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Editorial

Energy minimization methods represent a fundamental methodology in computer vision and pattern recognition, with roots in such diverse disciplines as physics, psychology, and statistics. Recent manifestations of the idea include Markov random fields, deformable models and templates, relaxation labelling, various types of neural networks, etc. These techniques are now finding application in almost every area of computer vision from early to high-level processing. This edition of Pattern Recognition contains some of the best papers presented at the International Workshop on Energy Minimization Methods in Computer Vision and Pattern Recognition (EMMCVPR'97) held at the University of Venice, Italy, from May 21 through May 23, 1997. Our primary motivation in organizing this workshop was to offer researchers the chance to report their work in a forum that allowed for both consolidation of efforts and intensive informal discussions. Although the subject was hitherto well represented in major international conferences in the fields of computer vision, pattern recognition and neural networks, there had been no attempt to organize a specialized meeting on energy minimization methods.

The papers appearing in this special edition fall into a number of distinct areas. There are two papers on contour detection. Zucker and Miller take a biologically plausible approach by providing a theory of line detection based on cortical cliques. Thornber and Williams, on the other hand, describe a stochastic contour completion process and provide an analysis of its characteristics.

The next block of papers use Markov random fields. Molina et al. compare stochastic and deterministic methods for blurred image restoration. Perez and Laferte provide a means of sampling graph representations of energy functions. Barker and Rayner provide an image segmentation algorithm which uses Markov Chain Monte Carlo for sampling.

Turning our attention to deterministic methods, Yuille and Coughlan provide a framework for comparing heuristic search procedures including twenty questions and the A-star algorithm. Hoffman et al. show how deterministic annealing can be used for texture segmentation. Rangarajan provides a new framework called self-annealing which unifies some of the features of deterministic annealing and relaxation labelling. The topic of deterministic annealing is also central to the paper of Klock and Buhmann who show how it can be used for multidimensional scaling.

Next there are papers on object recognition. Zhong and Jain show how localization can be effected in large databases using deformable models based on shape, texture and colour. Myers and Hancock provide a genetic algorithm that can be used to explore the ambiguity structure of line labelling and graph matching. Lastly, under this heading, Kittler shows some theoretical relationships between relaxation labelling and the Hough transform.

The final pair of papers are concerned with maximum a posteriori probability estimation. Li provides a recombination strategy for population based search. Gelgon and Bouthemy develop a graph representation for motion tracking.

We hope this special edition will prove useful to practitioners in the field. A sequel to the workshop will take place in July, 1999 and we hope a second compendium of papers will result.

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