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Project 3: Spherical Conformal Mapping

Due: 9:00 am, Nov. 7, 2024 (with a 48-hour grace period)

Implement spherical conformal parameterization method (shown in Figure 1). A detailed technical report is attached in the project package.

Gauss map or star map may be used as the initial condition. Suggested parameters for the gradient descent method: ending energy difference threshold: $1e-5$, step size: $1e-2$. The converging energy is roughly about 23.

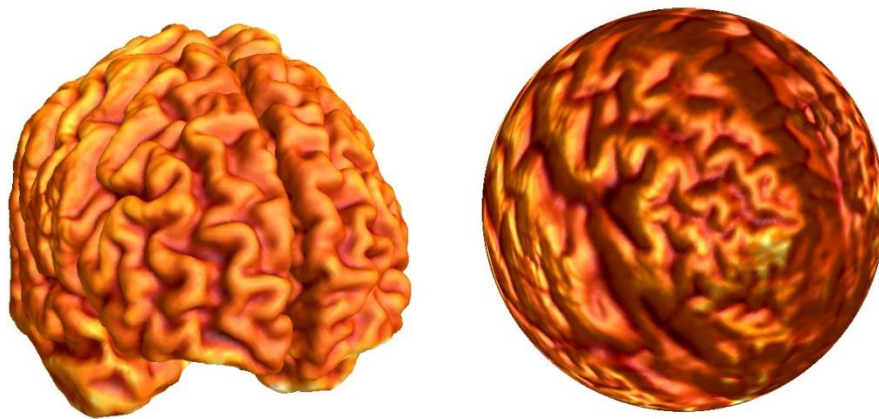


Figure 1. Spherical conformal mapping of a brain cortical surface.

Testing data:

- 1) UCLA's brain cortical surface model

Software library:

A C++ halfedge data structure software library is provided and encouraged to use in the project.

Mesh format is obj format. A free obj file viewer can be downloaded from <http://meshlab.sourceforge.net/>.

Hand in:

- 1) Implementation whole source code compilable package;
- 2) Conformal mapping result (the sphere) of the given surface (in obj format).



Bells and Whistles (20 points):

Try to use some more efficient optimization scheme, e.g., fast optimization with orthogonality constraints [1], to speed up the computation.

References:

1. Lai, R., Wen, Z., Yin, W., Gu, X., Lui, L.M.: Folding-free global conformal mapping for genus-0 surfaces by harmonic energy minimization. J. Sci. Comput. 58, 705–725 (2014)