DIGITAL IMAGE PROCESSING

Digital Image Fundamentals : Session 1

Dr. Mrinmoy Ghorai

Indian Institute of Information Technology
Sri City, Andhra Pradesh

Today's Lecture

- **Elements of Visual Perception**
- **Image Sensing and Acquisition**
- **Image Sampling and Quantization**

Elements of Visual Perception

Structure of the Human Eye

Elements of Visual Perception

Image Formation in the Eye

Elements of Visual Perception

Brightness Adaption and Discrimination

Elements of Visual Perception

Brightness Adaption and Discrimination

Elements of Visual Perception

Brightness Adaption and Discrimination

Elements of Visual Perception

Brightness Adaption and Discrimination

Elements of Visual Perception

Brightness Adaption and Discrimination

Elements of Visual Perception

Brightness Adaption and Discrimination

Elements of Visual Perception

Light and the Electromagnetic Spect[illegible]

Image Sensing and Acquisition

Image Acquisition using Sensor Strips and Sensor Arrays

Image Sensing and Acquisition

Image Acquisition using Linear Sensor Strip and Circular Sensor

Image Sensing and Acquisition

Image Acquisition

Proce

Image Sensing and Acquisition

A Simple Image Formation Model

Image Sensing and Acquisition

Some Typical Ranges of Illumination

- **Lumen -** a unit of light flow or luminous flux
- **Lumen per square meter (lm/m^2) -** the metric unit of measure for illuminance of a surface
- On a clear day, the sun may produce in excess of 90,000 lm/m^2 of illumination on the surface of the Earth
- On a cloudy day, the sun may produce less than 10,000 lm/m^2 of illumination on the surface of the Earth
- On a clear evening, the moon yields about 0.1 lm/m^2 of illumination

Image Sensing and Acquisition

Some Typical Ranges of Reflectance

- 0.01 for black velvet
- 0.65 for stainless steel
- 0.80 for flat-white wall paint
- 0.90 for silver-plated metal
- 0.93 for snow

Image Sampling and Quantization

Digitizing the coordinate values

Digitizing the amplitude values

Image Sampling and Quantization

Representing Digital Images

Representing Digital Images

Representing Digital Images

Spatial and Intensity Resolution

- **Spatial Resolution**
  - a measure of smallest discernible detail in an image
  - stated with ***dots (pixels) per unit distance, dots per inch (dpi)***

- **Intensity Resolution**
  - the smallest discernible change in intensity level
  - stated with ***8 bits, 16 bits, 24 bits,*** etc.

Spatial and Intensity Resolution

Spatial and Intensity Resolution

Spatial and Intensity Resolution

Next Class

- **Digital Image Fundamentals**
  - Image sampling and quantization – image interpolation
  - Relationship between pixels
  - The conditions for linear operations

Thank you:
Question?