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Great Circle Distance

Given the longitude and latitude of two points on a sphere, find the geodesic distance (curved distance) between the two points.

Haversine Formula

Let $(lat_1, long_1)$ be the first point, $(lat_2, long_2)$ be the second point and r be the radius of the sphere.

$$dlon = long_2 - long_1$$

$$dlat = lat_2 - lat_1$$

$$a = \sin\left(\frac{dlat}{2}\right) \times \sin\left(\frac{dlat}{2}\right) + \cos(lat_1) \times \cos(lat_2) \times \sin\left(\frac{dlon}{2}\right) \times \sin\left(\frac{dlon}{2}\right)$$

$$c = 2 \times \text{atan2}(\sqrt{a}, \sqrt{1-a})$$

$$d = r \times c$$

where, d is the Great Circle Distance.

Chord Length between Two Points

In case we need to find the straight line distance between two points on sphere, we can use the intermediate value of a from the Haversine formula. Let AB be the chord length, then we can calculate it using the formula:

$$AB = r \times \sqrt{4 \times a}$$

Problem

Can be found on [Gateway](#)