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Ultra-fast Radiography on the Fly

Thursday, 15 September 2011 13:11 (2 minutes)

Recent advances in synchrotron-based ultra-fast radiography have led to improved spatial resolution and contrast-to-noise ratios at high frame rates. These developments facilitate the observation of ever faster biological processes in vivo. Here we present a radiographic time series of wingbeats of two insects in tethered flight: the blowfly Calliphora vicina and the hoverfly Eristalis tenax, using the TOMCAT beamline of the Swiss Light Source. The temporal frequency of the projections allowed for image acquisition at over 2000 frames per second, equivalent to between ten and twenty radiographs per wingbeat. We now aim to use these data to reconstruct 3D time series of the wing hinge and neck motor systems during flight, by combining a large number of projections covering many wing-position / projection angle combinations. We have also investigated the image quality and radiobiological sustainability of mono- and polychromatic beams with different energy spectra and intensities. The high-resolution in vivo imaging technique used here is expected to drive new discoveries in animal biomechanics.

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