

## **2013 CAV Award Announcement**

The 2013 CAV (Computer-Aided Verification) Award was presented on July 17, 2013, at the 25th annual CAV conference in Saint Petersburg, Russia, to Kim G. Larsen, Paul Pettersson, and Wang Yi for the development of UPPAAL, a model checker for real-time systems. The annual award, which recognizes a specific fundamental contribution or a series of outstanding contributions to the CAV field includes a \$10,000 award. The award was presented with the citation: "for developing UPPAAL which is the foremost tool suite for the automated analysis and verification of real-time systems."

The CAV conference is the premier international event for reporting research on Computer-Aided Verification, a sub-discipline of Computer Science which is concerned with ensuring that software and hardware systems operate correctly and reliably. The CAV award was established in 2008 by the conference steering committee and was given this year for the sixth time.

### ***The Award-Winning Contribution***

Correct functioning of a wide range of systems, from pacemakers to communication protocols, depends on the timing pattern of the interaction of the system with its environment. UPPAAL is an integrated tool for modeling, simulation, analysis, and verification of such real-time systems. The development of UPPAAL started in 1995 as a joint project between Aalborg University, Denmark, and Uppsala University, Sweden. Over the last 18 years, UPPAAL has become an industrial-strength tool that exemplifies the virtuous cycle linking algorithmic advances, tool development, and applications to real-world systems, spurring advances on all these fronts.

In UPPAAL, a system is modeled as a network of timed automata, and the core analysis is performed by symbolic on-the-fly computation of reachable states of the system. The UPPAAL team has made significant conceptual advances on two fronts. First, the scalability of the core reachability analysis has improved dramatically due to the development of new data structures, new abstractions, and optimizations of basic operations used in the algorithm. Second, the model checker has been extended to perform automatic model-based testing (Uppaal-Tron), to analyze quantitative extensions of timed automata (Uppaal-Cora), and to synthesize controllers based on the theory of timed games (Uppaal-Tiga). The evolution of UPPAAL tool suite has beautifully showcased what can be achieved by means of the fruitful interplay between novel theoretical research and attention to implementation details.

UPPAAL has now become the standard reference tool for the analysis of real-time systems. Its impact is witnessed, for instance, by thousands of citations to the tutorial papers on the tool, over 100,000 downloads of the tool, and its use in a number of courses in universities around the world.

Since the first successful detection and correction of an error in a Bang & Olufsen protocol for transmission of messages between audio/video components in 1997, UPPAAL has been employed in a number of industrial case studies. This also led to a commercial version of UPPAAL (see [uppaal.com](http://uppaal.com)) with official licensed industry users, and a number of industry-academia jointly funded projects in EU.

In summary, UPPAAL is a real success story for the CAV community: while advances in the theory and tools underlying UPPAAL have been a main-stay of research papers published at CAV and related conferences over a twenty-year period, the resulting tool-suite is a mature software that is being used for modeling, debugging, and verifying safety-critical systems in academia and industry. This success is mainly due to the creativity, enthusiasm, and sustained investment of time and effort by Kim Larsen, Paul Pettersson, and Wang Yi. With this award, the CAV community recognizes the historical importance of their contributions.

### ***CAV Conference***

The CAV (Computer-Aided Verification) conference is an annual international conference dedicated to the advancement of the theory and practice of computer-aided formal analysis methods for hardware and software systems. The conference covers the spectrum from theoretical results to concrete applications, with an emphasis on practical verification tools and the algorithms and techniques that are needed for their implementation. The CAV conference was founded in 1989 by Edmund M. Clarke, Robert P. Kurshan, Amir Pnueli, and Joseph Sifakis. The first CAV conference was hosted in 1989 in Grenoble, France, and since then it has been held in multiple sites in North America, Europe, and the Middle East. This year's twenty-fifth CAV conference was held in Saint Petersburg, Russia, from July 15 to July 19, 2013.