Selected Publications in Image Understanding and Computer Vision from 1974 to 1983

J.G. Verly

18 April 1985

Lincoln Laboratory
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
LEXINGTON, MASSACHUSETTS


Approved for public release; distribution unlimited.
The work reported in this document was performed at Lincoln Laboratory, a center for research operated by Massachusetts Institute of Technology. This work was sponsored by the Defense Advanced Research Projects Agency under Air Force Contract F19628-85-C-0002 (ARPA Order 4881).

This report may be reproduced to satisfy needs of U.S. Government agencies.

The views and conclusions contained in this document are those of the contractor and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the United States Government.

The ESD Public Affairs Office has reviewed this report, and it is releasable to the National Technical Information Service, where it will be available to the general public, including foreign nationals.

This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER

[Signature]

Thomas J. Alpert, Major, USAF
Chief, ESP Lincoln Laboratory Project Office

Non-Lincoln Recipients

PLEASE DO NOT RETURN

Permission is given to destroy this document when it is no longer needed.

Reproduced From
Best Available Copy
SELECTED PUBLICATIONS IN IMAGE UNDERSTANDING
AND COMPUTER VISION FROM 1974 TO 1983

J.G. VERLY

Group 21

TECHNICAL REPORT 716

18 APRIL 1985

Approved for public release; distribution unlimited.
# TABLE OF CONTENT

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>ABBREVIATIONS</td>
<td>3</td>
</tr>
<tr>
<td>APPENDIX A: 1983</td>
<td>A-1</td>
</tr>
<tr>
<td>APPENDIX B: 1982</td>
<td>B-1</td>
</tr>
<tr>
<td>APPENDIX C: 1981</td>
<td>C-1</td>
</tr>
<tr>
<td>APPENDIX D: 1980</td>
<td>D-1</td>
</tr>
<tr>
<td>APPENDIX E: 1979</td>
<td>E-1</td>
</tr>
<tr>
<td>APPENDIX F: 1978</td>
<td>F-1</td>
</tr>
<tr>
<td>APPENDIX G: 1977</td>
<td>G-1</td>
</tr>
<tr>
<td>APPENDIX H: 1976</td>
<td>H-1</td>
</tr>
<tr>
<td>APPENDIX I: 1975</td>
<td>I-1</td>
</tr>
<tr>
<td>APPENDIX J: 1974</td>
<td>J-1</td>
</tr>
</tbody>
</table>
INTRODUCTION

This report contains a list of selected publications in image understanding and computer vision. The list was compiled as part of our work for the DARPA-sponsored Autonomous IR Sensor Technology program, and the choice of references was directly influenced by the needs of that program. Therefore, emphasis has been placed on theories, techniques, and systems for interpreting complex imagery; the more classical fields of image processing, e.g., filtering, enhancement, restoration, coding, and reconstruction, have not been included. The topics of edge detection and region segmentation as well as the well-known scene analysis problems of shape recognition from stereo, shading, texture, and motion have also been excluded.

The bibliography covers the last decade (1974-1983) and is based on the yearly surveys published by A. Rosenfeld in the Journal initially called "Computer Graphics and Image Processing (CGIP)" and now "Computer Vision, Graphics, and Image Processing (CVGIP)". The corresponding references are:

These surveys contain a total of 7,486 references of which 1,254 were selected for inclusion in this report. The table below shows the details of the selection process on a yearly basis.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TOTAL REFERENCES</th>
<th>NUMBER SELECTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>83</td>
<td>1,138</td>
<td>201</td>
</tr>
<tr>
<td>82</td>
<td>1,185</td>
<td>208</td>
</tr>
<tr>
<td>81</td>
<td>982</td>
<td>147</td>
</tr>
<tr>
<td>80</td>
<td>897</td>
<td>131</td>
</tr>
<tr>
<td>79</td>
<td>700</td>
<td>160</td>
</tr>
<tr>
<td>78</td>
<td>819</td>
<td>153</td>
</tr>
<tr>
<td>77</td>
<td>609</td>
<td>103</td>
</tr>
<tr>
<td>76</td>
<td>461</td>
<td>67</td>
</tr>
<tr>
<td>75</td>
<td>354</td>
<td>43</td>
</tr>
<tr>
<td>74</td>
<td>341</td>
<td>41</td>
</tr>
<tr>
<td>TOTAL</td>
<td>7,486</td>
<td>1,254</td>
</tr>
</tbody>
</table>

In this report, the references are organized by years, starting with 1983, and also by subjects within each year. The subject classes and titles are those of Rosenfeld's surveys and the reference numbers have also been kept unchanged to simplify the task of comparing this bibliography with the original source. Some editing was required to eliminate problems due to the use of "ibid" in the surveys and to maintain the same set of Journal abbreviations throughout the bibliography.

This report has been found extremely useful in the context of the Autonomous IR Sensor Technology program, but it should be of interest to any researcher involved in image understanding and computer vision. It can be read in a few hours and provides a fairly accurate view of the trends in the fields over the last decade.
ABBREVIATIONS

AI    Artificial Intelligence
BC    Biological Cybernetics
CACM  Communications of the ACM
CG    Computer Graphics (ACM Quarterly)
CGA   IEEE Computer Graphics and Applications
CGIP  Computer Graphics and Image Processing
CS    Computing Surveys
CVGIP Computer Vision, Graphics, and Image Processing
I&C   Information and Control
IFIP  IFIP Congress Proceedings
IJRR  International Journal of Robotics Research
IPL   Information Processing Letters
IS    Information Sciences
IVC   Image and Vision Computing
JACM  Journal of the ACM
J. CYBER Journal of Cybernetics
MI    Machine Intelligence
PACM  Proceedings of the ACM
P-IEEE Proceedings of the IEEE
P-NCC Proceedings of the National Computer Conference
PR    Pattern Recognition
PRL   Pattern Recognition Letters
P-SPIE Proceedings of the SPIE
SFCS  Symposium on Foundations of Computer Sciences
SIAM JAM SIAM Journal of Applied Mathematics
SIAM JC SIAM Journal of Computing
SP    Signal Processing
STOC  Symposium on Theory of Computing
T-AC  IEEE Transactions on Automatic Control
T-CAS  IEEE Transactions on Circuits and Systems
T-COMP IEEE Transactions on Computers
T-IT   IEEE Transactions on Information Theory
T-PAMI IEEE Transactions on Pattern Analysis and Machine Intelligence
T-SE   IEEE Transactions on Software Engineering
T-SMC  IEEE Transactions on Systems, Man, and Cybernetics
APPENDIX A: 1983

A. General References

A.1. Meetings

1. Army Research Office Workshop on Unsupervised Image Classification (Providence, RI, April 14-16, 1983).


11. (Department of Energy) Workshop on Research Goals and Priorities in Intelligent Machines (Leesburg, VA, November 2-4, 1983).

12. Symposium on Intelligence Applications of Artificial Intelligence (Langley, VA, December 6-8, 1983).


A.2. Journals, Handbooks


A.3. Textbooks, Surveys


30. A. Rosenfeld, Why computers can't see (yet), Abacus 1(1), Fall 1983, 17-26.


A.4. Graphics


A.6. Perception


D. Hardware and Software


D.1. Systems


D.2. Cellular Arrays, etc.

328. International Workshop on Parallel Processing by Cellular Automata (Berlin, DDR, September 15-16, 1982).

341. S. L. Tanimoto, A Boolean matching operator for hierarchical cellular logic, in [276], 152, 253-256.

D.3. Operations, Data Structures, Software, Databases

353. S. Levalldi, Neighborhood operators: an outlook, in [14], 1-14.

354. M. J. B. Duff, Neighborhood operators, in [81], 53-72.


363. R. A. Messner and H. H. Szu, Coordinate transformation from an image plane directly to an invariant feature space, in [3], 522-530.

370. C. Goad, Special purpose automatic programming for 3D model-based vision, in [4], 94-104.

E. Pictorial Pattern Recognition


E.2. Industrial Automation


449. T. N. Mudge and T. S. Abdel-Rahman, Case study of a program for the recognition of occluded parts, in [276], 56-60.

450. S. R. Sternberg and E. S. Sternberg, Industrial inspection by morphological virtual gauging, in [276], 237-247.


E.4. Remote Sensing, Reconnaissance, Cartography

503. L. F. Guseman, Jr., Ed., Proceedings of the NASA Symposium on Mathematical Pattern Recognition and Image Analysis (Houston, TX, June 1-3, 1983).


