Summary
The Performance of Runtime Data Cache Prefetching in a Dynamic Optimization System

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1 To be completed before class

What are the problems solved by this paper? (50 words)
Due to the growing gap between memory speed and the processor speed, cache misses are getting very costly. Dynamic cache prefetching can be used to prefetch misses that have some regular pattern. Compiler can also insert prefetch instructions. But since the compiler lacks dynamic information it tends to be less aggressive and insert very few prefetch instructions. One way to do it to collect runtime information and dynamically recompile the code. Some optimization frameworks have been proposed by they tend to have a huge overhead. So there is a need for a low overhead framework which can use some architecture support.

What are the approaches attempted by this paper? (50 words)
The ADORE framework proposed and used in this paper is built for the Itanium processors. In Itanium we have hardware support to collect runtime information using the Performance Monitoring Unit(PMU). The ADORE the phase detector is invoked every 100 milliseconds. If there is a stable phase detected, then the trace selector builds the traces based on the samples in the User Event Buffer. Then the traces are patched. Then it tracks the delinquent loads and inserts prefetch as necessary.

What are the main conclusions of this paper? (50 words)
After applying the dynamic optimization based prefetching the performance of Spec2000 benchmarks is improved by 57% over the code that was compiled using -O2 option in ORC. This shows that good performance can be got using this framework and the overhead of the framework is very low. The paper applied this technique only to data cache prefetching, but as such this can be applied to improve all other static optimization techniques.

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)