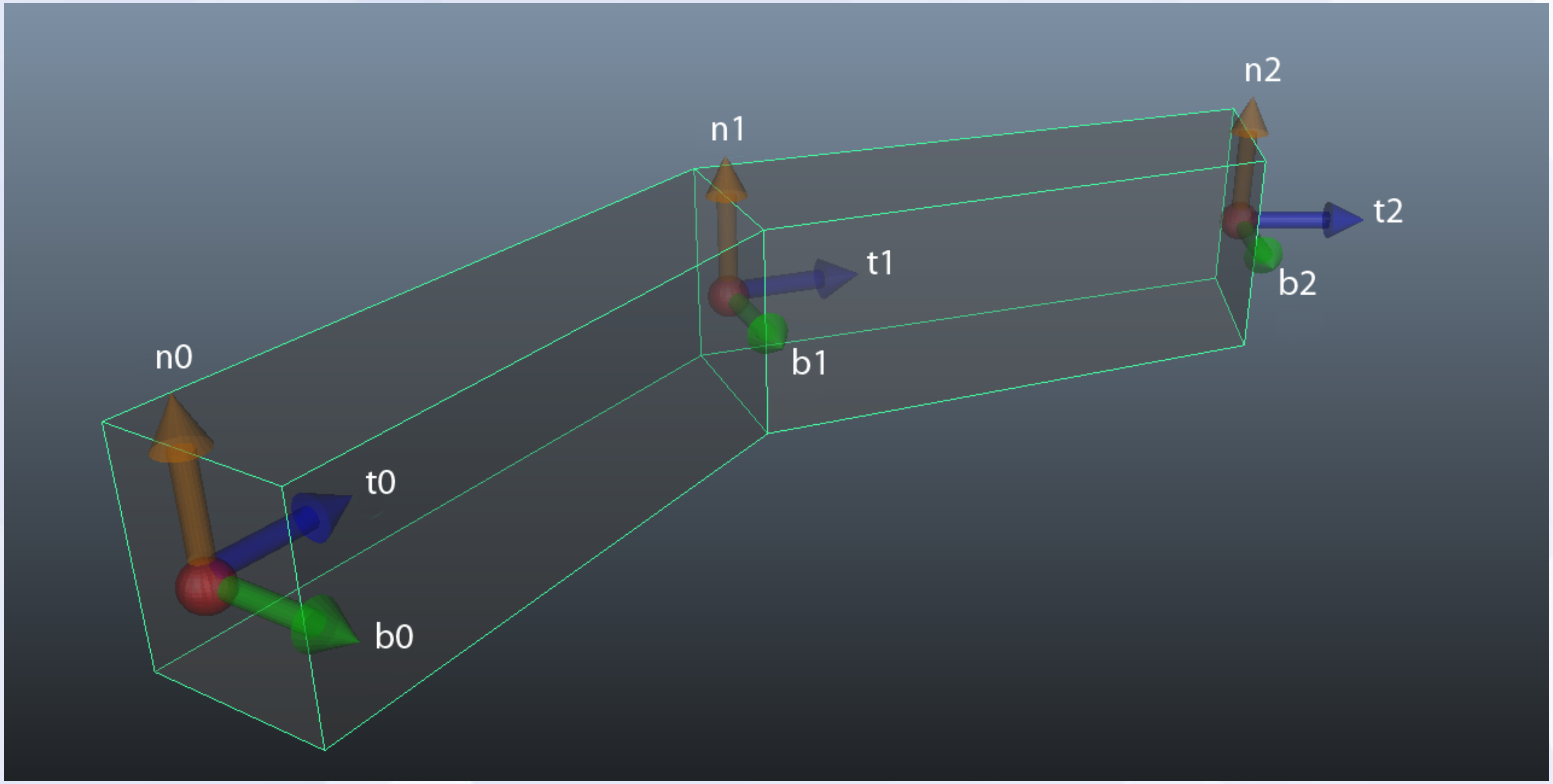
CS420 Assignment 2 Extra Hints

Rail Cross-section



How to draw a rectangle cross-section

- For each point p(u) on the curve
  - Compute local coord: T, N, B
  - Find 4 points v0(u), v1(u), v2(u) and v3(u) on the N-B plane as the vertices for a rectangle cross-section
- Draw cross-section between u0 and u1 by Connecting v0(u0), v1(u0), v2(u0), v3(u0) and v0(u1), v1(u1), v2(u1), v3(u1) with triangles

Lighting

- Init lighting:
  - *glLightfv(GL_LIGHT0,GL_DIFFUSE,...)*
  - Same for ambient and specular color
- In the display loop:
  - *glMaterialfv(GL_FRONT,GL_DIFFUSE,...)*
  - Same for specular, ambient and shinness
  - *glLightfv(GL_LIGHT0,GL_POSITION,...)*
  - *glEnable(GL_LIGHTING)*

  - Draw objects
  - If following objects don't need lighting:
    - *glDisable(GL_LIGHTING);*
- MODELVIEW matrix will affect the position of light sources
  - *glLightfv(GL_LIGHT0,GL_POSITION,...)*

