WATERSHED METHOD USED FOR CT – SCAN IMAGING

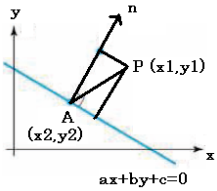
Harman Dewantoro, Andrew Adianto Wijaya

Cita Hati Christian Senior High School - Surabaya

1) Introduction

Many research of processing digital image that benefits the CT scan image has been done. One of the researches done is the identification of the type of tumor that uses the image and CT scan of the brain tumour, which implements the watershed method in order to use the process of the segmentation of the image of the CT scan brain tumor by calculating the values of threshold to collect the data for the minimum optimal flood.

2) Equations



The Orthogonal Projection Formula:

$$xp = x* + \frac{(b - aTx*)}{aTa}a$$

3) Content

The purpose of the investigation

Reducing number of brain tumor casualties, by sharpening CT-Scan Image using mathematical approach of watershed technique.

Method of the investigation (in comparison with known methods)

Images produced by CT-Scan are represented in an inaccurate manner, an analog picture, which are not able to be processed further more. This rough images results the increase of surgical failure rate. Watershed method allows further computation and analysis to be done, by transforming the image into small pixel-level gradient, and the transformation of the image into grey scale allows each layer of the scanning to be expressed in a three dimensional manner based on its grey level, white as the apex or outline of the image and black is the catchments basin (lowest value of grey level), in order to remove any close catchments basin by flooding the catchment basin. To simplify the swarming gradients, simplification of the expressed image in each layer are being orthogonally projected to obtain a limit cycle. The image can also be separated into different segments based on its segmentation type (background/partial).

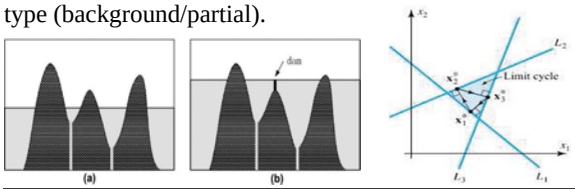
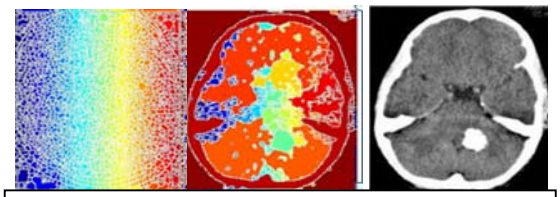


Illustration of flooding of two catchment basins, and simplification of a plane by orthogonal projection.

4) Results of the experiment



Result of flooding and orthogonal simplification (from right, to centre, and left).

	Catchments basins initial (pixels)	Catchments basins result (pixels)	Threshold (%)	Floodmin optimal (pixel
CT Scan tumor brain-1	3260	508	0.99	48
CT Scan tumor brain-2	2391	617	0.98	46
CT Scan tumor brain-3	3612	1131	0.98	49
CT Scan tumor brain-4	3251	880	0.98	47

Number of threshold and pixels reduced after watershed model.

5) Conclusion

Watershed provides images which possess gradients of grey level, which can be utilized to determine any possible outline from each segments from the CT-Scan Image, orthogonal processing simplifies the image further more in the end of the process.

6) References

1) Wiley, John. Sons (2005). *Computed Tomography*. United States of America. pp. 987-990.

2) Adipranata Rudy, Andreas Handojo, Ivan Prayogo, Oviliani Yenty Yuliana, *design and making application to image segmentation using morphological methods watershed*, Jurusan Information Engineering-University of Petra, (2005)

3) Chen Guang Zhao, Tian Ge Zhuang, *"A Hybrid Algorithm Based on Boundary Detection Watershed and Snake "*Elsevier, Pattern Recognition Letters 26 (2005) 1256-1265.

4) Gonzalez, R.C., Woods, R.E. *Digital Image Processing Second Edition*, Prentice Hall, New Jersey. (2002)

5) R. Lotufo, w. Silva, *a minimal set of markers for the watershed transform*, faculty of electrical and computer engineering Universidade Estadual de Campinas, Campinas-sp, brazil., 2002