CS 553 Scientific Visualization

Project #7:

Hyperbolic Geometry

Yu Zhang
Zhangy6@onid.oregonstate.edu
Master Student in Computer Science
School of Electrical Engineering and Computer Science
Oregon State University

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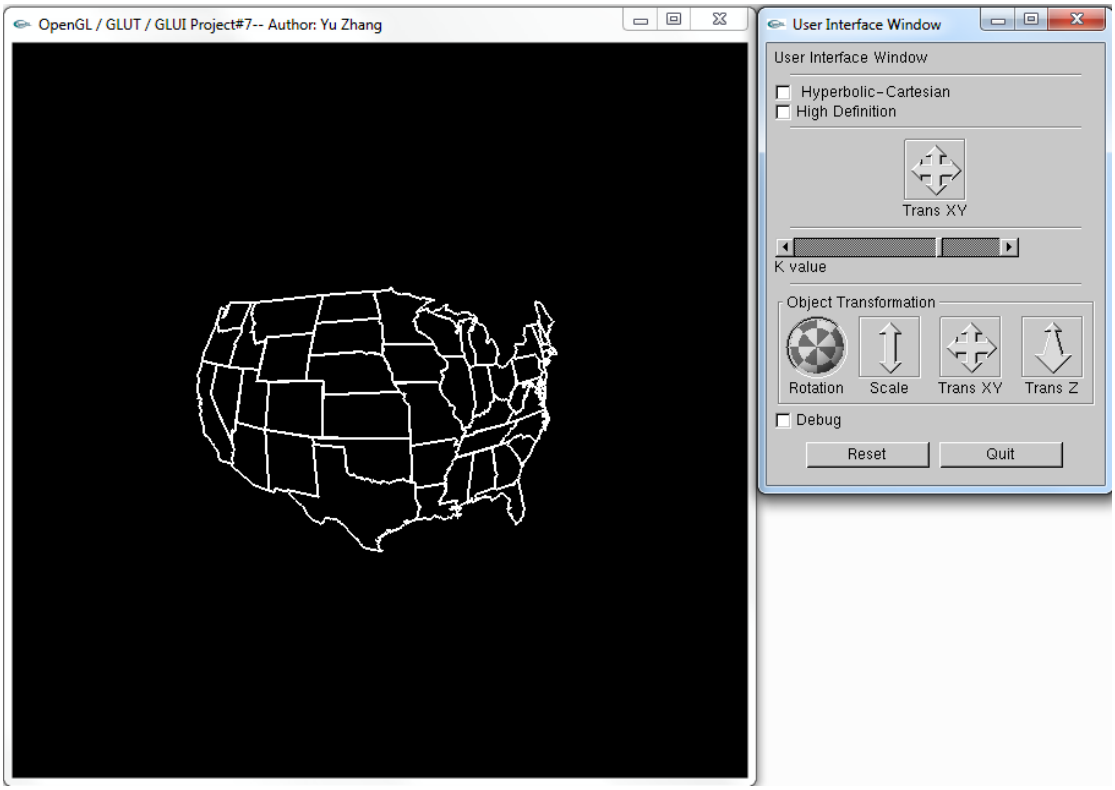
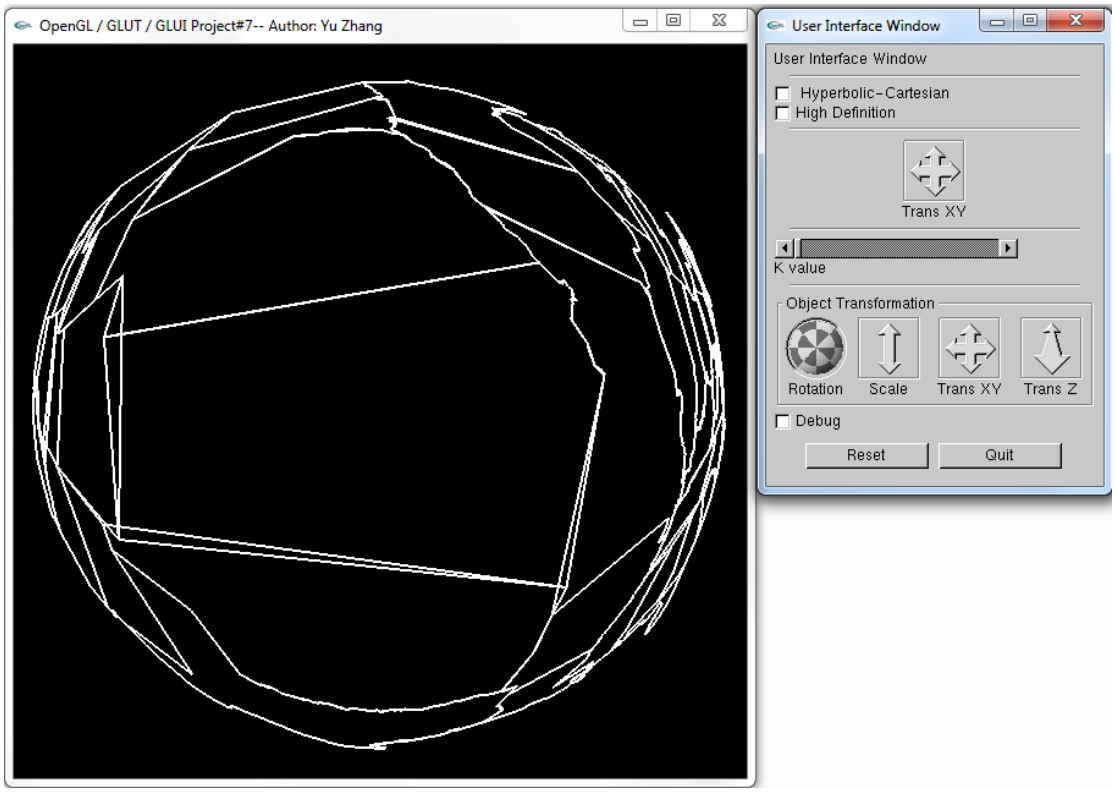
1. Images and relative comments of my project

