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LOOP UNROLLING EFFECT ON PARALLEL CODE OPTIMIZATION

By

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ABSTRACT

Users at this technological era running several parallel applications at the same time on their machines, these applications consume memory and processing time, the era that everything changing rapidly, users are looking forward to faster devices to complete tasks.

Continuous changing or updating hardware components is a difficult and expensive process, the other point of view was to optimize the applications to run on the same architecture with less execution time.

The Optimization process is under consideration matter in the scientific community. The goal of optimization of an application is to complete the same task in less execution time with the same results.

The optimization has several types and techniques, we consider in this thesis code optimization and specifically loop unrolling technique especially with the increase of pipeline depth in modern processors, as the loops in any application is the most complicated part due to the irregular conditional branching that has negative affect over the pipeline and execution of the application.

Several applications use loops in their implementations, Sparse Dens Matrix Multiplication (SpDM) problem is one of the most important problems used in several applications in numerical analysis, graph theories and image processing as mentioned in a research paper published from Berkeley University in the USA in 2016.

Implementing and applying the loop unrolling optimization technique on this problem, modifying the algorithm to enhance the performance of the application by reducing the execution time is our goal.

Loop unrolling technique could increase the execution time instead of decrease it, due to high unrolling factor usage that will result in a high miss rate in I-Cache, which will lead eventually to a high execution time.

Scientific committee split into two opinions, the first consider the SpDM is computational bound problem, reduce the number of mathematical instructions is the best way to optimize

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