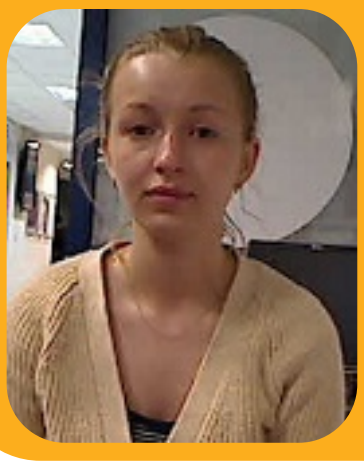
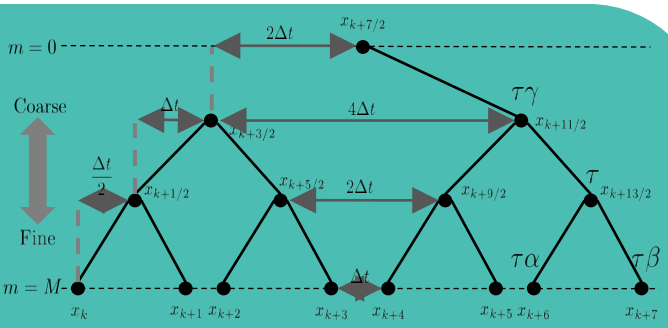
Anastasia Kadochnikova

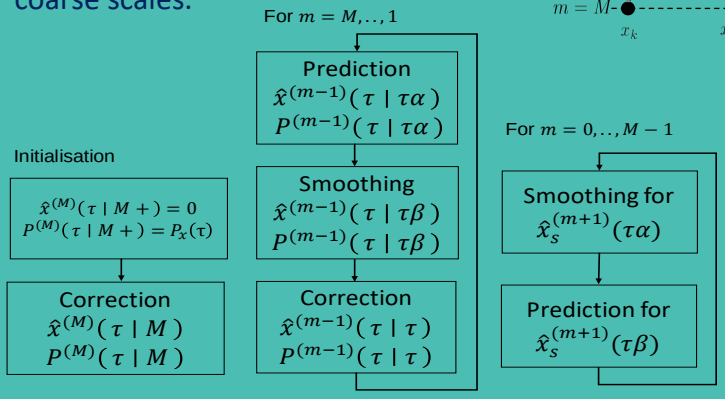


Anastasia Kadochnikova (AK) joined MultiSim in 2018 while completing her PhD studies with the Department of Automatic Control and Systems Engineering, the University of Sheffield. Her research interests lay in complex systems modelling and identification, including parameter and state estimation of hybrid systems, model selection, and applications in aerospace and biology.

Within Work Package 6 of the MultiSim project, AK works on the extension of the current multiscale estimation theory. The main focus of her research is developing a computationally stable state estimation framework that accounts for the dynamics of multiscale systems.

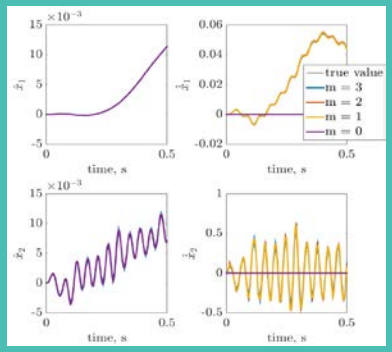
The most common representation of multiresolution systems is a Dyadic tree that separates complex process in multiple scales in which the state of the system evolves with different frequencies. High-frequency evolution is observed at finer scales, while low-frequency evolution is observed at coarse scales.

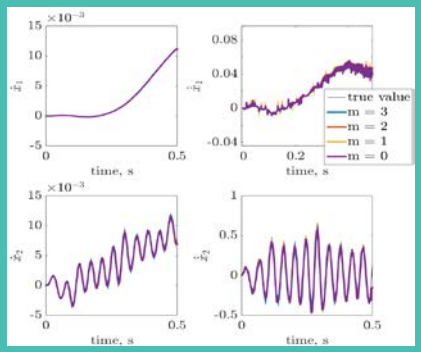


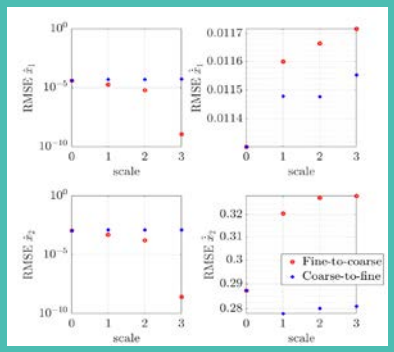


The algorithm can be broadly divided into three stages: initialisation, fine-to-coarse estimation sweep, and coarse to fine estimation sweep. Each step of the algorithm utilises the dynamical model of the system in forward time in square root implementation of the classical estimation procedures: Kalman filter prediction, meausrement update, and RTS

The performance of the proposed algorithm is demonstrated on the classical example of a multiscale system: double mass-spring system. The positions are observed only on one scale $M_y = 0$. The upward sweep successfully interpolates the states at coarser scales, and the downward sweep extrapolates the state at the finest scale.







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Publications

A. Kadochnikova, V. Kadirkamanathan, “Dynamically linked square root estimation framework for multi-timescale systems”, in preparation, 2019.