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An Inverse Optimal Control and Information Theoretic Understanding of the M/M/1 Queue

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In this problem, we discuss a two-agent dynamic team decision theory problem with non-classical information structure and feedback. It is the objective to design a team strategy that minimizes an additive time-invariant cost function that generalizes well-known problems and enables new formulations pertaining to "sequential information gain". We (i) demonstrate a structural result that characterizes optimal strategies using minimal sufficient statistics for optimal schemes and (ii) use this insight to characterize the inverse optimal control problem where for a fixed strategy is shown to be optimal - using variational equations from information theory - for a class of cost functions pertaining to likelihood ratios. We demonstrate the relationship with this result and time-reversible Markov chains in stochastic dynamical systems, and characterize a sequential information gain cost function for which the dynamics of the M/M/1 queue and other queuing systems are shown to be optimal.

Biography

Todd P. Coleman was raised in Dallas, TX. He received B.S. degrees in Electrical Engineering and Computer Engineering at the University of Michigan in 2000. He received M.S. and Ph.D. degrees in Electrical Engineering (minor in mathematics) from MIT in 2002, 2005, respectively. For the 2005-2006 academic year, he was a postdoctoral scholar in computational neuroscience at MIT and Harvard. From 2006--2011, he was an Assistant Professor at UIUC in the ECE and Neuroscience departments where he was co-PI on UIUC's first NSF IGERT pertaining to "neuro-engineering" and has was a Fellow for the Center for Advanced Study. . He is now an Associate Professor in the department of Bio-engineering at the University of California, San Diego. His research interests include information theory, operations research, computational neuroscience, and brain-machine interfaces.