

## Implementation

$$\mathbf{v}_{\parallel} = (\mathbf{v} \cdot \mathbf{u})\mathbf{u}$$

$$\mathbf{v}_{\perp} = \mathbf{v} - \mathbf{v}_{\parallel} = \mathbf{v} - (\mathbf{v} \cdot \mathbf{u})\mathbf{u}$$

$$\mathbf{w} = \mathbf{u} \times \mathbf{v}_{\perp} = \mathbf{u} \times \mathbf{v}$$

$$qvq^{-1} = qvq^*$$

$$= [\cos \frac{\theta}{2}, \sin \frac{\theta}{2} \mathbf{u}] [0, \mathbf{v}] [\cos \frac{\theta}{2}, -\sin \frac{\theta}{2} \mathbf{u}]$$

$$= [0, \mathbf{v}_{\parallel} + \cos \theta \mathbf{v}_{\perp} + \sin \theta \mathbf{w}]$$

$$= [0, \cos \theta \mathbf{v} + (1 - \cos \theta)(\mathbf{v} \cdot \mathbf{u})\mathbf{u} + \sin \theta (\mathbf{u} \times \mathbf{v})]$$