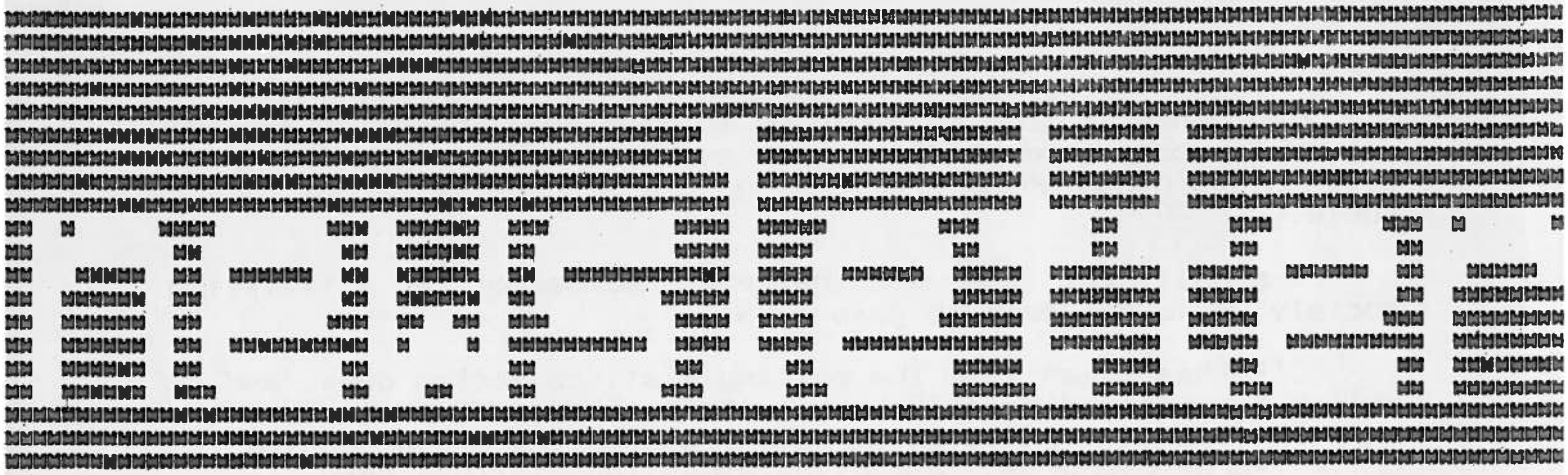

CSCSI/SCEIO CMCCS/ACCHO CIPPRS

Vol. 1, Number 3 September 1981

The CIPS Connection

There has been some recent activity in CIPS to clarify a number of issues. The main result of this clarification was a new CIPS constitution which defined the relationship between CIPS and other organizations. I would like to try to outline some of the issues and their consequences.

First, it is important to state some of the thinking, and reasons for initially entering into an affiliation with CIPS. The purpose of such an affiliation was to:

1. give the organization a stable mailing address,
2. provide consistent facilities for collection of annual dues, maintenance of the mailing list and handling of conference proceedings, and
3. provide better facilities for promotion and publicity of the society so that membership would grow and the organization would flourish.

CIPS, in return, would

1. charge an annual fee for every non-CIPS member,
2. mail out newsletters and brochures for a fee, and
3. keep the funds of the organization and provide a method for their disbursement against expenses.

The benefits to CIPS would be to give them access to another group of people from which to draw members, and provide them with a technical group which was lacking in a supposedly technical society.

A significant issue was that every member of the affiliating society would not have to join CIPS.

CIPS has taken over the mailing list, collected dues, and mailed out proceedings plus newsletters. They have provided only partial financial statements, but no accounting of the monies collected or disbursed. A duplicate mailing list has been maintained at the University of Alberta, mainly because it is easier to control, provides better response and does not leave the organization dependent on a doubtful service. Very few requests have been made of the CIPS office. For the most part, it is fair to state, they have responded well to those requests that have been made.

