

Implementation and Analysis of a Parallel Distributed Approach to 2D DFT computation

ABSTRACT

This project deals with the implementation and analysis of a parallel distributed processing approach to compute 2-D DFT at high speed. The implementation is based on a novel definition of the 2-D DFT relation developed by Dr. R. Gopikaumari at CUSAT-India. This new definition enables DFT computation to be organized in stages parallel stages involving only real additions except at the final stage of computation. The number of stages is independent of the order N and is always fixed at 4. Taking into account the need for parallel processing, the simulations were run in the JAVA programming language with its inherent support for multithreading. Different degrees of parallelism were simulated to explore speed-complexity tradeoffs.

2-D DFT was implemented using a hierarchical network model. Initially the specific algorithm for 6×6 DFT derived from the new definition was analyzed and implemented and the results were verified. The model was then upgraded to a network capable of implementing 2-D DFT for any order N such that $(N) \bmod 4 = 2$. Extending the definition to other orders of N is still being researched. This project also explored the application of this new method to problems in fractal-image compression.