

Needham, VDGAF, Chapter 20, Exercise 26, p. 226

Palmer, July 27, 2023, 12:30 am PST

26. Legendre's Projection of Convex Polygon. ... *Imagine that the complex polyhedron $\mathcal{P}$ is a wire frame, and a light bulb B is placed somewhere inside it. If S is a sphere centred at B and enclosing $\mathcal{P}$, prove that the shadow of the frame on the sphere is the desired geodesic partition.*

Assumptions: A convex polyhedron is composed of regular (straight-sided) polygons. Any infinite plane which passes through the centre of a sphere marks off an equatorial curve (great circle) on the surface. Any segment of this curve is a geodesic.

Rays of light from B that hit a wire frame edge E in $\mathcal{P}$ lie in a plane $\mathbf{P}$ containing B and E and cast a shadow curve $\tilde{E}$ onto S that also lies in $\mathbf{P}$. Hence, $\tilde{E}$ is a geodesic.