The Framebuffers

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The Framebuffer Uses RGB Colors

The Framebuffer: Integer Color Storage

The Framebuffer: Floating Point Color Storage

The Framebuffer

• Alpha values
  – Transparency per pixel
    \( \alpha = 0 \) is invisible
    \( \alpha = 1 \) is opaque
  – Represented in 8-32 bits (integer or floating point)
  – Alpha blending equation:

\[
\text{Color} = \alpha C_1 + (1 - \alpha) C_2
\]

0.0 \leq \alpha \leq 1.0

Note: this is really blending, not transparency!
The Framebuffer

- **Z-buffer**
  - Used for hidden surface removal
  - Holds pixel depth
  - Typically 32 bits deep
  - Integer or floating point

# Bits / Z  Total Z Values: 32  \(2^{32} = 4 \text{ B}\)

```c
// swap the double-buffered framebuffers:
glutSwapBuffers();
glutDisplayMode(GLUT_RGBA | GLUT_DOUBLE | GLUT_DEPTH);
gDrawBuffer(GL_BACK);
```

You draw into here
This is called the update
The monitor displays from here

"swap buffers" changes the role of the two framebuffers

You draw into here
This is called the refresh
The monitor displays from here

The Video Driver

- **N refreshes/second** (N is between 50 and 100)
- The framebuffer contains the R,G,B that define the color at each pixel
- Because of the double-buffering, Refresh is asynchronous from Update, that is, the monitor gets refreshed at N (60) frames per second, no matter how fast or slowly you update the back buffer.