

Data Fusion in Sensor Networks

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Abstract

There is a growing excitement about the potential application of large scale sensor networks in diverse applications such as precision agriculture, geophysical and environment monitoring, remote health care, and security. Rapid progress in sensing hardware, communications and low-power computing has resulted in a profusion of commercially available sensor nodes. The big challenge now is to develop effective methods for the automatic fusion and interpretation of the information generated by large-scale sensor networks. The success of future applications is predicated on finding solutions to this data fusion challenge.

This talk will focus on probabilistic models and Bayesian data fusion methods appropriate to describing and solving sensor network data fusion problems. Over a number of years, we have used such methods to develop decentralised algorithms for point-target estimation in sensor networks. More recently, other researchers have developed distributed Bayesian algorithms for sensor networks to estimate field properties, such as temperature or humidity over an area. The prospect of developing holistic Bayesian methods for fusion in sensor networks now looks to be a real and exciting possibility. This talk will describe these potential developments. Notions of divergence and information appear naturally in probabilistic fusion algorithms. In turn these provide a handle on two other sensor network data fusion problems; how to model and manage sensor node performance and how to learn patterns in or interpret sensor network information. These ideas will also be developed in this talk. Interspersed amongst these developments we will describe some real sensor network applications, some solved, some currently being addressed, and some that remain as a challenge to network data fusion methods.

Biography

Hugh Durrant-Whyte received the B.Sc. in Nuclear Engineering from the University of London, U.K., in 1983, and the M.S.E. and Ph.D. degrees, both in Systems Engineering, from the University of Pennsylvania, U.S.A., in 1985 and 1986, respectively. From 1987 to 1995, he was a Senior Lecturer in Engineering Science, the University of Oxford, U.K. and a Fellow of Oriel College Oxford. From 1995 to 2002 he was Professor of Mechatronic Engineering at University of Sydney. In 2002 he was awarded an inaugural Australian Research Council (ARC) Federation Fellowship. He also now leads the ARC Centre of Excellence in Autonomous Systems based at the University of Sydney. His research work focuses on autonomous vehicle navigation and decentralised data fusion methods. His work in applications includes automation in cargo handling, mining, defence, and marine systems. He has published over 300 technical papers and has won numerous awards and prizes for both his academic work and his commercialisation activities.