515. M. Goldberg, G. Karam, and M. Alvo, A production rule-based expert system for interpreting multi-temporal LANDSAT imagery, in [3], 77-82.


E.5. Miscellaneous

541. D. Hogg, Model-based vision: a program to see a walking person, IVC 1, 1983, 5-20.


F. Feature Detection, Segmentation, and Image Analysis

F.1. Features

553. A. B. Watson, Detection and recognition of simple spatial forms, in [81], 100-114.

557. O. A. Zuniga and R. M. Haralick, Corner detection using the facet model, in [3], 30-37.

560. J. F. Abramatic, P. Letellier, and M. Nudler, The "aesthetic" contour, in [3], 159-160.


567. D. Kuan, Three-dimensional feature extraction, in [3], 388-390.


582. Z. Wu and A. Rosenfeld, Filtered projections as an aid in corner detection, PR 16, 1983, 31-38.

F.2. Segmentation


610. O. D. Faugeras, M. Hebert, and E. Pauchon, Segmentation of range data into planar and quadric patches, in [3], 8-13.


F.3. Image Analysis

645. J. C. Latombe and A. Lux, Basic notions in knowledge representation and control for computer vision, in [27], 325-371.

646. T. Kanade, Representation and control in vision, in [14], 171-197.

647. L. G. Shapiro, Computer vision systems: past, present, and future, in [14], 199-237.

650. A. K. Mackworth, Constraints, descriptions and domain mappings in computational vision, in [81], 33-40.

653. L. N. Kanal, B. A. Lambird, and D. Lavine, Structural methods in image analysis and recognition, in [26], 361-382.


659. J. Glicksman, Using multiple information sources in a computational vision systems, in [18], 1078-1080.

660. A. Lux and V. Souvignier, PVV-a goal-oriented system for industrial vision, in [18], 1121-1124.

661. F. Tomita, A learning vision system for 2D object recognition, in [18], 1132-1135.


G. Matching and Time-Varying Imagery

G.1. Matching

669. D. J. Burr, Matching elastic templates, in [81], 260-270.


672. Z. Chen, P. H. Chiu, and T. C. Chou, A simplified method for matching sensed planar scenes to reference scenes in a 3D space, in [3], 366-369.

673. F. Glazer, G. Reynolds, and P. Anadan, Scene matching by hierarchical correlation, in [3], 432-441; also in [4], 233-242.

678. B. Bhanu, Recognition of occluded objects, in [18], 1136-1138.


692. H. Tsukune and K. Goto, Extracting elliptical figures from an edge vector field, in [3], 138-141.

705. M. Potmesil, Generating models of solid objects by matching 3D surface segments, in [18], 1089-1093.


G.2. Motion


H. Shape and Pattern

H.1. Representation

805. T. C. Henderson, Feature-based 2-D shape models, in [27], 263-272.

806. A. Rosenfeld, Hierarchical representation: computer representations of digital images and objects, in [27], 315-324.
815. J. L. Crowley, A multi-dimensional representation for shape, in [3], 326-335.


H.2. Properties, Segmentation

830. L. Cheatham, D. Casasent, and D. Fettery, Distortion invariant recognition using a moment feature space, in [3], 171-174.


832. F. Badi'i and B. Peikari, Invariant numerical shape modeling, in [3], 190-191.


H.4. Distance, etc.


H.6. Convexity, etc.


I. Texture

943. R. M. Haralick, Image texture survey, in [27], 145-172; also in [26], 399-415.

J. Formal Models

J.1. Syntactic Pattern Recognition


979. K. S. Fu, A syntactic-semantic approach to pictorial pattern analysis, in [14], 133-146.

981. A. Giordana and L. Saitta, A non-left-to-right parser for syntactic shape recognition, in [276], 143-150.

983. K. S. Fu, Applications of stochastic languages, in [26], 417-449.


J.2. Formal Languages


K. Three-Dimensional Scene Analysis


K.1. Representation, Geometry

1023. Panel on Solid Modeling, in [35], 163-165.

1024. Panel on Solid Modeling: a User Perspective, in [35], 357.


1026. J. N. Shoosmith and R. E. Fulton, Guest Eds., [Special Issues on] Computer-Aided Geometry Modeling, CGA 3(7,8), October and November 1983, 6-66 and 58-83 (containing papers from [1022]).

1027. O. D. Faugeras, 3-D shape representation, in [27], 293-303.

1028. O. D. Faugeras, Conversion algorithms between 3-D shape representations, in [27], 305-314.

1029. M. Brady, Criteria for representations of shape, in [80], 39-84.

1030. H. K. Nishihara, Recognition of shape in visible surfaces, in [81], 335-348.


1033. R. Scott, An algorithm to display generalized cylinders, in [4], 219-223.

1034. H. Sakurai and D. C. Gossard, Solid model input through orthographic views, in [35], 243-252.


1037. A. L. Thomas, Geometric modeling and display primitives—towards specialized hardware, in [35], 299-310.

1038. O. D. Faugeras and J. Ponce, Prism trees: a hierarchical representation for 3-D objects, in [18], 982-988.


1054. E. Pervin and J. A. Webb, Quaternions in computer vision and robotics, in [3], 382-383.

1055. N. Okabe, J. I. Toriwaki, and T. Fukumura, Paths and distance functions on three-dimensional digitized pictures, in [3], 384-386.


K.2. 3D from 2D

1068. A Rosenfeld, "Intrinsic images": deriving three-dimensional information about a scene from single images, in [27], 185-195.

1069. E. Catanzariti, Satellite image understanding through synthetic images, in [14], 369-383.


1072. D. N. Perkins, Why the human perceiver is a bad machine, in [80], 341-364.

1076. B. Aldefeld, Automatic 3D reconstruction from 2D geometric part descriptions, in [3], 66-72.

1078. J. R. Kender, Surface constraints from linear extents, in [4], 49-53.

1079. J. Ketonen, Deducing facts about scenes from images, in [4], 182-183.

1081. S. T. Barnard and A. P. Pentland, Three-dimensional shape from line drawings, in [4], 282-284, also in [18], 1062-1064.

1082. M. Herman, Monocular reconstruction of a complex urban scene in the 3D MOSAIC system, in [4], 318-326.

1083. R. I. D. Cowie, The viewer's place in theories of vision, in [18], 952-958.
1085. M. Brady and A. Yuille, An extremum principle for shape from contour, in [18], 969-972.


1087. K. A. Stevens, The line of curvature constraint and the interpretation of 3-D shape from parallel surface contours, in [18], 1057-1061.

1089. D. Terzopoulos, The role of constraints and discontinuities in visible-surface reconstruction, in [18], 1073-1077.

1091. M. Herman, T. Kanade, and S. Kuroe, The 3D MOSAIC scene understanding system, in [18], 1108-1112.

1092. N. Abe, F. Itoh, and S. Tsuji, Toward generation of 3-dimensional models of objects using 2-dimensionals and explanations in language, in [18], 1113-1115.

1094. J. R. Kender, Surface constraints from linear extents, in [5], 187-190.


K.3. Sensing, Planning, Recognition

1114. R. Bajcsy, Integrating vision and touch for robotics applications, in [2], 193-197.

1115. T. C. Henderson and W. S. Fai, A multi-sensor integration and data acquisition system, in [3], 274-279.

1125. O. D. Faugeras and E. Pauchon, Measuring the shape of 3-D objects, in [3], 2-7.

1126. A. F. Reeves and B. S. Wittner, Shape analysis of three dimensional objects using the method of moments, in [3], 20-26.

1127. M. J. Magee and J. K. Aggarwal, Intensity guided range sensing recognition of three-dimensional objects, in [3], 550-552.

1129. R. P. Fisher, Using surfaces and object models to recognize partially obscured objects, in [18], 989-995.

1130. O. D. Faugeras and M. Hebert, A 3-D recognition and positioning algorithm using geometrical matching between primitive surfaces, in [18], 996-1002.


