



CAD/CAM

LETTER



Information Compiled by the Canadian CAD/CAM Council

for the Advancement of Computer Integrated Manufacturing *

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1. A Seasonal Message

The writing for the CAD/CAM Newsletter is completed each month within the month under which it is dated. In other words, writing of the December issue will be completed in December, but will reach its readers some interval later after translation, printing and distribution are completed.

One of the principal objectives of the Canadian CAD/CAM Council, and of the newsletter, is to assist Canadian industry in making the transformation from the manufacturing technologies of the past to the computer integrated manufacturing methodology of the present and future. Success in achieving this transformation will be vital to maintaining employment in the manufacturing industry and will be an important element in the strength or weakness of the economy as a whole.

There is a second objective we should nurture. That is, to ensure that in every possible instance we will use this vastly new, different and highly productive capacity to produce the goods and services that the world at large really needs.

Mostly, we tend to think of the social aspects of automation in terms of the ergonomics of working conditions and the retraining needs of personnel in instances where there is job displacement.

Indeed these are important, but the nature of the product produced by these productive systems of unprecedented capability is a societal consideration of even greater magnitude.

It is the historical choice of swords versus plowshares -- restated in more modern and more urgent terms.

2. CAD/CAM Council Plans New Report

The Canadian CAD/CAM Council will be meeting for the first time in Saskatchewan, December 16-17 at the Saskatchewan Research Council. Previous meetings, since the council was established in 1978, have been held in almost all provinces, including British Columbia, Alberta, Manitoba, Ontario, Quebec, New Brunswick and Nova Scotia.

Previous reports of the council, addressed to Canadian government, industry and educational institutions, such as "Strategy for Survival" in 1980 and "Closing the Gap" in 1983, have dealt broadly with issues and recommendations related to the adoption of CAD/CAM technologies. This was appropriate at the time of their publication.

The council, in continuing to fulfil its role, is adopting a plan whereby future reports will focus on a particular area of identified concern. They will deal with the chosen subject substantially and in depth.

The time period from 1975 - 1985, insofar as CAD/CAM technology diffusion is concerned could be called the decade of early warning and growing awareness. Awareness was the identified issue. It has been, and continues to be addressed by an effort across Canada of substantial magnitude.

The next decade, or age, will probably be one where senior management knowledge, understanding and strategic planning for computer integrated manufacturing will be of paramount importance.

Accordingly, and with the assistance and cooperation of senior business leaders who are known to have already recognized this need, the CAD/CAM Council is now preparing a new report focussing on this area.

Hopefully, the report, which should be completed in the spring of 1986, will be as well recognized as the previous council reports.

Additional information will be provided to newsletter readers as it becomes available.

3. New Five Year Plan from NRC Focusses on Industry

On November 27, 1985 the Hon. F. Oberle, Minister of State for Science and Technology tabled the new five year plan of the National Research Council to the House of Commons.

The new plan entitled "A Practical Perspective", has been prepared for the years 1986 - 1990. In his remarks, the minister advised that "the National Research Council will continue to give Canada its vital base for long-term research, but for the next few years, will provide more emphasis on development and diffusion, the "Ds" in R&D". The plan has new ideas and new directions but does not request additional funding over that which has already been considered by cabinet.

In one section the report quotes as follows from the Royal Commission on the Economic Union and Development Prospects for Canada (The Macdonald Commission) "Do new technologies spread as rapidly through Canadian industry as they do through the industries of foreign countries? The leading investigators in the field have concluded that new technologies spread more slowly within Canadian manufacturing industries than in other countries."

To assist in technology diffusion NRC now has over 160 technology advisors in major Canadian centres. To further assist in this effort, the plan advises that NRC will establish a Technology Assessment Office. Its job will not so much be to make technological forecasts as to help others become aware of relevant trends and developments so that they will be able to make their own forecasts.

Among its few additions the plan also announces establishment of a Technology Coordination Centre. One of its main functions will be to act as a living directory to NRC, with knowledge of almost everyone and everything in the Council. In its simplest role the Technology Coordination Centre will act as a switchboard so that any staff member acting as a contact point for outside clients can establish contact with any appropriate part of NRC. The direct interaction can then proceed independently.

As Dr. Larkin Kerwin, President of NRC has said, "Our industries no longer have the luxury of easing into technological change -- competitors will leave us behind".

