
15EEE337 Digital Image Processing

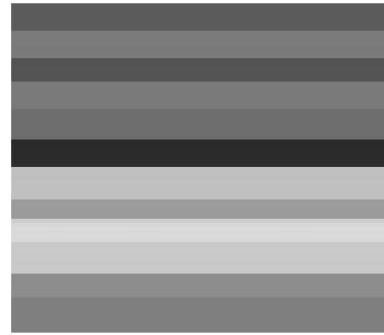
— Sarath T.V. —

Last lecture

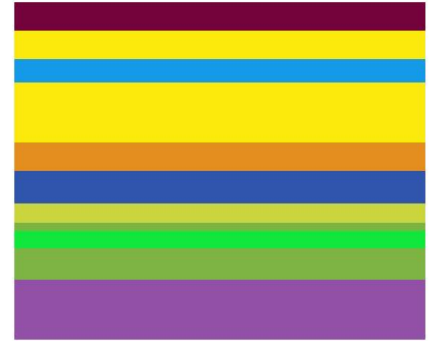
- Intensity resolution
- Effect of variation of intensity resolution
- Effect of variation of spatial resolution
- Types of images

Color image

- Color – a descriptor which simplifies object identification and extraction of object from a scene.
- Humans can distinguish thousands of color shades – manual image analysis.
- *Pseudo* and full color processing.
- *Pseudo* – assign color to a particular grayscale intensity/range of intensities.
- *Full color*- images acquired using full color sensor- digital camera.



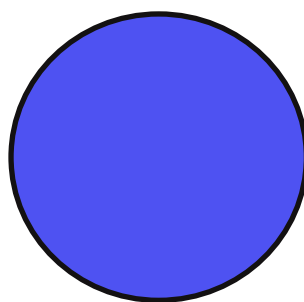
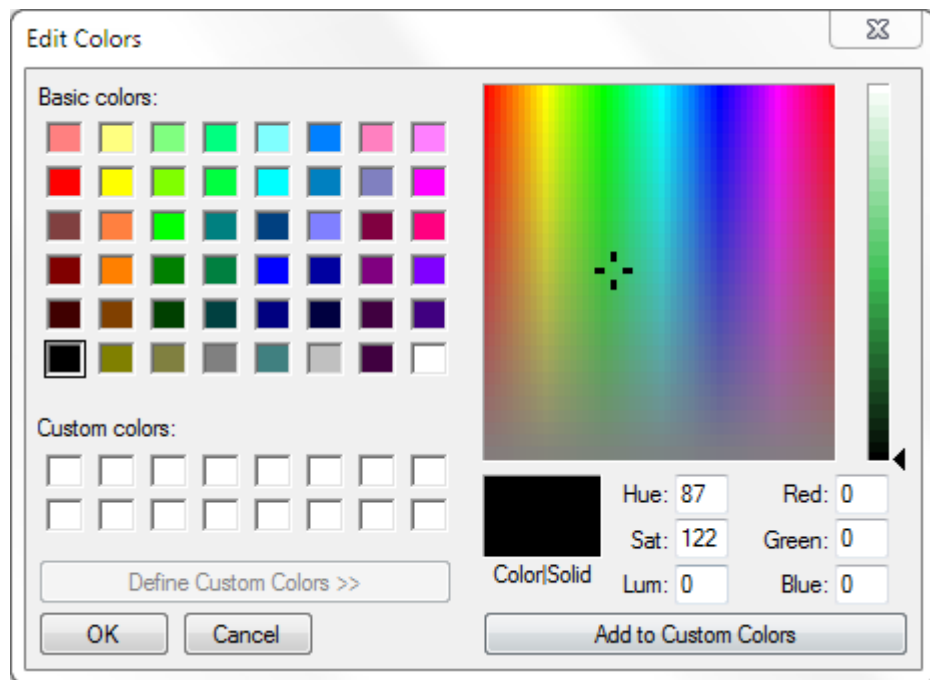
INPUT



OUTPUT

Characteristics to distinguish colors

- Brightness
 - Hue
 - Saturation
- Brightness- attribute that gives the perception that a source is radiating or reflecting light
 - Hue –attribute associated with dominant wavelength in a mixture of light waves. Object as a color.
 - Saturation –measure of amount of white light mixed with a hue.



