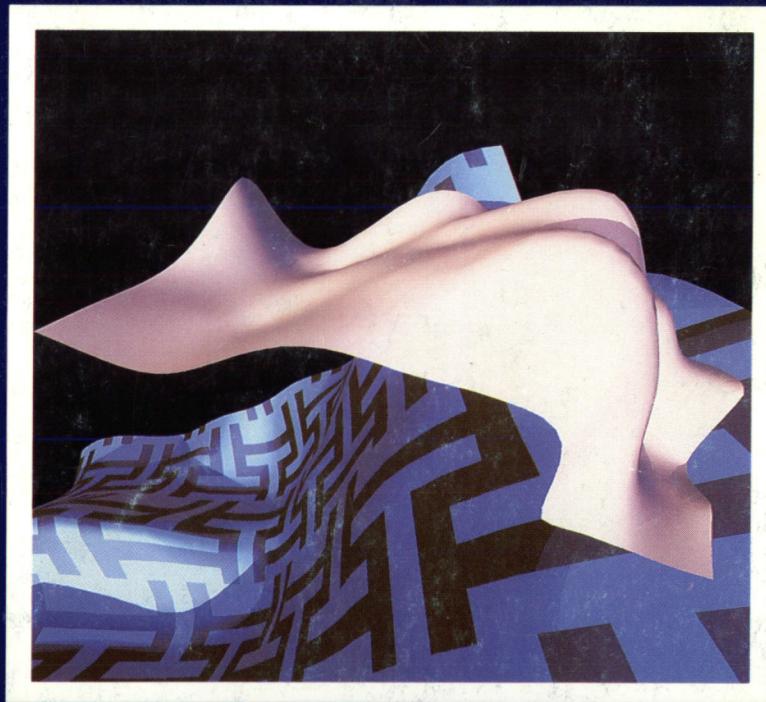


Proceedings

# Graphics'86 Interface'86

# Vision Interface'86

Comptes rendus



Canadian Information  
Processing Society

Vancouver, B.C.  
26-30 May/mai 1986



Canadian Man-Computer  
Communications Society

Copyright 1986 by  
Canadian Information Processing Society

Permission is granted to quote short excerpts and to reproduce figures and tables from these proceedings, provided that the source of such material is fully acknowledged.

ISSN 0713-5424

Published by the Canadian Information Processing Society

Conference sponsored by The Canadian Man-Computer Communications Society (CMCCS); Canadian Image Processing and Pattern Recognition Society (CIPPRS); Canadian Information Processing Society; in cooperation with the National Research Council of Canada

Membership information for the CMCCS, CIPPRS, as well as additional copies of this proceedings are available from:

Canadian Information Processing Society  
243 College Street, 5th Floor  
Toronto, Ontario  
M5T 2Y1  
tel.: (416) 593-4040

Price of proceedings: \$30.00

The Conference thanks the following organization for financial assistance

Apollo Computer Corporation  
Vertigo Systems International

#### Front Cover

The picture represents the visual side of a relationship between musical and visual structures. The artist-composer is Th. Goldberg, who used the graphics language LIG developed by R. Ross at University of British Columbia. The digital image was recorded on film at MacDonald Dettwiler, Richmond, B.C. on the COLOR FIRE 240 film recorder, at a resolution of 8192 pixels per line.

#### Back Cover

Image created by Martin Dubetz and Judith McGillis at the Department of Computing Science, University of Alberta.

Copyright 1986 par  
L'Association canadienne de l'informatique

Il est permis de citer de courts extraits et de reproduire des données ou tableaux du présent compte rendu, à condition d'en identifier clairement la source.

ISSN 0713-5424

Publié par l'Association canadienne de l'informatique

Conférence parrainée par la Société canadienne du dialogue homme-machine (SCDHM); l'Association canadienne de traitement d'images et reconnaissance des formes (ACTIRF); l'Association canadienne de l'informatique; en collaboration avec le Conseil national de recherches du Canada

Des renseignements sur la SCDHM, ACTIRF, et des exemplaires supplémentaires des comptes rendus sont disponibles à l'adresse suivante:

L'Association canadienne de traitement d'images et reconnaissance des formes  
243, rue Collège, 5<sup>e</sup> étage  
Toronto (Ontario)  
M5T 2Y1  
tél.: (416) 593-4040

Prix des comptes rendus: \$30.00

Les organisateurs de la conférence expriment leur gratitude à l'organisme ci-après qui a financé l'événement

Apollo Computer Canada Ltd.  
Vertigo Systems International

#### La couverture

L'image représente le côté visuel de la relation entre les structures musicales et visuelles. L'artiste est Th. Goldberg qui a utilisé le langage graphique LIG développé par R. Ross à l'Université de Colombie-Britannique. L'image numérique a été enregistré sur film à MacDonald Dettwiler, Richmond (C.-B.) à l'aide d'un enregistreur de film COLOR FIRE 240 avec une résolution de 8192 pixels par ligne.

