日米セミナー「画像解析および認識の実時間化・並列化」報告

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　標記のセミナーは昭和53年10月31日から11月4日にかけて、東京の国際文化会館で行われた．これは日米科学協力事業の一つとして行われているもので日本側は日本学術振興会が．米国側は National Science Foundation がそれぞれ実施機関となり．重要な科学上のトピックに対して両国から少数の研究者が集い．密度の高い討議を行うものである．いろいろなトピックについて年間20件位行われているが．画像処理関係ではこれまで次の2件が行われている．

(1)「図形および物体写真の解析」　1973年　　於京都
　　責任者　京都大学　長尾真，Maryland 大学　A. Rosenfeld

　　この論文は Rosenfeld が編集する雑誌 Computer Graphics and Image Processing　に逐次印刷された．

(2)「医用画像のデイジタル処理」　1975年　　於 Pasadena, Ca.
　　責任者　東京大学　尾上守夫，Carnegie-Mellon 大学　K. Preston, Jr.

　　この論文は Digital Processing of Biomedical Images　の単行本にまとめられて東大出版会および Planum Press から出版された．

　これらの時代から現在までの経過をみると．デイジタル画像処理の実用化のテンポの急速なのに驚かざるを得ない．技術的可能性を失たしている時期はすでに通りこして．いかに能率よく．経済的に画像処理を使いこなすかが当面の問題となってきたわけである．それとともに汎用計算機による処理の限界がはっきり感じられてきた．その処理速度．処理量の限界を打破するために広い意味での高速化が探求されている．本セミナーはそれに重点をおいて．実時間化．並列化のためのシステム構成．ハードウエア．ソフトウエアを体系的に検討することを目標にして開催された．日本側責任者は筆者．米国側は前回をそれぞれの任にあたられた Rosenfeld 教授と Preston 教授が共同でやられた．プログラムは表1に示す通りであった．オ3日午后は電総研と東大生研および富士通研究所の見学にあてられた．

　米国側参加者は表2に示す通りである．11月初旬に京都で行われたオ4回国際パターン認識会議に先行して行われたため英国，西独，カナダ，スエーデン，イタリーから8人のオ3国参加者があって、この分野の世界的展望が得られたのは幸であった．日本側参加者は地元の利もあって約60名の多数にのぼった．

　全体の印象としてはパイプラインによる高速化が日米ともに目だった．とくに"発生論理"による Stennberg の図形処理は面白かった．　CTなどに牽引されている医用，リモートセンニング，実時間化の要求のつよい産業用ロボットがこの分野の先端になることは予想通りであった．

　このセミナーに御助方．御協力下さって多くの方に感謝申上げる．

表 1

PROGRAM

1978 JAPAN - UNITED STATES SEMINAR ON RESEARCH TOWARDS

REAL TIME PARALLEL IMAGE ANALYSIS AND RECOGNITION

Morning Session
October 31, 1978

Opening of Seminar

M. Onoe (University of Tokyo, Japan)
- Introduction.

K. Preston (Carnegie - Mellon University, U.S.A.)
- Introduction.

A. Rosenfeld (University of Maryland, U.S.A.)
- Introduction.

E. Riseman (University of Massachusetts, U.S.A.)
- Image transformation in a hierarchical parallel
  array processor.

A. Tojo and S. Uchida
(Electrotechnical Laboratory, Japan)
- Image processing oriented multiprocessor system
  with a multipurpose video processor.

Afternoon Session
October 31, 1978

Software 1

A. Rosenfeld and C. Dyer
(University of Maryland, U.S.A.)
- Cellular Pyramids for image recognition.

S. Ito, Y. Takao and J. Iisaka
(IBM, Japan)
- A compound computer system for image data
  processing.

H. Enomoto, T. Katayama, Miyamura and N. Yonezaki
(Tokyo Institute of Technology, Japan)
- Image data modeling and language for parallel
  processing of structure lines.

P. Norgren (Perkin - Elemer Corporation. U.S.A.)
- Use of a structured programming language for
  an image measurement application.

S. Yokoi*, J. Toriwaki** and T. Fukumura**
(*:Mie University, **:Nagoya University, Japan)
- Theoretical consideration on distance transforma-
  tion family and their applications.

R. Kirsch (National Bureau of Standards, U.S.A.)
  Languages for manipulation of image data
  structures.

Y. Ohta, T. Kanade and T. Sakai
(Kyoto University, Japan)
- Color information for region segmentation.

E. Riseman (University of Massachusetts, U.S.A.)
- Boundary continuity - The Semantics of the
  parallel organization of local content.

