

Enrique Quintana Ortí

Title: SuperMatrix out-of-order scheduling of matrix operations for SMP and multi-core architectures

Abstract: We discuss the high-performance parallel implementation and execution of dense linear algebra matrix operations on SMP architectures, with an eye towards multi-core processors with many cores. We argue that traditional implementations, as those incorporated in LAPACK, cannot be easily modified to render high performance as well as scalability on these architectures. The solution we propose is to arrange the data structures and algorithms so that matrix blocks become the fundamental units of data, and operations on these blocks become the fundamental units of computation, resulting in algorithms-by-blocks as opposed to the more traditional blocked algorithms. We show that this facilitates the adoption of techniques to dynamic scheduling and out-of-order execution usual in superscalar processors, which we name “SuperMatrix Out-of-Order scheduling”. Performance results on a 16 CPU Itanium2-based server are used to highlight opportunities and issues related to this new approach.

Affiliation: Universidad Jaume I de Castellón.

Research: Desarrollo de bibliotecas de altas prestaciones para computación matricial densa, Resolución paralela de problemas de reducción de modelos, Optimización de aplicaciones científicas