More Information

Time Friday, December 1, 2000
1:00 pm - 2:00 pm

Location 50A-5132 Conference Room

Title Current work in the Overture Framework and the General Optimization of Object-OrientedApplications

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Abstract Overture is a serial/parallel object-oriented framework for solving partial differential equations in two and three space dimensions. Overture is a collection of C libraries that enables the use of finite difference and finite volume methods at a level that hides the details of the associated data structures. Overture can be used to solve problems in complicated, moving geometries using the method of overlapping grids. It has support for grid generation, difference operators, boundary conditions, database access and graphics.

ROSE is a preprocessor generation tool for the support of compile time performance optimizations of general object-oriented frameworks. The optimization of the interactions between objects within Overture is of particular interest since the Overture applications can be computationally large. Unfortunately, optimizations that might be obvious to the framework developer or application developer (e.g. cache based optimizations), due to the precise semantics of the framework's abstractions, are often lost through the C compiler's inability to recognize or leverage such semantics. Preprocessing steps can be used to introduce source-to-source transformations levaging the semantics of a framework's abstractions, but the development of such a preprocessor tool is particularly complicated for a general object-oriented language such as C . This talk will show how such framework specific preprocessors can be automatically generated.

In this talk we present Overture, including some examples, and present our approach toward optimizing the performance for Overture and the A /P array class abstractions upon which Overture depends. The results we present show that the semantics of the abstractions represented within Overture and the A /P array class library can be used to generate a preprocessor using ROSE. The results demonstrate the performance of an Overture application with and without such a preprocessing step, the final performance with preprocessing is equivalent to that of optimized C and Fortran 77. By design, ROSE is general in its application to any object-oriented framework or application and is in no way specific to Overture.

Sponsor Esmond Ng