T. Soma, T. Ida, N. Inada and M. Idesawa
(Institute of Physical and Chemical Research, Japan)
- Virtual plane concept in image processing.

Morning Session
November 1, 1978

Three – dimensional Images

K. Preston (Carnegie – Mellon University, U.S.A.)
- Display Methods in CT.

K. Tanaka and S. Tamura
(Osaka University, Japan)
- A parallel processing system specialized in three-
  dimensional display based on serial tomograms.

R. Sternberg
(Environmental Institute of Michigan, U.S.A.)
- Cytocomputer real-time pattern recognition.
(Parallel Algorithms for image processing).

H. Wani and H. Ishihara
(Shimazu Seisakusho Ltd., Japan)
- Real-time image processing in CT--convolver and
  back-projector --

Y. Tateno and Y. Umegaki
(National Institute of Radiological Sciences, Japan)
- Dynamic CT for heart.

M. Kuwahara, S.Eiho, H.Kitagawa & K.Minato
(Kyoto Universty, Japan)
- Computer analysis of ultrasonic echocardiography.

B. Gilbert (Mayo Foundation, U.S.A.)
- Data processing problems and solutions for a high
  axial and temporal resolution X-ray computed
  tomography unit.

Afternoon Session
November 1, 1978

System

B. Kruse (The Picture Processing Laboratory
University of Linkoping, Sweden)
- Parallel processing speed considerations based
  on runtime statistics of PICAP programs.

T. Ichikawa* and H. Aiso**
(*:KDD Laboratories, **:Keio University, Japan)
- A computing system organization for image data
  retrieval.

H. Aiso* and T. Ichikawa**
(*:Keio University, **:KDD Laboratories, Japan)
- A multi-microprocessor architecture for associative
  processing of image data.

K. Paton (Medical Research Council, U.K.)
- Economic criteria for development in image
  analysis.

M. Yoshida (Fujitsu Laboratories Ltd., Japan)
- High speed processing system for 2-D image.

S. Hanaki (Nippon Electric Co., Japan)
- An interactive image processing and analysis
  system.

M.J.B. Duff (University College London, U.K.)
- Cellular logic and neighbourhood operators.

M. Nagao (Kyoto University, Japan)
- Focus of attention in the analysis of complex
  pictures such as aerial photographs.

Morning Session
November 2, 1978

Remote Sensing and Automated Cytology

N. Kodaira, K. Kato and T. Hamada
(Meteological Satellite Center, japan)
- Man-machine interactive processing of extracting
  meteological information from the GMS image.

R. Haralick (University of Kansas, U.S.A.)
- A facet-model for image data.

S. Sternberg
(Environmental Institute of Michigan, U.S.A.)
- Applications of cytocomputer parallel picture
  processing.

T. Kasvand (National Research Council, Canada)
- Experiments on restoration of high altitude
  superwide angle aerial color photographs for
  crop estimation.

R. Suzuki and S. Yamamoto
(Central Research Laboratory, Hitachi Ltd., Japan)
- Real-time image processing in automated cytology.

S. Watanabe*, S. Tsunikawa*, Y. Okamoto**,
I. Sasao** and T. Tomaru***
(*:Toshiba Research and Development Center,
 :Toshiba Tamagawa Works, *:Medical Information
 System Development Center, Japan)
- A new system for automated PAP smear prescreening.

J.Green (Abbott Laboratory, U.S.A.)
- Real-time processing of blood cell images.

Morning Session
November 3, 1978

Real-time Hardware

M. Onoe and M. Ishizuka
(Tokyo University, Japan)
- Real-time shading corrector for television
  camera using microprocessor.

M. Hatori and Y. Taki
(Tokyo University, Japan)
- Interpolation to reduce difficulty in D-A
  conversion.

P. Norgren
(Perkin-Elmer Corporation U.S.A.)
- Architecture of a serial-parallel Golay image
  processor.

M. Kidode, H. Asada, S. Shinoda and S. Watanabe
(Toshiba Research and Development Center, Japan)
- Hardware implementation of image processing unit.

H. Matsushima, M. Ooyama and Y. Kaido
(Central Research Laboratory, Hitachi Ltd., Japan)
- Arrayed processor for image processing.

B. Gilbert (Mayo Foundation, U.S.A.)
- Ultra high speed transaxial reconstruction
processor for X-ray computed tomography of the
heart and circulation.