Copies of the plan, called "A Practical Perspective" are available in English or French.

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4. Book Reviews

"Computer Controlled Testing and Instrumentation: An Introduction to the IEC-625, IEEE-488 Bus", Martin Colloms, Pentech Press London: Plymouth 1983, 151 pages, hard cover.

The General Purpose Interface Bus, GPIB, also known by the standards IEC-625 or IEEE-488 is widely used in test and measuring instrumentation. This book may serve as a good single source for engineers and technologists who are implementing or specifying test equipment and controllers that use GPIB Bus. The book is also a good primer for design engineers involved in designing equipment with a GPIB Interface. In the latter case the book should be complimented with other references dealing with detailed GPIB electrical specifications.

Chapter 1 presents history and definition of GPIB Bus and classification of bus devices. Chapter 2 provides more detailed examination of bus specifications, its cabling, hardware and software. Chapter 3 discusses controller requirements together with many examples of available controllers. Chapter 4 presents some application examples. Peripherals associated with GPIB system are surveyed in Chapter 5. In chapter 6, bus problems, programming hangups, bus analysers and bus extendents are presented. Appendices give additional relevant material; data codes and interface, GPIB equipment manufacturers and a glossary of terms.

Reviewed by: Dr. M. Barakat, Head, Robotics and Automation Section, Division of Electrical Engineering, NRC.

"All About Computer-aided Design and Manufacture" - J.W. Fellows, Sigma Technical Press, Cheshire, UK, 1983, 210 pages, softcover, £9.95 (available fom J. Wiley and Sons Limited in Canada).

This is a small book which is well written and very readable. It is aimed at managers and executives interested in the implementation of CAD and/or CAM, but possessing little knowledge of CAD/CAM nor of its implementation requirements. This book is designed to serve as an introduction to the capabilities of such systems and in their installation and it does this very well indeed.

Mr. Fellows' book is a stand alone, self study manual. It is organized so as to introduce the reader to CAD and CAM, help him define his "needs", choose a CAD/CAM system which best matches these needs and implement the chosen system within the organization. It will undoubtedly entice the reader to dig further into this and related subjects, having here gained a good base of knowledge from which to grow.

The first three chapters introduce the user to the role of computers in engineering design and manufacturing. Such subjects as computer

graphics, data storage, different levels of computers (mainframe, mini, micro, etc.) and the introduction of CAD and CAM's basic functions are discussed. Chapter four discusses the requirements for a CAD center, including office layout, electrical and other requirements. The different functions required from CAD and CAM are discussed in chapters five and six, as are the ingredients for a successful implementation of a system. Chapter seven is exclusively devoted to the discussion on methods of accurately defining the organizations "needs". The last chapters, eight through eleven, supply a brief description of existing CAD/CAM systems. Users reports are included which are in themselves very informative. Other sources of information are also given.

In closing, this up-to-date book is highly recommended to the executive interested in CAD/CAM but unsure as to where to start. The author, as a consultant in this field, has very efficiently condensed his experiences, producing a book which is easily read and very informative.

Reviewed by: R. Desjardins P.Eng., Mechanical Engineering Dept.,
University of New Brunswick.

"The Role of Computers in Manufacturing Processes" - Gideon Halevi, John Wiley & Sons, 1980, 502 pages, hard cover.

This 500 page book is an indepth study of "Hal" technology which is a system used for decision making right from management to engineering and to the shop floor. It explains how productivity gains can be made in all departments by incorporating into one system major features of CAD/CAM, integrated manufacturing and group technology, as opposed to using stand alone systems.

The book covers current methods of manufacturing technology and is a valuable text for both manufacturing engineers and students involved in manufacturing. As Director of the CAD/CAM Research and Development Centre in Tel Aviv, Israel, the author is extremely authoritative and thorough in his presentation and has included numerous problems of modern manufacturing processes and their solutions.

The book is easily comprehended and is well annotated with many references.

I feel this book is well worth reading for anyone interested in the factory of the future and is a valuable reference book.

Reviewed by: Peter Jensen - Mr. Jensen has sixteen years experience in the heavy automotive manufacturing field with training in CAD/CAM at the Canadian Institute of Metal Working.

"Automated Guided Vehicles" - Thomas Muller, IFS (Publications) Ltd.,
Kempston, Bedford, UK, 1983, 290 pages.

