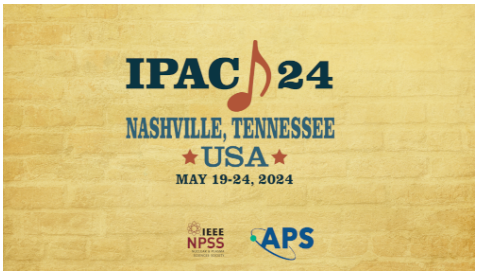

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Reinforcement learning enabled fast optimization in lasers and accelerator control: with experimental demonstration on laser combining

Monday, 20 May 2024 16:00 (2 hours)

Semi-deterministic optimization problems are common in operating complex lasers and accelerator facilities. In these problems, a few optimal solutions exist that can achieve satisfactory system performance for a specific system state. Typically, online optimizations are performed to find these optimal solutions, which can be time-consuming and must be repeated when the system state changes. In this paper, we propose a high-efficient optimization method called method, which can directly map any given system state to the optimal solution based on the optimization criterion. We demonstrate the effectiveness of our method in several real-life optimization scenarios, including simulations and experiments conducted at SLAC and LBNL. Our proposed method can significantly reduce the optimization time and cost and provide a more efficient solution for accelerator facility operations. Moreover, an 8-beam, diffractive coherent beam combiner is phase-controlled by the method, from random states, showing fast optimization of the complex laser system without labeling target patterns as demonstrated in previous publications.

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