

Error Correction Beyond Belief

Bane Vasic's error-correction results permeate data storage and communications

The work of Bane Vasic, a professor in the electrical and computer engineering department, in the area of coding for data storage is widely known. He co-invented the soft error-event decoding algorithm, and is the key architect of a detector-decoder chip developed at Bell Labs, which was the first to use the principle of soft decoding in magnetic-recording read channels.



Professor Bane Vasic

He is a leading expert in low-density parity-check (LDPC) codes that are now in many communications standards. A new decoding algorithm for LDPC codes recently developed at UA by Vasic has led to industry licensing the technology, and patents are pending to meet the growing demand for it.

The belief propagation algorithm used to interpret current error-correction codes is prone to abrupt drops in performance. Vasic describes it as “arguably one of the most important problems in coding theory,” and has discovered how to do error correction that outperforms and is simpler than belief propagation. The development of these new algorithms has taken years of research using new theoretical tools. Vasic said his discovery “opens up a plethora of beautiful theoretical problems.” The National Science Foundation agrees, and is funding this and other research.

Vasic's more recent work includes development of error-correction systems for nano-scale fault-tolerant memories. He has demonstrated that efficient error correction is possible even if error correction decoders are made of faulty components that make errors – in other words, if the device responsible for correcting errors, in the process of correction, makes errors.