CAD/CAM NEWSLETTER

August 1985

Information Compiled by the CAD/CAM Technology Advancement Council*

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1. Progress and Milestones - As of August 1985

To our knowledge the first paper presented and published in Canada on CAD/CAM technology was in 1975-6, and proposed establishment of the CAD/CAM Technology Advancment Council, which in fact did occur in 1978. The CAD/CAM Newsletter subsequently began in August 1979.

In 1980 the "CAD/CAM Council" issued its well known report "Strategy for Survival" with a follow-up report in 1983 entitled "Closing the Gap". Both reports pushed for the rapid adoption of CAD/CAM technology to improve industrial productivity and maintain international competitiveness.

It is now August 1985 and the CAD/CAM Newsletter has been issued on a regular monthly basis for six years. Its content and readership, which numbers several thousand on a requested basis, have both increased substantially, tracking the exponentially growing tempo and awareness surrounding CAD/CAM in its broadest sense. From the outset it was recognized that the newsletter, to be effective, would have to be informative, genuinely useful, consistent and above all, persistent. Technology development and application is never a "one-shot" exercise.

Where do we stand today? How much progress has been made?

The answer is that collectively all concerned have come a long way, but there is still a long way to go. More and more it is recognized that CAD/CAM, CAE (Computer Aided Engineering) or CIM (Computer Integrated Manufacturing), call it what you wish, is not an option - it is a matter of survival, just as the 1980 report indicated.

There is a constant growth of users. The updated directory of suppliers in Canada (to be available soon from DRIE) will indicate the increased activity of vendors and others providing CAD/CAM products or services. This includes the 77 CAD/CAM centres, large and small, 23 of which are industrially oriented and 54 of which are based in educational institutions across Canada. All are playing a strong role; users, suppliers, centres, educational institutions and others.

This may seem a lot. It may be even adequate. Nevertheless recent figures from the USA Bureau of Labour Statistics place Canada last, and the U.S.A. second last, in a list of ten countries for average growth of manufacturing productivity output per hour over the 1978-84 decade. The effects are seen in today's balance of trade and unemployment figures.

As a senior industry representative, speaking on the competitive factory and the global market place, said at the June 85 CAD/CAM and Robotics Conference "The competitive wave coming in our direction from more and more countries around the world is getting bigger and it is driven by people much more determined to succeed than are many Canadians.".

CAD/CAM is not just a "back-room" technology. It reaches out and impacts the firm right to the bottom line. In aggregate it affects the employment vs unemployment balance and will influence the Canadian standard of living, up or down, depending on our choices and actions.

We must work with better effort and better coordination, not only at developing, and especially at applying the technology, but also at informing and convincing our leaders in industry, education and government how vital all this is to Canada's future.

2. Canada Increases Participation in Automation Standards Development

It is widely recognized that a tremendous need exists for development of international standards for industrial automation systems, with programming languages, data transfer standards and communication standards all high on the list. The emerging standards such as IGES and MAP would be examples.

As described in the September 1984 CAD/CAM Newsletter, a Canadian Advisory Committee has been established by the Standards Council of Canada to follow the work of the International Standards Organization (ISO) Technical Committee 184 on Industrial Automation Systems, to formulate Canadian opinion on proposed ISO standards and to cast the Canadian ballots on these matters. The Canadian Committee is known as CAC/ISO/TC 184 which means it is the Canadian Advisory Committee for the ISO Technical Committee 184.

Three additional steps have now been taken, one at the Canadian committee level and two at the ISO international committee level, which all have the effect of increasing Canada's participation in the development and agreement on international standards for industrial automation.

- Dr. V. Thomson of the NRC Division of Mechanical Engineering in Ottawa has agreed to be the chairman for CAC/ISO/TC 184 and is currently establishing its structure in order to deal effectively with Canadian interests.

- Dr. M. Barakat of the NRC Institute for Manufacturing Technology in Winnipeg has been appointed by ISO to be the secretary for the ISO international subcommittee 3 dealing with non-device specific programming languages. Unlike the CAC above, which is composed entirely of Canadian representatives as its members, this international subcommittee has representatives from all the participating countries as its members and reports to the ISO in Paris.

