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Computer Science Lecture Series

Cyclone: Safe Programming at the C Level of Abstraction

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12:30-1:30pm
Monday, March 31, 2003
Room 381 - Computer Science Dept.

Abstract:

Memory safety and type safety are invaluable features for constructing robust software. However, most safe languages are at a high level of abstraction; programmers cede almost all control over data representation and memory management. This control is one reason C remains the de facto standard for writing systems software or extending legacy systems already written in C. The Cyclone project aims to bring safety to C-style programming without sacrificing the programmer control necessary for low-level software. To do so, we employ a variety of techniques including an advanced type system, flow analysis, run-time checks, and modern language features.

This presentation will focus primarily on how a novel type system can use a small set of techniques to allow safe multithreading and limited manual memory management without requiring unnecessary code duplication. A formal abstract machine that captures the interesting aspects of the type system lets us prove a type-soundness theorem that helps validate Cyclone's design. Empirical evidence suggests that Cyclone is useful for C-level tasks and that user control over data representation and run-time checks can improve application performance.

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