Texture

- Init texture:
  - *glGenTextures(1, &textureName);*
  - Load image data
  - *glBindTextures(GL_TEXTURE_2D,textureName);* //tells openGL subsequent code all works on the texture with the name *textureName* until another *glBindTextures* with a different texture name is called

- *glTexParameteri:*
  - *GL_TEXTURE_WRAP_S/T*
  - *GL_TEXTURE_MIN/MAG_FILTER*
- *glTexImage2D(GL_TEXTURE_2D, GL_RGBA, width, height, GL_RGB, GL_UNSIGNED_BYTE, pointer);*
- Or: *GluBuild2DMipmaps to use mipmaps*

- In the display loop:
  - *GlTexEnvf(...,GL_REPLACE/BLEND/MODULATE);* //tells openGL the method to combine texture and lighting in subsequent code until another *GlTexEnvf* changes the method
  - *glEnable(GL_TEXTURE_2D);*
  - *glBindTextures(GL_TEXTURE_2D,textureName);*

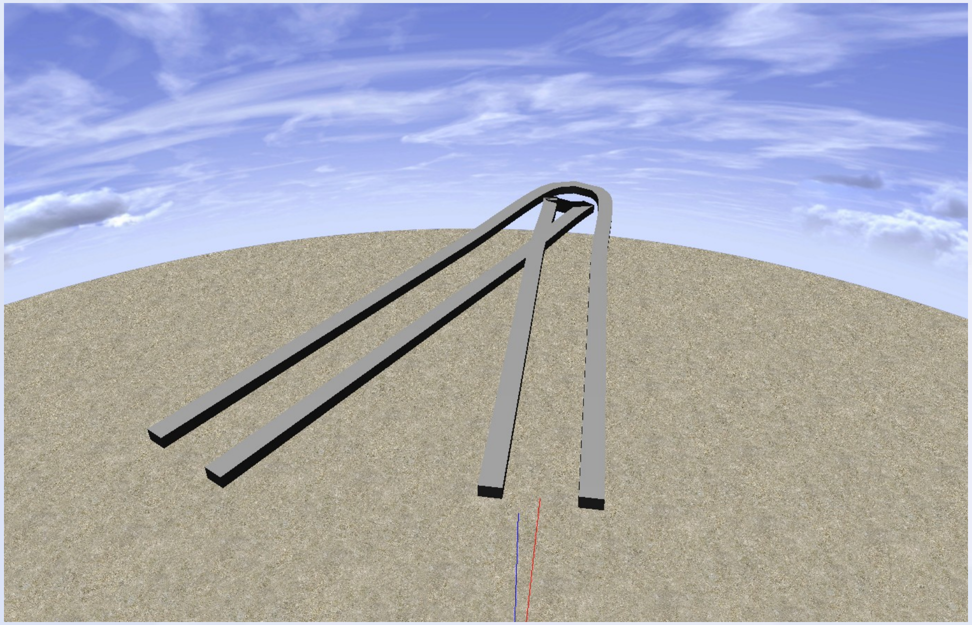
- Use *glTexCoord2f(0.0,0.0)* to specify texture coordinates for vertices when drawing
- If the following objects don't need texture:
  - *glDisable(GL_TEXTURE_2D);*

Recursive Subdivision

- *subdivide(u0,u1, maxlinelength)*
  - *umid = (u0 + u1) / 2;*
  - Compute curve point position *p0* and *p1* corresponding to *u0* and *u1*
  - If distance between *p0* and *p1* is larger than *maxlinelength*
    - subdivide(u0,umid,maxlinelength)
    - subdivide(umid,u1,maxlinelength)
  - Else *drawline(u0,u1)*

- Call this subdivide function inside the drawing function or glCallList:
    - maxlinelength = 0.001;
    - subdivide(0,1,maxlinelength);

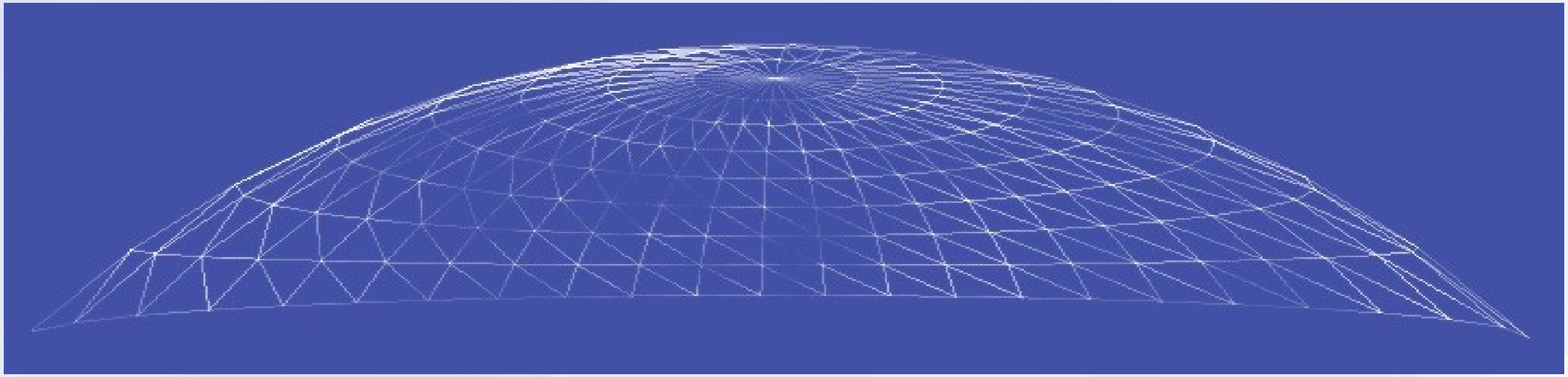
Rail Artifact



- Rail curvature is too large
- Could be avoided by changing orientation
- ...

