BAB V

KESIMPULAN DAN SARAN

A. Kesimpulan

Dengan menggunakan komputasi paralel maka dapat mempercepat komputasi yang dilakukan pada CPU. Pada penelitian ini didapati, pada citra dengan ukuran 64x64, penambahan kecepatan sebesar 1,5x, pada citra dengan ukuran 128x128, penambahan kecepatan sebesar 3,7x, pada citra dengan ukuran 256x256, penambahan kecepatan sebesar 4,5x, pada citra dengan ukuran 512x512, penambahan kecepatan sebesar 4,9x, dan pada citra dengan ukuran 1024x1024, penambahan kecepatan sebesar 7,1x. Didapati bahwa jika ukuran citra kecil maka tidak ada perbedaan yang mendasar, tetapi jika ukuran citra bertambah besar maka perbedaan waktu komputasi pun bertambah besar.

B. Saran

Disarankan untuk penelitian berikutnya dilakukan komputasi paralel dengan menggunakan NVIDIA CUDA pada metode segmentasi yang lainnya sehingga dapat dilakukan perbandingkan peningkatan kecepatan yang terjadi. Juga dalam penelitian selanjutnya adanya eksplorasi yang lebih dalam lagi dengan NVIDIA CUDA, dimana dengan menggunakan *shared memory* pada GPU sehingga mendapatkan hasil yang lebih cepat dibandingkan penelitian ini.

DAFTAR PUSTAKA

Castano-Diez, D. et al., 2008. Performance Evaluation of Image Processing Algorithms on the GPU. *Journal of Structural Biology,* 164(1), pp. 153-160.

Che, S. et al., 2008. A Performance Study of General Purpose Applications on Graphics Processors using CUDA. *Journal of Parallel and Distributed Computing,* 68(10), pp. 1370-1380.

Garland, M. et al., 2008. Parallel Computing Experiences with CUDA. *Micro, IEEE,* 28(4), pp. 13-27.

Guvenc, U., Demirci, R. & Karagui, T., 2010. Light Refraction Based Medical Image Segmentation. *Scientific Research and Essays,* 5(10), pp. 1127-1132.

Hardiyanto, I., Purwananto, Y. & Soelaiman, R., 2012. Impelementasi Segmentasi Citra dengan menggunakan Metode Generalized Fuzzy C-Means Clustering Algorithm with Improved Fuzzy Partitions. *Jurnal Teknik POMITS,* 1(1), pp. 1-5.

Heard, J. R., 2008. *Beautiful Code, Compelliing Evidence,* Chapel Hill: University of North Carolina.

Jayadevappa, D., Kumar, S. S. & Murty, D. S., 2009. A New Deformable Model Based on Level Sets for Medical Image Segmentation. *IAENG International Journal of Computer Science.*

Kaur, J. & Jindal, A., 2012. Segmentation Alogrithms for Thyroid Scintigraphy Images. *International Journal of Computer Science and Technology,* 3(1), pp. 449-451.

Kirk, D. B. & Hwu, W.-m. W., 2010. *Programming Massively Parallel Processors: A Hands-on Approach.* Burlington: Elsevier.

Li, C. et al., 2011. A Level Set Method for Image Segmentation in the Presence of Intensity Inhomogeneities with Application to MRI. *IEEE Transcations on Image Processing,* 20(7), pp. 2007-2016.

Li, C., Xu, C., Gui, C. & Fox, M. D., 2010. Distance Regularized Level Set Evolution and Its Application to Image Segmentation. *IEEE Transactions on Image Processing*, pp. 3243-3254.

Liu, J.-q. & Liu, W.-W., 2011. Adaptive Medical Image Segmentation Algorithm Combines with DRLSE Method. *Advanced in Control Engineering and Information Science*, Volume 15, pp. 2634-2638.

Luebke, D. & Humphreys, G., 2007. How GPUs Work. *Computer Magazine, IEEE Computer Society*, 40(2), pp. 96-100.

McAndrew, A., 2004. *An Introduction to Digital Image Processing with MATLAB*. s.l.:Victoria University of Technology.

McInerney, T. & Terzopoulos, D., 1996. Deformable Models in Medical Image Analysis: A Survey. *Medical Image Analysis*, 1(2), pp. 91-108.

