



INSTITUTE OF ENGINEERING,
JIWAJI UNIVERSITY

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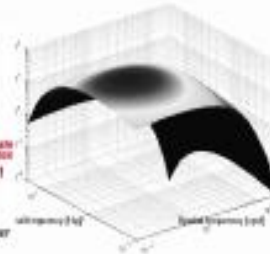
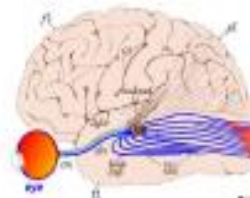
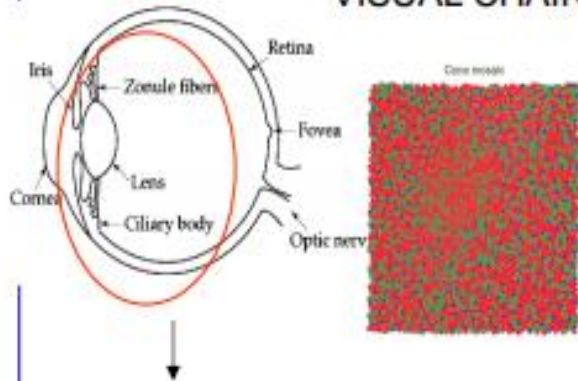
Subject:- Digital image Processing (CS-8302)

Topic:- Digital Image Fundamentals

Semester:- B.E. Eight Semester

Visual and Imaging chain

VISUAL CHAIN



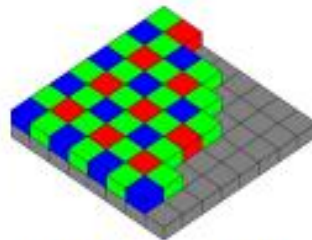
Optics

Sampling
(A/D)

