital Image Processing

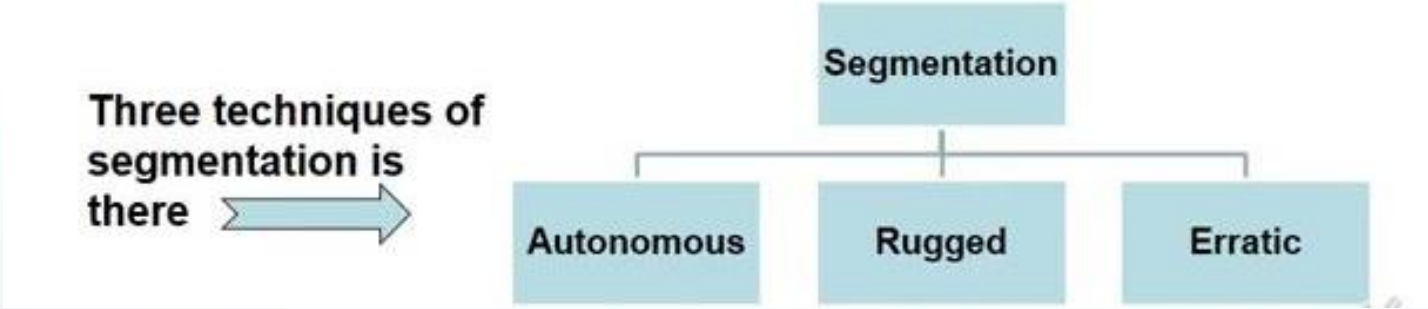
Segmentation



Segmentation

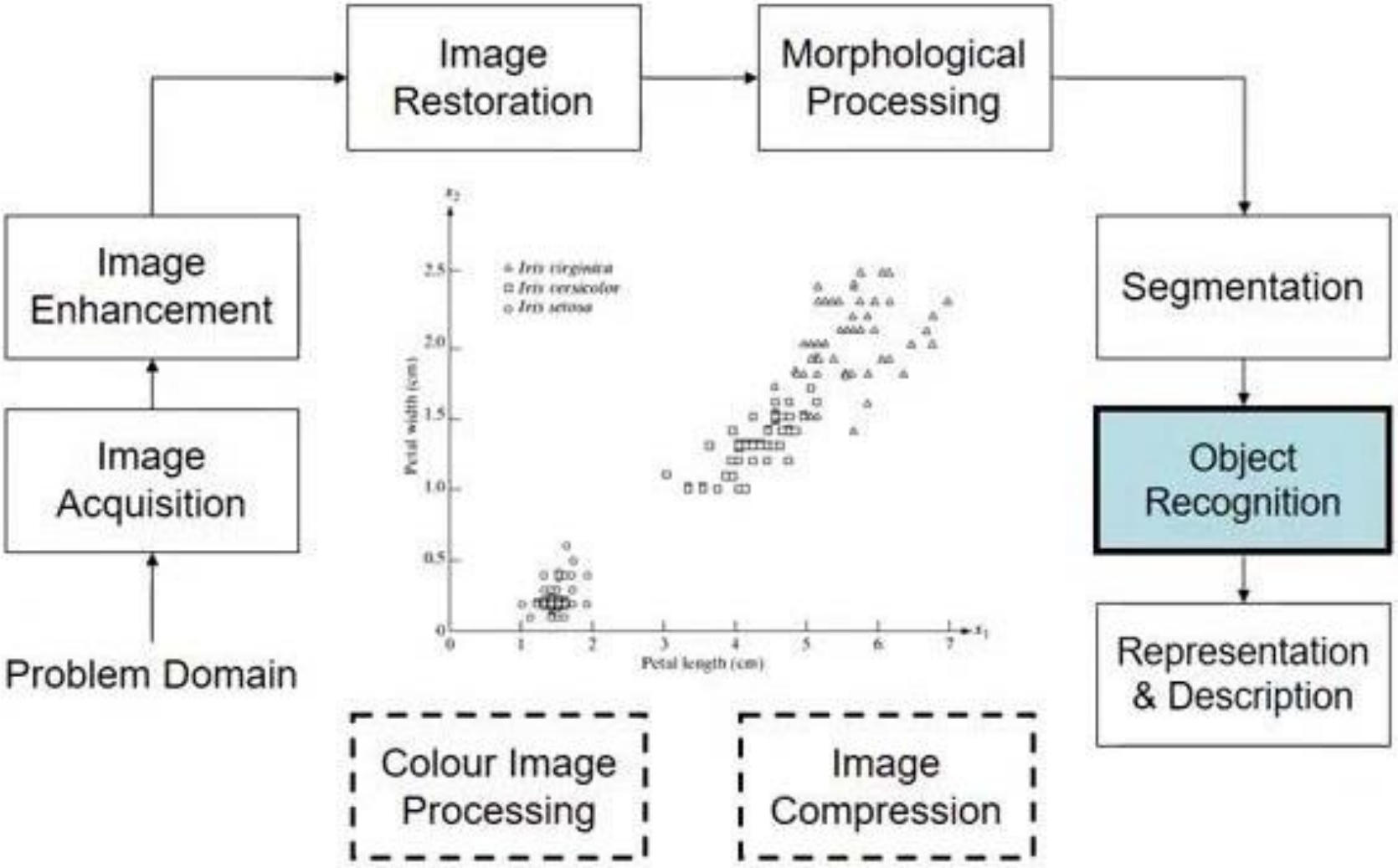
- It is the process of partition an image into its constituent part or object.





