

Adaptive-Optimal Control of Nonstationary Dynamical Systems

An adaptive-optimal control architecture is presented for adaptive control of constrained aerospace systems that are subject to dynamic change. The architecture brings together three key elements, model predictive control based reference command shaping, Gaussian Process (GP) based Bayesian nonparametric model reference adaptive control, and online GP clustering over nonstationary (time-varying) GPs. The key salient feature of our architecture is that not only can it detect changes, but it uses online GP clustering to enable the controller to utilize past learning of similar models to significantly reduce learning transients. Stability of the architecture is argued theoretically and performance is validated empirically.