# Acceleration of a Schwarz Waveform Relaxation Method for Parabolic Problems.

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**Abstract**

In this paper we generalize the Aitken-like acceleration method of the additive Schwarz algorithm for elliptic problems to the additive Schwarz waveform relaxation for parabolic problems. The domain decomposition is in space and time. The standard Schwarz waveform relaxation algorithm has a linear rate of convergence and low numerical efficiency. This algorithm is, however, friendly to cache use and scale with the memory of the parallel computer. It also minimizes the number of messages sent in a parallel implementation and is therefore very insensitive to delays due to a high latency network. M. Gander and co-workers have shown that the convergence of the algorithm can be speed up by optimizing the transmission conditions. Our Aitken-like acceleration is an alternative method that consists of postprocessing the sequence of interfaces generated by the domain decomposition solver and might be combined to the method of Gander et al. We show that our technique (1) is a direct solver that requires at most four solves per subdomain in the case of a linear parabolic problem that has time independent coefficients no matter the overlap, (2) is an efficient acceleration procedure for parabolic problems that are weak perturbation of linear operators with time independent coefficients, (3) does provide a rigorous framework to optimize the parallel implementation on a slow network of computers. Application to distributed computing of heat transfer problem on the grid will be discussed.