Complementary Sensor Fusion

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Rotation defined by ω:

$$q_\omega = \left(\cos\frac{\theta}{2}, v \cdot \sin\frac{\theta}{2}\right) \ with \ \theta = \|\omega\|\Delta t \ and \ v = \frac{\omega}{\|\omega\|}$$

Rotation defined by a and m:

$$h = m \times a$$

$$e = a \times h$$

$$M = \begin{bmatrix} h_x & h_y & h_z \\ e_x & e_y & e_y \\ a_x & a_y & a_y \end{bmatrix}$$

$$q_{a,m} = q_M$$

Quaternion interpolation:

$$q = \frac{\sin\big((1-\gamma)\delta\big)}{\sin\delta} q_{a,m} + \frac{\sin(\gamma\delta)}{\sin\delta} q_\omega$$

$$\delta = \cos^{-1}\big(q_{a,m} \cdot q_\omega\big)$$