The designer of new manufacturing or warehousing facilities now routinely considers the use of automated guided vehicle systems (AGVS) for material handling applications. They are increasingly being considered for retrofit installations and the incidence of their use in assembly line operations is growing.

These systems offer considerable flexibility, ease of expansion and the ability to be effectively interfaced with computer control systems. They are usually, however, the highest capital cost option for material movement. Considerable thought and planning is required before specifications are prepared and orders issued.

Dr. Muller's book will be of particular value to those entering the planning phase for an AGVS. This is a book oriented to the practitioner rather than the student. The early chapters of the work contain a great deal of solid information, defining the AGVS, describing its workings, outlining potential problems and discussing important implementation factors.

The organization of content by chapter leaves something to be desired and the book is not easy to dip into. It requires a thorough reading. A strong point is the large number of excellent charts and tables. These are presented very clearly and contain most useful information. Dr. Muller's strengths lie in the more technical aspects of planning and implementation. The chapters on justification and future trends are much weaker.

The fact that the book is written almost exclusively from a European, particularly German, point of view has some disadvantages for the North American reader. The extensive listing of European installations provided in the appendix is interesting, but, since it was prepared in 1980, is somewhat dated.

Dr. Muller undoubtedly did not intend his work to be the last word on AGVS. In a field which is developing so rapidly that would be impossible. His book provides a good level of basic knowledge which is obviously based on practical experience, not just on the theory.

Reviewed by Ian D. Hill, P.Eng., Principal, Hill Industrial Engineering, Toronto. A consulting industrial engineer, his particular areas of interest are in facilities planning, material handling systems, and programmable automation in manufacturing.

5. CAD/CAM Articles of Recent Interest

- "Robots and People" - H.H. Rosenbrock, Control Systems Centre Report No. 592, November 1981.

Presented as the Fourth Hartley Lecture in 1981, a distinguished control systems engineer and educator from Manchester University explores views on the interrelationship between automation and people. Using examples, he points out that since the industrial revolution a process has been proceeding in which the work involved in any task is subdivided into fragments, we automate the part we can and leave human labours the part left over. This part left over for human labour may or may not be the most demanding in skills or be the most interesting. Thus the once skilled machinist no longer shapes the part, but now loads and unloads the machine, just as the skill of the cotton spinner was replaced by the "self-acting mule" in 1830, leaving the human operator the job of mending broken threads, removing spun threads or cleaning the machines.

The author sees this process being carried into present day flexible manufacturing systems and other forms of automation. An alternative would be that human ability and skill are the most precious resources we have and that all efforts should be given to fostering them and using them to the full. In so doing a return to the spinning wheel is not suggested, but rather a reversal of the roles of master and servant between the man and the machine.

An "FMS" system is under development at the University of Manchester Institute of Science and Technology (UMIST) according to this principle in which the operator will make the first part using the NC machine tools, using the computer interfaces and programming the robot using his unique three-dimensional visualization and other skills. Subsequent parts are made from the knowledge recorded during this first process.

- "Artificial Intelligence: Employment and Income" - N.J. Nilsson, Human Systems Management, Vol. 5, #2, 1985, pp. 123-135.

The author who is director of the Artificial Intelligence Center, SRI International, proposes that artificial intelligence (AI) will have many profound societal effects. It promises potential benefits, with some risks, in education, defense, business, science and law. The paper in particular explores how AI is likely to affect employment and the distribution of income.

The conclusion is that AI offers the potential for achieving massive reductions in the amount of human labour needed to produce the world's goods and services. Mechanisms are considered essential to dissociate employment from income so that people will be able to benefit, generally, from the elimination of unnecessary labour.

Solutions are proposed in the form of a widely based "people's capitalism" where ownership of robotics and automation is widespread so

all may receive an adequate income, coupled with a "polynesian society" where time and labour are directed towards the caring professions of education, craft, sport and entertainment and in which friendship could again become a living art.

- "The Robot Revolution: An Interview with James Albus" - Communications of the ACM, March 1983, pp. 179-180.

Rather than robots per se, the author from the Automated Manufacturing Research Facility (AMRF) at the National Bureau of Standards, identifies the totally automated factory as the most economically important development. The fear of robots taking away jobs is believed to be almost completely unfounded since there is no historical evidence that rapid productivity growth leads to loss of jobs. In fact, quite the contrary, it is in industries that fall behind in productivity that job layoffs are prevalent. The world is filled with need, hence the problem is not finding work, but is finding mechanisms by which the wealth created by robot technology can be distributed. It is suggested that robot technology could someday completely eliminate poverty, not only from the U.S.A., but from the face of the earth. The question is do we have the wisdom to develop this technology in such a way that everyone benefits?