1132. R. C. Bolles, P. Horaud, and M. J. Hannah, 3DPO: A three-dimensional part orientation system, in [18], 1116-1120.


APPENDIX B: 1982

A. General References

A.1. Meetings


2. Workshop on Pattern Analysis in the Marine Environment (Diamondhead, MS, March 23-24, 1982).

3. NASA Workshop on Image Analysis (College Station, TX, April 28-30, 1982).


5. Workshop on Multiresolution Image Processing and Analysis (Leesburg, VA, July 19-21, 1982).


16. ECAI-82 (European Conference on Artificial Intelligence, Orsay, France, July 8-10, 1982).

17. NATO Advanced Study Institute on Pictorial Data Analysis (Bonas, Gers, France, August 1-12, 1982).


20. Second International Conference on Image Analysis and Processing (Selva di Fasano, Italy, November 15-18, 1982).


A.2. Paper Collections, Journals


A.3. Textbooks, Surveys


33. M. Brady, Computational approaches to image understanding, CS 14, 1982, 3-71.

34. M. Brady, Computer vision, AI 19, 1982, 7-16.

35. M. Brady, Artificial Intelligence approaches to image understanding in [12], 205-264.

36. L. E. Druffel, Summary of the DARPA image understanding research program, in [12], 265-281.

37. A. Rosenfeld, Image analysis: Progress, problems and prospects, in [19], 7-15.

38. L. Mérő and T. Vamos, Medium level vision, in [23], 93-122.

39. L. Uhr, Computer perception and scene analysis, in [26], 1-16.


A.4. Graphics


D. Hardware and Software


D.1. Systems


D.2. Algorithms, etc.

326. K. Preston, Jr., Cellular logic algorithms for graylevel image processing, in [261], 135-147.

327. C. Guerra, Reflections on local computations, in [261], 221-229.

D.3. Software, etc.


372. A. J. Hanson and M. A. Fischler, The DARPA/DMA Image Understanding Testbed, in [9], 342-351.

374. R. R. Kohler and A. R. Hanson, The VISIONS image operating system, in [19], 71-74.


D.4. Databases

394. A. Frank, MAPQUERY: Database query language for retrieval of geometric data and their graphical representation, in [43], 199-207.

E. Pattern Recognition

E.1. General References


| 428. | M. Pavel, The impact of categorical and shape theoretical formalism upon pattern recognition, in [19], 638-640. |

**E.3. Industrial Automation**

507. Conference on Applied Machine Vision (Cleveland, OH, April 7-8, 1982).


528. M. J. Chen and D. L. Milgram, A development system for machine vision, in [4], 512-517.

542. P. Rummel and W. Beutel, A model based image analysis system for workpiece recognition, in [19], 1014-1017.

**E.4. Medicine**

567. E. Granum, Application of statistical and syntactical methods of analysis and classification to chromosome data, in [12], 373-398.

**E.5. Remote Sensing, Reconnaissance**


603. A. Gorin, Aspect-based aircraft classification from dynamic imagery, in [4], 141-143.

614. R. J. Godden, J. A. Fullwood, H. M. Green, and D. R. Corrall, A knowledge-based technique for finding roads, in [19], 1189.
E.6. Miscellaneous


624. I. Suzuki and T. Kaminuma, MOSA: A system for molecular shape analysis, in [19], 1208.

F. Features, Matching, Motion

F.1. Features

660. L. Kitcheu and A. Rosenfeld, Gray-level corner detection, PRL 1, 1982, 93-102.

666. J. O. Fang and T. S. Huang, A corner finding algorithm for image analysis and registration, in [6], 46-49.


675. S. Inokuchi, T. Nita, F. Matsuda, and Y. Sakurai, A three dimensional edge-region operator for range pictures, in [19], 918-920.

678. V. Lattuati and D. Lemoine, Closed contour extraction application to meteorological pictures, PR 15, 1982, 145-152.


F.2. Matching


701. H. S. Baird and K. Steiglitz, A linear programming approach to noisy template matching, in [4], 50-57.

702. N. C. Mohanty, Image enhancement and recognition of moving ships in cluttered background, in [41], 135-140.

704. P. E. Anuta and F. Davallou, Resolution matching for registration of dissimilar images, in [4], 327-332.


712. R. Bajcsy and C. Broit, Matching of deformed images, in [19], 351-353.


734. A. Sanfeliu and K. S. Fu, A distance measure between attributed relational graphs for pattern recognition, in [19], 162-168.

737. L. G. Shapiro, Organization of relational models, in [19], 360-365.

G. Segmentation, Scene Analysis

G.1. Segmentation

794. R. Y. Wong and K. Hayrapetian, Image processing with intensity and range data, in [4], 518-520.


800. T. H. Hong and M. Shneier, Extracting compact objects using linked pyramids, in [9], 58-71.


G.2. 3D from 3D


841. H. C. Lee and K. S. Fu, A computer vision system for generating object description, in [4], 466-472.

842. J. C. Boquet and S. Tichkiewitch, An "expert system" for reconstruction of mechanical object from projections, in [4], 491-496.


846. A. P. Pentland, Local computation of shape, in [6], 22-25.

850. H. C. Lee and K. S. Fu, 3D shape from contour and selective confirmation, in [7], 162-170.


858. W. E. Hillis, A high-resolution imaging touch sensor, IJRR 1(2), 1982, 33-44.


G.3. Model Matching: "Relaxation"


866. B. Bhanu, Surface representation and shape matching of 3D objects, in [4], 349-359.

867. P. G. Mulgaonkar, L. G. Shapiro, and R. M. Haralick, Recognizing three-dimensional objects from single-perspective views using geometric and relational reasoning, in [4], 479-484.

871. B. Bhanu and O. D. Faugeras, Shape matching of 2D objects using a hierarchical stochastic labeling technique, in [4], 688-690.


873. K. E. Price, Symbolic matching of images and scene models, in [7], 105-112; longer version in [9], 299-308.


878. E. Mühlenfeld, Pattern recognition by a hypothesis-guided analysis of a contour graph structure, in [19], 357-359.

880. T. J. Fang, Z. H. Huang, L. N. Kanal, B. Lambird, D. Lavine, G. Stockman, and F. L. Xiong, Three dimensional object recognition using a transformation clustering technique, in [19], 678-681.

881. B. Bhanu, Shape matching of two-dimensional occluded objects, in [19], 742-744.

G.4. Scene Analysis


901. L. P. Wesley and A. R. Hanson, The use of an evidential-based model for representing knowledge and reasoning about images in the VISIONS system, in [7], 14-25.


907. S. I. Shaheen and M. D. Levine, Some experiments with the interpretation strategy of a modular computer vision system, in [11], 87-100.


909. M. Nadler, Hybrid pattern recognition: A synthesis of the numerical and qualitative approaches, in [12], 177-187.

910. W. Kestner, Segmentation and abstract interpretation in an image understanding system, in [19], 1011-1013.

911. M. G. Thomas and R. C. Gonzalez, Database representations in hierarchical scene analysis, in [23], 57-91.


913. M. Nagao, Control strategies in pattern analysis, in [19], 996-1006.

H. Shape and Pattern

H.1. Topology, Distance, Skeletons


955. G. Garibotto and R. Tosini, Description and classification of 3D objects, in [19], 333-835.

957. C. Arceili and G. Sanniti di Baja, Shape splitting using maximal neighborhoods, in [19], 1106-1108.

H.2. Layout, Packing, etc.


991. G. T. Toussaint, Computational geometric problems in pattern recognition, in [12], 73-91.
H.3. Convexity, Straightness, etc.


1012. C. Guerra and G. G. Pieroni, A graph-theoretic method for decomposing two-dimensional polygonal shapes into meaningful parts, T-PAMI 4, 1982, 405-408.


H.4. 2D Shape


1039. J. D. Boissonat, Stable matching between a hand structure and an object silhouette, T-PAMI 4, 1982, 603-612.


1042. R. Chellappa and R. Bagdazian, Optimal Fourier coding of image boundaries, in [4], 172-175.

1045. T. C. Henderson and E. Triendl, Storing feature descriptions as 2D trees, in [4], 555-556.

1048. H. Mori, Picture interpretation language for silhouette, in [19], 19-22.

1049. G. Hartmann, Recognition of continuous line structures by a hierarchical system, in [19], 195-200.

1051. G. W. Zack, Finding local boundary characteristics by wave extraction, in [19], 458-460.

1053. T. Kasvand and N. Otsu, Regularization of piece-wise linear digitized plane curves for shape analysis and smooth reconstruction, in [19], 468-471.


