

NUMERICAL ANALYSIS AND SCIENTIFIC COMPUTING
DEFENSE

High Performance Java Software for Image Processing

Piotr Wendykier
Emory University

Abstract: Parallel computing has been used for scientific computing applications since the 1960s, when the first supercomputers were developed. However, only recently have these programming paradigms become useful for software running on desktop and notebook computers. In this dissertation we demonstrate the advantage of exploiting modern computer architectures in scientific computing with multithreaded programming in Java for applications in image processing. A significant contribution of this work is an open source, multithreaded high performance scientific computing Java library called Parallel Colt. In addition, on top of Parallel Colt, we have implemented six ImageJ plugins for deconvolution, super resolution, fast Fourier transforms and image cropping. Hence, we are able to provide software to solve important problems in real image processing applications, and which can effectively make use of multi-core CPUs available on affordable desktop and notebook computers.

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Advisor: James Nagy

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