Additionally, Conference monies were never transferred to CIPS. The main hesitation, in the first instance, was due to skeptisicm, and not wanting to be trapped, whereby CIPS controlled the organization in an authoritarian or arbitrary manner. This skeptisism has since shown to be justified.

In the new constitution there are two categories under which CMCCS, CSCSI and CIPPRS could fall. These are: special interest groups and affiliated societies. As a special interest group all members would have to also be CIPS members. On the other hand, the details for an affiliated society are not complete, but are based on a fee for service which would permit a profit for CIPS.

Currently, not much is happening, other than a number of mumblings, grumblings and some attempts to sort out the details. What is important is to decide what to do in the future, since the current status quo won't last much longer. The following alternatives present themselves:

1. become a CIPS-SIG and require all members to join CIPS.

2. Affiliate with CIPS under an agreement, which is yet to be worked out.

3. Band together with the Computer Science Association into a loose arrangement where administrative overheads are shared.

4. Take some other, as yet undefined, course of action such as complete separation or affiliation with some other group.

It may be unfair to place all the responsibility or blame onto the current CIPS management without trying to explain their problem. CIPS is the only significant computer society in Canada, and is therefore in a rather unique position. Their mis-direction

can be explained by several things, one of which is a lack of support by the academic and research community. This is undoubtedly due to many things, but it is true (old Arab proverb: Don't complain to the camel driver about the direction of the camel train unless you are part of it).

Currently CIPS is attempting to rationalize its current position of being a club interested in dinner meetings and non-technical talks. Its technical efforts in publications and conferences is sadly lacking and will not improve unless the club image is either downplayed or discarded. Because the past strengths of CIPS have been due to its camaraderie, and good will developed through the dinner meeting format, it is difficult to reverse the past behavior and thinking. One concession that has been granted to the pro-section-membership-requirement forces was to tighten up on the seemingly loose arrangement with such groups as ours.

On our side, the fundamental questions are: Can we survive alone? Are there enough active participants to keep up the momentum?

Wayne A. Davis
29 September 1981

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Letter to the editor dated 18 February 1981:

Perhaps the Emperor is naked; Emperor Telidon, that is. Your little note in the Newsletter seems quite appropriate, especially as Japan Inc. has yet to be heard from in the personal computer area.

I noticed in the 15 January issue of the English paper "ELECTRONIC TIMES", on page 3, the observation that SONY expects the U.S. word processing market to be $6 billion, "the same as the colour TV market". With this kind of attention being given to getting smart electronics into the market, perhaps Telidon is a minnow trying to deflect the Queen Mary!

However, in addition to the concerns that you mentioned, and that may be even larger than you suggested once Japan Inc. drops the other shoe, my concerns lie elsewhere. I do not believe any of us perceive the benefit of the railroads as being the jobs that were created by the construction of the rights of way or the rolling stock. We, and the people then, if one reads the papers of the day, recognize that the railroad's significance lay in the goods that were hauled. Ordinary people expected that the railway would profoundly benefit everyone, not just those directly concerned with its creation or operation.

The railway was understood as being something that would make everyone richer. Telidon, on the other hand, is not perceived

that way, nor is there any real substantive evidence to suggest that there is any real hope of such a situation. Beyond the exploratory work in the economics of ethereal goods that I am doing, nobody is really tackling this problem. It is an unmitigated disaster, for this may be the only way to escape from the moribundancy of our present economic situation. In short, I feel that there has been what is tantamount to criminal neglect in not doing the proper infrastructure studies that establish directions for the evolution of a wealth creating role for information technology. The tree must come before the flowers, yet we are busy pushing neat graphics terminals before we know how to sustain them with content that can go head-to-head with "Dallas".

Like you, I love the idea of Telidon, and furthermore, I am convinced that something of this nature must come eventually. However, I fear greatly that the potential will be long in being actualized simply because of short term expediencies being given too great a credence by those who are in charge of the "project".

