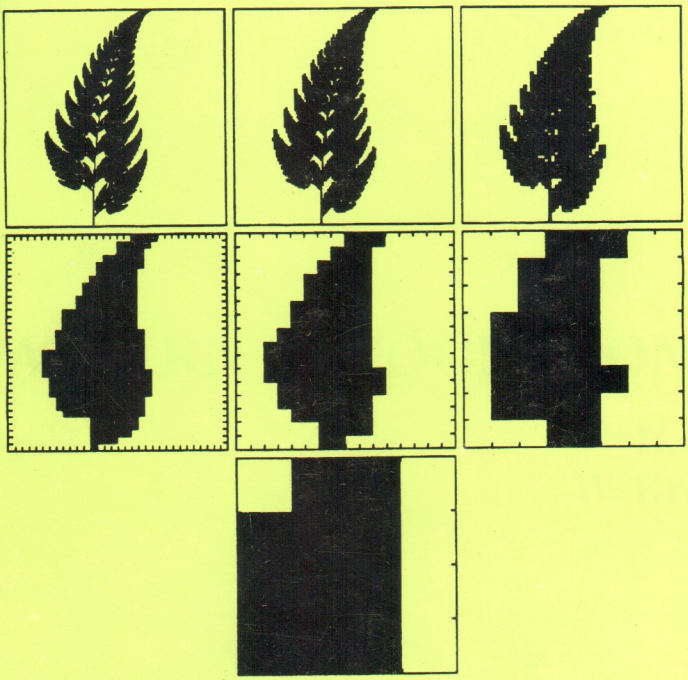
PROCEEDINGS of the 16th ÖAGM - Meeting

Vienna, May 6-8, 1992

PATTERN RECOGNITION 1992



edited by

Horst Bischof, Walter G. Kropatsch

Österreichische
Computer
Gesellschaft

R. Oldenbourg
Wien
München

SCHRIFTENREIHE DER
ÖSTERREICHISCHEN COMPUTER GESELLSCHAFT
BAND 62

Pattern Recognition 1992

edited by

Horst Bischof, Walter G. Kropatsch

R.Oldenbourg Wien München 1992

Die Deutsche Bibliothek – CIP-Einheitsaufnahme

Pattern recognition 1992 / ed. by Horst Bischof; Walter G. Kropatsch. – Wien; München: Oldenbourg; Wien: Österr. Computer Ges., 1992
(Schriftenreihe der Österreichischen Computer Gesellschaft; Bd. 62)
ISBN 3-486-22382-8 (Oldenbourg, München)
ISBN 3-7029-0347-X (Oldenbourg, Wien)
ISBN 3-85403-062-2 (Österreichische Computer Gesellschaft)
NE: Bischof, Horst (Hrsg.): Österreichische Computer Gesellschaft: Schriftenreihe der Österreichischen ...

Druck: Druckerei Riegelnik
1080 Wien, Piaristengasse 19

ISBN 3-85403-062-2 Österreichische Computer Gesellschaft
ISBN 3-7029-0347-X R. Oldenbourg Verlag Wien
ISBN 3-486-22382-8 R. Oldenbourg Verlag München

International Contact Forum (Session chair: Pinz)

Current activities in Computer Vision and Pattern Recognition in Slovenia*

Franc Solina

University of Ljubljana, Faculty of Electrical Engineering and Computer Science,
Computer Vision Laboratory, Tržaška c. 25, 61001 Ljubljana, Slovenia
E-mail: franc@ninurta.fer.yu

Abstract: *We review recent research activities in Slovenia in the areas of computer vision and pattern recognition. Research organizations, their projects and research activities are presented.*

Pattern recognition research in Slovenia was started in 1970's by academician prof. dr. Ludvik Gyergyek at University of Ljubljana. Most of the research is still located there—in various laboratories at the Faculty of Electrical Engineering and Computer Science. For a review of past work see [13]. This paper concentrates on current activities in Slovenia and gives most important references published in the past two years.