Sky Dome

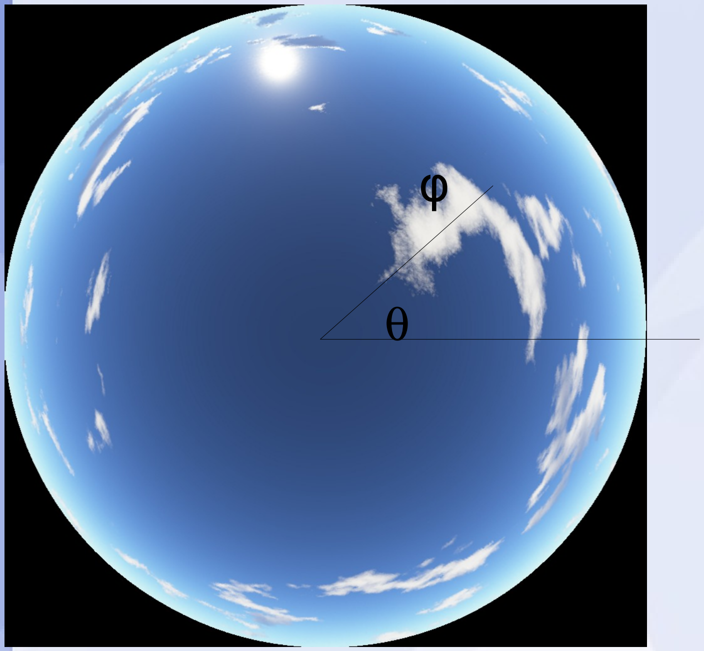
- Using latitude φ and longitude θ angles

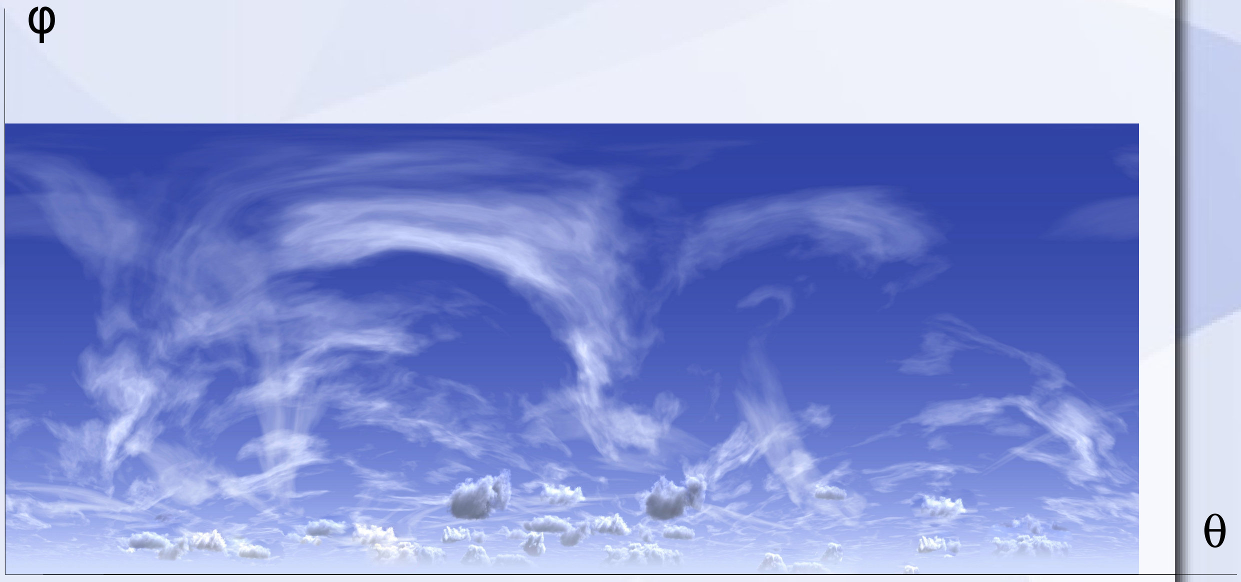


http://www.flipcode.com/archives/Sky_Domes.shtml

Dome Texture

- Two kinds of texture image





Camera Speed

- h_max: the maximum potential energy

$$u_{new} = u_{current} + (\Delta t) \frac{\sqrt{2g(h_{max} - h)}}{\left\| \frac{dp}{du} \right\|}$$

- $Ev + Ep = Ep_{max}$
- $||v|| = ||dp/dt||$

Thanks!