The Role of Human Creativity in Mechanized Verification

(Invited Talk)

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Abstract

In a presentation at FMCAD 1996 I decried industry's expectations that the creative insights of highly-paid, world-class hardware designers "should" be checkable by "push-button" tools. In the associated paper, my co-authors and I observed that unequivocal rejection of "lightweight" tools is impossible because of the role of "heavyweight thinking" in their use: problems that are impossibly large can often be rendered tractable by push-button means if the user is clever or persistent enough to create the right abstractions. The sensitivity of "tractability" to apparently minor modeling decisions is a well-known phenomenon for all of our tools. The decision not to model a certain bit or to avoid a certain form of definition, while appearing coincidental to the reader, may in fact be a crucial choice and we ought to highlight such decisions when we are aware of their importance. That we sometimes do not highlight them is not intellectual dishonesty but concern for clarity. Like mathematicians who revise a proof repeatedly for publication, the key insights are often lost as the presentation is polished. In this talk I again delve into the key question of the role of human creativity in mechanized verification. I argue that the more explicit we make that role, the better. Unlike mathematicians, we are fundamentally concerned with automating the methods of theorem discovery and proof. By highlighting the "minor decisions" that represent major breakthroughs in the problem, we serve our science better because we identify the key problems yet to be solved.

Short Biography

J Strother Moore holds the Admiral B.R. Inman Centennial Chair in Computing Theory at the University of Texas at Austin. He is the author of many books and papers on automated theorem proving and mechanical verification of computing systems. Along with Boyer he is a co-author of the Boyer-Moore theorem prover and the Boyer-Moore fast string searching algorithm. With Matt Kaufmann he is the co-author of the ACL2 theorem prover. Moore got his BS from MIT in 1970 and his PhD from the University of Edinburgh in 1973. Moore was a co-founder of Computational Logic, Inc., and served as its chief scientist for ten years. He and Bob Boyer were awarded the Current Prize in Automatic Theorem Proving by the American Mathematical Society in 1991 and they were awarded the Herbrand Award in 1999. In 2005, Boyer, Moore and Kaufmann won the ACM Software System Award, for the Boyer-Moore theorem prover. Moore served as chair of the UT Department of Computer Science from 2001 to 2009. Moore is a Fellow of the American Association for Artificial Intelligence, the ACM, and the National Academy of Engineering.