

Accelerating Electromagnetic Simulators Using Graphics Processing Units

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Electromagnetic simulators are essential tools in the design cycle of today's complex microwave and RF systems. Accurate electromagnetic simulations allow designers to gain better understanding of their designs, make more informed decisions and consequently, produce higher quality products. Applications of electromagnetic codes extend beyond RF and microwave and span areas from photonics to geophysics, from waves interacting with material at frequencies below 1 Hz to hundreds of THz. Engineers and scientists have insatiable appetite for larger and more complex designs – faster, more complex and larger simulators allow for ever more sophisticated designs and scientific discoveries, which, in turns, trigger the need for more simulation power. The introduction of Graphics Processing Units (GPUs) into the realm of electromagnetic simulations brought about a disruptive transformation in simulation technology. The paper will review the development and current state of hardware acceleration of electromagnetics code with particular emphasis on Finite Difference Time Domain code and GPU. In this context we will also review interesting applications of accelerated simulators: from advanced antennas and biomedical applications, to exploration for Oil and Gas under seabed using a Controlled Source Electromagnetic Methodology (CSEM). We will also review latest achievements in acceleration technology in FDTD.



Biography - Michal Okoniewski

Dr. Okoniewski is a Professor in the Electrical and Computer Engineering Department with Schulich School of Engineering, University of Calgary, Calgary, Canada. He holds Libin/Ingenuity Chair in Bio-Engineering and the Canada Research Chair in Applied Electromagnetics. He is interested in many aspects of applied electromagnetics, ranging from computational electrodynamics, to tunable reflectarrays, self configuring antennas, RF MEMS

and RF micro-machined devices. He has pioneered hardware acceleration of computational electromagnetic. He has co-founded a few companies, including publicly traded Acceleware Ltd., where he has been acting as the Chief Scientist and CEO, as well as Director. He is actively involved in bio-electromagnetics, where he works on tissue spectroscopy, cancer detection, and micro- Nuclear Magnetic Resonance spectroscopy utilizing MEMS/CMOS sensors. Dr. Okoniewski has published over 80 journal publications, as well as a number of patents. He has just completed his tenure at AdCom for IEEE AP-Society.

Whenever he finds time he goes backcountry skiing, windsurfing and scuba-diving with his daughters.