1. ABSTRACT

Fixing software bugs has always been an important and time-consuming process in software development. Fixing concurrency bugs has become especially critical in the multicore era. However, fixing concurrency bugs is challenging, in part due to non-deterministic failures and tricky parallel reasoning. Beyond correctly fixing the original problem in the software, a good patch should also avoid introducing new bugs, degrading performance unnecessarily, or damaging software readability. Existing tools cannot automate the whole fixing process and provide good-quality patches. I will present AFix, a tool that automates the whole process of fixing one common type of concurrency bug: single-variable atomicity violations. AFix starts from the bug reports of existing bug-detection tools. It augments these with static analysis to construct a suitable patch for each bug report. It further tries to combine the patches of multiple bugs for better performance and code readability. Finally, AFix’s run-time component provides testing customized for each patch. Experimental evaluation shows that patches automatically generated by AFix correctly eliminate six out of eight real-world bugs and significantly decrease the failure probability in the other two cases. AFix patches never introduce new bugs and have similar performance to manually-designed patches.

2. SPEAKER BIOGRAPHY

Ben Liblit is an associate professor in the Computer Sciences Department of the University of Wisconsin–Madison, with research interests in programming languages and software engineering. Professor Liblit worked as a professional software engineer for four years before beginning graduate study. His experience has inspired a research style that emphasizes practical, best-effort solutions that bring formal methods to bear against the ugly complexities of real-world software development.

Professor Liblit completed his Ph.D. in 2004 at UC Berkeley with advisor Alex Aiken. He earned the 2005 ACM Doctoral Dissertation Award for his work on post-deployment statistical debugging, and has received AFOSR Young Investigator and NSF CAREER awards in support of his research.