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Abstract
The modeling of physical systems such as fluid flow, electrical, and acoustical phenomena is of great importance. Many approaches exist to analyze the behavior of such systems including finite element and finite difference techniques. Alternatively, it is possible to find a multi-dimensional lumped electrical network, which represents the behavior of the linear or nonlinear system. From this network, it is then reasonably straightforward to develop a discrete-time equivalent, which is a multi-dimensional wave digital filter (MDWDF). The main distinct advantages of such a model are massive parallelism in time and high accuracy inherent in nature. The parallelism of the MDWDF approach in time is usually referred to as partial parallelism. To achieve its full parallelism, one must combine it with some spatial updating technique. Using the chained multidimensional retiming technique, the concept of full parallelism in terms of software pipelining is applied to the MDWDF models. In this thesis, we propose alternative possibilities in which the physical system modeling can achieve its full parallelism based on the MDWDF and MD retiming techniques.
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