Variability in joint kinematics: attitude vector vs Euler angles

1. Introduction

Accurate determination of joint kinematics is of great importance for understanding musculoskeletal function, where the former are often expressed based on the identification of centres and axes of rotation (Akbari- Ehrig19

Different methods have been proposed to compute joint axes from motion data: FHA, IHA, SARA

The position of a helical axis derived from the IHA using positional data is affected by a systematic error perpendicular to the true axis direction, whereas the axis direction is identical to those computed with either the FHA or SARA approach (true direction). – Ehrig 19

Both helical axis methods were fur- thermore used to estimate joint centre and joint axis positions. Here, the centre is often defined as the point which is nearest to all elements of a set of helical axes while the axis is defined as the line which is most parallel to all helical axes, although they may also be derived from the optimisation of a cost function. Ehrig19

HELICAL AXIS: The determination of a helical axis requires information about

the moving segment at two discrete instances of the motion (time frames), usually given by two rotations R0; R1, which, together with the associated translation vectors t0; t1; set up the transformations from local to global coordinates. EHrig 19