Parallel and Distributed Incremental Attribute Evaluation Algorithms for Multi-User Software Development Environments

Gail E. Kaiser
Columbia University
Department of Computer Science
New York, NY 10027
212-854-3856
Kaiser@cs.columbia.edu

Simon M. Kaplan
University of Illinois at Urbana-Champaign
Department of Computer Science
Urbana, IL 61801
217-244-0392
Kaplan@cs.uiuc.edu

Abstract

We address the problem of *change propagation* in multi-user software development environments distributed across a local area network. We model the program as an attributed parse tree segmented among multiple user processes and model changes as asynchronous subtree replacements requested by individual users. We then implement change propagation using decentralized incremental evaluation of an attribute grammar that defines the desired programming language. Building up to our primary result, we present algorithms that support parallel evaluation on a centralized tree in response to single edits, multiple edits with a single editing cursor, and multiple edits with multiple editing cursors. Then we present our algorithm for parallel evaluation on a decentralized tree in response to single or multiple edits. We also present a protocol to guarantee reliability of the evaluation algorithms as components of the decentralized tree become unavailable due to failures and return to availability.

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