

On the Cyclic Steepest Descent Method

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Abstract: The classical steepest descent method, which was due to Cauchy (1847), has played a special role in the development of numerical analysis and optimization. In practice, the steepest descent method performs slowly and is influenced greatly by the problem condition. By the seminal work of Barzilai and Borwein (1988), however, the method can be significantly accelerated by carefully choosing the stepsize while keeping the negative gradients as search directions. Following this line, many Barzilai-Borwein-type gradient methods were proposed by various researchers.

Unfortunately, the theoretical analysis of Barzilai-Borwein-type gradient methods seems quite difficult. In spite of their excellent numerical performances, there is not enough theoretical evidence showing the Barzilai-Borwein-type is superior to the classical steepest descent method in the any-dimension case. In this talk, the author shall address one special gradient method — the cyclic steepest descent method. The talk is mainly based on the work of Dai and Fletcher (2005) and some new results.

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