- "Reexamining FMS'S" - J. Jablonowski, American Machinist Special Report 774, March 1985, pp. 125-140.

A reexamination of flexible manufacturing systems provides information on both current trends in new systems and changes made recently to some earlier installed systems. Current trends include greater emphasis on the cell concept and single cell systems. Some earlier systems using rail carts would probably use automated guided vehicle systems (AGV's) if designed today. Robots are being considered to transport smaller or tubular parts. Tool management and handling is receiving more attention. Standards such as the Manufacturing Automation Protocol (MAP) will make interfacing easier. Simulation, often with animation, is making design easier and more certain. Strategic benefits, as well as cost reduction, are being included in the management justification. Reexamination of existing installations finds changes, often due to changing business conditions. One installation has been sold, moved and re-built. Another has had a series of updates such as adding more machining centers and two more computers. A third has been torn down and its machines either sold or offered for sale - but at a higher value than if it had been a fixed-purpose hard automation system.

CAM Special Reports are available from American Machinist Resource Center, P.O. Box 1130, Times Square Station, New York, N.Y. Single copies, usually \$3.00 (U.S.), minimum pre-paid order \$15 (U.S.), minimum billed or charged order \$25 (U.S.).

6. CAD/CAM Information Available

The Society of Manufacturing Engineers has available a number of bibliographic data searches of information published over the past ten years.

- "Computer Automated Process Planning" - Report # ME-85-880086

Contains citations concerning computer automated process planning in manufacturing. Computer integrated planning of industrial production processes for productivity improvement and quality control are discussed. Development and evaluation of generative process planning systems are included. (Contains 114 citations)

- "CAD/CAM in the Automotive and Aerospace Industries"
Report # ME-85-880110

Contains citations concerning the design, development and implementation of CAD and CAM systems in the automotive and aerospace industries. The uses of computer simulation, graphics and modeling techniques in automobile, aircraft and spacecraft design and manufacturing are discussed. Computer integrated design and manufacturing systems and automated process planning are evaluated. (Contains 139 citations)

- "Machining Centres" - Report # ME-85-880128

Contains citations concerning the design, development and performance evaluation of machining centers in the manufacturing industry. Vertical and horizontal designs of machining centers are discussed, including tool exchangers, control systems, diagnostic inspection, and environmental monitoring devices. Numerical controlled machining centers in flexible manufacturing systems are considered. (Contains 96 citations)

- "Automation in the Finishing Industry" - Report # ME-85-880102

Contains citations concerning automated, high production techniques of finishing metals, plastics, ceramics and woods in such applications as the automotive, aerospace and furniture making industries. While spray painting and surface coating of decorative and protective finishes with wet and dry materials are emphasized, finishing processes also considered in this bibliography refer to contaminate removal, trimming, honing, polishing and grinding. Robotics and computer automated mechanization are discussed relative to performance, design, software and economic analysis. (Contains 133 citations)

- "Jigs and Fixtures" - Report # ME-85-880029

Contains citations concerning design, manufacturing and evaluation of jigs and fixtures in production machining and assembly operations. Computer integrated jig and fixture operations with robotic control systems are discussed. Jigs and fixtures are evaluated relative to reliability, adaptability, programmability and economics. (Contains 118 citations)

- "Manufacturing Data Bases" - Report # ME-85-880037

Contains citations concerning design, development and evaluation of data bases in manufacturing systems. Computer integrated design and manufacturing data systems are evaluated. The data base types discussed are independent, centralized, interfaced and distributed. (Contains 76 citations)

- "Group Technology" - Report # ME-85-880052

Contains citations concerning group technology (GT) in the manufacturing industry. Development, design and applications of GT classification, coding and implementation in manufacturing processes and production planning are discussed. Computer integrated GT programs developed and designed for industrial production are presented. (Contains 111 citations)

- "Computers in Assembly" - Report # ME-85-880060

Contains citations concerning design, evaluation and applications of computer automated assembly systems in the manufacturing industry, including electronics and automotives. Assembly lines integrated with computer aided design and manufacturing systems are discussed. Computer controlled robotic assembly techniques are presented. (Contains 72 citations)