M. Takagi and M. Onoe
(Tokyo University, Japan)
- Color display with multiple functions.

J. Green (Abbott Laboratory, U.S.A.)
- A pipeline processor for cell image analysis.

Afternoon Session
November 3, 1978

Software 2

A. Rosenfeld and A. Wu
(University of Maryland, U.S.A.)
- Cellular graph automata

Y. Fukada
(Mitsubishi Electric Corporation, Japan)
- Real-time region analysis for image data.

R. Haralick (University of Kansas, U.S.A.)
- Symbolic and non-numeric parallel neighborhood
  operations.

S. Tsuji and M. Yachida
(Osaka University, Japan)
- Efficient analysis of dynamic images using plan.

S. Sternberg
(Environmental Institute of Michigan, U.S.A.)
- Cytocomputer (Implementation of a real-time
parallel picture processing system.)

T. Kamae, T. Hoshino, M. Okada and M. Nagura
(Yokosuka Electrical Communication Laboratoty, Japan)
- Interactive technique of producing and encoding
color graphics.

J. Sklansky (University of California, U.S.A.)
- Polygonal representation of three dimensional
curves.

S. Levialdi, A. Maggiolo-Schettini, et al.
(Laboratory Cybernitics, Italy)
- PIXAL: A high level language for image processing
  (Working paper)

K.S. Fu (Purdue University, U.S.A.)
- A study on parallel parsing of tree languages and
  its application to syntatic pattern recognition.

Night Session
November 3, 1978

Medical Applications

K. Preston (Carnegie - Mellon University, U.S.A.)
- An interactive system for medical image
  processing.

T. Kaminuma, J. Kariya, S. Suzuki and S. Kurashina
(Tokyo Metropolitan Institute of Medical
 Science, Japan)
- Towards image analysis center in medicine.

K. Baba, K. Miyamoto* and K. Kimura*
(Dept. of Path., *:Lab. of Medical Sciences, Dokkyo
 Univ. Japan)
- A simplified method to detect the frequency
  distribution of spherical size of growth hormone
  granules using a stereological rule.

A. Kawahara (Nippon Kogaku Co., Japan)
- An approach to automated cytoxicity test by means
  of digital image processing.

J. Sklansky (University of California, U.S.A.)
- Parallel algorithms for detection of nodules
  in chest radiographs.

Morning Session   Hybrid systems
November 4, 1978
                         S. Ishizaka
                         (The University of Tsukuba, Japan)
                         - Optical fourier transform for analysis of cell
                           motility.

                         Y. Ichioka and S. Kawata
                         (Osaka University, Japan)
                         - Hybrid Image Processing using a simple optical
                           technique.

                         G.W. Stroke
                         (University - Munchen, West Germany)
                         - Opto-digital(holographic) computing and display.

                         Total discussion

                         M. Onoe, K. Preston and A. Rosenfeld
                         - Seminar summary concluding remarks, Future
                           activities.

Afternoon Session   Free discussion
November 4, 1978

表2   [1] US Participants

Professor K.Preston, Jr.
Carnegie-Mellon University
Schenley Park
Pittsburgh, Pennsylvania, 15213   Dr. P.Norgren
U.S.A.   Perkin-Elmer Corporation
                                       U.S.A.
Professor A.Rosenfeld
University of Maryland   Dr. Yoh-Han Pao
College Park, Maryland, 20742   Division of Engineering
U.S.A.   National Science Foundation
                                       Washington, D.C.
Professor K.S.Fu   U.S.A.
Purdue University
West Lafayette, Indiana, 47906   Dr. E.M.Riseman
U.S.A.   Univerwsity of Massachusetts
                                       Amherst, Massachusetts
Dr. B.Gilbert   U.S.A.
Mayo Foundation
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U.S.A.   University of California
                                       Irvine, California, 92664
Dr. J. Green   U.S.A.
Abbott Diagnostics Division
Abbott Laboratroies   Dr. S.Sternberg
4757 Irving Boulevard   Environmental Institute of Michigan
Dallas, Texas, 75247   Ann Arbor, Michigan, 48107
U.S.A.   U.S.A.

Dr. R.M.Haralick   Prof. L.Shapiro
University of Kansas   University of Kansas
Lawrence, Kansas, 66044   Lawrence, Kansas, 66044
U.S.A.   U.S.A.

Dr. R.Kirsch   Dr. W.Gruner
National Bureau of Standards   National Science Foundation
Washington, D.C.   Tokyo, Japan
U.S.A.

[2] Third Country Participants

Dr. M.J.B.Duff
University College
London, U.K.

Dr. T.Kasvand
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Canada

Dr. B.Kruse
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University of Linkoping
Linkoping, Sweden

Dr. S. Levialdi
Laboratory for Cybernetics
Naples, Italy

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