# Abstract

Medical image processing in general and CT scan in particular require a huge amount of computations for formation of the images from the raw data collected by the scanners. Technology demands real time processing of CT images for continuous monitoring of patients and provide an aid to medical fraternity during surgery. But use of PC that executes operations sequentially fails to meet this requirement due to high volume of sinogram data and huge computational complexity involved in reconstruction of CT images.

As a possible solution to this problem an FFT based parallel algorithm is proposed for reconstruction of 2D/3D CT images, which is suitable for computation with parallel processing environment. This formula is special because it is both theoretically exact, and it may be implemented using parallel computer system. Therefore, it has the potential for both high accuracy and a fast implementation. The algorithm basically computes an image from its sinogram data using the convolution operation, which can be computed efficiently using concurrent 1D FFTs and matrix multiplications.

An FPGA based parallel-pipelined hardware system is designed and implemented for the above algorithm, which consists of hardware modules like Fast Fourier Transform (FFT), Matrix multiplier and contains an efficient control system. The hardware system is about five times faster as compared to its single processor based computation.

The algorithm is applied onto different CT modalities like Fan-beam CT, Spiral/Helical CT etc. Some manipulations of the fan-beam data are needed in order to fit them for the proposed algorithm. The reconstructed image quality is found to be comparable to that of the existing algorithms.