Multiscale
representation

Filtering

Processing



IMAGING CHAIN



The EM spectrum

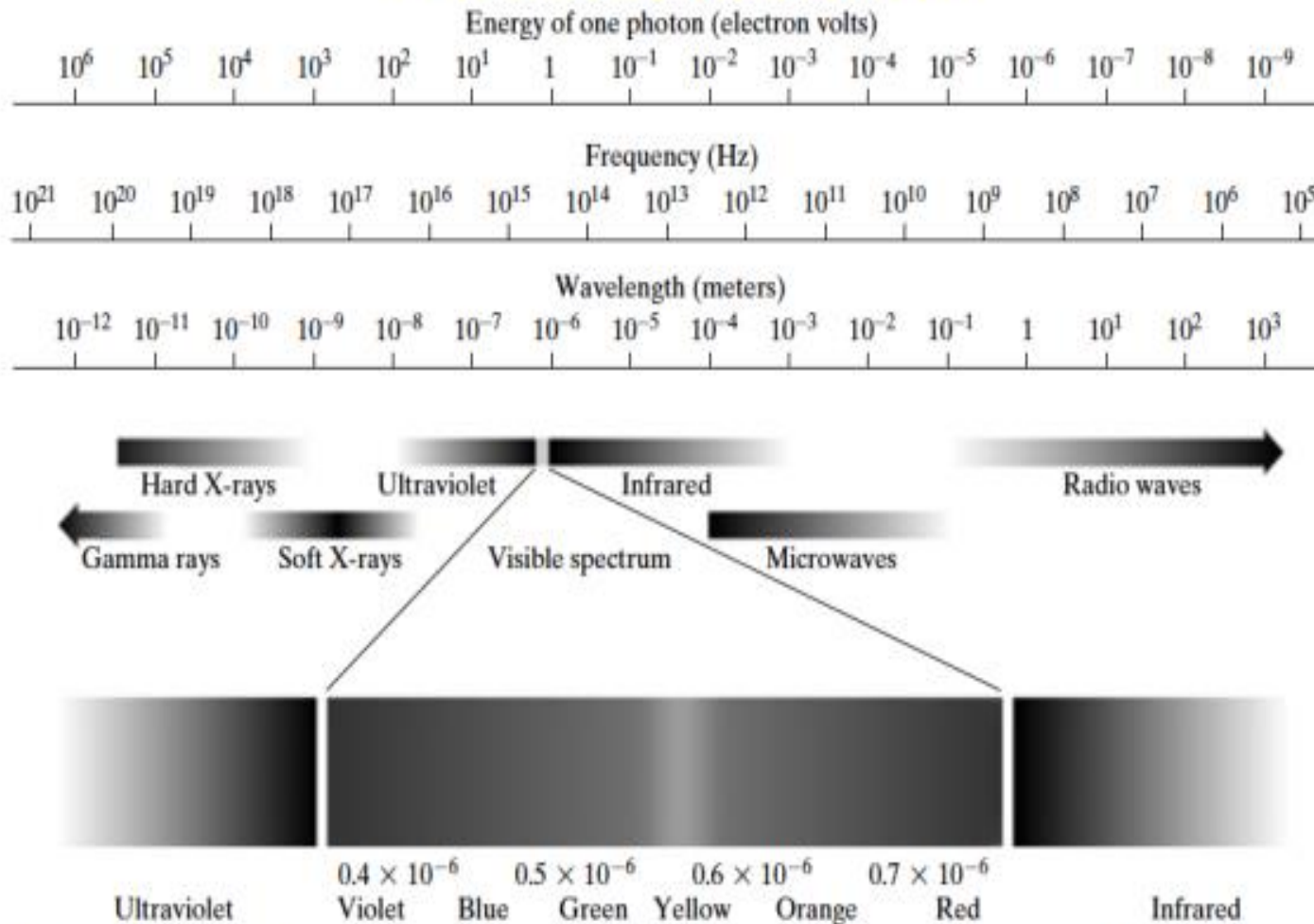


FIGURE 2.10 The electromagnetic spectrum. The visible spectrum is shown zoomed to facilitate explanation, but note that the visible spectrum is a rather narrow portion of the EM spectrum.



EM units

- The electromagnetic spectrum can be expressed in terms of wavelength, frequency, or energy. Wavelength (λ) and frequency (ν) are related by the expression $c=\lambda\nu$ where c is the speed of light (**2.998×10^8** m/s).
- The energy of the various components of the electromagnetic spectrum is given by the expression **$E=h\nu$** where h is Planck's constant.
- The units of wavelength are meters, with the terms microns (denoted μ and equal to 10^{-6} m) and nanometers (10^{-9} m) being used just as frequently.
- Frequency is measured in Hertz (Hz), with one Hertz being equal to one cycle of a sinusoidal wave per second.
- A commonly used unit of energy is the electron-volt.

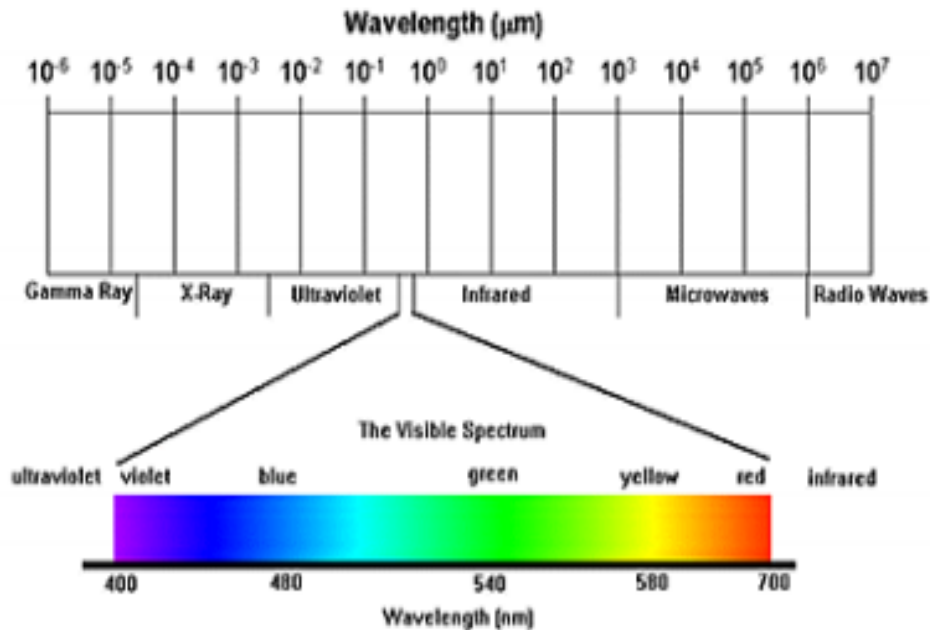


Visible light

- Light is a particular type of electromagnetic radiation that can be seen and sensed by the human eye.
- The visible band of the electromagnetic spectrum spans the range from approximately 0.43 nm (violet) to about 0.79 nm (red).
- *For convenience*, the color spectrum is divided into six broad regions: violet, blue, green, yellow, orange, and red.
- Light that is void of color is called achromatic or monochromatic light. The only attribute of such light is its intensity, or amount. The term gray level generally is used to describe monochromatic intensity because it ranges from black, to grays, and finally to white.



Visible light



EM and perceptual units

- **Radiance** is the total amount of energy that flows from the light source, and it is usually measured in watts (**W**).
- **Luminance**, measured in lumens (**lm**), gives a measure of the amount of energy **an observer perceives** from a light source.
 - For example, light emitted from a source operating in the far infrared region of the spectrum could have significant energy (radiance), but an observer would hardly perceive it; its luminance would be almost zero.
- **Brightness** is a subjective descriptor of light perception that is practically impossible to measure using a physical detector.



REFERNCE

- Anil K. Jain , “Fundamentals of digital Image processing”, Prentice Hall, 1997.
- Rafael C. Gonzales , Richard E. Woods,”Second Edition,Pearson Education,2004.
- Chi-Wah Kok, Wing –Shan Tam,” Digital Image Interpolation in Matlab“, John Wiley & Sons, 14-Dec-2018.



THANKS