Yours truly,
Gordon B. Thompson,
Communications Studies, Bell-Northern Research.

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Letter to the Editor

Re: Newsletter editorial

Dear Editor:

For your information please find enclosed a brief placed on file with the Human Rights Commission's SIN study group.*

I enjoyed Wayne Davis' massacre of TELIDON. While I know something of the Avro Arrow, and the aborted FP 6000, perhaps someone would enlighten me about 'DATARS'.

With respect to the new American Association for Artificial Intelligence (AAAI), may I submit that while the concept of AI is interesting, and even useful, the focus of CSCSI should be broader and more inclusive in its concerns.

Yours truly,
David Curran,
23 - 56 East Cordova Street, Vancouver, B.C. V6A 1K2

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*A lengthy brief entitled "Information as Commodity" was received with this letter. Subsequently, many addenda were also received. People interested in this subject should contact Mr. Curran directly. -ed.

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Richard Larratt's response to "The Great Telidon Massacre", InfoIndustry News, 6 February 1981.

The Great Telidon Massacre by W. A. Davis, Editor-in-Chief, CSCSI/SCEIO Newsletter (artificial intelligence CIPS group) ... in which Davis doesn't see the pont of Telidon ... when one can use a mini or micro processor and get in to already in place computer systems. "A Telidon terminal, as I understand it (forgive me, Herb, for my ignorance), is merely a device for displaying Telidon information ... (whereas) a TRS-80 or an Apple II, or even Intellivisiion ... are general purpose, in the sense that they can be reprogrammed, and devices added ... including, probably, access to the Telidon data base if it ever becomes available."

Where this editor thinks Davis errors, is that he doesn't admit to something extra (colour, sound, animation, voice) being needed (or a near zero price-point: like pocket calculators) to give the tired old EDP terminal mass approval ... which except with us hackers ... it doesn't have ... what the effective extras are, is what is to be learned, in the marketplace, in the next few years.

Dear Wayne:
Re: "The Great Telidon Massacre"
If the world was populated just by hackers and engineers you'd probably be right.
Who knows what mix/combo is gonna ring the consumers' bells?
Truth is no one knows yet, but soon some will!

I've got two micros at home, one 6502-based, one Z80A.

We can't assume that what makes sense to us makes sense to many ... not 'cause we're better 'cause we are, is different, not same! Good Regards, Richard.

P.S. If you peek inside a Telidon terminal you'll find a 6809 plus 16K ROM plus 12K RAM plus 256X200X4bits ... so I'd think you could ROM it easy ... basic ... I'd think you could have it going as a personal computer 'cause that's just about what it is before it gets ROM'ed into Telidon.

12 February 1980

Wayne: Truth is I'm simply too busy to write you the personal and directed letter you deserve - if I did - it would encourage you to DEMAND A TELIDON TERMINAL from D.O.C. and then get some graduate students ROMing and RAMing it into the personal computer it is. If you want to print the letter take it out of my InfoIndustry News - a very limited circulation paper (currently 84). Again, best regards. Richard.
P.S. Whereas I'd like the letter (exactly) you can quote and misquote from the other stuff.....
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Note to Editor from G. McCalla, University of Saskatchewan:

ARTISTS

We have received a couple of CSCS/SCEIO LOGO submissions. Are there any more budding young (or not so young) artists out there?

