Summary
Data Dependence Profiling for speculative optimizations.

Kiran Yellajosula
February 21, 2005

1 To be completed before class

What are the problems solved by this paper? (50 words)

Traditional data dependence analysis algorithms have limited ability in identifying array based variables but not pointer based references as in C or C++ or sparse matrix dependences array[index[k]]. The absence of such analysis techniques inhibits the ability of the compiler to perform aggressive optimizations for low probability dependences. In situations where memory operations are instrumented, the profiling is very slow and time consuming due to the vast address space of a program.

What are the approaches attempted by this paper? (50 words)

The authors propose a software based data dependence profiling technique that obtains context sensitive memory dependences between operations. The profiling is done through the use of a shadow memory which is used for identifying dependences across procedures and loops. The profiled data is used to perform optimizations like speculative partial redundancy elimination or code scheduling on the Itanium processor. They also propose various techniques to collect the data dependence probability and methods of reducing the space and time complexity of the profiling.

What are the main conclusions of this paper? (50 words)

The profiled data can be used to effectively to perform speculative optimizations in processors supporting speculative execution or across multiple threads. The performance improvement by such techniques can be as high as 32%. Sampling can be used to identify the dependences between various operations. The size of the shadow entries and data granularity play a very important role in profiling data. The sampling overhead can slow down the run time by an average of 40 times but using sampling can reduce the overhead to 20% of the program execution time.

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)