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Title:	Rigorous Integration of Inertial Navigation with Optical Sensors by Dynamic Networks
Author:	Denis Rouzaud and Jan Skaloud
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Abstract:	This paper presents a new concept for simultaneous modeling and adjusting of raw inertial observations with optical and (if available) GNSS data streams. The presented post-mission procedure of dynamic networks allows treating dynamic (e.g., inertial) and static (e.g., optical) raw observations with a spatial-temporal complexity that cannot be expressed in the traditional form of optimal filtering/smoothing. The theory is supported by a simulation scenario of terrestrial mobile mapping where sections of trajectory lacking GNSS coverage are visited several times and the optical observations (ranges and angles) are optimally combined, by using the presented approach, with angular and specific force observations of an onboard IMU. This simulation reveals that the parameter and covariance estimation via dynamic networks is i) equal to that obtained by the conventional INS/GNSS (if available) integration via filtering/optimal smoothing; and, ii) largely superior to the smoother when positioning states are conditioned across different times thanks to optical observations.
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