H.5. 3D Shape


1060. R. Bajcsy, Three-dimensional object representation, in [12], 283-295.


1066. J. W. Boyse and J. E. Gilchrist, GMSolid: Interactive modeling for design and analysis of solids, in [1061], 27-40.

1067. R. Hillyard, The Build group of solid modelers, in [1061], 43-52.

1068. C. M. Brown, PADL-2: A technical summary, in [1061], 69-84.

1069. W. Myers, An industrial perspective on solid modeling, in [1061], 86-97.


1080. S. N. Srihari, Hierarchical data structures and progressive refinement of 3D images, in [4], 485-490.

1082. O. D. Faugeras, M. Hebert, P. Mussi, and J. D. Boissonnat, Polyhedral approximation of 3-D objects without holes, in [4], 593-598.


1084. S. Ganapathy and T. G. Dennehy, A new general triangulation method for planar contours, in [43], 69-75.

1085. P. M. Hanrahan, Creating volume models from edge-vertex graphs, in [43], 77-84.

1086. W. E. Carlson, An algorithm and data structure for 3-D object synthesis using surface path intersections, in [43], 255-263.
1088. C. Lin and M. J. Perry, Shape description using surface triangulation, in [7], 38-43.

1090. H. Enomoto, N. Yonezaki, and Y. Watanabe, Application of structure lines to surface construction and 3-dimensional analysis, in [14], 106-137.

1091. C. Dane and R. Bajcsy, An object-centered three-dimensional model builder, in [19], 348-350.

1092. J. D. Boissonat, Representation of objects by triangulating points in 3-D space, in [19], 830-832.

I. Texture

I.2. Analysis, Recognition


J. Formal Models

J.1. Syntactic Pattern Recognition


1142. Q. Y. Shi and K. S. Fu, Efficient error-correcting parsing for (attributed and stochastic) tree grammars, IS 26, 1982, 159-188.

1147. H. Bunke, Attributed programmed graph grammars and their application to schematic diagram interpretation, T-PAMI 4, 1982, 574-582.

1148. K. S. Fu, Recent progress in syntactic pattern recognition, in [23], 1-31.

1149. K. S. Fu, Attributed grammars for pattern recognition-A general (syntactic-semantic) approach, in [4], 18-27.


1153. T. C. Henderson and L. S. Davis, Hierarchical models and analysis of shape, in [11], 197-204.


1155. M. G. Thomason, Syntactic methods in pattern recognition, in [12], 119-137.

1156. K. S. Fu, Hybrid approaches to pattern recognition, in [12], 139-155.

1157. K. S. Fu, A general (syntactic-semantic) approach to picture analysis, in [14], 56-74.


1159. R. E. Blake, An approach to multi-sensor syntactic pattern recognition using affix grammars, in [19], 175-177.

1160. Q. Y. Shi and K. S. Fu, Parsing and translation of (attributed) expansive graph languages for scene analysis, in [19], 684-687.
APPENDIX C: 1981

A. General References

A.1. Meetings

1. Image Analysis Techniques and Applications (Society of Photographic Scientists and Engineers: Tucson, AZ, January 8-9, 1981).


A.2. Paper Collections, Journal Issues


A.3. Textbooks, Surveys


28. A. Rosenfeld, Image pattern recognition, in [20], 596-605.

29. J. M. Brady, Preface—the changing shape of computer vision, in [22], 1-15.


D. Hardware, Software

D.1. General References


D.3. Hardware


D.4. Software, Algorithms

366. G. Nagy, What is a "good" data structure for 2-D points, in [11], 119-135.


374. R. M. Haralick, Some neighborhood operators, in [257], 11-35.

375. B. Zavidovique and G. Stamon, "Bilevel" processing of "multilevel" pictures, in [5], 310-313.


D.5. Databases


391. L. G. Shapiro, Design of a spatial information system, in [11], 101-117.
E. Pattern Recognition

E.1. General References


E.3. Industrial Automation, Robotics


442. H. P. Moravec, Rover visual obstacle avoidance, in [6], 785-790.


E.4. Medicine


E.5. Remote Sensing, Reconnaissance


494. D. L. Milgram and A. Rosenfeld, Object detection in infrared images, in [17], 228-353.

496. B. J. Schachter and G. E. Tisdale, Evaluation and real-time implementation of image understanding algorithms, in [3], 178-183.


E.6. Miscellaneous


F. Features, Matching, Motion

F.1. Features


556. D. H. Ballard, Generalizing the Hough transform to detect arbitrary shapes, in [23], 111-122.

559. J. D. Dessimoz, Specialized edge-trackers for contour extraction and line thinning, SP 2, 1980, 71-73.


F.2. Matching


593. S. Sakane, An algorithm for scale invariant segment matching, in [5], 565-571.

594. B. V. Funt, Multi-processor rotation and comparison of objects, in [6], 218-220.
596. R. C. Bolles and M. A. Fischler, A RANSAC-based approach to model fitting and its application to finding cylinders in range data, in [6], 637-643.

597. H. H. Nagel and B. Neumann, On 3D reconstruction from two perspective views, in [6], 661-663.

598. D. B. Gennery, A feature-based scene matcher, in [6], 667-673.


F.3. Motion


G. Segmentation, Scene Analysis

G.1. Segmentation


664. C. H. Chen, On the statistical image segmentation techniques, in [5], 262-266.


674. K. S. Fu and J. K. Mui, A survey on image segmentation, in [457a], 3-16.

675. M. P. C. McQueen, A generalization of template matching for recognition of real objects, in [23], 139-145.

G.2. Relaxation

G.3. Multiresolution Representations


G.4. 3D from 2D

729. S. Liebes, Jr., Geometric constraints for interpreting images, or common structural elements: orthogonal trihedral vertices, in [3], 168-174.

730. D. G. Lowe and T. O. Binford, The interpretation of three-dimensional structure from image curves, in [6], 613-618.


737. K. Ikeuchi and B. K. P. Horn, Numerical shape from shading and occluding boundaries, in [22], 141-184.

738. T. O. Binford, Inferring surfaces from images, in [22], 205-244.

739. T. Kanade, Recovery of the three-dimensional shape of an object from a single view, in [22], 409-460.


745. V. Marik, Algorithms of the complex tactile information processing, in [6], 773-774.

G.5. Scene Analysis

749. R. A. Brooks, Model-based three dimensional interpretations of two dimensional images, in [3], 136-143; also in [6], 619-624.

750. D. L. Waltz, Toward a detailed model of processing for language describing the physical world, in [6], 1-6.

752. M. Oshima and Y. Shirai, Object recognition using three-dimensional information, in [6], 601-606.
753. A. K. Mackworth, Structuring domain knowledge for visual perception, in [6], 625-627.

754. T. E. Weymouth, Experiments in knowledge-driven interpretation of natural scenes, in [6], 628-630.

755. Z. Zdrahal, A structural method of scene analysis, in [6], 680-682.


760. R. A. Brooks, Symbolic reasoning among 3-D models and 2-D images, in [22], 285-348.

762. G. Y. Tang and T. S. Huang, Using the creation machine to locate airplanes on aerial photos, PR 12, 1980, 431-441.


H. Shape and Pattern

H.1. Connectedness, Distance, Borders, Skeletons


H.2. Packing, Layout, etc.


H.3. Location, Intersection, Covers, Convexity, etc.

825. A. Klinger, Searching images for structure, in [16], 151-167.

H.4. 2D Shape

845. G. Y. Tang, A discrete version of Green's theorem, in [5], 144-149.


848. L. Van Eyck, P. Waubacq, J. De Roo, A. Oosterlinck, and H. Van den Berghe, Two fast, orientation determining algorithms, well suited for hardware implementation, in [5], 297-299.

852. T. Pavlidis, Shape description, in [12], 289-310.

853. T. C. Henderson, Shape grammar compilers, in [12], 327-336.


864. E. Bribiesca, Arithmetic operations among shapes using shape numbers, in [22], 123-137.


H.5. 3D Shape


876. C. Dane and R. Bajcsy, Three-dimensional segmentation using the Gaussian image and spatial information, in [5], 54-56.

878. L. G. Shapiro, J. D. Moriarty, R. M. Haralick, and P. G. Mulgaonkar, Matching three-dimensional models, in [5], 534-541.