#### Le verso du livre

Une image créée par Martin Dubetz et Judith McGillis au département d'informatique, de l'Université d'Alberta.

#### Vision Interface '86

# **Proceedings / Comptes rendus**

**Graphics Interface '86**  
**Vision Interface '86**

**26-30 May/mai**  
**Vancouver, British Columbia**



#### **Message from the Conference General Chair**

Graphics Interface '86 and Vision Interface '86 are another ground-breaking endeavour of the Canadian Man-Computer Communications Society. We are particularly proud of the fact that the event is the 12th Canadian conference devoted to computer graphics and the longest running computer graphics conference in North America.

This year we have accepted the Canadian Image Processing and Pattern Recognition Society as a partner. In the past, CIPPR has participated in the program, but not as extensively nor as visibly. While the joint conference has certainly led to some coordination problems, it is hoped the synergism generated will be beneficial to all participants.

It is also significant that this is the first time that Graphics Interface is being held in Vancouver. We welcome the Vancouver participants who have not had an opportunity to attend GI Conferences in the past, and we hope for their continued support.

Putting together a program of this size and scope is a considerable task, and I want to thank the organizers for all their work. In particular I would like to mention Mark Green for putting together the Graphics Interface program, Morris Goldberg and Bob Woodham for the Vision Interface program, Gunther Schrack for local arrangements, and Marceli Wein for the Proceedings. Without volunteer efforts such as theirs, the conference would not be nearly as enjoyable.

**Wayne A. Davis**  
President CMCCS and  
Conference Chairman

#### **Message from the Chairman of the Local Organizing Committee**

A wide variety of events is taking place during Graphics Interface/Vision Interface '86. There are two days of tutorials to introduce new and interesting topics to those wanting more background information; three days of technical sessions presenting recent ideas, concepts and results in computer graphics and computer vision; a film show of the latest applications of technology to the world of entertainment; and a banquet and two receptions to allow the opportunity for the personal contacts and conversations so important at a professional conference.

#### **Message du président de la conférence**

Graphics Interface '86 et Vision Interface '86 constituent une autre activité novatrice de la Société canadienne du dialogue homme-machine. Nous sommes tout particulièrement fiers que cette douzième conférence canadienne consacrée à l'imagerie informatique soit la plus ancienne conférence dans le domaine en Amérique du Nord.

Cette année, l'Association canadienne de traitement d'images et reconnaissance des formes s'est jointe à nous pour l'organisation de la conférence. L'ACTIRF a participé au programme des conférences antérieures, mais jamais de manière aussi active ni aussi visible. Bien que le caractère conjoint de la conférence ait engendré certains problèmes de coordination, nous espérons que tous les participants bénéficieront des effets positifs de la "synergie" résultante.

De plus, il est important de souligner qu'il s'agit de la première fois que Graphics Interface a lieu à Vancouver. Nous souhaitons la bienvenue aux participants de Vancouver qui n'ont pas eu l'occasion d'assister aux conférences GI antérieures et nous espérons que leur participation se poursuivra à l'occasion des conférences futures.

L'établissement d'un programme de cette envergure est une tâche considérable et je tiens à remercier tous les organisateurs. Je veux mentionner en particulier Mark Green qui a coordonné le programme de Graphics Interface, Morris Goldberg et Bob Woodham qui ont coordonné le programme de Vision Interface, ainsi que Marceli Wein qui est responsable du compte rendu. Sans la participation bénévole de ces gens et d'autres personnes, le résultat final ne serait pas aussi satisfaisant.

**Wayne A. Davis**  
Président de la SCDHM et  
Président de la conférence

#### **Message du Président du Comité d'organisation local**

Le programme de Graphics Interface/Vision Interface '86 offre une gamme très variée d'activités. Tout d'abord, deux journées de séances d'étude portant sur des domaines nouveaux et captivants à l'intention des personnes qui désirent s'y familiariser; ensuite, trois jours d'ateliers techniques traitant d'idées, de concepts et de résultats récents dans les secteurs de l'imagerie informatique et de la vision informatique; un programme de films montrant certaines applications récentes de ces technologies au domaine des arts du spectacle; et finalement, un banquet et deux réceptions favorisant les conversations et contacts personnels, facette très importante d'une conférence professionnelle.