- Mr. J. Nassr, President of ICAM Technologies in Montreal has been nominated to ISO as the chairman for the international subcommittee 3 on non-device specific programming languages.

To provide a more comprehensive description, the structure of the ISO Technical Committee 184 and its five subcommittees is presented below. The structure for the Canadian advisory committee to be adopted will have an approximately similar matching pattern.

Persons wishing further information, or interested to participate in CAC/ISO/TC 184 should contact either;

W.J. Baigrie, P.Eng., Assistant Manager
Technical Services Division
International Standardization Branch
Standards Council of Canada
2000 Argentia, Suite 2-401
Mississauga, Ontario
L5N 1V8
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Building M-2
Div. of Mechanical Eng.
National Research Council
Montreal Road
Ottawa, Ontario
K1A 0R6
Telephone: (613) 993-9461

ISO Technical Committee 184

Title: Industrial Automation Systems

Scope: Standardization in the field of "Industrial Automation Systems" Pertaining to the domain of "Discrete part manufacturing", and involving the application of multiple technologies, i.e. information systems, communications, numerical and/or Electronic equipment of control of machines.

This scope may include special machines or parts of machines. Standardization is particularly oriented towards the integration into OPEN systems and communications between such systems.

Working Group 1: Communications and interconnections

Task: Standardization of interfaces, protocols, data format and message structure to interconnect computers, equipment and systems in automated factories. The equipment includes e.g. NC machines, industrial robots, programmable controllers, measuring equipment, and other devices for automation purposes.

Subcommittee 1: Numerical control of machines.

Area of Work: Standardization of codes, formats, axis and motion nomenclature, data structures, command languages and related systems aspects for the numerical control of machines.

Subcommittee 2: Industrial robots.

Area of Work:
- Definition/characterization
- Terminology
- Graphic Representation
- Performance and performance testing methods
- Safety
- Mechanical Interfaces
- Programming methods
- Requirements for information interchange

Subcommittee 3: Non-device specific programming languages.

Area of Work: Standardization non-device specific applications languages.

Subcommittee 4: Standardization of the external representation of product definition data, used in computer aided design, analysis, manufacture, test and inspection for obtaining:

- long term, retrievability and understandability
- completeness and integrity
- exchange capability

Subcommittee 5: Requirements for systems integration

Area of Work: To identify requirements for new standards and to develop and define reference models for systems integration in the area of industrial automation.

3. CAD/CAM Human Resource Planning

A series of informal consultations on human resource planning with respect to CAD/CAM technology has been held as follows:

Atlantic Provinces (Moncton), on July 16, 1985;
Quebec (Montreal), on July 19, 1985;
Ontario (Toronto), on July 23, 1985;
Manitoba (Winnipeg), on July 24, 1985;
Saskatchewan (Saskatoon), on July 25, 1985;
Alberta (Edmonton), on July 26, 1985; and
British Columbia (Vancouver), on July 29, 1985.

The consultation involved 104 persons from industry, research institutes, associations, universities, colleges, provincial governments and the Canada Employment and Immigration Commission.

A report will be available in September. A copy may be requested from:

Gunter Rochow
Senior Industrial Consultant
Labour Market Planning and
Adjustment Branch
Canada Employment and Immigration Commission
Ottawa/Hull
K1A 0J9

4. Video Tapes

A video tape on "Adaptive Control" is available from the Society of Manufacturing Engineers as a new addition to its subscription series "Manufacturing Insights". Installations of adaptive control at four industrial site locations are visited to illustrate applications and benefits, supporting the interviews with leading industry experts. Purchase price $190 (U.S.) for SME members, $200 (U.S.) for non-members.

"Manufacturing Insights", the Video Tape Series for Industrial Management, is produced quarterly by SME and presents a 30 - 40 minute examination of different leading edge technologies in each issue. Tapes are available in 3/4"-U-Matic, ½"VHS, Beta I and Beta II formats.

Contact: Video Communications Dept.
Society of Manufacturing Engineers
One SME Drive
P.O. Box 930
DEARBORN, MI 48121, U.S.A.

