# Chapter 2 Digital Image Fundamentals

## Some functions and limitations of human vision

### 2.1 Elements of Visual Perception

* The visual system cannot operate over a large range of light simultaneously.
* It accomplishes this large variation by changing its overall sensitivity, a phenomenon known as brightness adaptation.
* The total range of distinct intensity levels the eye can discriminate simultaneously is rather small when compared with the total adaptation range.

## Electromagnetic energy spectrum and properties of light

### 2.2 Light and the Electromagnetic Spectrum

* Higher wavelength, lower frequency.
* Higher frequency, higher energy per photon.
* Light is a type of electromagnetic radiation that can be sensed by the eye.
* Light that is void of color is called monochromatic light (achromatic).
* Chromatic light is color light.
* Radiance is the total amount of energy that flows from the light source, and it is usually measured in watts (W).
* Luminance gives a measure of the amount of energy an observer perceives from a light source, and it is usually measured in lumens (lm).

## Digital image generation and representation

### 2.3 Image Sensing and Acquisition

* Most of the images in which we are interested are generated by the combination an “illumination” source and the reflection or absorption of energy from that source by the elements of the “scene” being imaged.

Image Acquisition Using a Single Sensing Element

* In order to generate a 2-D image using a single sending element, there has to be relative displacements in both the x-and y-directions between the sensor nd the area to be imaged.

Image sampling quantization

Spatial and intensity resolution and their effects on image appearance

Geometric relationships between image pixels

Principal mathematical tools in digital image processing

Digital image processing techniques