And there is more! Vancouver is an inviting city, nestled between the mountains and the sea with plentiful fine restaurants, entertainment, breathtaking sights, and fascinating neighbourhoods such as Gastown, Chinatown and Granville Island, to name but a few. Of course there is Expo '86, an entire summer of entertainment and information, concentrating on transportation and communication of the past, present and future. I hope you can find time to take advantage of at least some of these attractions.

A conference of this size depends entirely on the dedication of the volunteers who are organizing it. Much work has been invested, and I wish to express my sincere thanks to all my fellow committee members who gave much time and effort to make this conference possible. I hope you will benefit from it.

**Gunther Schrack**  
University of British Columbia

#### **Message from the Program Chair Graphics Interface '86**

Over the years Graphics Interface has developed a reputation for a varied and interesting program. It is my hope that the 1986 program will meet the standards set by previous Graphics Interface conferences.

This year's program is a major departure from those of previous years, in that there are fewer parallel sessions. The Program Committee had to be more selective in the review of papers. I would like to thank the committee members for the extra effort required to review the papers (most of which were full papers, as opposed to the extended summaries submitted in previous years). The trend towards fewer parallel sessions should increase the quality of the papers presented at Graphics Interface.

Another major difference in 1986 is the inclusion of the Vision Interface conference. This new conference is being held in parallel with Graphics Interface, with sessions open to attendees of both conferences. Graphics Interface and Vision Interface will share several common sessions and this will encourage interaction between these two related fields.

**Mark Green**  
University of Alberta

#### **Graphics Interface '86**

Et ce n'est pas tout! Vancouver est une ville très accueillante, sise entre la montagne et mer, et qui regorge d'excellents restaurants, de lieux de divertissement, de paysages à couper le souffle et de quartiers pittoresques comme, par exemple, Gastown, Chinatown et Granville Island. Sans parler bien sûr d'Expo '86, qui offrira pendant tout l'été un programme de divertissement et d'information, en particulier dans les domaines des transports et des télécommunications d'hier, d'aujourd'hui et de demain. Je vous souhaite d'avoir le temps de profiter d'au moins une partie de ces attractions.

Une conférence de cette envergure repose entièrement sur le travail des volontaires qui l'organisent. La somme de travail nécessaire a été énorme et je veux remercier tous les autres membres du comité d'organisation qui ont consacré beaucoup de temps et d'énergie à cette conférence; sans eux, la tenue de la conférence aurait été impossible. J'espère que la conférence vous sera profitable.

**Gunther Schrack**  
University of British Columbia

#### **Message du président du programme de Graphics Interface '86**

Depuis ses débuts, Graphics Interface a acquis la réputation d'offrir un programme varié et intéressant. J'ose espérer que le programme de 1986 satisfera aux critères exigeants établis lors des conférences Graphics Interface précédentes.

Le programme de cette année se distingue nettement de celui des années précédentes puisqu'il comporte moins d'activités concomitantes. Le Comité du programme a dû étudier les communications proposées avec plus de rigueur. Je remercie les membres de ce comité pour le surcroît de travail qu'a exigé la lecture des textes (dont la plupart étaient des articles complets plutôt que des résumés détaillés comme les années précédentes). La diminution du nombre d'activités en parallèle devrait accroître la qualité d'ensemble des communications présentées lors de Graphics Interface.

L'autre nouvel aspect très important en 1986 est l'adjonction de la conférence Vision Interface. Cette nouvelle conférence se tient en parallèle à Graphics Interface et toutes les activités sont ouvertes aux membres des deux conférences. Plusieurs ateliers seront communs à Graphics Interface et Vision Interface, ce qui devrait favoriser les échanges entre ces deux domaines connexes.

**Mark Green**  
University of Alberta

#### **Vision Interface '86**

**Message from the Program Co-chairs of Vision Interface**

Welcome to Vision Interface '86, sponsored by the Canadian Image Processing and Pattern Recognition Society (CIPPERS). It is a great pleasure to begin a new series of vision conferences in conjunction with Graphics Interface '86, the 12th graphics conference sponsored by the Canadian Man-Computer Communications Society (CMCCS). Vision Interface '86 has relied heavily on the organizational work of the Graphics Interface '86 Planning Committee, for which we are most grateful. Hopefully, all attendees benefit from the joint tutorial program and technical sessions of the companion conferences. As Program Co-chairs of Vision Interface '86, we thank our invited speakers and all those who submitted papers. These proceedings become the permanent record of your efforts.

