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Relative Almost Sure Regret Bounds for Certainty Equivalence Control of Markov Jump Systems

In this talk, we consider the learning and control problem for unknown Markov jump linear systems (MJLS) with perfect state observations. We first establish an upper bound on regret for any learning-based algorithm. We then propose a certainty-equivalence based learning algorithm and show that this algorithm achieves a regret of $O(\sqrt{T} \log(T))$ relative to a certain subset of the sample space. As part of our analysis, we propose a switched least squares method for the identification of MJLS, show that this method is strongly consistent, and derive data-dependent and data-independent rates of convergence. These results show that certainty equivalence control along with the switched least squares method for MJLS has the same rate of convergence as the certainty equivalence control method for linear systems.