879. K. Ikeuchi, Recognition of 3-D objects using the extended Gaussian image, in [6], 595-600.


881. B. W. York, A. R. Hanson, and E. M. Riseman, 3D object representation and matching with B-splines and surface patches, in [6], 648-651.

882. J. D. Boissonnat and O. D. Faugeras, Triangulation of 3-D objects, in [6], 658-660.

883. J. O'Rourke, Polyhedra of minimal areas as 3D object models, in [6], 664-666.

885. G. E. Hinton, Shape representation in parallel systems, in [6], 1088-1096.

886. L. G. Shapiro, Structural shape description for two-dimensional and three-dimensional shapes, in [12], 311-326.


J. Formal Models

J.1. Grammars


946. N. S. Chang and K. S. Fu, A study on parallel parsing of tree languages and its application to syntactic pattern recognition, in [257], 107-129.


J.2. Automata

APPENDIX D: 1980

A. General References

A.1. Meetings and Collections


5. Proceedings, 5th International Conference on Pattern Recognition (Miami Beach, FL, December 1-4, 1980; IEEE Publ. 80CH1499-3).


A.2. Surveys

16. A. Rosenfeld, Recent developments in image and scene analysis, in [7], 42-49.


18. H. Niemann, Digital image analysis, in [8], 77-122.


D. Hardware and Software

D.1. Hardware, Systems


D.2. Software, Data Structures


284. D. A. Bourne, On automatically generating programs for real time computer vision, in [5], 759-764.

302. G. M. Chaikin and C. F. R. Weiman, Conformal computational geometry for machine vision, in [5], 1106-1110.

D.3. Data Management


E. Pictorial Pattern Recognition

E.1. General References


E.3. Industrial Automation

399. H. Tropf, Analysis-by-synthesis search for semantic segmentation applied to workpiece recognition, in [5], 241-244.


E.5. Remoting Sensing, Reconnaissance, Navigation, Cartography


E.6. Miscellaneous Applications


482. M. Herman, Computer interpretation of human stick figures, in [2], 174-177.


F. Feature Detection, Matching, Time-Varying Imagery

F.1. Feature Detection

492. M. James, Feature detection using the general linear model, PR 11, 1979, 137-140.

509. S. Inokuchi and R. Nevatia, Boundary detection in range pictures, in [5], 1301-1303.

F.2. Image Matching

512. R. M. Haralick, Scene matching methods, in [6], 221-243.


514. B. K. P. Horn and B. L. Bachman, Registering real images using synthetic images, in [640], 129-159.
517. D. G. Lowe, Solving for the parameters of object models from image descriptions, in [1], 121-127.


531. S. Ranade and A. Rosenfeld, Point pattern matching by relaxation, PR 12, 1980, 268-275.

532. R. C. Bolles, Locating partially visible objects: the local feature focus method, in [2], 41-43.

535. D. C. Suraqui, Study of a model for description classification and identification of bidimensional contour edges, in [5], 41-44.

G. Segmentation and Scene Analysis

G.1. Segmentation


G.3. Scene Analysis


642. R. A. Brooks and T. O. Binford, Representing and reasoning about partially specified scenes, in [1], 95-103.

646. C. C. Parma, A. R. Hanson, and E. M. Riseman, Experiments in schema-driven interpretation of a natural scene, in [3], 237-245.
W. Kestner, Considerations about knowledge-based image interpretation, in [5], 330-332.


T. A. Binford, R. A. Brooks, and D. G. Lowe, Image understanding via geometric models, in [5], 364-369.


G.4. Three-Dimensional Analysis


K. A. Stevens, Representing and analyzing surface orientation, in [640], 101-125.

B. K. P. Horn, Derivation of invariant scene characteristics from images, P-NCC, 371-376.


E. C. Freuder, Information needed to label a scene, in [2], 18-20.

T. Kanade and J. R. Kender, Mapping image properties into shape constraints: skewed symmetry and affine-transformable patterns, in [3], 130-135.

D. L. Milgram and C. M. Bjorklund, Range image processing: planar surface extraction, in [5], 912-919.

K. Ikeuchi, Shape from regular patterns (an example of constraint propagation in vision), in [5], 1032-1039.

S. Ishikawa, Guessing shape of a polyhedron from an imperfect line drawing, in [5], 1044-1048.
671. R. Bajcsy, Three-dimensional scene analysis, in [5], 1064-1074.

672. M. Idesawa and T. Yatagai, 3-D shape input and processing by Moiré technique, in [5], 1085-1090.

H. Pattern and Shape

H.1. Texture: Models, Synthesis


H.2. Texture: Analysis Perception


H.3. Representation


740. S. L. Tanimoto and C. L. Jackins, Geometric modelling with oct-trees, in [3], 117-123.

741. B. W. York, A. R. Hanson, and E. M. Riseman, A surface representation for computer vision, in [3], 124-129.
H.4. Distance, etc.


767. J. Serra, Principles, criteria and algorithms in mathematical morphology, in [6], 73-135.

768. C. Lantuejoul, Skeletonization in quantitative metallography, in [6], 107-135.

H.5. Layout, Packing, Intersection

783. K. Weiler, Polygon comparison using a graph representation, in [23], 10-18.

H.6. Shape: Parts, Convexity


H.7. Shape: Properties


828. E. Bribiesca and A. Guzman, How to describe pure form and how to measure differences in shapes using shape numbers, PR 12, 1980, 101-112.


838. M. Leroi and M. Bourton, Structural encoding of linear outline in scene analysis, in [5], 358-360.

839. R. Lopez de Mantaras and J. Aguilar Martin, Learning, assisted learning, and self-learning procedures in shape classification, in [5], 455-458.


842. G. Radack and N. Badler, A new boundary encoding with applications to jigsaw puzzles, in [5], 1029-1031.

843. I. Dinstein and T. Silberberg, Shape discrimination with Walsh descriptors, in [5], 1055-1061.

844. S. V. Fogel and R. J. P. de Figuereido, A method for construction of complete invariant systems of features for scene analysis, in [5], 1223-1227.


848. G. T. Toussaint, Pattern recognition and geometrical complexity, in [5], 1324-1347.

I. Formal Models

I.1. Grammars

849. K. S. Fu, Syntactic image modeling using stochastic tree grammars, CGIP 12, 1980, 136-152.


861. W. H. Tsai and K. S. Fu, Error-correcting isomorphisms of attributed relational graphs for pattern analysis, T-SMC 9, 1979, 757-768.

862. T. Pavlidis, Structural descriptions and graph grammars, in [303], 86-103.

863. K. S. Fu, Picture syntax, in [303], 104-127.

864. K. S. Fu, Syntactic models in pattern recognition and applications, in [6], 303-314.

866. A. C. Sanderson and J. Segen, A pattern-directed approach to signal analysis, in [5], 613-617.


APPENDIX E: 1979

A. General References

A.1. Meetings and Collections


6. IJCAI-79 (Proceedings of the Sixth International Joint Conference on Artificial Intelligence, Tokyo, Japan, August 20-23, 1979).


A.2. Texts and Surveys


D. Hardware and Software

D.2. Software, Data Structures


E. Pictorial Pattern Recognition

E.1. General References


E.3. Industrial Automation

272. Y. Nakagawa and A. Rosenfeld, A note on polygonal and elliptical approximation of mechanical parts, PR 11, 1979, 133-142.

E.4. Medicine


316. O. Firschein, D. Gennery, D. Milgram, and J. J. Pearson, Progress in navigation using passively sensed images, in [4], 139-144.


322. M. Nagao, T. Matsuyama, and H. Mori, Structural analysis of complex aerial photographs, in [6], 610-616.


337. Workshop on Imaging Trackers and Autonomous Acquisition Applications for Missile Guidance (Huntsville, AL, November 19-20, 1979).

