A WAVELET APPROACH IN HIGH PERFORMANCE VISUALIZATION OF DIGITAL MAMMOGRAMS USING DISTRIBUTED PARALLEL COMPUTATION

RESEARCH MANAGEMENT INSTITUTE (RMI)
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR
MALAYSIA

BY :

PROF DR ARSMAH IBRAHIM
PM DR NORMA ALIAS
PM DR KHAIRIL ISKANDAR OTHMAN
PM DR MOHD IDRIS JAYES
PROF DR MD SAION SALIKIN
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4. Report

4.1 Proposed Executive Summary

Beowulf is a machine dedicated to parallel computing that gives better price/performance ratio as it is built from off the shelf components and runs mainly free software. One can build a Beowulf system using standard Linux distribution without any additional software (Sterling et al., 1999). Norma et.al (2003, 2005) from the Mathematics Department in UTM successfully set a Linux-based Beowulf cluster called NORMA for high performance computation with 38 CPUs. Hanifah (2007) successfully set up a Linux-based Beowulf cluster called ARS with 8 CPUs in the Mathematics Department of UiTM which is ready to do high performance computations. These clusters can be used for intermediate and large scale mathematical problems that are inefficient or ineffective for single processor computers to compute. Both clusters can be used for writing parallel programs using MPI allowing multiple programs be run simultaneously to generate output from different simulation runs.

Processing large digital images requires substantial high computational power. The job requires a HPC system. Solution using multiprocessors machines is expensive. A set of inexpensive machines as nodes of a virtual machine can cut down the cost. According to Hui et.al (1994) parallel computing environment based on networks of workstations can form effective and economical platforms for HPC. Hui, et.al., (1994) demonstrated how a variety of time-dependent PDEs can be computationally solved effectively using a cluster of SUN workstations. Sauron, Mako and Press are examples of Beowulf clusters in CPAC (Center for Parallel Astrophysical Computing) that are used for visualization research purposes (Harvard, 2004). Crystal, another Beowulf cluster set up in the Mathematics Department of University of Connecticut is also used now for visualization researches (Department of Mathematics, University of Connecticut, 2007). COMPAQ ALPHA Cluster in University of Calgary, Canada is another example of a Beowulf cluster workstation that has a HPC and communication system for computer-aided diagnosis of breast cancer (Rangayyan, 2000).

Advanced cluster based solutions can provide capabilities not only for higher resolutions during the acquisition of images from the system but also for increased front end manipulation of digitized images that are acquired to improve their quality (Srinivasan et al., 2005). Hence the performance of ARS workstation cluster can be increased to produce high quality visual images, minimize the computing time, and maximize the speed. The time execution can be reduced if more CPUs are connected. This project intends to connect the ‘ARS-NORMA’ clusters to form a distributed parallel computing network so that the capacities of both clusters can be merged to form a grid-computing platform ready for high visualization computations. The wavelet approach that can effectively detect and locate microcalcifications in digital mammograms will be