Mohsen, F. M. A., Hadhound, M. M. & Amin, K., 2011. A new Optimization-Based Image Segmentation method by Particle Swarm Optmization. *International Journal of Advanced Computer Science and Applications (IJACSA), Special Issue on Image Processing and Analysis.*

NVIDIA, 2006. *Parallel Programming.* [Online] Available at: http://www.nvidia.com/object/cuda_home_new.html [Accessed 18 September 2013].

Nyma, A. et al., 2012. A Hybrid Technique for Medical Image Segmentation. *Journal of Biomedicine and Biotechnology*, pp. 1-7.

Osher, S. & Sethian, J. A., 1988. Fronts Propagating with Curvature Dependent Speed: Algorithms Based on Hamilton-Jacobi Formulations. *Journal of Computational Physics*, 79(12), pp. 12-49.

Park, I. K. et al., 2011. Design and Performance Evaluation of Image Processing Algorithms on GPUs. *Parallel and Distributed Systems, IEEE Transactions on*, 22(1), pp. 91-104.

Patil, D. D. & Deore, S. G., 2013. Medical Image Segmentation: A Review. *International Journal of Computer Science and Mobile Computing*, January, 2(1), pp. 22-27.

Petel, B. C. & Sinha, G. R., 2010. An Adaptive K-means Clustering Algorithm for Breast Image Segmentation. *International Journal of Computer Applications,* 10(4), pp. 35-38.

Rani, U., Subbaiah, P. V., Rao, D. V. & K, N., 2011. Optimal Segmentation of Brain Tumors using DRLSE Level Set. *International Journal of Computer Applications,* 29(9), pp. 6-11.

Richard, N. & Fernandez-Maloigne, C., 2013. Fuzzy Color Image Segmentation using Watershed Transform. *Journal of Image and Graphics*, 1(3), pp. 157-160.

Sanders, J. & Kandrot, E., 2011. *CUDA by Example: An Introduction to General-Purpose GPU Programming.* Boston: Addison Wesley.

Senthilkumaran, N. & Rajesh, R., 2009. Edge Detection Techniques for Image Segmentation - A Survey of Soft Computing Approaches. *International Journal of Recent Trends in Engineering,* 1(2), pp. 250-254.

Shams, R., Sadeghi, P., Kennedy, R. & Hartley, R., 2010. Parallel Computation of Mutual Information on the GPU with Application to Real-Time Registration of 3D Medical Images. *Computer Methods and Programs in BIomedicine 99,* pp. 133-146.

Silicon Graphics, I., 1994. *OpenGL Reference Manual.* Release 1 ed. Canada: Addison-Wesley Publishing Company.

Singh, S., Singh, S., Banga, V. & Chauha, D., 2013. *CUDA for GPGPU Applications - A Survey,* Forezepur: SBS State Technical Campus.

Solomon, C. & Breckon, T., 2011. *Fundamental of Digital Image Processing: A Practical Approach with Examples in Matlab.* Chichester, West Sussex: Wiley Blackwell.

Yang, Z., Zhu, Y. & Pu, Y., 2008. *Parallel Image Processing Based on CUDA.* Wuhan, Hubei, IEEE, pp. 198-201.

Zuva, T., Olugbara, O. O., Ojo, S. O. & Ngwira, S. M., 2011. Image Segmentation, Available Techniques, Developments and Open Issues. *Canadian Journal on Image Processing and Computer Vision,* 2(3), pp. 20-29.

LAMPIRAN 1. BIODATA PENULIS

Nama : Indra Rianto, S.Kom, MM.

Tempat Tanggal Lahir: Ambon, 16 Februari 1988

Pekerjaan : Pegawai Negeri Sipil pada Pusat Komputer Universitas Negeri Manado

Pendidikan : S2 Magister Management (Januari 2009 - Desember 2010)

S1 Teknik Informatika (Agustus 2005 - Desember 2008)

SMA Negeri 1 Ambon (Juli 2002 – Juni 2005)

SMP Kristen Urimessing Ambon (Juli 1999 – Juni 2002)

SD Negeri 1 Ambon (Juli 1992 – Juni 1999)