Chapter3 Raster Image

Pixel is short for picture element
A raster images is simply a 2D array that stores the pixel value for each pixel
image pixels != display pixel

3.1 Raster Devices

- Output
  - Display
    - Transmissive: liquid crystal display LCD
    - Emissive: light-emitting diode LED display
  - Hardcopy
    - Binary: link-jet printer
    - Continuous tone: dye sublimation printer
      thermal dye transfer donor ribbon continous tone
      ppi: pixel per inch
      dpi: dots per inch
      stair stepping
- input
  - 2D array sensor: digital camera
    CCD: charge-coupled devices
    CMONS: complimentary metal-oxide-semiconductor
  - 1D array sensor: flatbed scanner

3.2 Images, Pixels, Geometry

$I(x,y): R \to V$
$R \subset \mathbb{R^2}$ is a rectangular area and V is the set of possible pixel values

3.2.2 Monitor intensities and Gamma

- monitors are nonlinear with respect to input
  displayed intensity = (maximum intensity)a^γ

a in the input pixel value between 1 and 0
describing a display's nonlinearity using γ is only an **approximation**

3.3 RGB Color

```
black = (0, 0, 0)
red = (1, 0, 0)
green = (0, 1, 0)
blue = (0, 0, 1)
yellow = (1, 1, 0)
magenta = (1, 0, 1)
cyan = (0, 1, 1)
white = (1, 1, 1)
```

3.4 Alpha Compositing

pixel coverage α fraction of pixel covered by the foreground layer
$c = \alpha c_f + (1-\alpha)c_b$
alpha mask alpha channel

- Image Storage
  jpeg: lossy
  tiff: lossless
  ppm: lossless
  png: lossless