# UTSA partners to deliver software tools for high performance computing

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Raj Boppana in the UTSA Research Data Center

A collaboration between the UTSA Department of Computer Science and Edina, Minn.-based Silicon Informatics Inc. has yielded the delivery of a pair of highly flexible, scalable high performance computing (HPC) software tools: the pseudorandom number generator (CPRNG) and the interstream correlation tester software (ISC Test). The tools have a variety of applications. They could be used in simulations by the military to determine enemy strategies or weapons testing. The finance industry could also benefit implementing both tools to simulate future financial

portfolios or stock options for retiring seniors.

The project originated in 2013, when the U.S. Army Research Office awarded a Small Business Technology Transfer (STTR) contract to Silicon Informatics Inc. to translate university research on highly scalable parallel random number generation into products for high-performance computing applications. UTSA and Silicon Informatics partnered to develop and commercialize tools enabling software applications realistically mimic complex phenomena.

Random number generation is crucial for the realistic computer modeling of complex phenomena in science and industry and extends to cryptography, astrophysics and weather phenomena. Additional uses include the simulation of turbulent behavior in internal combustion engines, risk in financial instruments and portfolios and animation for films and video games.

The new simulation and quality assurance tools are designed for users of high performance computing systems and include several industry firsts:

- a high quality, highly scalable context-aware pseudorandom number generator (CPRNG) that delivers each random number generated to the location from which it is called
- the ability to perform an online, real-time analysis of the quality of parallel random number streams while a software application is running
- a highly scalable framework that will indicate correlations among parallel streams, regardless of whether the number of streams is just a few, or in the billions
- a highly flexible framework that allows users to "plug-in" third-party generators and testers for comparative analysis among generators and testers, ensuring the best, most error-free generator for each application

"With our unique interstream correlation tester, we have, for the first time, addressed the issue of testing for correlations across multiple streams of random numbers," said Raj Boppana, interim chair of the UTSA Department of Computer Science and principal investigator on the Army-supported project. "The interstream correlation tester is a totally different way of looking at how the existence of correlations is determined. It complements existing test methods, most of which focus on instrastream correlations."

Boppana says the researchers have applied their interstream correlation tester to as many as 1.5 billion streams of random numbers."

"From the start, we designed the context-aware pseudorandom number generator and the interstream correlation tester to be used in multi-core systems and large parallel multi-processor clusters," said Bob Keller, CEO of Silicon Informatics.

"At UTSA, we continue to look for ways to accelerate the path from research to market. This public private partnership is an example of UTSA's commitment to facilitating the success of new technology companies that sponsor research and license faculty innovations." said Cory Hallam, Chief Commercialization Officer.

The development of the context-aware pseudorandom number generator and the interstream correlation tester is supported by the U.S. Army Research Office (ARO) through a Phase II Small Business Technology Transfer (STTR) contract awarded to Silicon Informatics, Inc. The researchers recently delivered their beta version of the CPRNG/ISC Test framework to the Department of Defense Supercomputing Resource Center, Army Research Laboratory. The CPRNG/IDC Test framework is now available for licensing to providers of high performance computing tools and software.