**M. Goldberg**  
University of Ottawa

and

**R.J. Woodham**  
University of British Columbia

**Message des co-présidents du programme de Vision Interface**

Nous vous souhaitons la bienvenue à Vision Interface '86, que commandite l'Association canadienne de traitement d'images et reconnaissance des formes (ACTIRF). C'est avec un vif plaisir que nous inaugurons une nouvelle série de conférences sur la visionique, en collaboration avec Graphics Interface '86, la douzième édition de cette conférence commanditée par la Société canadienne du dialogue homme-machine (SCDHM). Vision Interface '86 a beaucoup profité de l'expérience du comité d'organisation de Graphics Interface '86; nous lui exprimons toute notre reconnaissance. Nous espérons que tous les participants profiteront du programme commun de séances d'études et d'ateliers techniques des deux conférences. À titre de co-présidents de Vision Interface '86, nous remercions les conférenciers invités ainsi que tous ceux qui nous ont soumis des articles. Le présent compte rendu forme un témoignage permanent de vos travaux.

**M. Goldberg**  
Université d'Ottawa

et

**R.J. Woodham**  
University of British Columbia

**ORGANIZING COMMITTEE / COMITÉ ORGANISATEUR**

<b>Conference Chairman/Président de la conférence</b>	Wayne Davis, University of Alberta
<b>GI '86 Program and Tutorials/Programme et cours d'instruction GI '86</b>	Mark Green, University of Alberta
<b>Program Committee/Comité du programme</b>	W.W. Armstrong, University of Alberta T.W. Calvert, Simon Fraser University W.A. Davis, University of Alberta M. Dubetz, University of Alberta A. Fournier, University of Toronto M. Green, University of Alberta D.R. Hill, University of Calgary S. MacKay, NRCC/CNRC D. Peachey, University of Saskatchewan G.F. Schrack, University of British Columbia G. Singh, University of Alberta P.P. Tanner, University of Waterloo M. Tuori, Defence and Civil Institute of Environmental Medicine/Institut militaire et civil de médecine environnementale M. Wein, NRCC/CNRC
<b>VI '86 Program/Programme VI '86</b>	Morris Goldberg, University of Ottawa/Université d'Ottawa Robert Woodham, University of British Columbia
<b>Proceedings Editors/Rédacteurs des comptes rendus</b>	Marceli Wein, Evelyn M. Kidd, NRCC/CNRC
<b>Treasurer/Trésorier</b>	Mike Kendrick, Vertigo Systems International
<b>Publicity/Publicité</b>	Chander Khanna, Vertigo Systems International
<b>Filmshow/Séance cinématographique</b>	Severin Gaudet, Vertigo Systems International
<b>Equipment Exhibition/Exposition de matériel</b>	Tom Poiker, Simon Fraser University
<b>Local Arrangements/Arrangements locaux</b>	Gunther Schrack, University of British Columbia
<b>Audio-Visuals/Audiovisuel</b>	Norm Dadoun, University of British Columbia
<b>Corporate Sponsorships/Parrainage collectif</b>	John Dill, Microtel Pacific Research
<b>Secretary/Secrétaire</b>	Willie Laurilla, Capilano College
<b>Member-at-Large/Membre sans titre particulier</b>	Tom Calvert, Simon Fraser University

**CANADIAN MAN-COMPUTER COMMUNICATIONS SOCIETY/  
LA SOCIÉTÉ CANADIENNE DU DIALOGUE HOMME-MACHINE**

**President/Président**

Dr. Wayne A. Davis  
Department of Computing Science  
University of Alberta  
Edmonton, Alberta  
T6G 2H1

**Vice-President/Vice-président**

Peter P. Tanner  
Computer Graphics Laboratory  
University of Waterloo  
Waterloo, Ontario  
N2L 3G1

**Secretary-Treasurer/Secrétaire-trésorier**

Dr. Fred G. Peet  
Pacific Forest Research Centre  
Victoria, B.C.  
V8Z 1M5

**CANADIAN IMAGE PROCESSING AND PATTERN RECOGNITION SOCIETY /  
L'ASSOCIATION CANADIENNE DE TRAITEMENT D'IMAGES ET RECONNAISSANCE DES FORMES**

**President/Président**

Ching Y. Suen  
Department of Computer Science  
Concordia University  
1455 de Maisonneuve Blvd. W.  
Montreal, Quebec  
H3G 1M8