5. Book Reviews

- Automated Visual Inspection - Edited by B.G. Batchelor, D.A. Hill, D.C. Hodgson, IFS (Publications) Ltd., U.K. (1985)

This 561 page book is a review of vision systems that covers a full range of technology, particularly, it is a valuable collection of material on visual inspection technologies. There are 19 chapters:

1. The Context of Automated Inspection
2. Economic Considerations
3. Industrial Relations
4. Illumination Equipment
5. Optics for Image Sensors
6. Image Acquisition
7. Lighting and Viewing Techniques
8. Coherent Optical Techniques
9. Television Techniques
10. Solid-State Image Sensors
11. Flying Spot Laser Scanners
12. Fibre-Optic Sensors
13. Principles of Digital Image Processing
14. Microprocessor-Based Visual Inspection Systems
15. The INTELLECT Image-Processing System
16. Interactive Image Processing for Problem Evaluation
17. An Automated Visual Inspection Laboratory
18. Image Processing System Design
19. Case Studies

The first three chapters introduce the general subject of automated visual inspection, and the remaining chapters review the relevant technologies.

This book discusses the automation of inspection with light and its application to a wide range of problems in many different industries. The subject is approached as a branch of Systems Engineering and hence necessarily involves many associated technical disciplines.

Automated industrial inspection is taken to encompass a wide variety of tasks including defect detection, surface examination, measurement of tools and components, counting, grading, sorting, sizing, orientation and posture recognition (for robot control), and in-process monitoring and control.

This book was prepared in the United Kingdom and emphasis is on activities in the U.K. Frankly, we do not see this as a limitation. Actually the technology is state-of-the-art worldwide, and the book is well worth obtaining and reading. It is available for $59 (U.S.) from IFS (Publications) Ltd., 35-39 High Street, Kempston, Bedford, MK42 7BT, U.K.

Reviewed by K.E. McKee (Reproduced from Manufacturing Productivity Frontiers, May 1985.)

6. CAD/CAM Articles of Recent Interest

- "America's New Commitment to Manufacturing Education" - American Machinist Special Report 77, June 1985, pp. 105-120.

This American Machinist Special Report No. 77 presents a composite review of trends and changes in manufacturing education in the U.S.A. Technical colleges and universities are developing new curricula and establishing new facilities in an overall, but gradual, move to strengthen manufacturing education. Financial support programs are described, such as the $2.4 million provided over the past five years by The Society of Manufacturing Engineers (SME), the $50 million IBM grant for manufacturing education shared by five major and twenty two lesser recipients and the National Science Foundation $94.5 million grants recently announced to establish engineering-research centres at six universities. Activities at individual universities are described including the master's degree program of GMI in which lectures video taped on campus are provided to engineers in industry through twenty three "learning centers" at cooperative industrial plants. Observers from West Germany have pointed out the distinct lack of cooperative R&D and sharing in the U.S.A. Some examples are given of joint research, indicating that this concept is gaining favor in both industry and government.

Copies of this and other AM Special Reports are available. Single copies prepaid $4 (U.S.), minimum billing $16 (U.S.).

Contact: American Machinist Resource Center
P.O. Box 1130
Times Square Station
NEW YORK, NY 10036, U.S.A.

- FMS: The Drive Towards Cells", R.P. Bergstrom, Manufacturing Engineering, August 1985, pp. 34-38.

Article explains that many companies are turning towards the installation of flexible manufacturing cells rather than more complex, more costly, flexible manufacturing systems. The number of cells installed in the U.S. is projected to increase from an estimate of 525 in 1984 to more than 8000 by 1989. This includes stand-alone cells plus 25-30% of all cells which will be built originally as part of a flexible manufacturing system.

- The following summaries of recent CAD/CAM articles are reproduced from "Manufacturing Frontiers", May 1985.

- "The Changing Shape of Machining Centers" - Mark Albert, Modern Machine Shop, March 1985, p. 71.

The concepts of the flexible machining system are having a powerful impact on the design of new equipment, particularly machine tools. In

the future, there will not be a sharp distinction between the types of equipment found in the job shop and the types of equipment found in the mass production plant. Two examples are used to indicate the general trends and the opposite directions from which they start. For the average shop, the changing shape of machining centers means that the ability of a machine to develop into an automated cell or be integrated into a flexible system may be the key to expanded capacity and productivity in the future. Shops will grow not so much by acquiring machines, but by adding automation as a system takes shape.