Color models

- A color model is a system for creating a full range of colors from a small set of primary colors.
- **RGB Color Model**
- **CMYK Color Model**
- **HIS Color Model**
- RGB –each color appears as spectral component of red green and blue.
- In matrix form 3 channel ,one for each R,G and B channel.

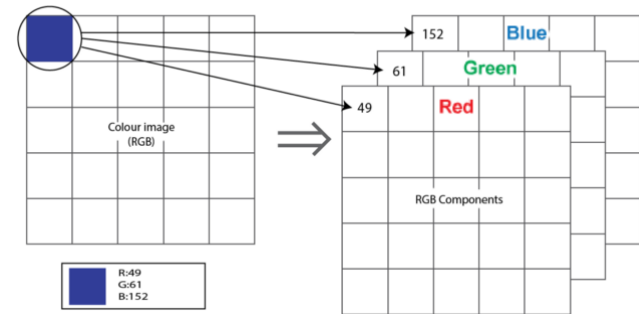
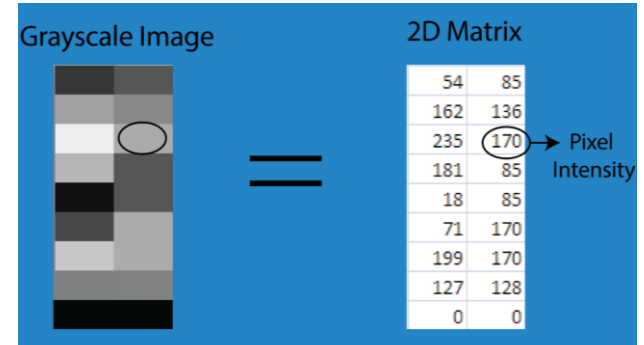
CMY-CMYK color model.

- Cyan magenta and yellow –secondary colors of light or primary colors of pigment.
- When a surface coated with cyan pigment is illuminated with white light, no red light is reflected from the surface because cyan subtracts red light from reflected white light.
- Color printer and copiers (deposits colored pigments on paper) require CMY data input or RGB to CMY conversion internally.

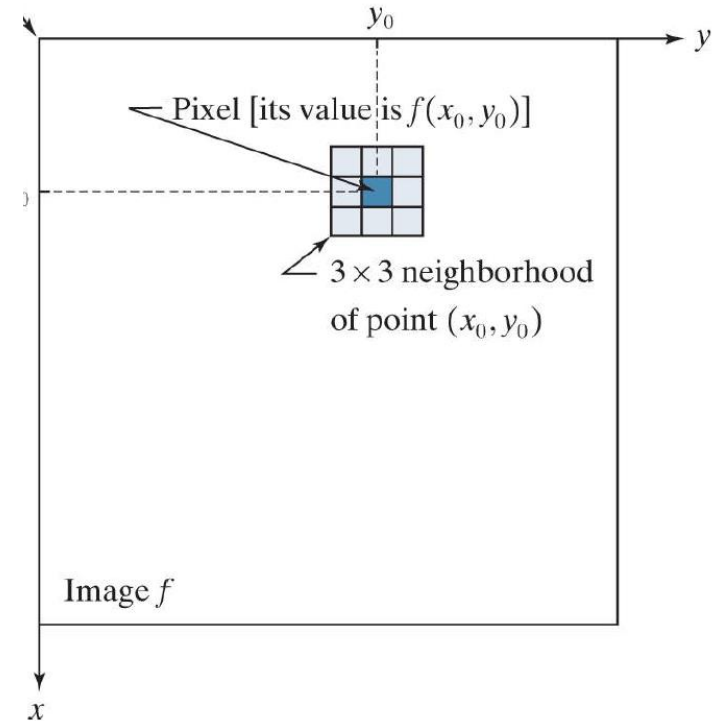
HSI model

- RGB and CMY models suited for hardware implementation.
- Cannot describe colors in terms that practical for human interpretation.
- Describe color by its hue ,saturation and brightness.

- An image can be represented in the form of a 2D matrix where each element of the matrix represents pixel intensity. This state of 2D matrices that depict the intensity distribution of an image is called Spatial Domain.
- Direct manipulation of pixels in an image- Spatial domain processing.