**Secretary-Treasurer/Secrétaire-trésorier**

Morris Goldberg  
Department of Electrical Engineering  
University of Ottawa  
Ottawa, Ontario  
K2N 6N5



TABLE OF CONTENTS/TABLE DES MATIÈRES

APPLICATIONS / APPLICATIONS	Page
<i>Computer Graphics and the Fashion Industry</i> J. Nisselson, New York Institute of Technology, Old Westbury, New York .....	1
<i>Some Implications of Dynamic Structural Analysis</i> J.A. Hoskins and W.D. Hoskins, University of Manitoba, Winnipeg, Manitoba .....	7
<i>An Encoding Scheme for Presentation Graphics with Animation</i> H.J. Ferch, University of Manitoba, Winnipeg, Manitoba .....	11
<i>Kinematic and Geometric Modelling and Animation of Robots</i> H.A. ElMaraghy, McMaster University, Hamilton, Ontario .....	15
<b>COMPUTER GRAPHICS AND ARTIFICIAL INTELLIGENCE / INFOGRAPHIE ET INTELLIGENCE ARTIFICIELLE</b>	
<i>Semantic Network Reasoning for Picture Composition</i> R. Ostrovsky, B.R. Gardner, and M. Holynski, Boston University, Boston, Massachusetts .....	20
<i>Experiences with Using Prolog for Geometry</i> W.R. Franklin, Rensselaer Polytechnic Institute, Troy, New York; M. Nichols, North American Philips Lighting Co., Bloomfield, New Jersey; and S. Samaddar, P. Wu, Rensselaer Polytechnic Institute, Troy, New York .....	26
<i>The Inference Machine Laboratory: Graphic Tools for Knowledge Management</i> J.W. Lewis, Martin Marietta Laboratories, Baltimore, Maryland .....	32
<b>DISPLAY ALGORITHMS / ALGORITHMES GRAPHIQUES</b>	
<i>PORTRAY - An Image Synthesis System</i> D.R. Peachey, University of Saskatchewan, Saskatoon, Saskatchewan .....	37
<i>An Adaptive Subdivision by Sliding Boundary Surfaces for Fast Ray Tracing</i> K. Nemoto and T. Omachi, NEC Corporation, Kawasaki, Japan .....	43
<i>Profiling Graphic Display Systems</i> P. Schoeler, Alias Research Inc. and University of Toronto; and A. Fournier, University of Toronto, Toronto, Ontario .....	49
<i>Using Caching and Breadth-First Search to Speed Up Ray-Tracing</i> P. Hanrahan, Pixar Corp., San Rafael, California .....	56
<b>USER INTERFACES I / INTERFACE AVEC L'USAGER I</b>	
<i>What are Visual Programming, Programming by Example, and Program Visualization?</i> B.A. Myers, University of Toronto, Toronto, Ontario .....	62
<i>An Editing Model for Generating Graphical User Interfaces</i> D.R. Olsen, Jr., Brigham Young University, Provo, Utah .....	66
<i>Automatic Generation of Graphical User Interfaces</i> G. Singh and M. Green, University of Alberta, Edmonton, Alberta .....	71
<b>ALGORITHMS / ALGORITHMES</b>	
<i>A Fast Algorithm for General Raster Rotation</i> A.W. Paeth, University of Waterloo, Waterloo, Ontario .....	77

Table of Contents/Table des matières (cont'd/suite)

