

ABSTRACT

Edwin Chong

Adaptive Sensing: Formulation, Approximation, and Application

Edwin K. P. Chong
Colorado State University

Adaptive sensing involves actively managing sensor resources to achieve a sensing task, such as object detection, classification, and tracking. Such problems arise in a wide variety of disciplines. In this set of three tutorial-style lectures, we describe an approach to adaptive sensing based on approximately solving a partially observable Markov decision process (POMDP) formulation of the problem. Such approximations are necessary because of the very large state space involved in practical adaptive sensing problems, precluding exact computation of optimal solutions. We review the theory of POMDPs and show how the theory applies to adaptive sensing problems. We then describe a variety of approximation methods, with examples to illustrate their application in adaptive sensing. The examples also demonstrate the gains that are possible from non-myopic methods relative to myopic methods, and highlight some insights into the dependence of such gains on the sensing resources and environment.