Rotations

Special Orthogonal Matrices

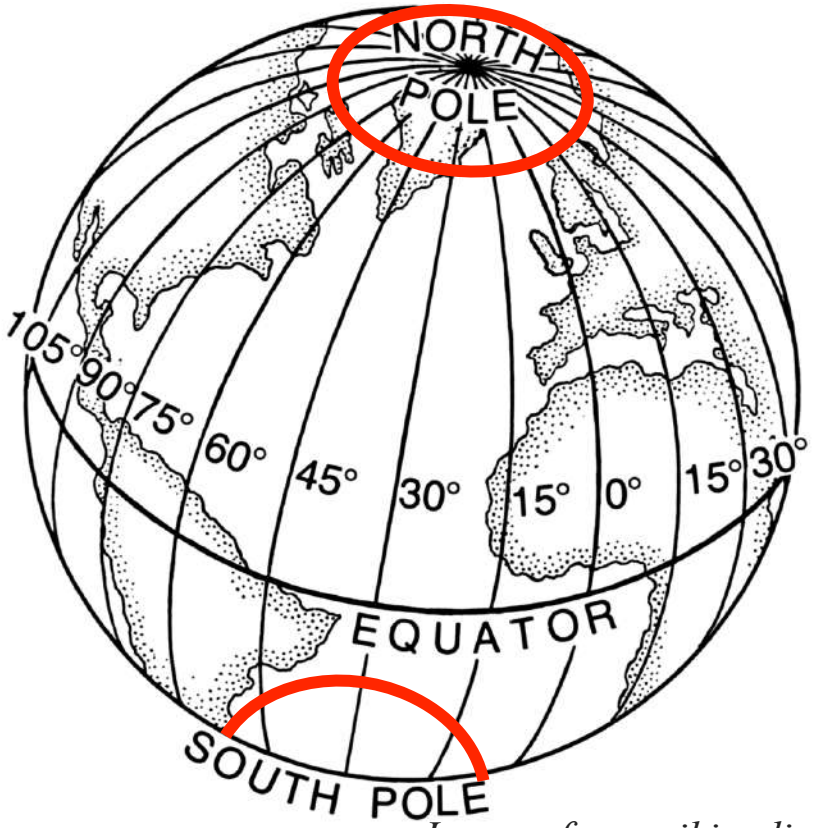
$$\left\{ R \in \mathbb{R}^{3\times 3} \mid R^T R = R R^T = I,\ \det R = 1 \right\}$$

Special Orthogonal group
in 3 dimensions

- The group of rotations is called $SO(3)$
- Coordinates for $SO(3)$
  1. Rotation matrices
  2. Euler angles
  3. Axis angle parameterization
  4. Exponential coordinates
  5. Quaternions

Coordinates for a Sphere

- Parameterize using a set of local coordinate charts (latitude and longitude)
- We want a collection of charts to describe the Earth's surface



Images from wikipedia

What is the minimum number of charts you need to cover the Earth's surface?

Images from wikipedia

What is the minimum number of charts you need to cover $SO(3)$?

$$SO(3) = \left\{ R \in \mathbb{R}^{3\times 3} \mid R^T R = R R^T = I,\ \det R = 1 \right\}$$