Variations Around the Standard LQG Model

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Abstract:

This talk will provide an introduction to the tutorial session by first recalling the basic elements and assumptions of the standard LQG model, and then identifying several variations around it. One of these variations is placement of memory restrictions on the controllers, which brings in a *signaling* element into controller design. Here linearity of optimal controller is retained for some classes of such problems (which will be identified), but for most it does not (also to be discussed). Another variation is failure of channels according to some probability law, yet another one is adversarial intrusion into transmission of information (which leads to a stochastic zero-sum game), and yet a third one is introduction of bandwidth limitations, which necessitates quantization of the signals transmitted. Optimal designs for all these variations will be presented. Also to be discussed is what is known as *rational expectation* models (arising particularly in economics) where the evolution of a decision process depends on future expectations of a decision-maker on that evolution, which can also be handled within the linear-quadratic framework with Gaussian statistics, though quite different from the basic LQG framework. Yet another topic to be covered is *incentive designs*, again in the linear-quadratic framework, where now there are (at least) two decision-makers with different objective functions, where one has the capability to (partially) shape the objective of the other one toward his own benefit. The talk will conclude with variations in the direction of other types of stochastic dynamic games as a segue to the next talk in the session.