Fundamental Steps of Digital Image Processing

Object Recognition

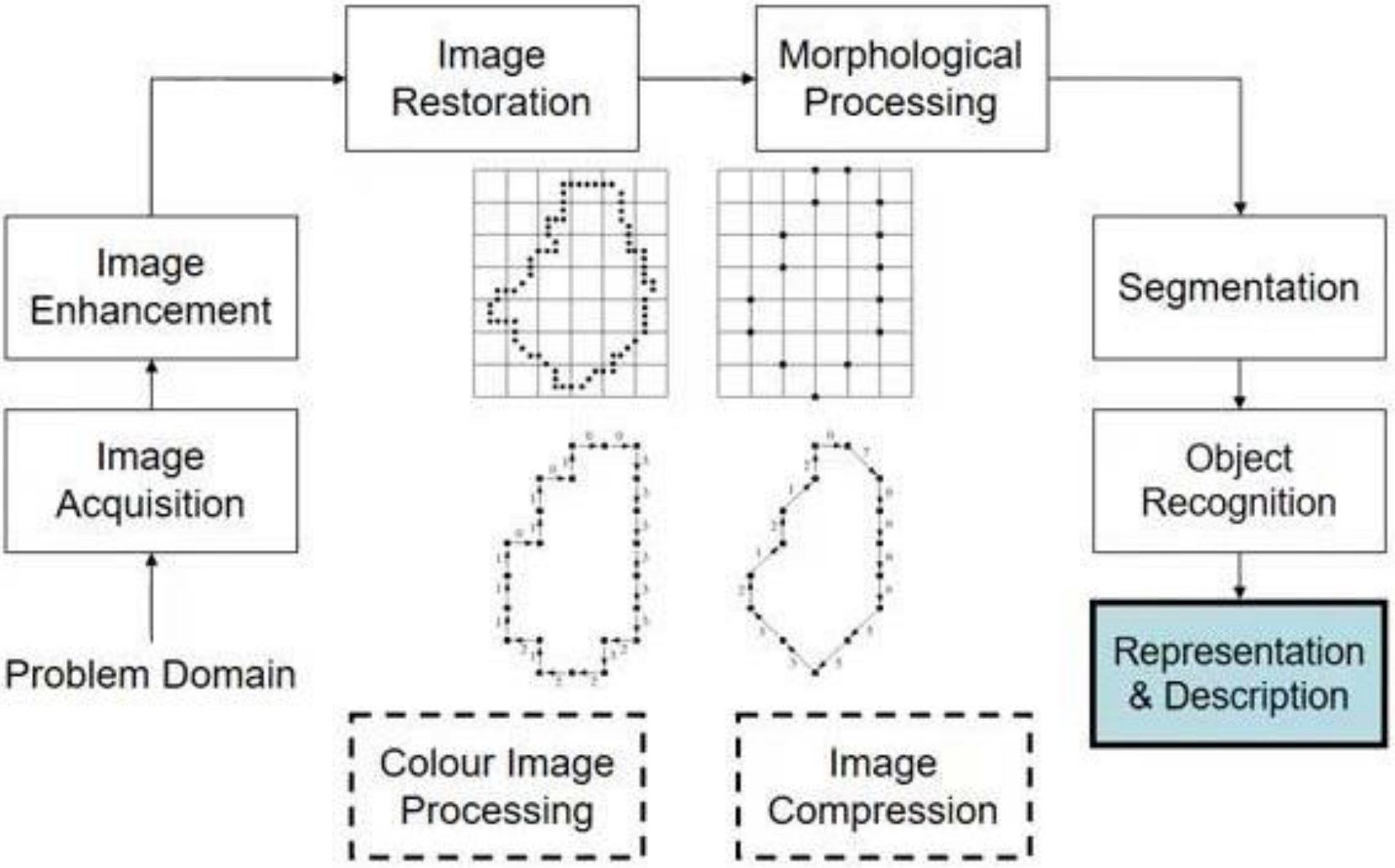


Object Recognition

- It is the process that assigns a label (e.g., “vehicle”) to an object based on its descriptors which is used in artificial intelligence of software.

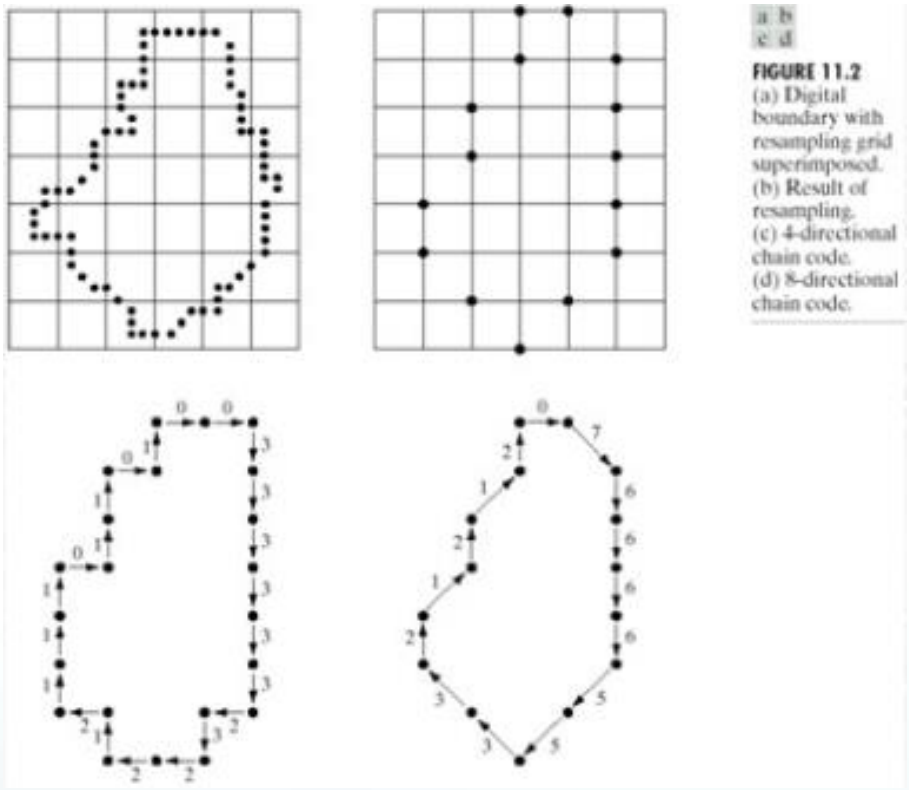
Fundamental Steps of Digital Image Processing

Representation & Description



Representation & Description

- **Representation:** Makes a decision whether the data should be represented as a boundary or as a complete region
- **Description:** also called feature selection, which deals with extracting attributes.



a b
c d

FIGURE 11.2
(a) Digital boundary with resampling grid superimposed. (b) Result of resampling. (c) 4-directional chain code. (d) 8-directional chain code.

