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On the Estimation of Rotation Axes

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A common problem in biomechanics is to estimate a joint's rotation axis. The axis is expressed as a 3×1 unit vector giving the axis' orientation in a local coordinate system attached to one of the two segments of the joint. Several optimization methods are available for estimating rotation axes. This talk focuses on statistical models to estimate these axes. The data for analysis consists of $\mathrm{SO}(3)$ or $\mathrm{SE}(3)$ elements giving the time varying posture of the joint. Models featuring one axis and two axes of rotation will be considered. The estimation of the rotation axis of the knee and of the two rotation axes of the ankle will be presented as illustrations.