Evolution of Waveform Relaxation (WR) for Circuit Analysis

Albert E Ruehli

ruehli@us.ibm.com

IBM T. J. Watson Research, USA

In this paper we give an account of the beginnings of the Waveform Relaxation (WR) technique in 1980. Initially, WR was intended exclusively for the solution of large time domain circuits problems. At the time it became clear that VLSI (Very Large Scale Integration) would generate circuits which could not be solved with conventional techniques at least not with a high degree of accuracy. We will give insights into the evolution of the approach which is applied today for the solution of large circuits. We consider some of the problems which had to be solved to make WR into a general purpose solution technique for heterogeneous systems. These issues are related to concepts like partitioning (splitting) and scheduling and latency. The WR techniques have gained even more importance with the wide availability of small SMP parallel processor workstations. It has been shown that large problems can be solved with a high efficiency on a large number of processors. In our assessment, the potential of the WR techniques has not been fully realized so far and further research in the general area of WR techniques could yield new and interesting approaches.