Chapter 1 Introduction

* Upon completion of this chapter, you should:
  + Understand the concept of a digital image.
  + Have a broad overview of the historical underpinnings of the field of digital image processing.
  + Understand the definition and scope of digital image processing.
  + Know the fundamentals of the electromagnetic spectrum and its relationship to image generation.
  + Be aware of the different fields in which digital image processing methods are applied.
  + Be familiar with the basic processes involved in image processing.
  + Be familiar with the components that make up a general-purpose digital image processing system.
  + Be familiar with the scope of the literature where image processing work is reported.

What is Digital Image Processing?

* An image may be defined as a two-dimensional function, f(x,y), where x and y are spatial (plane) coordinates, and the amplitude of f at any pair of coordinates (x,y) is called the intensity or gray level of the image at that point.
  + When x, y, and the intensity values of f are all finite, discrete quantities, we call the image a digital image.
* Low-level process is characterized by the fact that both its inputs and outputs are images.
* Mid-level processing of images involves tasks such as segmentation (partitioning an image into regions or objects), description of those objects to reduce them to a form suitable for computer processing, and classification (recognition) of individual objects.
  + A mid-level process is characterized by the fact that its inputs generally are images, but its outputs are attributes extracted from those images (e.g., edges, contours, and the identity of individual objects).
* Higher-level processing involves “making sense” of an ensemble of recognized objects, as in image analysis, and, at the far end of the continuum, performing the cognitive functions normally associated with human vision.
* Digital image processing encompasses processes whose inputs and outputs are images and, in addition, includes processes that extract attributes from images up to, and including, the recognition of individual objects.

Infrared light wavelengths

* Visible blue
* Visible green
* Visible red
* Near infrared
* Middle infrared
* Thermal infrared
* Short-wave infrared