KEYNOTE

Democratizing Parallel Computing, Democratizing Education: Teaching a MOOC about GPU computing

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Abstract: Modern graphics processing units, or GPUs, herald the democratization of parallel computing. The GPUs that consumers buy to play video games execute tens of thousands of concurrent threads, providing a level of massively parallel computation that was once the preserve of supercomputers. Thus today's GPUs not only render video game frames, they also accelerate astrophysics, video transcoding, image processing, protein folding, seismic exploration, computational finance, radio astronomy, heart surgery, self-driving cars - the list goes on and on. GPU computing has proven to be the vanguard of a general move toward parallelism. Today a non-parallel program will achieve less than 1.1% of the peak arithmetic throughput in a high-end desktop CPU, and less than 3.2% of peak in a high-end smartphone. It is imperative that we teach students parallel computing: they will inherit a world in which there exists no other kind.

Meanwhile, the world of education is being shaken up by massively online open courses, or MOOCs, that offer a democratization of education. Universities and companies suddenly offer high quality courses over the internet -- for free! -- to anybody in the world. And students are responding by the millions. MOOCs rely on video-based instruction, automated grading, peer learning, and vibrant self-organized communities of learners. Educators and pundits are wondering what the sudden emergence and wild popularity of MOOCs will mean for the future of higher education.

Together with my co-instructor Prof. John Owens (UC Davis), I have been teaching a MOOC focused on GPU computing. Our Udacity course "CS 344: Introduction to Parallel Computing" has over 20,000 registered students from over 130 countries. I will share my experience and thoughts on GPUs, MOOCs, and parallel computing education.

Bio: David Luebke helped found NVIDIA Research in 2006 after eight years teaching computer science on the faculty of the University of Virginia. David is currently Senior Director of Research at NVIDIA, where he continues the research on computer graphics and GPU architecture that led to his pioneering work on GPU computing. His honors include the NVIDIA Distinguished Inventor award, the NSF CAREER and DOE Early Career PI awards, and the ACM Symposium on Interactive 3D Graphics "Test of Time Award." Dr. Luebke has co-authored a book, a SIGGRAPH Electronic Theater piece, a major museum exhibit visited by over 110,000 people, and dozens of papers, articles, chapters, and patents on computer graphics and GPU computing.