ABSTRACT: Numerous engineering systems are governed by partial differential equations (PDEs), such as energy systems, water management systems, swarm robotic systems, traffic management systems, and additive manufacturing systems. This talk will present a recent optimal sensor design result with infinite-time Kalman filters, to enable high performance in state estimation for systems governed by PDEs. Kalman filters are popular state estimators since they are optimal in minimizing the estimation error variance for given measurements. The focus of this talk is to achieve further minimization of the error variance by also optimizing over the sensor design. The optimal sensor design problem is thus incorporated into the state estimation problem, considering into the optimization criteria not only the sensor location but also other factors such as the sensor shape. The problem is well-posed and admits optimal solutions, for which several examples will be shown to illustrate this approach.

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