E.6. Miscellaneous


344. Fifth International Congress for Stereology (Salzburg, Austria, September 3-8, 1979).

F. Local Feature Detection, Matching, Time-Varying Imagery

F.1. Edge Detection, Peaks

358. P. V. Sankar and A. Rosenfeld, Hierarchical representation of waveforms, T-PAMI 1, 1979, 73-80.
F.2. Linear Features, Contours

361. B. Neumann, Best-first interpretation of imperfect object contours, in [3], 222-228.

362. R. A. Brooks, Goal-directed edge linking and ribbon finding, in [4], 72-78.


F.3. Matching, Stereo


395. R. M. Haralick, Scene analysis, arrangements, and homomorphisms, in [1], 199-212.

G. Segmentation and Scene Analysis

G.1. Segmentation

422. S. Hsu and J. L. Mundy, Regionalization of image data using surface approximation, in [5], 314-317.


428. M. Shneier, Using pyramids to define local thresholds for blob detection, in [10], 31-35.


431. Y. Nakagawa and A. Rosenfeld, Some experiments in variable thresholding, PR 11, 1979, 191-204.


441. P. Lemkin, The boundary trace transform: An edge and region enhancement transform, CGIP 9, 1979, 150-165.

G.2. Three-Dimensional Analysis


448. D. A. Huffman, Surface curvature and applications of the dual representation, in [1], 213-222.

453. H. Freeman and M. Potmesil, Curved surface representation utilizing data extracted from multiple photographic images, in [503], Section H.


462. K. Sugihara, Automatic construction of junction dictionaries and their exploitation for the analysis of range data, in [6], 859-864.

463. R. J. Woodham, Relating properties of surface curvature to image intensity, in [6], 971-977.


467. I. Chakravarty, A generalized line and junction labeling scheme with applications to scene analysis, T-PAMI 1, 1979, 202-205.


471. R. Shapira and H. Freeman, The cyclic order property of vertices as an aid in scene analysis, CACM 22, 1979, 368-375.
G.3. **Relaxation Processes**

475. A. Rosenfeld, A. Danker, and C. R. Dyer, Blob extraction by relaxation, in [4], 61-65.

482. D. R. Smith, Search strategies for the ARGOS image understanding system in [10], 42-46.


484. F. R. D. Velasco and A. Rosenfeld, The application of relaxation to waveforms with ambiguous segmentation, T-SMC 9, 1979, 420-428.

G.4. **Scene Analysis: Issues**


491. B. L. Bullock, The necessity for a theory of specialized vision, in [1], 27-35.

494. R. Nevatia, Characterization and requirements of computer vision systems, in [1], 81-87.

495. R. Reddy, Pragmatic aspects of machine vision, in [1], 89-98.

496. S. L. Tanimoto, Regular hierarchical image and processing structures in machine vision, in [1], 165-174.


500. B. K. P. Horn, Vision, in [3], 147-163.


G.5. **Scene Analysis: Representation**


505. D. Marr, Representing visual information--A computational approach, in [1], 61-80.

506. G. J. Agin, Hierarchical representation of three-dimensional objects using semantic models, in [503], Section A.
508. J. F. Blinn, Geometric representations in computer graphics Part I, in [503], Section D.

509. J. W. Boyse, Data structure for a solid modeller, in [503], Section E.

510. C. M. Brown, Some issues and answers in geometric modelling, in [503], Section F.

511. G. T. Herman, Representation of 3-D surfaces by a large number of simple surface elements, in [503], Section I.


513. M. E. Newell, Geometric representations in computer graphics Part II, in [503], Section K.

514. H. K. Nishihara, Intensity, visible surface, and volumetric representations, in [503], Section L.

515. R. N. Shepard, Connections between the representations of shapes and of their spatial transformations, in [503], Section N.

520. P. H. Winston et al., MIT's representation techniques, in [10], 128-135.

521. T. O. Binford, Spatial representation, in [10], 140-144.


G.6. Scene Analysis: Systems

524. R. Bajcsy and A. K. Joshi, A partially ordered world model and natural outdoor scenes, in [1], 263-270.

525. A. R. Hanson and E. M. Riseman, VISIONS: a computer system for interpreting scenes, in [1], 303-333.

526. M. D. Levine, A knowledge-based computer vision system, in [1], 335-352.

528. F. Birch et al., A (self-adapting) network for recognition of visual structures, in [3], 28-32.

529. T. O. Binford and R. A. Brooks, Geometric reasoning in ACRONYM, in [4], 48-54.

530. R. A. Brooks, R. Greiner, and T. O. Binford, Progress report on a model-based vision system, in [503], Section C.

531. R. T. Chien and J. N. Selander, On the use of graph models for representation and object recognition, in [503], Section G.

532. M. D. Levine and S. I. Shaheen, A modular computer vision system for picture segmentation and interpretation, in [5], 523-539.

533. R. A. Brooks, R. Greiner, and T. O. Binford, The ACRONYM model-based vision system, in [6], 105-113.

534. G. Giralt, R. Sobek, and R. Chatila, A multi-level planning and navigation system for a mobile robot; a first approach to HILARE, in [6], 335-337.


H. Pattern and Shape

H.1. Texture Analysis


H.2. Image Modelling and Texture Synthesis

569. W. Dungan, Jr., A terrain and cloud computer image generation model, in [19], 143-150.
570. C. I. Yessios, Computer drafting of stones, wood, plant, and ground materials, in [19], 190-198.

572. Workshop on Image Modelling (Chicago, IL, August 6-7, 1979).

H.3. Topology and Spatial Pattern

573. F. Veillon, One pass computation of morphological and geometrical properties of objects in digital pictures, SP 1, 1979, 175-189.


578. S. Kawai, A boundary curve criterion, CGIP 11, 1979, 281-289.


H.4. Shape: Segmentation, Description, Matching


597. I. Rock, Form and orientation, in [503], Section M.


599. L. G. Shapiro and R. M. Haralick, Decomposition of two-dimensional shapes by graph-theoretic clustering, T-PAMI 1, 1979, 10-20.

600. L. S. Davis, Shape matching using relaxation techniques, T-PAMI 1, 1979, 60-72.


606. F. A. Sadjadi and E. L. Hall, Object recognition by three dimensional moment invariants, in [5], 327-336.

607. L. G. Shapiro, Structural shape description and matching, in [5], 413-420.

608. E. Bribiesca and A. Guzman, How to describe pure form and how to measure differences in shapes using shape numbers, in [5], 427-436.

609. H. Freeman, Use of incremental curvature for describing and analyzing two-dimensional shape, in [5], 437-444.

610. C. M. Bjorklund and T. Pavlidis, Global shape decomposition using the k-syntactic similarity approach, in [5], 445-452.

611. T. Pavlidis and D. J. Sakrison, Applications of a simple statistical model for curves, in [5], 599-603.

H.5. Shape: Convexity, Intersections


616. P. J. Green, Constructing the convex hull of a set points in the plane, Computer J. 22, 1979, 262-266.


H.6. Shape: Skeletons, Symmetry, etc.


633. H. Wechsler, A structural approach to shape analysis using mirroring axes, CGIP 9, 1979, 246-266.

638. J. O'Rourke and N. Badler, Decomposition of three-dimensional objects into spheres, T-FAMI 1, 1979, 295-305.

644. B. Shapiro, J. Pisa, and J. Sklansky, Skeletons from sequential boundary data, in [5], 265-270.

646. B. I. Soroka, Generalized cylinders from parallel slices, in [5], 421-426.

I. Formal Models

I.1. Syntactic Pattern Recognition

650. K. S. Fu, Syntactic pattern recognition and its applications to signal processing, in [2], 1-21.


653. N. S. Chang and K. S. Fu, Parallel parsing of tree languages for syntactic pattern recognition, PR 11, 1979, 213-222.


657. G. Y. Tang and T. S. Huang, A syntactic-semantic approach to image understanding and creation, T-PAMI 1, 1979, 135-144.


I.2. Multidimensional Grammars and Automata


661. M. Yannakakis and T. Pavlidis, Topological characterization of families of graphs generated by certain types of graph grammars, I&C 42, 1979, 72-86.

646. B. I. Suroka, Generalized cylinders from parallel slices, in [5], 421-426.

I. Formal Models

I.1. Syntactic Pattern Recognition

650. K. S. Fu, Syntactic pattern recognition and its applications to signal processing, in [2], 1-21.


653. N. S. Chang and K. S. Fu, Parallel parsing of tree languages for syntactic pattern recognition, PR 11, 1979, 213-222.


659. G. Y. Tang and T. S. Huang, A syntactic-semantic approach to image understanding and creation, T-PAMI 1, 1979, 135-144.

