The Design and Analysis of Parallel Algorithms

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Computing Models provide frames for the analysis and design of algorithms. Unfortunately, the balance required between simplicity and realism makes it difficult to guarantee the necessary accuracy for the whole range of algorithms and machines. Simplicity implies a minimal number of architecture parameters (usually including computational power, bandwidth and latency). Accuracy implies just the opposite. The short history of Parallel Computing has seen the arrival (and the departure) of many proposals. Undoubtedly, the best known among those is the Parallel Random Access Machine (PRAM), the Postal/LogP Model and the Bulk Synchronous Parallel Model (BSP). From these three, the oldest one, the PRAM model, has been discarded as unrealistic. The other two, LogP and BSP, remain but do not escape of those aforementioned conflicts. Each model enforces/matches a different parallel programming style. To make the situation worse, none of these two styles agrees completely with the currently dominant style in parallel and distributed programming: MPI message passing. The talk will make emphasis on BSP, its weakness and strengths. As developing examples, we will use two programming paradigms: nested data parallelism and pipelining.