Fundamental Steps of Digital Image Processing

Image Compression

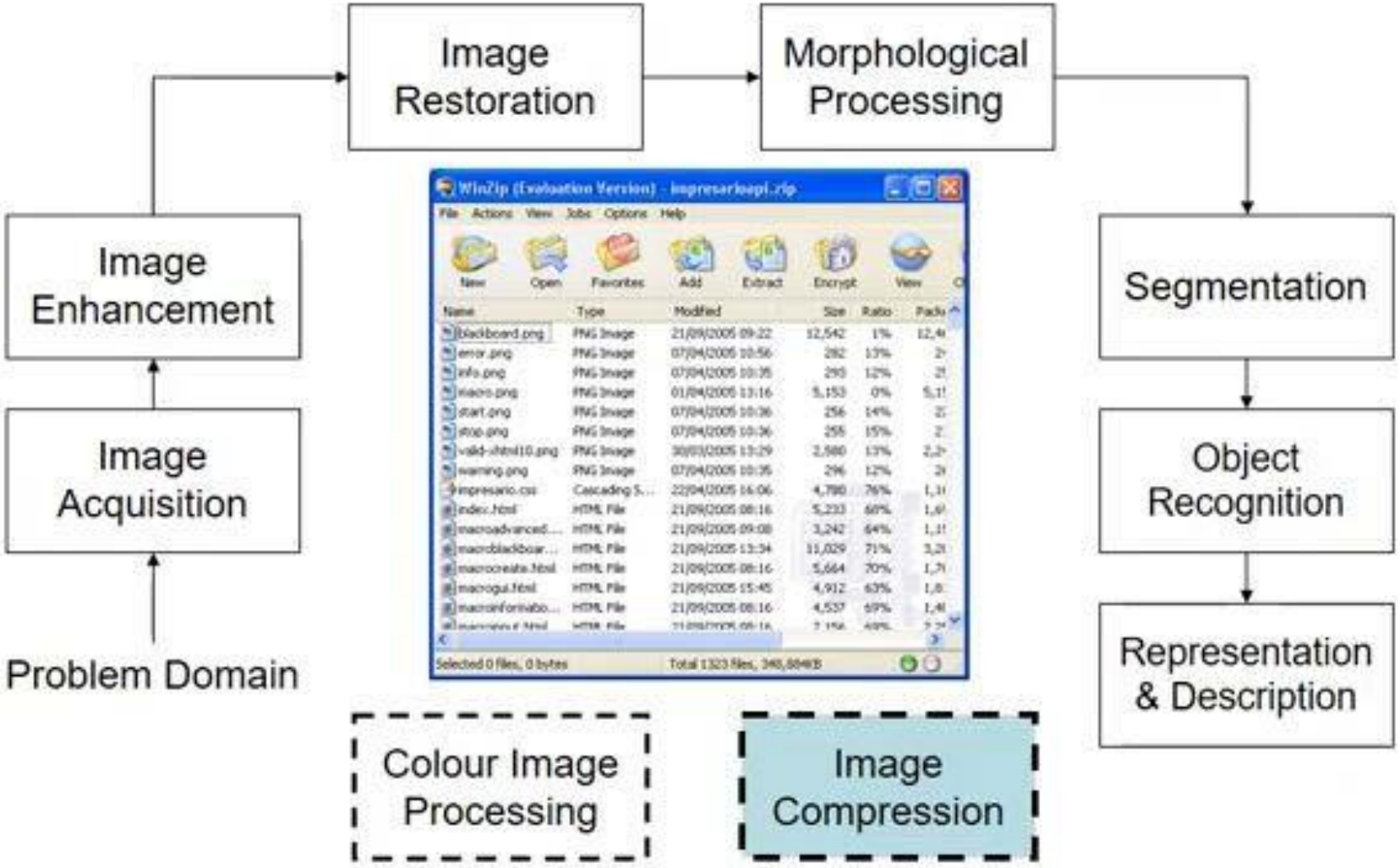


Image Compression

- As the name implies, deals with techniques for reducing the storage required to save an image, or the bandwidth required to transmit it.