661. S. Peleg, Maximal derivations for probabilistic strings in stochastic languages, I&C 42, 1979, 290-304.


I.2. Multidimensional Grammars and Automata


668. M. Yannakakis and T. Pavlidis, Topological characterization of families of graphs generated by certain types of graph grammars, I&C 42, 1979, 72-86.


APPENDIX F: 1978

A. General References

A.1. Meetings


A.2. Texts, Collections, Surveys


A.3. Graphics


D. Hardware and Software

D.1. Input, Storage, Nondigital Processing


244. S. Levialdi, M. Duff, K. Preston, Jr., P. Norgren, and J. I. Yoriwaki, Theoretical and practical considerations in the application of neighborhood logic to image processing, in [11], 139-145.


D.3. Software, Data Structures

267. J. A. Feldman, Systems support for advanced image understanding, in [7], 31-35.

E. Pictorial Pattern Recognition


E.2. Automation, Assembly, Inspection, etc.


F-3


E.3. Medicine


356. K. Preston, Jr., Applications of the Golay transform to image analysis in cytology and cytophenetics, in [2], 401-412.


E.4. Remote Sensing, Cartography, etc.


398. L. F. Pau, Infrared source classification system, in [2], 343-345.


405. O. R. Mitchell, Target/background segmentation and classification in FLIR imagery, in [7], 115-117.

406. D. L. Milgram, Results in FLIR target detection and classification, in [7], 118-124.


F. Matching and Local Feature Detection

F.1. Matching Applications


468. K. Price, Symbolic matching with substantial changes in orientation, in [6], 19-21.


470. K. Price, Symbolic matching and analysis with substantial changes in orientation, in [7], 93-99.


F.3. Exact Matching

F.5. Curve Detection, Angle Detection

520. J. Camillerapp and J. Quinqueton, Lines extraction from radar images, in [2], 361-372.

522. A. Iannino and S. D. Shapiro, A survey of the Hough transform and its extension to curve detection, in [6], 32-38.


G. Segmentation and Scene Analysis

538. A. K. Mackworth, How to see a simple world: an exegesis of some computer programs of scene analysis, MI 8, 1977, 510-537.


543. Y. Shirai, Recent advanced in 3-D scene analysis, in [11], 86-94.


545. T. S. Huang, Image understanding systems, in [11], 1136.
G.1. Segmentation: Clustering, etc.


G.2. Segmentation: Partitioning, etc.

577. S. C. Wu, J. M. S. Prewitt, and J. Lehman, To extract a connected object of arbitrary shape from its background by decision tree method, in [8], 352-353.


582. S. Hsu, J. L. Mundy, and P. R. Beaudet, Web representation of image data, in [11], 675-680.


G.3. Scene Analysis: Approaches, etc.


587. B. L. Cohen, A powerful and efficient structural pattern recognition system, AI 9, 1977, 223-255.


G.4. Constraint Analysis, "Relaxation"


613. V. A. Kovalevsky, Recent advances in statistical pattern recognition, in [11], 2-12.
G.5. Scene Analysis: Examples


616. I. Chakravarty, A generalized line and junction labelling scheme with applications to scene analysis, in [6], 10-13.

617. R. A. Brooks, R. Greiner, and T. O. Binford, A model based vision system, in [7], 36-44.


626. R. A. Brooks, R. Greiner, and T. O. Binford, Progress report on a model-based vision system, in [12], 145-151.

627. S. M. Rubin, The ARGOS image understanding system, in [12], 159-162.

G.6. Scene Analysis: Time-Varying Scenes

636. B. Neumann, Interpretation of imperfect object contours for identification and tracking, in [11], 691-693.

H. Pattern and Shape

H.4. Pattern and Shape: General


H.5. Shape Properties and Descriptors


711. S. Grinaker, Recording binary pictures by their contour slope sequence, in [1], 273-287.

712. H. Freeman, Shape characterization by the method of roving line-segment scanning, in [6], 199.


714. A. V. Kulkarni, Sequential shape feature extraction from line drawings, in [8], 230-237.


717. E. Bribiesca and A. Guzman, Shape description and shape similarity measurement for two-dimensional regions, in [11], 608-612.

718. F. Veillon, One pass computation of morphological and geometrical properties of objects in digital pictures, in [11], 672-674.


722. H. Freeman, Shape description via the use of critical points, PR 10, 1978, 159-166.


H.6. Convexity, Decomposition, etc.

744. H. N. Christiansen and T. W. Sederberg, Conversion of complex contour line definitions into polygonal element mosaics, in [28], 187-192.


H.7. Three-Dimensional Objects


750. N. Badler and J. O'Rourke, Decomposition of three-dimensional objects into spheres, in [6], 157-159.


753. N. Badler and R. Bajcsy, Three-dimensional representations for computer graphics and computer vision, in [28], 153-160.


I. Formal Models

I.1. Syntactic Pattern Analysis


760. K. S. Fu, Syntactic methods in pattern recognition, in [1], 99-132.

761. K. S. Fu, Recent advances in syntactic pattern recognition, in [11], 13-18.


765. G. Y. Tang and T. S. Huang, A semantic-syntactic approach to image understanding, in [6], 160-172.

766. G. Y. Tang and T. S. Huang, A semantic-syntactic approach to image understanding and creation, in [7], 87-92.

767. K. C. You and K. S. Fu, A syntactic approach to shape recognition, in [7], 105-112.


773. W. H. Tsai and K. S. Fu, Syntactic error-correcting recognition of patterns and its applications to texture discrimination, in [12], 31-36.


I.2. (Sequential) Automata and Grammars


783. M. Yannakakis and T. Pavlidis, Topological characterization of families of graphs generated by certain types of graph grammars, in [8], 269-274.

APPENDIX G: 1977

Introduction


8. Workshop on Computer Vision Systems (June 1-3, 1977, Amherst, MA).


16. A. Rosenfeld, Digital image processing and recognition, in [3], i-11.


Pictorial Pattern Recognition


**Matching and Local Feature Detection**


385. C. S. Clark, Image encoding for scene registration through a vertex-based model, in [5], 165-168.

386. S. A. Dudani and A. L. Luk, Scene model for image based guidance systems, in [4], 230-234.


408. G. P. Ashkar and J. W. Modesto, The contour extraction problem with biomedical applications, in [1], 216-224.

424. G. Y. Gardner, J. Mendelsohn, and M. R. Wohlers, Extraction of an aircraft silhouette when the aircraft is moving across the background, in [4], 329-342.

**Segmentation and Scene Analysis**

434. J. Prager, P. Nagin, R. Kohler, A. Hanson, and E. Riseman, Segmentation processes in the VISIONS system, in [2], 642-643.

438. D. P. Panda, Segmentation of FLIR images by pixel classification, in [6], 55-70.
462. S. W. Zucker, Toward consistent descriptions in vision systems, in [2], 709.

471. E. C. Freuder, A computer system for visual recognition using active knowledge, in [2], 671-677.


474. T. Williams, J. Lowrance, A. Hanson, and E. Riseman, Model-building in the VISIONS system, in [2], 644-645.

478. W. A. Perkins, Model-based vision for scenes containing multiple parts, in [2], 678-684.

484. S. Tsuji, A. Motzono, and S. Kuroda, Understanding a simple cartoon film by a computer vision system, in [2], 609-610.


497. R. A. Lewis and A. R. Johnston, A scanning laser range finder for a robotic vehicle, in [2], 762-768.


500. C. Brown and K. Lantz, Representation and use of knowledge in a goal-directed vision system, in [6], 5-11.

503. B. K. P. Horn, Towards a science of image understanding, in [2], 648.

504. T. Kanade, Model representations and control structures in image understanding, in [2], 1074-1082.

505. T. Kasvand, Some observations on linguistics for scene analysis, in [10], 179-209.

Pattern and Shape


516. T. Wallace and P. A. Wintz, 3-dimensional aircraft recognition using Fourier descriptors, in [7], 55-63.


523. S. D. Shapiro and A. Iannino, Performance of transforms for curve detection, in [1], 378-386.

528. E. T. Lee, A shape-oriented image data base, in [11], 266-270.


532. W. Burton, Representation of many-sided polygons and polygonal lines for rapid processing, CACM 20, 1977, 166-171.

533. B. Shapiro and L. Lipkin, The circle transform, an articulable shape descriptor, in [4], 88-90.


536. M. J. Eccles, M. P. C. McQueen, and D. Rosen, Analysis of the digitized boundaries of planar objects, PR 9, 1977, 31-41.


