Area: Microelectronic Technologies & Devices

Host: Assistant Professor Fong Xuanyao

TOPIC	:	**Massively Parallel Continuous Local Search for Hybrid SAT Solving on GPUs**
SPEAKER	:	**Mr Cen Yunuo** **Graduate Student, ECE Dept, NUS**
DATE	:	**Friday, 22 September 2023**
TIME	:	**10.00AM to 11.00AM**
VENUE	:	**Block E4, E4-04-04** **College of Design and Engineering, NUS** **Alternatively,** **Join Zoom Meeting:** **https://nus-sg.zoom.us/j/84077835079?pwd=VWNmNy9CRIZsWEZqNHVlek1MTDdnZz09** **Meeting ID: 840 7783 5079** **Passcode: 870353**

ABSTRACT

Although state-of-the-art (SOTA) SAT solvers based on conflict-driven clause learning (CDCL) have achieved remarkable engineering success, their sequential nature limits the parallelism that may be extracted for acceleration on platforms such as the graphics processing unit (GPU). In this work, we propose FastFourierSAT, a highly parallel hybrid SAT solver based on gradient-driven continuous local search (CLS). This is realized by a novel parallel algorithm inspired by the Fast Fourier Transform (FFT)-based convolution for computing the elementary symmetric polynomials (ESPs), which is the major computational task in previous CLS methods. The complexity of our algorithm matches the best previous result. Furthermore, the substantial parallelism inherent in our algorithm can leverage the GPU for acceleration, demonstrating significant improvement over the previous CLS approaches. We also propose to incorporate the restart heuristics in CLS to improve search efficiency. We compare our approach with the SOTA parallel SAT solvers on several benchmarks. Our results show that FastFourierSAT computes the gradient 100+ times faster than previous prototypes implemented on CPU. Moreover, FastFourierSAT solves most instances and demonstrates promising performance on larger-size instances.

BIOGRAPHY

Cen Yunuo is a third-year Ph.D. student in electrical and computer engineering at National University of Singapore advised by Dr. Fong Xuanyao. He is interested in hardware-algorithm codesign for combinatorial optimizations.

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