	Page
<i>A Cel-Based Model for Paint Systems</i> T.M. Higgins and K.S. Booth, University of Waterloo, Waterloo, Ontario	82
<i>Design and Experience with a Generalized Raster Toolkit</i> A.W. Paeth and K.S. Booth, University of Waterloo, Waterloo, Ontario	91
<i>Graphics Tools in Adagio, A Robotics Multitasking Multiprocessor Workstation</i> S.A. MacKay and P.P. Tanner, National Research Council of Canada, Ottawa, Ontario	98
<b>MODELLING I / MODELISATION I</b>	
<i>Exploiting Classes in Modeling and Display Software</i> T. Whitted and E. Grant, University of North Carolina, Chapel Hill, North Carolina	104
<i>Applications of World Projections</i> N. Greene, New York Institute of Technology, Old Westbury, New York	108
<b>HUMAN ANIMATION / ANIMATION DU CORPS HUMAIN</b>	
<i>Animating Human Figures: Perspectives and Directions</i> N.I. Badler, University of Pennsylvania, Philadelphia, Pennsylvania	115
<i>The Interactive Specification of Human Animation</i> G. Ridsdale, S. Hewitt, and T.W. Calvert, Simon Fraser University, Burnaby, British Columbia	121
<i>Goal Directed Animation using English Motion Commands</i> K. Drewery and J. Tsotsos, University of Toronto, Toronto, Ontario	131
<i>Speech and Expression: A Computer Solution to Face Animation</i> A. Pearce, B. Wyvill, G. Wyvill, and D. Hill, University of Calgary, Calgary, Alberta	136
<i>Virya - A Motion Control Editor for Kinematic and Dynamic Animation</i> J. Wilhelms, University of California, Santa Cruz, California	141
<i>Near-Real-Time Control of Human Figure Models</i> W.W. Armstrong, M. Green, and R. Lake, University of Alberta, Edmonton, Alberta	147
<i>Modeling and Animating Three-Dimensional Articulate Figures</i> D.G. Cachola and G.F. Schrack, University of British Columbia, Vancouver, British Columbia	152
<b>MODELLING II / MODELISATION II</b>	
<i>Constraint-Based Modeling of Three-Dimensional Shapes</i> P. Prusinkiewicz and D. Streibel, University of Regina, Regina, Saskatchewan	158
<i>The Stochastic Modelling of Trees</i> A. Fournier and D.A. Grindal, University of Toronto, Toronto, Ontario	164
<i>Methods for Stochastic Spectral Synthesis</i> J.P. Lewis, New York Institute of Technology, Old Westbury, New York	173
<i>Interactive 3-D Modeling with Personal Computers</i> R.W. Thornton and G.J. Glass, New York Institute of Technology, Old Westbury, New York	180

Table of Contents/Table des matières (cont'd/suite)

	Page
<b>USER INTERFACE II / INTERFACE AVEC L'USAGER II</b>	
<i>Psychology and the User Interface: Science is soft at the frontier</i> J.M. Carroll, IBM T.J. Watson Research Center, Yorktown Heights, New York .....	186
<i>Learning Graphics Programming by Direct Communication</i> M. Tuori and T. Pointing, Defence and Civil Institute of Environmental Medicine, Downsview, Ontario .....	188
<b>HARDWARE / MATERIEL</b>	
<i>VLSI and Graphics at the Pixel Level</i> H. Fuchs, University of North Carolina, Chapel Hill, North Carolina .....	193
<i>Hardware Assistance for Z-Buffer Visible Surface Algorithms</i> K.S. Booth, D.R. Forsey, and A.W. Paeth, University of Waterloo, Waterloo, Ontario .....	194
<b>ANIMATION / ANIMATION</b>	
<i>Eliminating the Dichotomy Between Scripting and Interaction</i> J.F. Schlag, New York Institute of Technology, Old Westbury, New York .....	202
<i>Survey of Texture Mapping</i> P.S. Heckbert, New York Institute of Technology, Old Westbury, New York .....	207
<i>Keyframe-Based Subactors</i> L. Forest, D. Rambaud, N. Magnenat-Thalmann, and D. Thalmann, Université de Montréal, Montréal, Québec .....	213
<i>The Representation of Water</i> G. Wyvill, University of Otago, Dunedin, New Zealand; and A. Pearce and B. Wyvill, University of Calgary, Calgary, Alberta .....	217
<b>VISION/GRAFICS INTERFACE / INTERFACE ENTRE LA VISION PAR ORDINATEUR ET L'INFOGRAPHIE</b>	
<i>Part Structure for 3-D Sketching</i> A.P. Pentland, SRI International, Menlo Park, California .....	223
<i>Interfacing Image Processing and Computer Graphics Systems Using an Artificial Visual System</i> J.M. Coggins, K.E. Fogarty, and F.S. Fay, University of Massachusetts Medical School; and Worcester Polytechnic Institute, Worcester, Massachusetts .....	229
<i>Connected Component Labeling Using Modified Linear Quadtrees</i> X. Wang and W.A. Davis, University of Alberta, Edmonton, Alberta .....	235
<i>Asterisk*: An Extensible Testbed for Spline Development</i> J.R. Gross, T.D. DeRose, and B.A. Barsky, University of California, Berkeley, California .....	241
<i>Graphical Applications of L-Systems</i> P. Prusinkiewicz, University of Regina, Regina, Saskatchewan .....	247
<i>Fractals, Computers and DNA</i> P. Oppenheimer, New York Institute of Technology, Old Westbury, New York .....	254
<i>A Knowledge-Based Approach to Computer Vision Systems</i> M.D. Levine and W. Hong, McGill University, Montréal, Québec .....	260

Table of Contents/Table des matières (cont'd/suite)

