Hardware-optimized, Symmetric, High-Performance Auto-Parallelization System with Loop-Level Parallelization, and Method Thereof

Field of the Invention

The current invention generally relates to multi-processor systems, in particular multi-core systems and parallel computing systems allowing multiprocessing in which two or more processors or cores work together to execute multiple program codes and/or processor instruction sets simultaneously, the multi-processor systems or parallel-computing systems comprising a number of central processing units linked together to enable said multiprocessing or parallel processing to take place. In particular, it relates to compiler systems for optimizing a computer program for execution by a parallel processing system having a plurality of processing units. More particularly, the described embodiments relate to systems and methods for auto-parallelization of code for execution in the described multi-processor systems. In the technical field of multiprocessor systems, important characteristics and classifications arise inter alia, from way, how processor memory access is handled and whether system processors are of a single type or various ones in the system architecture.

Background of the Invention

In the last years, a fundamental change in computer architecture has been observed that will impact every facet of data processing and operation of every electronic device from cell phone to supercomputer, since it introduces parallelism of unprecedented scale, which confronts traditional technical approaches of code optimization and parallelization. In particular, it creates the technical requirement for computer and processor-specific code parallelization to achieve a true optimization. Whereas the conventional multicore approach (2, 4, and even 32 cores) adopted by the computing industry came slowly to a performance plateau, technology moves to higher performance per watt and per chip area using manycore technology (hundreds or even thousands of cores). However, fully unleashing the potential of the manycore approach to ensure future advances in sustained computational performance will