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Implementation of Adjoint Sensitivity Analysis in WARP

Tuesday 12 August 2025 16:00 (2 hours)

The design of accelerator lattices involves evaluating and optimizing Figures of Merit (FoMs) that characterize a beam's properties. These properties—hence the FoMs—depend on the many parameters that describe a lattice, including the strengths, locations, and possible misalignments of focusing elements. Often what is required is the gradient of the FoM with respect to each of the parameters. For systems that require numerical simulation, a naïve computation of a gradient requires one simulation for the "base case", plus one additional simulation for each parameter of interest—a daunting effort in the case of computationally demanding simulations with many parameters. Adjoint techniques allow one to extract gradient information from one base-case simulation plus an additional one or two carefully prepared simulations.* We demonstrate these techniques using the accelerator simulation code WARP, and we present our proof-of-concept results using several different FoMs as the basis for adjoint analyses of a simple beamline with multiple parameters.

Please consider my poster for contributed oral presentation

No

Would you like to submit this poster in student poster session on Sunday (August 10th)

No

Footnotes

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I have read and accept the Privacy Policy Statement

Yes

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