a) Interface of my project (zoom out)



b) Interface of my project (zoom in)

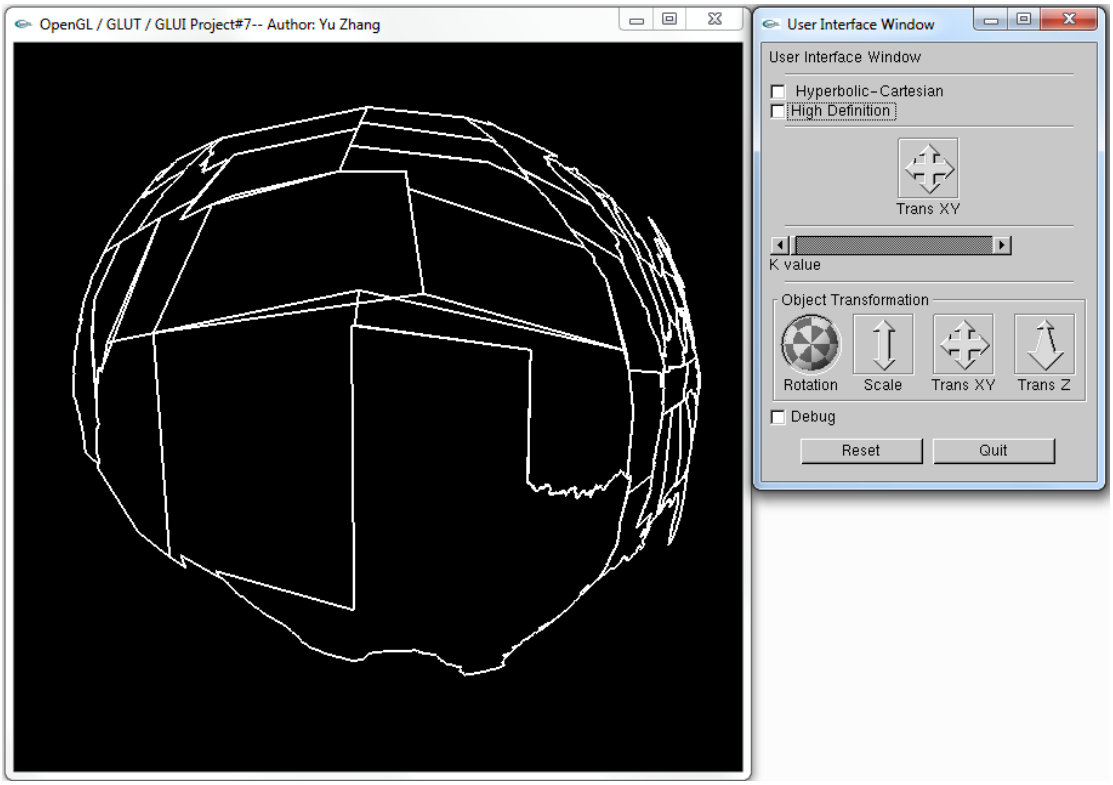


In this project, we are required to implement a U.S. national map. The data is given and we need to firstly import the data to our program. So in the function InitGraphics(), I used