- "Machine Vision: Some Perspectives" - Gary Rutledge, Rolf Iverson and Victor Wolanski, Machine and Tool Blue Book, March 1985, p. 42.

The development of a general-purpose vision technology has not been as successful as was hoped and no single technology has been capable of handling a significant spectrum of applications. The industry has been dominated by three basic schemes: binary processing, structured light and correlation. The recent introduction of full gray scale processing systems holds the promise of a more acceptable approach to solving industrial vision problems.

- "Robot Accuracy" - Robert N. Stauffer, Robotics Today, April 1985, p. 43-49.

Accuracy is not a factor in a very high percentage of the applications of today's industrial robots. The main challenge to the accuracy of modern robots involves those situations where the robot is sent to a point for the first time and must follow those directions with great precision. This limitation in performance essentially makes off-line programming impractical, a situation which will not be acceptable in the fully automated factory of tomorrow. The direct-drive concept in robot design will make an important contribution to improved robot arm response and accuracy.

- "CIM: Product, Process, Perception or Promise?" - Robert Waterbury, Assembly Engineering, April 1985, p. 10.

Computer integrated manufacturing (CIM) is not yet a ready-made product or system that one can simply plug into the shop floor. There are at least three types of integration that must be achieved in order to have a true system: the integration of computerized systems, the integration of physical systems, and the integration of organizational systems. A case study is given of the proposed General Motors Saturn automotive production plant.

- "Fundamentals of Factory Communications" - Rodney J. Heisterberg, Commline, March-April 1985, p. 17-20.

Emerging local-area network (LAN) technology can provide direct access to timely, accurate information about the status of key production resources by integrating shop-floor-control (SFC) systems with both automated material handling and storage (AMH&S) and manufacturing. A

complete factory-communications system consists of four management levels: factory, department, workcenter and operation. Private automatic branch exchange (PABX), baseband and broadband are the major LAN technologies. Interface standards are now needed to ensure that multivendor elements will communicate with each other.

7. CAD/CAM Information Available

- Proceedings of the Robots 9 Conference held June 2-6, 1985 in Cobo Hall, Detroit are available in two volumes. $95 (U.S.) for SME members, $110 (U.S.) for non-members plus $2.00 (U.S.) for postage and handling.

  Volume 1, Advancing Applications (898 pp.)
  Volume 2, Current Issues and Future Concerns (892 pp.)

  Contact: Publication Sales
  Society of Manufacturing Engineers
  One SME Drive, P.O. Box 930
  Dearborn, MI 48121, U.S.A.

- Proceedings of the AUTOFACT 6 Conference held October 1-4, 1984 in Anaheim, California containing 91 papers in 26 chapters are available. Price $68 (U.S.).

  Contact: Publication Sales
  SME (as above)

- Technical Digest

  The Technical Digest is a quarterly guide to new Technical Papers published by SME.

  The Digest is produced directly from the SME INTIME Manufacturing Databank—providing titles, authors, number of pages, and concise abstracts of current papers. The information is divided into sections for quick reference: Assembly, Finishing, Manufacturing Systems, Material Removal, and more.

  Each year the fourth quarter provides a special Cumulative Edition, containing a convenient "entire year" reference. This volume contains a compilation of the first three quarters, plus the fourth quarter, plus additional special features.

  SME members may obtain this publication for $22 (U.S.) in addition to their current dues and publications billing.

  Contact: SME (as above)

- Proceedings of the North American Manufacturing Research Conference are available in 450 pages (approx.), hardcover.

  Each year, NAMRC provides a forum for international manufacturing professionals to discuss critical new research and applications.

The proceedings from this important conference allow examination of papers devoted to three primary areas of manufacturing: Metal Forming, Material Removal, and Manufacturing Systems.

Recent NAMRC volumes have included over 65 papers each, devoted to such subjects as: cold forging; CAD for forging and extrusion dies, EDM; ion implantation; CBN grinding; computer vision; adaptive control; FMS; and more.