	Page
<b>REMOTE SENSING AND GEO INFORMATION SYSTEMS / TELEDÉTECTION ET SYSTÈMES D'INFORMATION GÉOGRAPHIQUES</b>	
<i>Integration of Remotely Sensed Data and Geographic Information Systems</i> D.G. Goodenough, Canada Centre for Remote Sensing, Ottawa, Ontario .....	266
<i>Image Segmentation Based on Color and Texture Gradient</i> P.T. Nguyen, IBM France, Paris, France .....	267
<i>Map/Image Congruency Evaluation Knowledge Based System</i> G.W. Plunkett and D.G. Goodenough, Canada Centre for Remote Sensing, Ottawa, Ontario; and M. Goldberg, University of Ottawa, Ottawa, Ontario .....	273
<i>A Context Based Technique for Smoothing of Digital Thematic Maps</i> B. Yee and D. Turpin, MacDonald, Dettwiler and Associates Ltd., Richmond, British Columbia; and E. Kenk and M. Sondheim, B.C. Ministry of Environment, Victoria, British Columbia .....	279
<i>Principe de codage visuel de la couleur appliquée à des images satellitaires</i> M.-J. Lefèvre-Fonollosa and H. Cruchant, Centre national d'études spatiales, Toulouse, France .....	284
<i>A File Organization Scheme for Polygon Data</i> C.H. Hwang and W.A. Davis, University of Alberta, Edmonton, Alberta .....	287
<b>ROBOTICS / ROBOTIQUE</b>	
<i>Mathematical Morphology Applied to Range Image Processing</i> C.C. Archibald, Machine Vision International, Ottawa, Ontario; and S.R. Sternberg, Machine Vision International, Ann Arbor, Michigan .....	293
<i>Incremental Construction of 3-D Models From a Sequence of Framed Views: Matching Partial Objects</i> S. Xie and T.W. Calvert, Simon Fraser University, Burnaby, British Columbia .....	300
<i>Image Techniques for the Identification of Depressions and Other Obstacles in Automated Guidance of Roving Robots</i> M. Adjouadi, University of Hawaii at Manoa, Honolulu, Hawaii .....	307
<i>A Computational Theory of 3D Shape Reconstruction From Image Contours</i> P. Liang and J.S. Todhunter, University of Pittsburgh, Pittsburgh, Pennsylvania .....	313
<b>PERCEPTION AND COMPUTATIONAL VISION / PERCEPTION ET LA MATHÉMATIQUE DE LA VISION PAR ORDINATEUR</b>	
<i>Selection and Use of Image Features for Segmentation of Boundary Images</i> D. Walters, University at Buffalo (SUNY), Buffalo, New York .....	318
<i>Cortical Representation of Texture Primitives</i> A.E.J. Walford and M.E. Jernigan, University of Waterloo, Waterloo, Ontario .....	325
<i>Speeded Phase Discrimination: Evidence for Global to Local Processing</i> J.M. Barr, University of Oxford, Oxford, United Kingdom .....	331
<i>Correspondence in Apparent Motion: Defining the Heuristics</i> M. Green, York University, North York, Ontario .....	337
<i>Three Processing Characteristics of Texture Discrimination</i> T.M. Caelli, University of Alberta, Edmonton, Alberta .....	343

Table of Contents/Table des matières (cont'd/suite)

	Page
<b>IMAGE PROCESSING AND PATTERN RECOGNITION / TRAITEMENT D'IMAGES ET RECONNAISSANCE DES FORMES</b>	
<i>Parallel Architectures for Machine Vision</i> S.L. Tanimoto, University of Washington, Seattle, Washington .....	349
<i>Determining Displacement Fields Along Contours From Image Sequences</i> P. Bouthemy, IRISA/INRIA, Rennes, France .....	350
<i>Edge-Only Matching Techniques in Robot Vision</i> S. Nagendran and T.M. Caelli, University of Alberta, Edmonton, Alberta .....	356
<i>A Method of Learning Rules from Uncertain Data Applied to the Computer Vision Problem</i> D. Hutber and P. Sims, British Aerospace PLC, Bristol, England .....	361
<i>Sequential Estimation of Boundaries in Texture Images</i> D. Brzakovic, University of Tennessee, Knoxville, Tennessee; and A. Liakopoulos, System Dynamics Inc., Gainesville, Florida .....	366
<i>Detection of Specularities in Colour Images Using Local Operators</i> P.N.E. Pellicano, Simon Fraser University, Burnaby, British Columbia .....	370
<b>APPLICATIONS: OTHER / AUTRES APPLICATIONS</b>	
<i>Coupling Visual and Dynamic Features to Study Handwritten Signatures</i> J.-J. Brault and R. Plamondon, Ecole Polytechnique de Montréal, Montréal, Québec .....	375
<i>Detecting Glass Fibers Using Computer Vision</i> A.S. Malowany, M.D. Levine, M.R. Kamal, R.Kurz, and A.-R. Mansouri, McGill University, Montréal, Québec .....	380
<i>Reconstruction and Display of The Retina</i> K.R. Sloan, Jr., D. Meyers, and C.A. Curcio, University of Washington, Seattle, Washington .....	385
<i>Optical Character Recognition of Touching Characters</i> S. Shlien and K. Kubota, Communications Research Centre, Ottawa, Ontario .....	390
<i>Contour Line Region Segmentation</i> L. O'Gorman and G.I. Weil, AT&T Bell Laboratories, Murray Hill, New Jersey .....	396