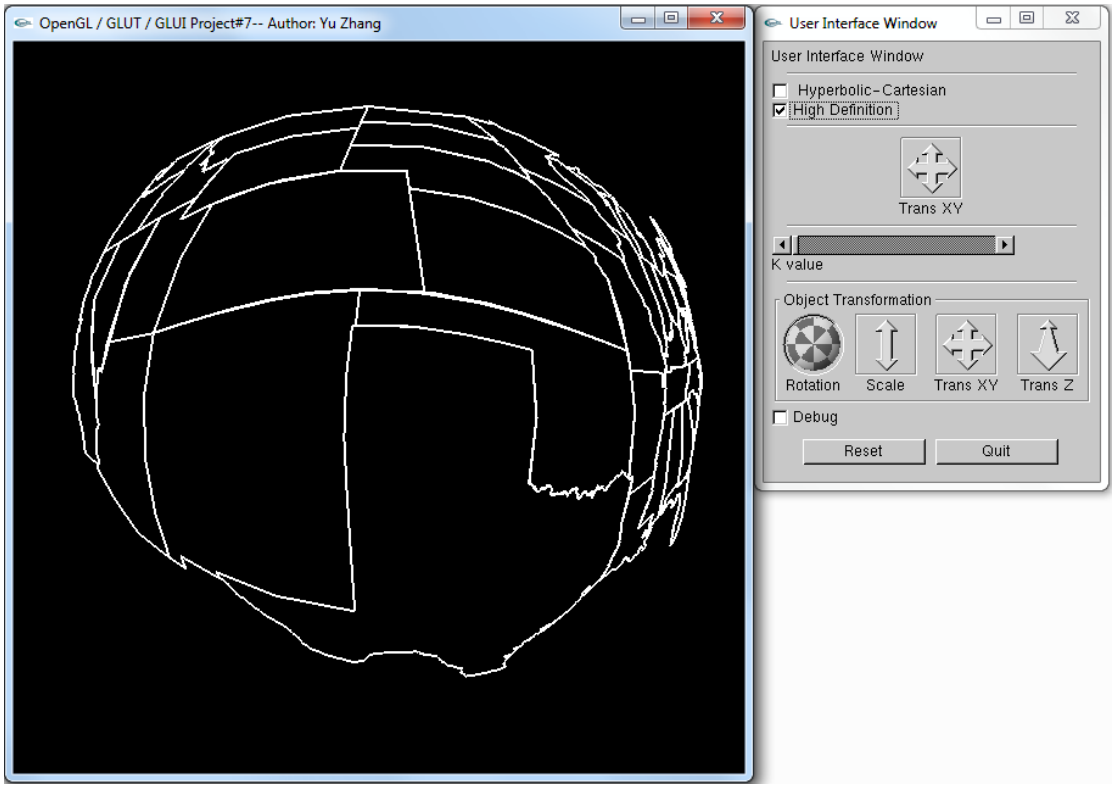
FILE *fp = fopen("proj07.dat", "r");

And there are three main parts in this project: Hyperbolic-Cartesian, Hyperbolic-Polar and High definition for these two kinds of hyperbolic geometry.

c) Polar with low definition



d) Polar with high definition



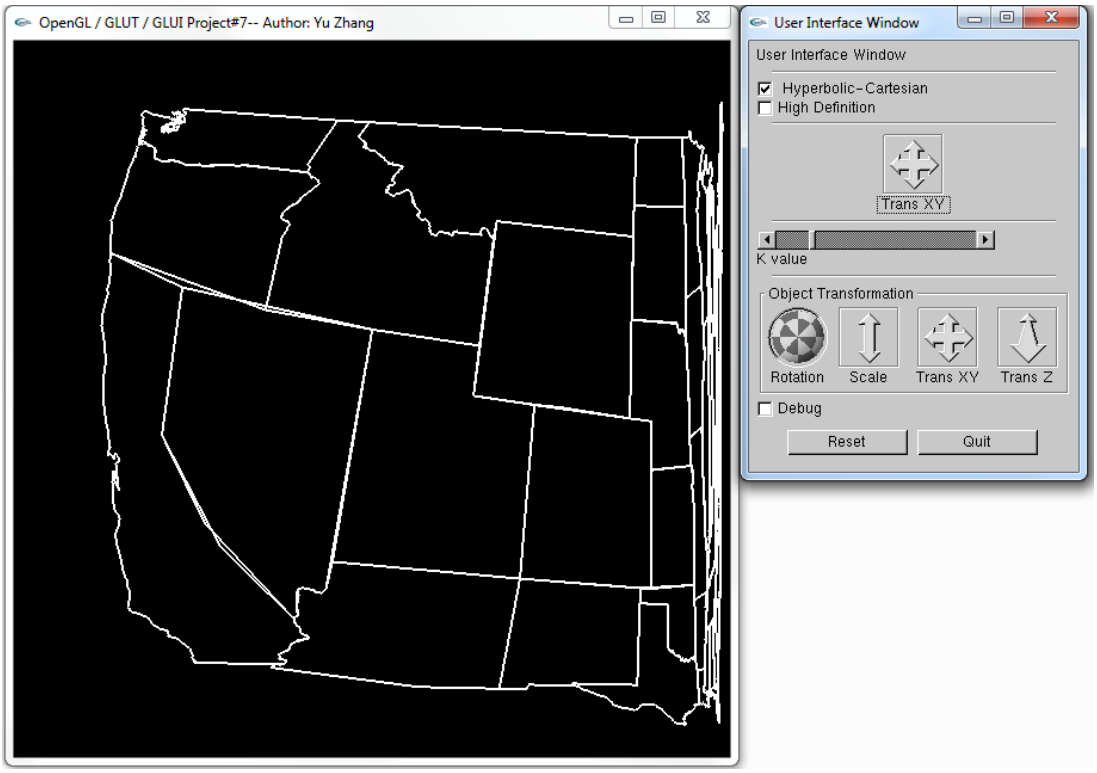
For implementing the polar part, I followed the instructions on the class website, the main algorithm is