540. H. Freeman, Shape description via the use of critical points, in [1], 168-174.

541. S. L. Horowitz, Peak recognition in waveforms, in [271], 31-49.

543. A. K. Agrawala and A. V. Kulkarni, A sequential approach to the extraction of shape features, CGIP 6, 1977, 538-557.

544. T. Pavlidis and H. Y. F. Feng, Shape discrimination, in [271], 125-145.

545. T. Pavlidis and F. Ali, Contour description by general syntactic techniques, in [5], 16-22.


553. B. Kuipers, Modelling spatial knowledge, in [2], 292-298.

554. R. K. Bajcsy and B. I. Soroka, Steps toward the representation of complex three-dimensional objects, in [2], 596.


557. T. C. Woo, Progress in shape modeling, in [301], 40-46.


559. R. E. Barnhill and R. F. Riesenfeld, Surface representation for computer aided design, in [10], 413-426.


561. R. Shapira and H. Freeman, Reconstruction of curved-surface bodies from a set of imperfect projections, in [2], 628-634.

562. K. Sugihara and Y. Shirai, Range data understanding guided by a junction dictionary, in [2], 706.

563. R. Shapira and H. Freeman, A cyclic-order property of bodies with three-face vertices, T-COMP 26, 1977, 1035-1039.

564. R. Nevatia and T. O. Binford, Description and recognition of curved objects, AI 8, 1977, 77-98.


569. T. Lozano-Perez, Parsing intensity profiles, CGIP 6, 1977, 43-60.

**Formal Models**

589. K. S. Fu, Introduction to syntactic pattern recognition, in [271], 1-30.

590. K. S. Fu, Syntactic methods and image processing, in [1], 19-20.


595. K. S. Fu, Error-correcting parsing for syntactic pattern recognition, in [10], 449-492.

596. S. Y. Lu and K. S. Fu, Error-correcting tree automata for syntactic pattern recognition, in [1], 121-128.

APPENDIX H: 1976

Introduction


3. A. Rosenfeld and J. S. Weszka, Picture recognition, in [163], 135-166.


5. K. S. Fu and A. Rosenfeld, Pattern recognition and image processing, T-COMP 25, 1976, 1336-1346.


7. Workshop on Standards for Image Pattern Recognition (Gaithersburg, MD, June 3-4, 1976).


11. NATO Advanced Study Institute on Digital Image Processing and Analysis (Bonas (Gers), France, June 14-25, 1976).


Hardware and Software

146. A. R. Hanson and E. M. Riseman, Design of VISIONS: segmentation and interpretation of images, in [158], 135-144.

152. A. Shliferstein and Y. T. Chien, Some properties of image processing operations on projection sets obtained from digital pictures, in [155], 822-828.
Pictorial Pattern Recognition


208. M. D. Levine and J. Leemet, Computer recognition of the human spinal outline using radiographic image processing, PR 7, 1975, 177-185.

221. H. B. Demuth, Feature extraction through least squares fit to a simple model, in [155], 37-41.


255. W. A. Perkins, Multilevel vision recognition system, in [155], 739-744.


Matching and Local Feature Detection


295. S. D. Shapiro, Aspects of transform method for curve detection, in [158], 90-97.

311. Y. Yakimovsky, Boundary and object detection in real world images, JACM 23, 1976, 599-618.


323. H. Wechsler, Interpretation of scenes consisting of planar geometrical shapes, in [155], 838-843.


331. B. L. Bullock, Finding structure in outdoor scenes, in [159], 61-85.

333. T. D. Garvey, An experiment with a system for locating objects in multisensory images, in [155], 567-575.

Pattern and Shape


362. T. Pavlidis, Syntactic feature extraction for shape recognition, in [155], 95-99.

363. T. Pavlidis, Syntactic pattern recognition on the basis of functional approximation, in [159], 389-398.


375. T. Ishiketa, Tree of eigenvalues of two-dimensional figures, in [155], 55-59.


388. B. G. Baumgart, A polyhedron representation for computer vision, P-NCC, 1975, 589-596.


399. R. O. Duda and D. Nitzan, Low-level processing of registered intensity and range data, in [155], 598-601.

401. M. Ishii and T. Nagata, Feature extraction of three-dimensional objects and visual processing in a hand-eye system using laser tracker, PR 8, 1976, 229-237.

Formal Models

420. K. S. Fu, Tree languages and syntactic pattern recognition, in [159], 257-291.

Appendix I: 1975

Introduction

8. Advance Papers of the Fourth International Joint Conference on Artificial Intelligence (Tbilisi, Georgia, USSR, Sept. 3-8, 1975), Artificial Intelligence Laboratory, MIT, Cambridge, MA, 1975.

Implementations


Pictorial Pattern Recognition

151. G. T. Toussaint, Subjective clustering and bibliography of books on pattern recognition, IS 8, 1975, 251-257.


173. S. Tsuji and A. Nakamura, Recognition of an object in a stack of industrial parts, in [8], 811-818.

174. M. Yachida and S. Tsuji, A machine vision for complex industrial parts with learning capability, in [8], 819-826.

**Segmentation**

245. Y. P. Chien, On the optimal extraction of boundary curves, in [7], 208-209.

**Shape and Texture**

252. S. L. Horowitz and T. Pavlidis, Picture processing by graph analysis, in [7], 125-129.


## Scene Analysis


292. F. Rocker and A. Kiessling, Methods for analyzing three dimensional scenes, in [8], 669-673.

297. D. Waltz, Understanding line drawings of scenes with shadows, in [291], 19-91.


299. N. Zavalishin, Identification of bodies in a contour image of a three-dimensional scene, in [8], 710-715.

300. D. A. Huffman, Curvature and creases: a primer on paper, in [7], 360-370.

301. S. A. Underwood and C. L. Coates, Jr., Visual learning from multiple views, T-COMP 24, 1975, 651-661.

302. J. Gips, A syntax-directed program that performs a three-dimensional perceptual task, PR 6, 1974, 189-199.


## Formal Models


333. S. M. Chou and K. S. Fu, Transition network grammars for syntactic pattern recognition, in [7], 139-146.


I-3
APPENDIX J: 1974

Introduction


Implementations


150. T. Ito, An algebraic theory of pattern manipulation, in [29], 81-85.

Picture Properties


256. E. Persoon and K. S. Fu, Shape discrimination using Fourier descriptors, in [29], 126-130.


263. E. T. Lee, The shape-oriented dissimilarity of polygons and its application to the classification of chromosome images, PR 6, 1974, 47-60.

Picture Parts and Picture Description


277. Y. Yakimovsky, On the recognition of complex structures: Computer software using artificial intelligence applied to pattern recognition, in [29], 345-353.


297. B. J. Kuipers, An hypothesis-driven recognition system for the blocks world, in [29], 169-173.


299. F. Rocker, Localization and classification of three dimensional objects, in [29], 527-528.

300. N. S. Ivancevic, Stereometric pattern recognition by artificial touch, PR 6, 1974, 77-83.


306. U. Montanari, Recent progress in picture processing and scene analysis, in [29], 513-516.

**Picture Automata and Grammars**


313. L. W. Füng and K. S. Fu, Stochastic syntactic classification of noisy patterns, in [29], 102-103.

314. M. G. Thomason and R. C. Gonzalez, Classification of imperfect syntactic pattern structures, in [29], 88-89.


324. A. K. Joshi, Remarks on some aspects of language structure and their relevance to pattern analysis, PR 5, 1973, 365-381.


This report contains a list of selected publications in image understanding and computer vision. The list was compiled as part of our work for the DARPA-sponsored Autonomous IR Sensor Technology program, and the choice of references was directly influenced by the needs of that program. Therefore, emphasis has been placed on theories, techniques, and systems for interpreting complex imagery; the more classical fields of image processing, e.g., filtering, enhancement, restoration, coding, and reconstruction, have not been included. The topics of edge detection and region segmentation as well as the well-known scene analysis problems of shape recognition from stereo, shading, texture, and motion have also been excluded.

The bibliography covers the last decade (1974-1983) and is based on the yearly surveys published by A. Rosenfeld in the Journal initially called "Computer Graphics and Image Processing (CGIP)" and now "Computer Vision, Graphics, and Image Processing (CVGIP)".