Display Lists

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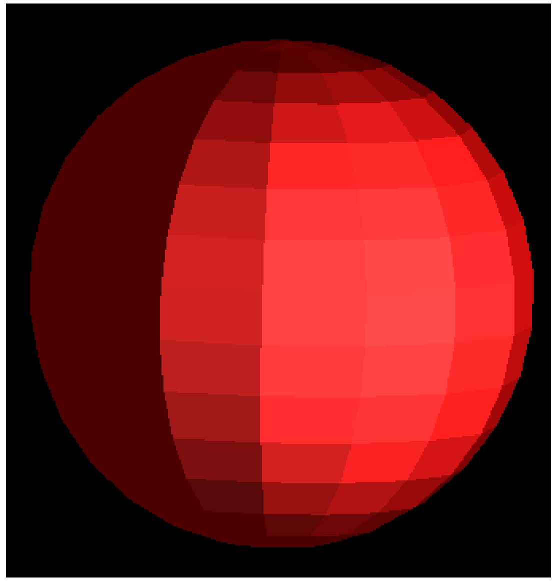
Drawing a Sphere – Notice a lot of time-consuming Trig Function Calls!

```
void
Sphere( float radius, int slices, int stacks )
{
        struct point top, bot;          // top, bottom points
        struct point *p;
        NumLngs = slices;
        NumLats = stacks;

        Pts = new struct point[ NumLngs * NumLats ];
        for( int ilat = 0; ilat < NumLats; ilat++ )
        {
                float lat = -M_PI/2.  +  M_PI * (float)ilat / (float)(NumLats-1);
                float xz = cos( lat );
                float y  = sin( lat );
                for( int ilng = 0; ilng < NumLngs; ilng++ )
                {
                        float lng = -M_PI  +  2. * M_PI * (float)ilng / (float)(NumLngs-1);
                        float x =  xz * cos( lng );
                        float z = -xz * sin( lng );
                        p = PtsPointer( ilat, ilng );
                        p->x  = radius * x;
                        p->y  = radius * y;
                        p->z  = radius * z;
                        p->nx = x;
                        p->ny = y;
                        p->nz = z;
                        p->s = ( lng + M_PI    ) / ( 2.*M_PI );
                        p->t = ( lat + M_PI/2. ) / M_PI;
                }
        }
```



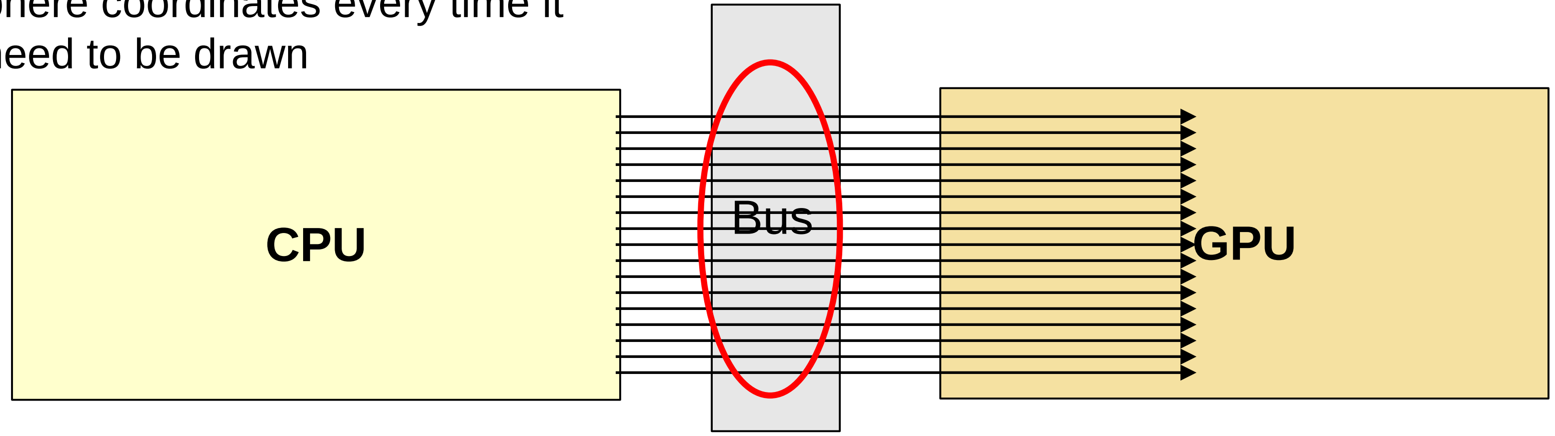
Even worse, the trig calls are inside single or nested for-loops!

```
top.x   =  0.;         top.y   = radius;       top.z   = 0.;
top.nx = 0.;           top.ny = 1.;             top.nz = 0.;
top.s   = 0.;          top.t    = 1.;
bot.x   =  0.;          bot.y   = -radius;       bot.z = 0.;
bot.nx = 0.;            bot.ny = -1.;             bot.nz = 0.;
bot.s   = 0.;           bot.t    =  0.;

glBegin( GL_QUADS );
for( int ilng = 0; ilng < NumLngs-1; ilng++ )
{
        p = PtsPointer( NumLats-1, ilng );
        DrawPoint( p );
        p = PtsPointer( NumLats-2, ilng );
        DrawPoint( p );
        p = PtsPointer( NumLats-2, ilng+1 );
        DrawPoint( p );
        p = PtsPointer( NumLats-1, ilng+1 );
        DrawPoint( p );
}
glEnd( );

glBegin( GL_QUADS );
for( int ilng = 0; ilng < NumLngs-1; ilng++ )
{
        p = PtsPointer( 0, ilng );
        DrawPoint( p );
        p = PtsPointer( 0, ilng+1 );
        DrawPoint( p );
        p = PtsPointer( 1, ilng+1 );
        DrawPoint( p );
        p = PtsPointer( 1, ilng );
        DrawPoint( p );
}
glEnd( );
```

