Raster Devices and Images

(Slides courtesy of Tamar Shinar)
Raster Devices
Raster Display

Hearn, Baker, Carithers
Transmissive vs. Emissive Display

[H&B, Fig. 2-16]
Raster Display

red, green, blue subpixels
What is an image?

**Continuous image**

\[ I : \mathbb{R} \rightarrow V \]

\[ R \subset \mathbb{R}^2 \]

\[ V = \mathbb{R}^+ \quad \text{(grayscale)} \]

\[ V = (\mathbb{R}^+)^3 \quad \text{(color)} \]
What is an image?

Sampled image

\[ I : R \rightarrow V \]
\[ R \subset \mathbb{Z}^2 \]
\[ V = [0, 1] \quad \text{(grayscale)} \]
\[ V = [0, 1]^3 \quad \text{(color)} \]

\( n_x = \) number of columns
\( n_y = \) number of rows

\[ [-0.5, n_x - 0.5] \times [-0.5, n_y - 0.5] \]
Bit depth - defined by device standards

<table>
<thead>
<tr>
<th>Bit Depth</th>
<th>Number of Colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 (monochrome)</td>
</tr>
<tr>
<td>2</td>
<td>4 (CGA)</td>
</tr>
<tr>
<td>4</td>
<td>16 (EGA)</td>
</tr>
<tr>
<td>8</td>
<td>256 (VGA)</td>
</tr>
<tr>
<td>16</td>
<td>65,536 (HiColor, XGA)</td>
</tr>
<tr>
<td>24</td>
<td>16,777,216 (True Color, SVGA)</td>
</tr>
<tr>
<td>32</td>
<td>16,777,216 (True Color + Alpha Channel)</td>
</tr>
</tbody>
</table>

(Note alpha)

(Humans can perceive ~10,000,000 colors)
Color representation

additive

subtractive
Alpha Channel

\[ \mathbf{c} = \alpha \mathbf{c}_f + (1 - \alpha) \mathbf{c}_b \]