- "Gaging" - Report # ME-85-880078

Contains citations concerning research, innovations and applications of non-contact, in-process, online and post-process gaging systems in manufacturing. Laser, electro optic and ultrasonic technology relative to automated gaging in such industries as aerospace and automotives are included. Gaging equipment design, standardization of gaging throughout the manufacturing industry, programmable gaging and computer applications are considered. (Contains 103 citations)

The above information is provided courtesy of Manufacturing Productivity Frontiers. For further information on each of the above, contact:

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One SME Drive, P.O. Box 930
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7. CAD/CAM Conferences, Exhibitions, Workshops and Seminars

- "7th Annual D CLASS Conference for Non-Users" - March 3-4, 1986, Brigham Young University, Provo, Utah.

The D CLASS system is a general purpose decision tree processor which can run on a wide variety of processors ranging from the IBM 370 to the

IBM PC-XT. It is perhaps best note for its application to both generative and variant computer aided process planning (CAPP) since this application has received extensive development by BYU and its users. D CLASS is also in use for other applications such as time standards, cost estimating, material selection and tool selection.

The conference will provide an opportunity for potential D CLASS users to exchange ideas with current D CLASS users, to observe new applications and receive introductory hands on training and experience. Registration deadline February 27, 1986. Fee \$225 (U.S.)

Contact: D CLASS '86
Conference Center
154 Harman Building
Brigham Young University
Provo, Utah 84602, U.S.A.
Telephone: (801) 378-4903

- "Robots '86" - April 21-24, 1986, Chicago, Illinois
- "Vision '86" - June 3-5, 1986, Detroit, Michigan
- "5th Canadian CAD/CAM & Robotics Conference & Exposition" - June 17-19, 1986, Toronto, Ontario.
- "AUTOFACT '86" - November 11-15, 1986, Cobo Hall, Detroit, Michigan.

Call for papers has been issued. Deadline for submission of abstracts February 1, 1986. Authors to be notified March 30, 1986. Papers in camera ready form required June 30, 1986.

For information concerning the above four conferences,

Contact: Technical Activities Dept.
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8. Twenty Selected CAD/CAM Abstracts

For a review of CAD/CAM developments around the world and recommended further reading to help keep your organization informed on the challenges and opportunities involved, see the selection of twenty CAD/CAM abstracts in the section attached for this month.

While the abstracts are informative in themselves, copies of most of the articles cited can be obtained from your nearest technical library or from the Canada Institute for Scientific and Technical Information (CISTI) as noted in the abstracts section.

We suggest that readers may wish to take a special look at the abstracts section for this month and the preceding month and consider providing a copy to the president or chief executive officer of their company. There is clearly a growing recognition that computer integrated manufacturing requires strategic planning with management involvement starting right from the top. The abstracts chosen over recent months give special emphasis to this.

9. CAD/CAM Quotes

- "Man should be master of the machine wherever possible. Systems in which man becomes the servant or the slave of the machine should be avoided by careful systems design and selection of objectives."
- "Computer and production systems -- should be designed in a manner which avoids having the operator paced by the machine, especially over long periods of time. The system design -- should have the machine paced by the operator, not vice versa."
- "Applications in which the operator's performance rate is monitored and recorded by the computer should only be implemented with the awareness and understanding by the operator of the methodology and how the information is utilized."
- "Coincident with the emergence and adoption of new technologies, Canada must develop improved mechanisms for more vigorous technologically based social planning in order to be prepared, to adapt, and to more conveniently accept the changes which will inevitably occur."
- "The widespread application of advanced information and automation systems such as CAD/CAM, creates the possibility that a large part of the industrial activity and economic wealth of the nation may be created by a relatively small fraction of the population so employed. It is important that as this possibility advances and perhaps becomes reality, that equitable mechanisms be established and maintained for the distribution of such wealth, as well as its creation. Unemployment insurance is the principal such mechanism today, but will require modification in order not to further and seriously weaken the work ethic if the number of recipients increases."

"Strategy for Survival" The 1980 report of the CAD/CAM Technology Advancement Council.

10. This newsletter may be reproduced in whole or in part. Reprinting in other Canadian publications is encouraged. Acknowledgement to the Canadian CAD/CAM Council for the Advancement of Computer Integrated Manufacturing would be appreciated.

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