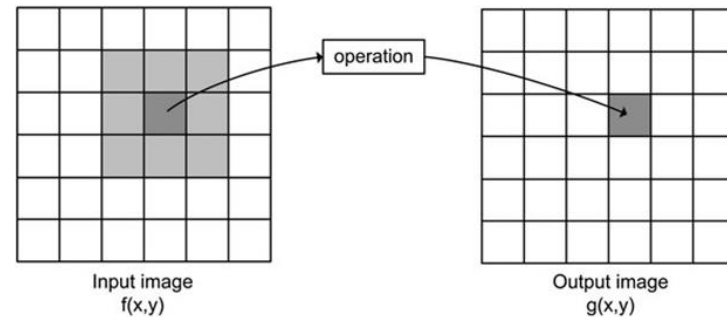


- Spatial processing – Intensity transformations and spatial filtering.
- Intensity transformations operate on single pixel of an image
- Eg Contrast manipulation and image thresholding.
- Spatial filtering –operations on the neighborhood of every pixel in a image.
- Eg image smoothing and sharpening



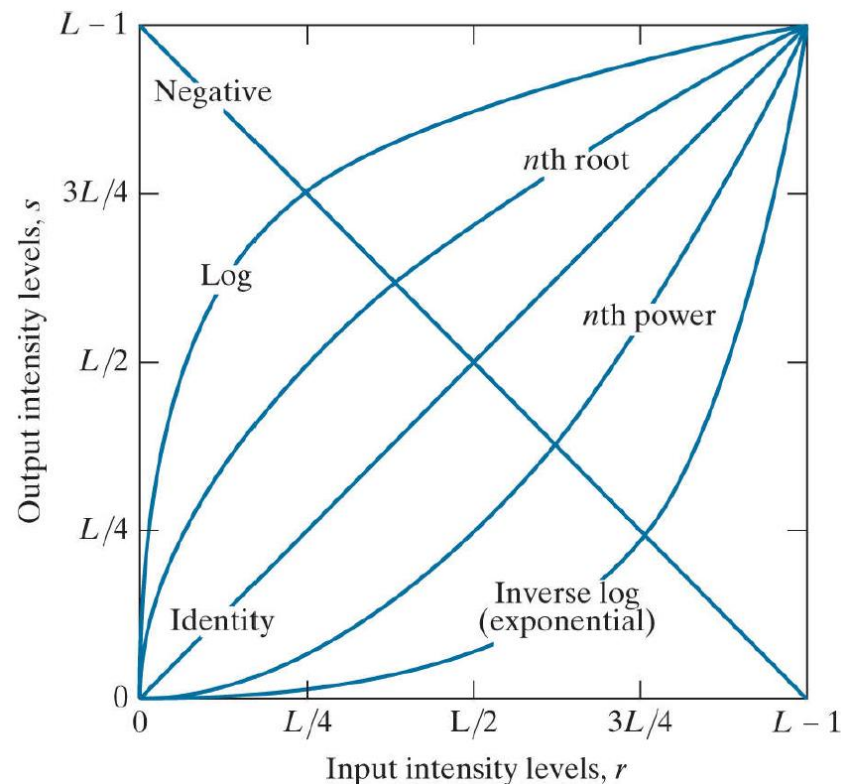
Spatial domain processes

- $g(x, y) = T[f(x, y)]$
- $f(x, y)$ - input image
- $g(x, y)$ - output image
- T - operator on f
- 1x1 neighbourhood -intensity transformation- g depends on the value of f at single point (x, y) .
 - $s = T(r)$
- s & r - intensity of g and f at x, y



Basic intensity transformation functions

- Simplest of all image processing techniques.
- *Image negatives*
- Reversing the intensity levels of a digital image.
- Enhance white or gray detail in dark regions of an image.





THANK
YOU

A graphic featuring the words "THANK YOU" in a stylized, neon-like font. The word "THANK" is rendered in a pinkish-purple color, and "YOU" is in a light blue color. The text is centered and surrounded by several horizontal lines of varying lengths and colors, including pink, yellow, and light blue, creating a dynamic, glowing effect against a dark background.