Image Segmentation via Texture Selective Masks

Harvey A. Cohen Jane You
Computer Science and Computer Engineering
La Trobe University
Bundoora, Victoria, Australia 3083

EXTENDED ABSTRACT

In this paper the use of texture selective masks for the segmentation of textured images is first outlined. Examples of segmentation of collages of Brodatz textures illustrate the method. We then introduce a statistical approach that provides an objective measure of the capabilities of such masks for recognition and segmentation.

Laws [1] proposed the texture energy TE as a texture classifer function. The TE is evaluated by calculating over a window the sum $EIii^2$ where Iij is the pixel grey scale AFTER convolution with a zero sum texture selective mask. Laws [1] proposed a set of fixed feature selective masks. Benke and Skinner [2] extended Laws approach through the use of adaptive masks, but provided no statistical evaluation. In [3], we have shown that adaptive masks tuned to maximise the TE for various textures give markedly lower standard deviation for the TE than do Law's fixed masks. In [4] we showed that our extension of the Benke-Skinner approach could be effectively applied to as many as 15 different Brodatz textures.

The segmentation of textured images can be usefully considered a two stage process. In the first stage each pixel is tentatively classified, with each pixel gaining the label of a classifier function. In the second stage, relaxation methods, including region growing, which embody region smoothness heuristics are applied. Using texture selective masks, as we describe, involves using the Laws Texture Energy as a classifier function. Hence an objective measure of the discriminating power of our adaptive masks, in comparision with those of Benke and Skinner, and the fixed masks of Laws is provided through the determination of the variance of the texture energy over regions of (known) one component texture. It is found that for segmenting images comprising a small number of textures, tuning masks to minimise the SDV of TE is especially effective.

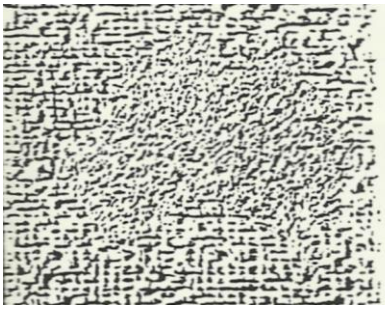
REFERENCES

[1] Laws, K. I., *Textured Image Segmentation*, Ph.D Thesis, University of Southern California, January, 1980.

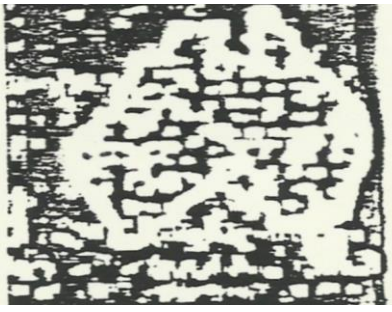
[2] Benke, K.K., Skinner, D.R. and Woodruff, C.J., *Convolution Operators as A Basis for Objective Correllates for Texture Perception* IEEE SMC Vol. 18 No. 1 Jan./Feb., 1988, pp. 158 - 163.

[3] Cohen, H.A. and You, J., *Texture Statistic Selective Masks* , Proceedings of the 6th Scandinavian Conference on Image Analysis, Oulu, Finland, 1989. pp. 930 - 935.

[4] You, J. and Cohen, H. A., *Image Segmentation via Convolution Masks*, Proceedings of the Third National Conference on Robotics, Melbourne, Australia, 1990, pp. 305 - 316.



Two texture collage "Australia"



Using laws mask R5R5

"Australia" end of Stage I using adaptive mask Ml.