



Where Algebra Meets Signal Processing: Generating SW/HW Implementations of Algorithms

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I introduce **SPIRAL** (www.spiral.net), the first release originally described in [1], a generator of libraries of linear signal processing algorithms like linear transforms, including the discrete Fourier transform, the discrete cosine transform, filters, or wavelets, as well as applications like JPEG2000, Viterbi decoding, and SAR image formation algorithms. **SPIRAL** is a new breed of intelligent compilers that couples domain knowledge, computer architecture modeling, machine learning methodologies, and compiler technology to generate automatically highly tuned SW codes and very efficient HW IP cores. **SPIRAL** produces automatically C code with embedded vector and parallel instructions for multicore or multiprocessor architectures, or netlists for FPGA implementations. **SPIRAL** can optimize for or trade among a range of criteria including runtime, power/energy, accuracy, or area. **SPIRAL** has been benchmarked against expert hand tuned implementations and has been licensed as a tool by INTEL.

SPIRAL involves a larger team of faculty and students from CMU, Drexel (CS), and UIUC (CS).

[1] M. Pueschel, J. M. F. Moura, J. Johnson, D. Padua, M. Veloso, B. W. Singer, J. Xiong, F. Franchetti, A. Gacic, Y. Voronenko, K. Chen, R. W. Johnson, and N. Rizzolo "[SPIRAL: Code Generation for DSP Transforms](#)," **IEEE Proceedings**, Volume:93(2), pp. 232-275, Feb/ 2005. *Invited paper, Special issue on Program Generation, Optimization, and Platform Adaptation.*