Image Analysis in the Study of Dissipative Spatial Patterns

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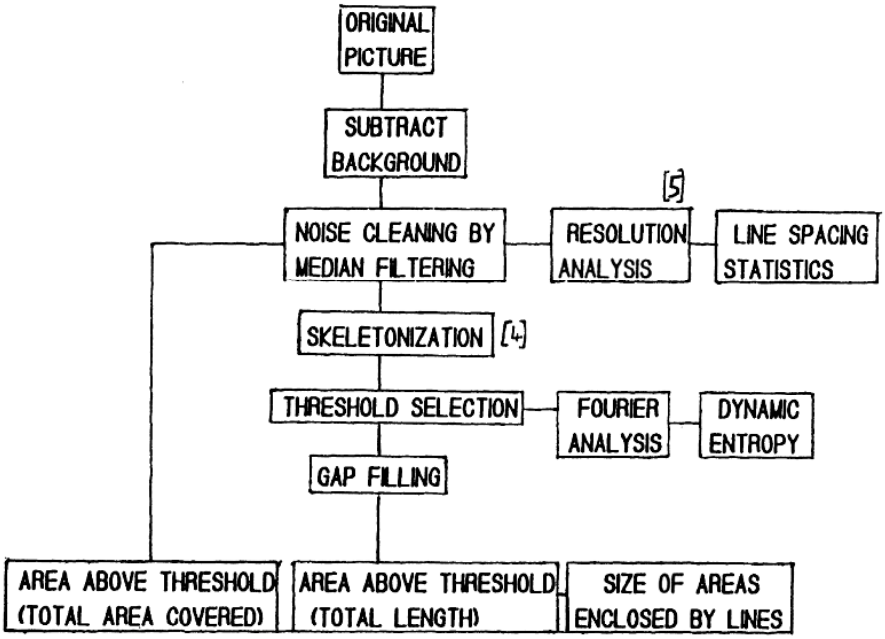
The rapidly growing science of image analysis (IA) by artificial intelligence methods has been applied to many diverse fields such as: biology, geology, earth scanning by satellites, photography, and a variety of military uses. In chemistry IA has been used mainly for rapid analysis of spectral output [1] in, for instance mass spectroscopy. Recently we have applied this powerful tool for the analysis of real spatial structures in chemistry. One example is in fractal surface analysis [2] and the other is in dissipative spatial patterns. In the latter case, the discovery of the general phenomenon of spatial structure formation by chemical reactions at liquid interfaces [3] has led to questions previously unasked by chemists, for instance, 'How to measure the kinetic growth of a product not distributed evenly in space ?'; 'What is the change in entropy as a pattern develops ?'; 'How to qualitatively differentiate one pattern from another ?'.

Using both standard and original software we have been able to tackle these problems. The various steps are shown in the following scheme.



1) K. Varmuza, "Pattern Recognition in Chemistry", Springer, 1980.
P. Jurs, T. Isenhour; "Chemical Applications of Pattern Recognition", Wiley, 1975.
2) D. Avnir, D. Farin, S. Peleg, D. Yavin, in preparation.
3) See D. Avnir and M.L. Kagan - this volume.
4) S. Peleg, A. Rosenfeld; IEEE Trans. PAMI-3 , 208 (1981).
5) S. Peleg, J. Naor, R. Hartly, D. Avnir: IEEE Trans. Pattern Anal. Machine Intel. PAMI-6, 518 (1984).