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McGill University

Electrical Engineering Department

Computer Vision and Graphics Laboratory

RESEARCH PROJECTS: COMPUTER VISION

Cooperative and Competitive Computation in Vision Systems

This continuing algorithmic research has primarily been centered around the study of networks of cooperating and competing computational processes. These processes, called relaxation labeling processes, are particularly useful in reducing local ambiguities which arise during the processing of visual information. For example, when an original intensity array (i.e. picture) is interpreted into a low level, symbolic vocabulary, local feature detectors do not respond only to the selected pattern feature; they also respond to various noise configurations. The relaxation labeling processes reduce these kinds of local ambiguities by making use of constraint or compatibility relationships between pairs of neighbouring response interpretations (or labels). They work in a parallel and iterative manner, thus allowing local certainties to exert a more global influence. Formally, relaxation labeling is a class of computational processes that manipulate labels on graphs. The underlying graph structure denotes both the picture parts or abstract objects to be labeled and the neighbour relations over these projects. If the relaxation process operates discretely, then it discards labels that are inconsistant with the label sets attached to neighbouring nodes. If it operates continuously, then it updates a measure of certainty attached to each label. The initial certainties are obtained, e.g., on the basis of the feature detector responses. Our research into cooperative computation is proceeding both theoretically and empirically.

Theoretical Analysis of Relaxation Processes

Relaxation labeling processes are a class of cooperative mechanisms for reducing ambiguity and noise. This project is an attempt to characterize, in abstract terms, more precisely what this means for continuous relaxation processes. That is, it is an attempt to develop the theory underlying relaxation labeling. The theory is founded on a definition of consistency in labelings, motivated by discrete relaxation, and is developed in two

directions. The first direction is the development of an explicit functional that can be maximized to guide the search for consistent labelings from inconsistent ones. The functional is similar to others that have recently been suggested from results in optimization theory. It only exists under restricted circumstances, however, and is mainly used to derive a new relaxation operator that is valid under these restrictions. The second direction, based on variational calculus, provides the real core of the theory. The problem of finding consistent labelings is shown to be equivalent to solving a variational inequality. A procedure for accomplishing this is derived which is very similar to the above restricted relaxation operator. Surprisingly, this new relaxation operator can be approximated by the more standard ones, which leads us to conjecture that the successful applications of the standard operators are explainable by the current theory. Observations about the convergence of this new operator, as well as its generalization to more general compatibility functions, are described.

Robert Hummel (Courant Institute, NYU), Steven Zucker

A Hierarchical System for Line Labeling and Grouping

After local assertions have been attached to positions in an image, they must be grouped into more global and abstract ones. Since this grouping process is as inherently ambiguous and uncertain as the original labeling process, relaxation techniques can once again be used. However, now they are organized into multiple level systems in which consistency (compatibility) requirements must hold both at each level and between levels. Thus, the local neighbourhood for the relaxation updating rule has grown from a circle, for single-level systems, to a sphere for multiple-level ones. The labelling and grouping of unit line segments in noisy, gray-level images was chosen as a problem domain in which these complex relaxation systems could be studied. The first level of this system labels the image with oriented unit line assertions. This is a complete relaxation process in which the compatibility relations are derived from a model for the good continuation of line orientation. A second relaxation process, operating concurrently with this one, attempts to disambiguate labels indicating whether pairs of neighbouring line segments should be connected. This grouping process uses intensity-based compatibility functions. Thus the two processes use modularly-independent knowledge sources in a richly cooperative manner. Finally, two relaxation processes run between the levels so that information is transferred properly between them. One of these processes updates line labels on the basis of grouping labels, and the other updates grouping labels on the basis of line labels.

J. L. Mohammed, Steven Zucker

Texture Discrimination Using Multiple Image Representations

The co-occurrence based approach to texture discrimination can be viewed as one of finding summary statistical representations for the information in textural patterns. Functions of these statistics then provide the feature vectors for standard pattern classifiers. In an empirical study we found that, for certain classes of patterns, features of intensity and edge co-occurrences, taken together, were more powerful (for discrimination) than features of either one individually. The purpose of this project is to determine the reason for this improved behavior theoretically, and to study image representations other than edges that are useful for texture discrimination.