1 Major Organizations and Laboratories

- Faculty of Electrical Engineering and Computer Science, University of Ljubljana
  - Computer Vision Laboratory (segmentation, planning of image aquisition, material properties through vision, parametric models, superquadrics),
  - Laboratory for Systems, Automatics and Cybernetics (analysis of continuous Slovenian speech, face recognition),
  - Laboratory for Artificial Perception (matching of tomography images of brains, muscle tissue cell analysis, stereo),
  - Laboratory for Adaptive Systems and Paralell Processing (target tracking, neural networks for image processing),
  - Laboratory for Computer Graphics and Numerical Methods (ECG analysis in cooperation with Harvard – MIT, Division of Health Sciences and Technology),

*Preparation and presentation of this report was supported by Project P2–1122 funded by The Ministry of Science and Technology, Republic of Slovenia

- Institute Jožef Stefan (vectorization of technical drawings and maps, speech understanding for computer user interfaces),
- Faculty of Technology and Natural Sciences, University of Ljubljana (NMR imaging).

2 Research programs, projects, cooperation

Research activities and programs have been also affected by the recent political changes in Slovenia. New directions and policies for funding will be set by a new National Research Program which is still in preparation. The new highlights, however, are clear—competitive funding of projects, international cooperation, and relevance of research for the Slovenian economy. Among the first projects funded by the Slovenian Ministry of Research and Technology under these new guidelines is Project P2–1122 *Shape Reconstruction with Parametric Models* in Computer Vision Laboratory.

Participation in international projects is still very difficult to achieve since most relevant agreements were signed by the former Yugoslavia. Slovenia is only starting to enable such cooperation on a new basis. One of the very few programs that Slovenian scientists can participate is the Tempus program. Faculty of Technology and Natural Sciences at University of Ljubljana is participating in the Tempus Project JEP–2296-91: *Image Processing with Applications in Robotics and Medicine.*

Slovenian economy is also in transition and restructuring for new markets. Companies are hesitant to fund long range research and development. However, there are some small commercial computer vision projects in the area of quality control and surveillance.

International cooperation, as mentioned above, is handicapped by the lack of official frameworks. The few examples of working cooperation were made possible by extended visits of Slovenian scientists and students abroad:

- GRASP Laboratory, University of Pennsylvania (parametric shape models, segmentation, image aqusition planning, material properties of materials by means of vision, elastic 3-D matching).
- Harvard – MIT, Division of Health Sciences and Technology (analysis of electrocardiograms).

3 Research areas

Segmentation with Parametric Models [6,14] Segmentation based on simultaneous recovery and selection of various parametric models (surface patches, lines and curves) is achieved using a new iterative optimizing algorithm. A minimum description length criterion for selecting the optimal scale for scene description is studied.

Planning the Next View to Maximize the Information Content [7,8] A new strategy for directing imaging sensors based on maximizing the information on the scene under exploration is studied.

Extraction of Physical Properties of Materials by Means of Vision [5] By controling the camera motion separation of the diffuse and the specular component of image irradiance is possible. This in turn gives besides surface orientation also information on material type.

Recovery of Superquadric Models from Different Image Cues [11,12] The success of recovering superquadric models from range images initiated research on recovery of superquadric models from other image cues such as occluding 2-D contours.

Analysis of electrocardiograms [3,4] Research is concentrated on automated detection of transient ischemic ST segment changes during ambulatory ECG monitoring. Time-domain analysis techniques and principal components based recognition technique are investigated. Beside this, development of performance measures and evaluation protocols for algorithms to detect transient ischemia are developed.

Processing of computer tomography images [1] Cross-evaluation of CT and PET images by matching with a 3-D anatomical atlas is studied. Matching is performed by 3-D elastic deformation.

Morphometric analysis of cells [?,10] Morphometric analysis of microscopic images of muscle tissue using pattern recognition methods is studied. Qualitative properties such as diameter, area, composition ratio and arrangement can be determined.

Slovenian Phoneme Recognition [9] The goal of this research is to determine the most important properties of a speech signal, suitable for Slovenian speech phoneme recognition.

Human Face recognition [15] A system for recognizing and identifying human faces based on an anthropological model consisting of 19 facial parameters is developed.