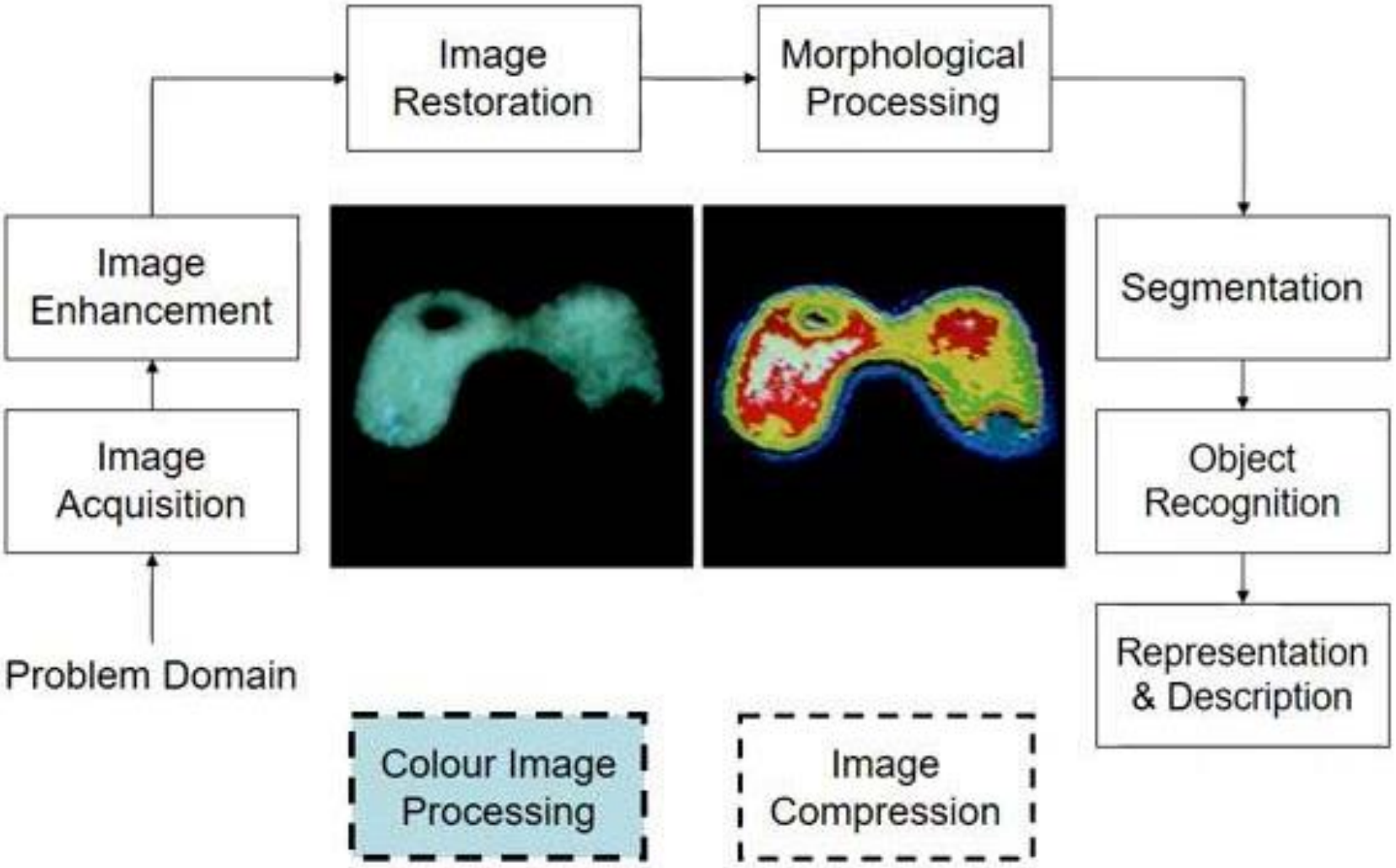
Original Image
Size-116 KB

Compressed Image
Size-12.9 KB, 11 %

Compressed Image
Size-1.95 KB, 1.6 %

Fundamental Steps of Digital Image Processing

Colour Image Processing



Colour Image Processing

- It is an are which is popular because of the use of digital images over the internet.
- Color is also used in as the basis for extracting features of interest in an image.
- According to the theory of the human eye, all colors are seen as variable combinations of the three so-called primary colors Red (R) Green (G) and Blue (B)

RGB Red(R) Green(G) Blue(B)

End Of Lecture