Kamal Gupta, Steven Zucker

Image Segmentation and Interpretation Using a Knowledge Database

We have proposed and implemented a new paradigm for a modular computer vision system, which is both data directed and knowledge based, for segmenting and interpreting real world pictures. This paradigm exhibits the properties of extensibility, modularity, and model-analysis separability. The system consists of two associative memories and several independent processes. The first, a SHORT TERM MEMORY (STM), maintains the current data and deductions about the scene under analysis. The second, a LONG TERM MEMORY (LTM), is the embodiment of the relevant information (syntactic, semantic and pragmatic) about the image domains to be analyzed. Both memories are designed as relational databases and are completely separate from the analysis processes. The latter have access to the memories using a special communication language which is designed as a relational algebraic sublanguage. A process can only interact with another through the STM. The concept of competition and cooperation is adopted as the system's basic processing strategy. It is implemented as a continuous relaxation labelling process which simultaneously segments and interprets the input picture. The current implementation has two obvious advantages. First, it has been designed so that additional processes may be added to the system at any time without necessitating major revision. Second, we have isolated the model from the computer code that implements the algorithm for the analysis. This was achieved by introducing the LTM in the form of a relational database. In turn, this has enhanced the experimental capabilities of the system. The user need only change the LTM relations to modify and test his model. Thus, he can incrementally build his model by changing it and experimenting with the system. Several tests with a real outdoor scene were performed and the results were excellent. Considerable attention is being directed to the low level image analysis process which is designed as a production system. Knowledge of a general nature about low level properties of an image is employed to segment it into uniform regions separated by connected lines.

The two data types of regions and line segments are maintained independently throughout the analysis, which results in a nonpurposive segmentation to be used at higher levels. The possibility of having both low level and high level knowledge-based analysis occuring simultaneously is also being investigated. The model information has been restricted to be a two dimensional description of the class of scenes under analysis. We are now in the process of expanding the system to be able to include three dimensional models, as well as shadows and occlusion in natural scenes.

S. I. Shaheen, A. Nazif, D. Rosenberg, M. D. Levine, Y. Youssef, D. Kashtan

RESEARCH PROJECTS: BIOMEDICAL IMAGE PROCESSING

Quantifying and Characterizing the Morphology of Moving Cells

Cell Movement is a fundamental process of some importance to aspects of cell biology as diverse as migration of cells in embryological development and to host defense mechanisms. This study is promarily concerned with the interaction between external factors and cell internal processes that occur at or within the cell membrane. However, there is no existing method to quantify the observable changes in nucleus and membrane shape that occur in locomotion. To achieve this objective using automatic techniques of digital image processing, this research is aimed at developing an image interpretation system capable of analyzing the structural changes in the shape of moving objects from a sequence of pictures. To do this, the system would have to be able to: recognize the various image patterns, segment and interpret the desired object, and detect significant changes in the location of the moving object as well as in its shape. Of particular interest is the symbolic description and numerical quantification of the cell shape and movement patterns. Using a relational database we have developed a knowledge-based biomedical image processing system capable of analyzing a cine film of a moving cell(s) to provide a quantification and symbolic description of the cell's geometry, thereby characterizing the changes in shape of the cell membrane. The system is designed to consist of two main analysis stages: static scene analysis and dynamic motion analysis. To date we have designed and tested the first stage which provides a numerical and symbolic description of the cell geometry and location in a given frame. We propose to develop the different computational processes of the dynamic motion analysis within the next year. Using this approach, we shall conduct investigations which might provide clues as to the nature and description of "receptors" on or within the membrane, which would be a vital link in the interaction between external factors and cell internal processes. It is interesting to note that this technique is also applicable to other similar problems, such as for example, the visual monitoring of the behavior of rats under the influence of various drug protocols, or the

quantification and analysis of the changes of growing plants in different soils or under the effect of different fertilizers.

