Parallel Implementation of Shape based Image Retrieval Approach on CUDA in Compressed Domain

Abstract

Fast and accurate algorithms are necessary for Content based image retrieval (CBIR) systems to perform operations on compressed images databases such as jpeg or through compressive sensing. Feature extraction and feature matching are two important steps in any CBIR system. Wrong matching may affect the accuracy rate of CBIR systems. The matching of query image which is in uncompressed form to image in database which is in compressed form is very challenging. However, existing algorithms suffer from a flawed tradeoff between accuracy and speed. In this research work, shape based image retrieval is carried out using modified standard DCT approach and parallelized it on Graphics Processing Unit (GPU). The main goal of this research work is to make CBIR faster for processing a large number of images database using parallel implementation of algorithms on GPU. GPUs are emerging as powerful parallel systems at a cheaper cost. Our work employs extensive usage of highly multithreaded architecture and shared memory of multi-cored GPU. An efficient use of shared memory is required to optimize parallel reduction in Compute Unified Device Architecture (CUDA). Experimental results show that our method can achieve a speedup of about 15x over the serial
implementation when running on a GPU named GeForce 9500 GT having 32 cores. Shape based retrieval method of CBIR is also evaluated using Recall, Precision, F-measure, True Negative rate, and Accuracy evaluation measures.

Reference

- Salih Burak Gokturk, Carlo Tomasi, Bernd Girod, Chris Beaulieu, “medical image compression based on region of interest, with application to colon ct images”, Electrical Engineering, Computer Science, Radiology Departments, Stanford University
- Ruey-Feng Chang, Wen-Jia Kuo and Hung-Chi Tsai, “image retrieval on uncompressed and compressed domains”, Department of Computer Science and Information Engineering, National Chung Cheng University, Chiayi, Taiwan 621, R.O.C., 0-7803-6297-7/00/ 2000 .
Parallel Implementation of Shape based Image Retrieval Approach on CUDA in Compressed Domain

- Manocha, D. “Interactive geometric & scientific computations using graphics hardware”, SIGGRAPH 2003
- Li, Wei, Wei, Xiaoming, A. and Kaufman, “Implementing lattice boltzmann computation on graphics hardware”. In proceeding of the International Conference for High Performance Computing and Communications.

Index Terms

- Computer Science
- Image Processing

Key words

- Shape based Image Retrieval
- Parallelization
- GPU
- CUDA