AUTHOR INDEX / RÉPERTOIRE DES AUTEURS

Adjouadi, M.	307	Kenk, E.	279
Archibald, C.C.	293	Kubota, K.	390
Armstrong, W.W.	147	Kurz, R.	380
Badler, N.I.	115	Lake, R.	147
Barr, J.M.	331	Lefevre-Fonollosa, M.-J.	284
Barsky, B.A.	241	Levine, M.D.	260, 380
Booth, K.S.	82, 91, 194	Lewis, J.P.	173
Bouthemy, P.	350	Lewis, J.W.	32
Brault, J.-J.	375	Liakopoulos, A.	366
Brzakovic, D.	366	Liang, P.	313
Cachola, D.G.	152	MacKay, S.A.	98
Caelli, T.M.	343, 356	Magnenat-Thalmann, N.	213
Calvert, T.W.	121, 300	Malowany, A.S.	380
Carroll, J.M.	186	Mansouri, A.-R.	380
Coggins, J.M.	229	Meyers, D.	385
Cruchant, H.	284	Myers, B.A.	62
Curcio, C.A.	385	Nagendran, S.	356
Davis, W.A.	235, 287	Nemoto, K.	43
DeRose, T.D.	241	Nguyen, P.T.	267
Drewery, K.	131	Nichols, M.	26
ElMaraghy, H.A.	15	Nisselson, J.	1
Fay, F.S.	229	Olsen, Jr., D.R.	66
Ferch, H.J.	11	Omachi, T.	43
Fogarty, K.E.	229	Oppenheimer, P.	254
Forest, L.	213	Ostroovsky, R.	20
Forsey, D.R.	194	O'Gorman, L.	396
Fournier, A.	49, 164	Paeth, A.W.	77, 91, 194
Franklin, W.R.	26	Peachey, D.R.	37
Fuchs, H.	193	Pearce, A.	136, 217
Gardner, B.R.	20	Pellucano, P.N.E.	370
Glass, G.J.	180	Pentland, A.P.	223
Goldberg, M.	273	Plamondon, R.	375
Goodenough, D.G.	266, 273	Plunkett, G.W.	273
Grant, E.	104	Pointing, T.	188
Green, Marc	337	Prusinkiewicz, P.	158, 247
Green, Mark	71, 147	Rambaud, D.	213
Greene, N.	108	Ridsdale, G.	121
Grindal, D.A.	164	Samaddar, S.	26
Gross, J.R.	241	Schlag, J.F.	202
Hanrahan, P.	56	Schoeler, P.	49
Heckbert, P.S.	207	Schrack, G.F.	152
Hewitt, S.	121	Shlien, S.	390
Higgins, T.M.	82	Sims, P.	361
Hill, D.	136	Singh, G.	71
Holynski, M.	20	Sloan, Jr., K.R.	385
Hong, W.	260	Sondheim, M.	279
Hoskins, J.A.	7	Sternberg, S.R.	293
Hoskins, W.D.	7	Streibel, D.	158
Hutber, D.	361	Tanimoto, S.L.	349
Hwang, C.H.	287	Tanner, P.P.	98
Jernigan, M.E.	325	Thalmann, D.	213
Kamal, M.R.	380	Thornton, R.W.	180

Todhunter, J.S.	313	Whitted, T.	104
Tsotsos, J.	131	Wilhelms, J.	141
Tuori, M.	188	Wu, P.	26
Turpin, D.	279	Wyvill, B.	136, 217
Walford, A.E.J.	325	Wyvill, G.	136, 217
Walters, D.	318	Xie, S.	300
Wang, X.	235	Yee, B.	279
Weil, G.I.	396		