$$x'' = r' * (x'/r) = x'/(r+K)$$
$$y'' = r' * (y'/r) = y'/(r+K)$$

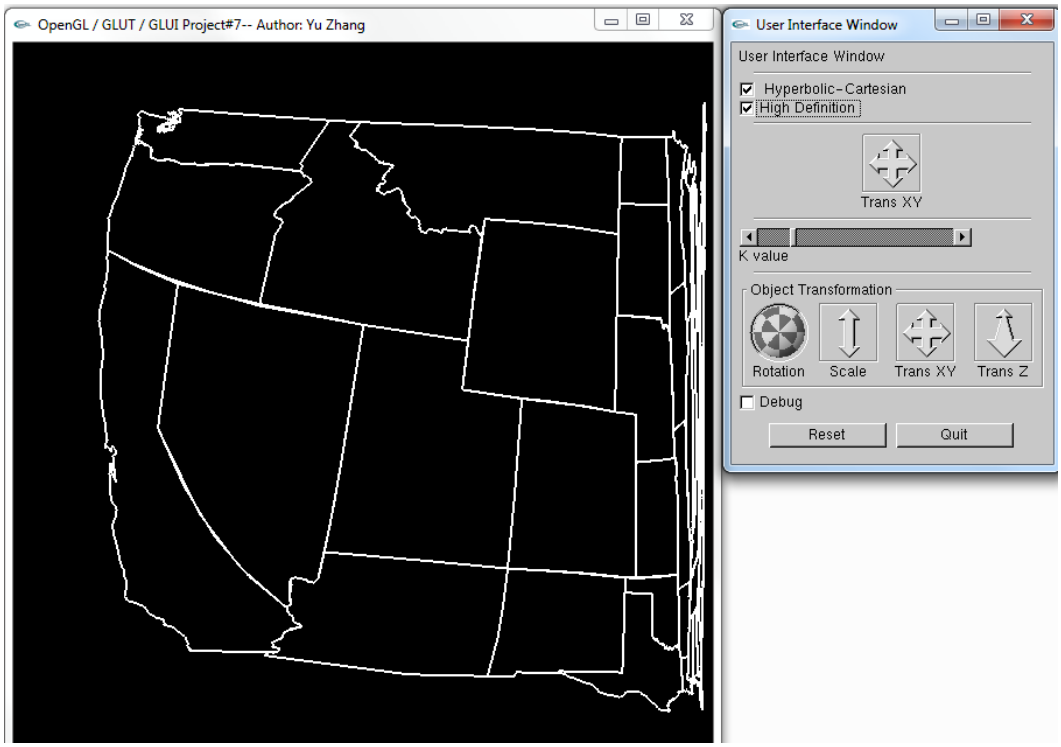
For high definition part, I followed the algorithm showed in our slides, and I also created the function DrawHyperbolicLine()

```
void
DrawHyperbolicLine( P0, P1 )
{
        Compute point  A = (P0 + P1) / 2.

        Convert point A to Hyperbolic Coordinates, calling it A'

        Convert P0 and P1 to Hyperbolic Coordinates P0', P1'
        Compute point  B' = (P0' + P1') / 2.

        Compare A' and B
        if( they are "close enough" )
        {
                Draw the line P0'-P1'
        }
        else
        {
                DrawHyperbolicLine( P0, A );
                DrawHyperbolicLine(  A, P1 );
        }
}
```

e) Cartesian with low definition



f) Cartesian with high definition



In this part, the main algorithm is

x'' = x' / sqrt(x'*x' + K*K)

y'' = y' / sqrt(y'*y' + K*K)

All in a word, this project is not very hard, I followed the algorithm showed in the class website and modified some codes, then it' done successfully.