

OpenGL Transparency



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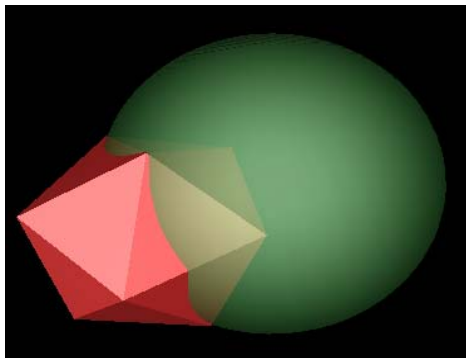
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OpenGL Transparency

OpenGL has a nice feature that lets you display see-through objects. This is useful in visualization when wanting to see some objects through other objects.

OpenGL calls it “**transparency**”, but in fact it is really “**blending**”. Be sure to remember this. Real transparency is a subtractive-color process. For example, looking at a pure red object through a pure green piece of glass will give you **black**.

OpenGL “transparency” would instead blend the RGB of the red object with the RGB of the green glass, giving a shade of yellow.



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When Defining Your Object

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Instead of using `glColor3f()` to specify the red, green, and blue of an object, use `glColor4f()` to specify red, green, blue, and *alpha*. Alpha is the transparency factor.

Or, if you are using lighting,

```
glMaterialfv( GL_FRONT, GL_AMBIENT,  rgba );  
glMaterialfv( GL_FRONT, GL_DIFFUSE,  rgba );
```

- An alpha value of **0.0** means that this object is **completely transparent** (i.e., invisible – not too useful).
- An alpha value of **1.0** means that this object is completely **opaque** (also not useful as a transparency).

$$C' = \alpha C_{new} + (1. - \alpha) C_{old}$$



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In the Display() Callback

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1. Draw the solid things first

2. Enable color blending:

```
glEnable( GL_BLEND );
```

3. Make the Z-buffer read-only:

```
glDepthMask( GL_FALSE );
```

This is important because you don't want the presence of a transparent object close to your eye to prevent the writing of its blend with an object a little farther away.



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In the Display() Callback

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- Define how much of the about-to-be-written pixel color (the “source”) and how much of the already-existing pixel color (the “destination”) will end up being used:

```
glBlendFunc( src, dst );
```

The value for `src` multiplies the about-to-be-written source pixel color (S) and the value of `dst` multiplies the already-existing destination pixel color (D). While there are several options for `src` and `dst`, the most useful combination is:

Src (C_{new})	Dst (C_{old})	Result (C')
GL_SRC_ALPHA	GL_ONE_MINUS_SRC_ALPHA	$C' = \alpha S + (1-\alpha)D$

- Draw the transparent things.
- After drawing all the transparent elements of the scene, set the depth mask back to read-write and disable blending:

```
glDepthMask( GL_TRUE );  
glDisable( GL_BLEND );
```



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Tips

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- Remember that the way OpenGL implements this is not really transparency, it is *blending*. True transparency is a color-subtractive process. Blending is a color-additive process. If the goal is to make a yellow window look and behave like a real yellow window, this won't work correctly. If the goal is to just see inside something, this works very well.
- Recognize that OpenGL picking will know nothing about your transparency. As far as it is concerned, you drew all solid, opaque polygons.
- An example from the world of medical visualization:



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