Target Identification and Tracking with Neural Networks [2] A system for real-time visual tracking of several targets using a neural-net approach is under development. Targets are identified on the basis of their contours and their trajectory is predicted.

References

[1] R. Bajcsy and S. Kovačič, "Multiresolution Elastic Matching", *Computer Vision, Graphics and Image Processing*, 46:1-21, April, 1989.

[2] A. Dobnikar, A. Likar, B. Jurčič-Zlobec, and D. Podbregar, "Visual Tracking and Classification with Artificial Neural Networks," in B. Souček (Ed.), *Fast, Invariant, Dynamic and Parallel Intelligence*, Willey, New York, 1992

[3] F. Jager, R. G. Mark, and G. B. Moody, "Analysis of transient ST segment changes during ambulatory monitoring", *Proceedings IEEE Computers in Cardiology Conference*, Venice, 1991, pp. 453-456

[4] F. Jager, G. B. Moody, A. Taddei, and R. G. Mark, "Performance measures for algorithms to detect transient ischemic ST segment changes", *Proceedings IEEE Computers in Cardiology Conference*, Venice, 1991, pp. 369-372

[5] Aleš Jaklič and Franc Solina. Analysis of multiple reflection components. In Peter Mandl, editor, *Modelling and New Methods in Image Processing and in Geographical Information Systems, Proceedings of 15. ÖAGM Work Meeting in Klagenfurt 24.–26. April 1991*, Shriftenreihe der ÖCG, Band 61, pages 123–134, Wien, München, 1992. R. Oldenburg.

[6] A. Leonardis and R. Bajcsy. "Finding parametric curves in an image," In G. Sandini, editor, *Proceedings of The Second European Conference on Computer Vision—ECCV-92*. Springer-Verlag, 1992. LNCS-Series Vol. 588.

[7] J. Maver and R. Bajcsy. "Occlusions and the Next View Planning," *IEEE International Conference on Robotics and Automation*, pages 1806–1811, Nice, France, May 1992.

[8] J. Maver and R. Bajcsy. "Occlusions as a guide for planning the next view," *IEEE Transaction on Pattern Analysis and Machine Intelligence*, 1992. Accepted for publication.

[9] F. Mihelič, L. Gyergyek, and N. Pavešić, "Feature Representations and Classification Procedures for Slovene Phoneme Recognition," *Pattern Recognition Letters*, North Holland, Netherlands, 1992. Accepted for publication.

[10] F. Pernuš and I. Eržen, "Arrangement of fiber types within fascicles of human vastus lateralis muscle," *Muscle & Nerve*, 1991, in press.

[11] F. Solina and R. Bajcsy. "Recovery of parametric models from range images: The case for superquadrics with global deformations," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, PAMI-12(2):131–147, 1990.

[12] Franc Solina and Zaviša Bjelogrlić. "Methodologies and techniques for interpretation of 3D range images," *Proceedings First ESA Workshop on Computer Vision and Image Processing for Spaceborne Applications*, WPP–029, ESTEC, Nordwijk, The Netherlands, June 1991.

[13] Franc Solina. Pattern recognition and computer vision in Slovenia – an overview. In Peter Mandl, editor, *Modelling and New Methods in Image Processing and in Geographical Information Systems, Proceedings of 15. ÖAGM Work Meeting in Klagenfurt 24.–26. April 1991*, Shriftenreihe der ÖCG, Band 61, pages 27–35, Wien, München, 1992. R. Oldenburg.

[14] F. Solina and A. Leonardis, "Selective scene modeling," *Proceedings of the 11th International Conference on Pattern Recognition*, Hague, Netherlands, September 1992.

[15] M. Vezjak, J. Korošec, L. Gyergyek, N. Pavešić, I. Erjavc, T. Savšek, and A. Gere, "System for Description and Identification of Individuals," In Baldomir Zajc and Franc Solina, editors, *Proceedings 6th IEEE Mediterranean Electrotechnical Conference*, pages 1251-1254, Ljubljana, Slovenia, May 1991. IEEE Region 8.