Summary
Data dependence profiling for speculative optimizations

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February 21, 2005

1  To be completed before class

What are the problems solved by this paper? (50 words)
Compiler optimizations have been used to improve the performance of many programs. The compiler has the advantage of being able to see the entire program and decide on the optimizations, but the main disadvantage of the compiler is that it doesn’t have run-time information. Because of this, the compiler is forced to take conservative decisions resulting in less optimized code. For example, if there is a lot of pointer accesses, the compiler cannot tell which pointer access is which data. With profiling, the compiler can get some runtime information and hence can do more aggressive optimizations. Data dependence information is essential to do many optimizations in the compiler. Data dependence profiling can also be used to get dynamic dependence information and that would help the compiler to do more aggressive optimizations with the help of some hardware like the ALAT of Itanium. The data dependence profiling can be very costly if done in software. So there is a need for doing efficient data dependence profiling.

What are the approaches attempted by this paper? (50 words)
In this paper, the code is first instrumented at each memory reference (register dependences can be easily got from static analysis). The instrumentation is done after the global optimization phase of the ORC, to reduce the number of instrumented memory references. Each memory reference is assigned a static reference id. When the instrumentation library call is executed, the memory reference is mapped to a location in the shadow space depending on its address. By examining the locations in the shadow space we will be able to get the dependence information. This is much more efficient than pair-wise comparisons. Also the paper tries to reduce the granularity of profiling and also used sampling to improve the efficiency.

What are the main conclusions of this paper? (50 words)
The data dependence profiling is used to improve speculative Partial redundancy elimination (PRE). This gives an average performance improvement of 8.22% for Spec2000 benchmarks. This is also found to be much better than alias profile based optimization. This shows that if compiler can get the data dependence information, it can do much better optimizations. The paper also shows that having a granularity of 32 bytes will lead to just about 15% false dependences. So if we use optimizations to improve our data dependence profiling, we won’t lose much information and still we will be able to get good speedup.

2  To be completed after class

Did this paper address an important issue? Explain. (100 words)
Are the proposed approaches valid? Describe its strength and weakness. (100 words)

Do the results support the conclusions? Explain. (100 words)

Describe the potential future works? (100 words)