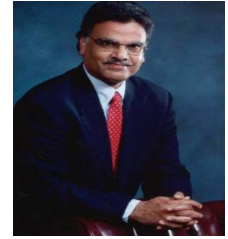




Distinguished Seminar Comp. Sci. Dept.



Optimizing Performance of Cache Memory Systems in Multicore Processors

Dr. Krishna Kavi, Univ. of North Texas

Apr 19th Tuesday, 12:30 to 1:30pm

Butler-Carlton (Civil) # 120

Abstract - This talk focuses on techniques to improve cache memory performance in multicore processors. It is an understatement to say that the performance of multicore systems is limited by their memory systems' performance. Our research has developed both hardware and software solutions to improve the performance of (L1 and L2) cache memories. Software solutions include profiling of data access patterns, relocating data, and restructuring code to improve performance. Hardware solutions include customizing cache address mapping (or indexing) for different threads and/or different objects within an application, and the simultaneous existence of multiple address mappings. We are developing a program analysis tool that helps with our hardware and software solutions. Gleipnir is built on top of a widely used program analysis tool called Valgrind. When fully developed, Gleipnir can be used to obtain very fine grained information with each memory access, including the program variable associated with that access, the function and thread that caused the access.

Localities exhibited by data depend on object types and how they are accessed in an application. Better performance can be achieved by spreading data accessed by applications more uniformly across the cache and minimize cache conflicts. Code and data restructuring techniques that rely on profiled information on data accesses can minimize conflict misses and improve uniformity of cache accesses. Uniformity of accesses can also be achieved using custom indexing for each application. We are also investigating the use of multiple indexing schemes (or multiple decoders) with cache memories. Performance can also be improved if cache memories are partitioned and reconfigured optimally to meet divergent needs of data types and access patterns. Combining data and code restructuring with reconfigurable caches can lead to even better performance.

Brief Bio - Dr. Krishna Kavi is currently a Professor of Computer Science and Engineering and the Director of the NSF Industry/University Cooperative Research Center for Net-Centric Software and Systems at the University of North Texas. During 2001-2009, he served as the Chair of the department. He also held an Endowed Chair Professorship in Computer Engineering at the University of Alabama in Huntsville, and served on the faculty of the University Texas at Arlington. He was a Scientific Program Manger at US National Science Foundation during 1993-1995. He served on several editorial boards and program committees.