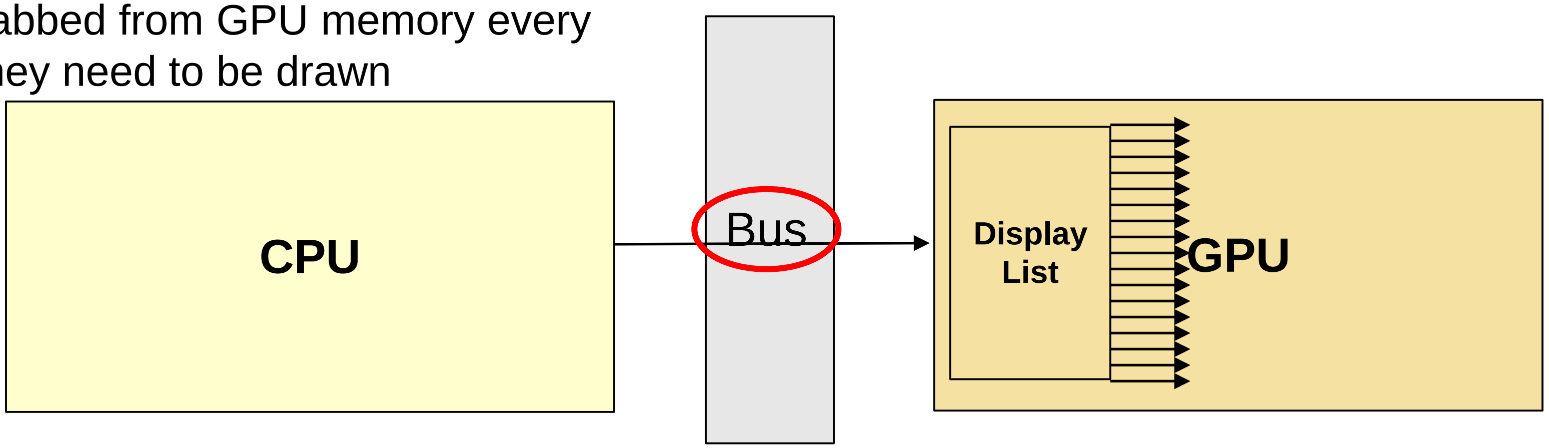
```
glBegin( GL_QUADS );
for( int ilat = 2; ilat < NumLats-1; ilat++ )
{
        for( int ilng = 0; ilng < NumLngs-1; ilng++ )
        {
                p = PtsPointer( ilat-1, ilng );
                DrawPoint( p );
                p = PtsPointer( ilat-1, ilng+1 );
                DrawPoint( p );
                p = PtsPointer( ilat, ilng+1 );
                DrawPoint( p );
                p = PtsPointer( ilat, ilng );
                DrawPoint( p );
        }
}
glEnd( );
```

You don’t want to execute all that code every time you want to redraw the scene, so draw it once, store the numbers in GPU memory, and call them back up later

Without Display List:
The CPU re-computes and transmits the sphere coordinates every time it they need to be drawn



With Display List:
The CPU computes and transmits the sphere coordinates *once* and then they are grabbed from GPU memory every time they need to be drawn



You don’t want to execute all that code every time you want to redraw the scene, so draw it once, store the numbers in GPU memory, and call them back up later

The solution is to incur the sphere-creation overhead *once*, and whenever the sphere needs to be re-drawn, just draw the saved numbers, not the equations. This is a **Display List**.

1. How many unique, unused, consecutive DL identifiers to give back to you

2 . The ID of the first DL in the unique, unused list

Creating the Display List in InitLists( ):

```
// a global GLuint variable:
SphereList = glGenLists( 1 );
glNewList( SphereList, GL_COMPILE );

Sphere( 5., 30, 30 );

glEndList( );
```

3. Open up a display list in (GPU) memory

4. The coordinates, etc. end up in memory instead of being sent to the display

5. All done with storing the numbers in the DL

Calling up the Display List in Display( ):

```
glCallList( SphereList );
```

6. Pull all the coordinates, etc. from memory, just as if the code to generate them had been executed here

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