In addition, every NAMRC proceedings includes a Transactions section containing a selection of the year's best SME Technical Papers.

NAMRC proceedings are available to SME members for $64.50 (U.S.) in addition to their normal dues and publication billing.

Contact: SME (as above)

- Proceedings 22nd Design Automation Conference

Proceedings are available for the ACM/IEEE 22nd Design Automation Conference (DAC) June 23-26, 1985, 838 pages.

Papers on the use of computers as aids at every point in the design process, from conceptual design through manufacturing, were presented at this, the premiere conference devoted solely to design automation, and are included in this volume.

Members $35 (U.S.) plus $5 (U.S.) handling charge. Non-members $70 (U.S.) plus $7 (U.S.) handling charge.

Contact: IEEE Computer Society Order Department
P.O. Box 80452
Worldway Postal Center
Los Angeles, CA 90080, U.S.A.
Telephone: (714) 821-8380

8. CAD/CAM Conferences, Exhibitions, Workshops and Seminars

- "OCAM Seminars for Oct. 1985"

The Ontario Centre for Advanced Manufacturing (OCAM) through its two operational centres, the Ontario CAD/CAM Centre in Cambridge and the Ontario Robotics Centre in Peterborough, provides regular seminars on CAD/CAM and Robotics topics. A brief listing for those scheduled in October 1985 includes:

Date		Topic	Location
Oct.	1	An Introduction to CAD/CAM Technology	Cambridge
Oct.	2	Experiences of CAD/CAM Users	Cambridge
Oct.	2	Arc Welding with Robotics	Peterborough

A separate SME conference on sensors for untended manufacturing will also run concurrently at the Westin Hotel, Detroit on the same dates. A third conference on robotics and automated welding, sponsored by RI/SME will be held at the Hyatt Regency in Dearborn, just outside Detroit on the same dates, with separate registration.

Contact: Technical Activities Department
One SME Drive
P.O. Box 930
Dearborn, MI 48121, U.S.A.
Telephone: (313) 271-1080

- "1986 IEEE International Conference on Robotics & Automation"
April 7-10, 1986, San Francisco, CA.

Call for papers has been issued covering virtually all aspects of robotics and automation and broader aspects such as flexible manufacturing, material handling, scheduling etc. Four copies of papers of approximately 15-20 pages double spaced should be submitted by October 1.

Contact: Rajan Suri
University of Wisconsin-Madison
Dept. of Industrial Engineering
1513 University Avenue
Madison, WI 53706, U.S.A.

- "23'rd ACM/IEEE Design Automation Conference"
June 29 - July 2, 1986, Las Vegas, NV.

Call for papers has been issued for presentations describing original, recent and novel R&D or product development covering all aspects of design automation including simulation, testing, IC layout, silicon compilation, PCB placement, system level design aids, solid modeling, mechanical CAD, data bases, robotics and expert systems. Five complete copies of papers, in prescribed format, must be submitted no later than November 15, 1985.

Contact: Donald E. Thomas
Program Chairman
Design Automation Conference
IBM Thomas J. Watson Research Center
P.O. Box 218
Yorktown Heights, NY 10598, U.S.A.

10. CAD/CAM Quotes

"The best solution to the manufacturing dilemma...is a substitution of capital, in which the United States has a comparative advantage, for labor, in which it does not. --The move toward unmanned factories will require a large investment and a long term commitment by management. Few managers at

this time have the expertise to make such a decision. --In the long run increased use of automation can make the country more competitive internationally, leading to greater wealth and higher levels of employment."

> Richard M. Cyert, president of Carnegie-Mellon University in "The Plight of Manufacturing: What Can Be Done?" Issues in Science and Technology, Summer 1985.

"Surely you want to take part in the world's work?" they asked. "No," I replied truthfully. "I've resigned till they get automation."

> Brendan Behan in "Confessions of an Irish Rebel" Arrow Books Ltd. 1965.

11. This newsletter may be reproduced in whole or in part. Reprinting in other Canadian publications is encouraged. Acknowledgement to the CAD/CAM Technology Advancement Council would be appreciated.

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