

Mortensen's approach to minimum energy filtering on the special orthogonal group

Robert Mahony (Australian National University)

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Minimum energy filtering is the process of designing a state filter for a system based on minimizing a deterministic cost functional associated with the observations. In the case of linear systems the minimum energy filter is the same as the Kalman filter, although based on a least squares deterministic cost criterion rather than the stochastic interpretation that is usually used for the Kalman filter. Mortensen's approach is a process of generating progressive realizable approximations of the solution of a minimum energy filter by differentiating the boundary condition of the associated optimal control problem. In the case of non-linear systems on Euclidean space, the second order Mortensen approximation of a minimum energy filter is the extended Kalman filter. In this talk I present recent results on deriving the second second order approximation of a minimum energy filter for kinematic system on $SO(3)$. Interestingly, the resulting filter is not the multiplicative Kalman filter, an invariant observer that serves as the industry standard for this problem. The filter obtained using Mortensen's approach shows better transient response and better asymptotic tracking than the multiplicative Kalman filter and the approach offers the potential for a design paradigm to obtain high performing near optimal filters for systems with invariance.

Biography: Prof. Mahony obtained a science degree majoring in applied mathematics and geology from the Australian National University in 1989. After working for a year as a geophysicist processing marine seismic data he returned to study at ANU and obtained a PhD in systems engineering in 1994. Between 1994 and 1997 he worked as a Research Fellow in the Cooperative Research Centre for Robust and Adaptive Systems based in the Research School of Information Sciences and Engineering in ANU. From 1997 to 1999 he was a post as a post-doctoral fellow in the CNRS laboratory for Heuristics Diagnostics and complex systems (Heudiasyc), Compiègne University of Technology, FRANCE. Between 1999 and 2001 he held a Logan Fellowship in the Department of Engineering and Computer Science at Monash University, Melbourne, Australia. Since July 2001 he has worked in the

Department of Engineering, ANU, and was promoted to full Professor in 2010. His research interests are in non-linear control theory with applications in robotics, mechanical systems and motion systems, mathematical systems theory and geometric optimisation techniques with applications in linear algebra, computer vision, digital signal processing and machine learning.