Image Manipulation Example – Identify the Deserts

1. Draw a sphere with a globe texture
   ```glsl
   Texture2D 6 worldtex.bmp
   Program Desert Min <0. 1. 1.> Max <0. 0. 1.> TexUnit 6
   ```
2. Read the texture
   ```glsl
   uniform float Min, Max;
   vec3 newcolor = texture2D(TexUnit, gl_TexCoord[0].st).rgb;
   ```
3. Determine weights for Red, Green, and Blue that identify the deserts
Point Clouds

Can change:
• Color
• Alpha
• Pointsize

3D Probe
Volume Rendering

Can change:
  • Color
  • Alpha

Aligning the Planes with the Viewing Vector
Line Integral Convolution

At each fragment:
1. Find the flow field velocity vector there
2. Follow that vector in both directions
3. Blend in the colors at the other fragments along that vector

Extruding Shapes Along Flow Lines

Parameterize the shape and re-cast it into T-N-B coordinates along the flowline, \( P(t) \)

Tangent:
\[
T(t) = \frac{\dot{P}(t)}{||\dot{P}(t)||}
\]

Binormal:
\[
B(t) = \frac{\dot{P}(t) \times \ddot{P}(t)}{||\dot{P}(t) \times \ddot{P}(t)||}
\]

Normal:
\[
N(t) = B(t) \times T(t)
\]

This are known as the three Frenet Equations and are very useful for geometrically characterizing what is happening on a curve
Extruding Shapes Along Flow Lines:
As long as you are writing a shader anyway, ...

Add bump-mapping to aid in understanding the orientation

Add moving "humps" to create a peristaltic effect