

Title:

Basics of DHP type Adaptive Critics /Approximate Dynamic Programming and Some Application Issues.

Organizer:

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Abstract:

Tutorial starts with basic control design problems, and brings focus on the Adaptive Critic Method for solving them. Provides a basic overview of Adaptive Critic methods, and focuses on a selected version of Adaptive Critics known as DHP. Describes the DHP process at high level, and provides intuitive description of the mathematics for developing the weight-update rules. Defines the Bellman Dynamic Programming formulation, and sets it up as foundation of the Adaptive Critic methods -- specifically the simultaneous training of the controller and the critic to optimize the Bellman Value Function. Key parameters of the resulting ADP process are described. A careful walk-through of three (published) examples of applications of the DHP method: the traditional Pole-Cart Benchmark problem, steering controller for an autonomous 4-wheel terrestrial vehicle, and Hypersonic Aircraft control augmentation system. Details of the design process for each example are given, and provide examples of the various strategies for solving the governing equations, different examples of different Utility Functions and corresponding controllers designed by the DHP based on these Utility Functions are given, plots of experimental results for each, and conclusions drawn from each sample application. Three short video clips demonstrate different tests for the aircraft example.