M. D. Levine, P. Noble (Faculty of Dentistry), Y. M. Youssef

Experiments in Tracking the Morphology of Proliferating Cell Cultures by Automatic Picture Processing

An evaluation system has been designed and implemented for the tracking of cells and the genealogies of proliferating cultures. The main goal of this research is to develop a framework for approaching problems of this nature, and to evaluate this framework with a specific problem. The structure we originally adopted as our model has much in common with a state variable control representation. Experimental results are most encouraging; the system has the ability to track an individual cell, detect the onset of mitosis, and follow the parent's offspring after mitosis. A genealogy table as well as the state information for each individual cell tracked at each time interval, is recorded. This data is then used to provide a synopsis of the events tracked, either through interactive graphics display or hard copy output. At present, efforts are being expanded to analyze the strengths and limitations of our approach, and with this information our original framework can be improved. Accordingly, a rule-based analysis structure is being contemplated.

F. Ferrie, M. D. Levine, P. Noble (Faculty of Dentistry), P. Riley (University of London)

A Real-Time System for Tracking and Quantifying Blood Cell Movement

White blood cells play an important part in the protection of the body, and can in some cases lead to the elimination of tumour cells. The research described here is the second stage of a two-stage project aimed at tracking defensive blood cells and quantifying the dynamics of their motion in order to define those parameters which are important for tumour cell elimination. In the first stage of the project, the feasibility of carrying out the analysis using automatic digital picture processing techniques was established. Results obtained compared favorably with visual and manual computations performed on data derived from 16 mm movie films of cell motion using time-lapse photography. In the present stage, the system has been modified and upgraded to allow for real-time image capture and cell tracking. Software has been transferred to the DEC VAX 11/780 processor which is linked to the Grinnell 24 plane color display and frame grabber and has the capability of capturing TV-scanned images and digitizing them at the rate of 30 frames per second. Since significant blood cell motion takes place over a time period measured only in seconds, frame grabbing need only be carried out at the latter rate, and the interval between frames

utilized for processing, storage, etc. For purposes of noise reduction, several frames are in fact captured at the maximum rate and their average value transferred to main memory. Image processing then consists of four tasks:

a. Initialization,

b. editing,

c. tracking and

d. analysis. The implementation of this system is in progress.

A. Boyarsky (Concordia University), F. Ferrie, M. D. Levine, P. Noble (Faculty of Dentistry), Y. M. Youssef

Study of the Geometry of Circulating Platelets

Vascular homeostatis is the mechanism by which the vascular system of humans is ensured of maintaining blood in a healthy, circulating condition within a closed system. Blood platelets appear to play a central role in homeostatis, the particular mechanism by which the vascular system is protected from death due to bleeding after injury. In addition, in the abnormal state, thrombosis may lead to clinical complications and possible death through vascular occlusion and/or damage. Platelet shape change is usually considered to be the first event for the participation of platelets in homeostatis and thrombosis.

Notwithstanding the importance of this phenomenon, very little quantitative study of the geometry of circulating platelets has occurred, as measured with intact platelets in blood or plasma. A significant reason for this is the difficulty in visually tracking moving objects and dynamically observing their shape in three dimensional space. This 3D pattern recognition is necessary because the majority (99%) of the rotating platelets may be classified into one of three groups:

a. disc-shaped,

b. discshaped with pseudopods, and

c. spherical shaped with many pseudopodia.

The platelet morphology, represented by certain significant shape parameters, may be computed for each of these three classes and then used to compare human blood platelets from normal donors with those having certain disorders. The objective of this project is to develop an automated computer analysis system to aid in the study of the geometry of these platelets as they move and rotate freely in solution.

M. Frojmovic, M. D. Levine, F. Ferrie

Information Extraction from Cross Sectional Layers of the Patient

Cross sectional images of a patient can be routinely obtained by computed tomography. They provide much valuable quantitative information for diagnosis and therapeutic purposes as well as medical research. To date, an interactive method has been developed and implemented on minicomputer to identify boundaries of organs and tissues for the purpose of radiotherapy planning. The method is being extended for complete automatic operation.

H. C. Lee

Computed Tomography (CT)

Motion of the patient or certain tissues and organs is an important cause of image degradation for CT scanners presently in clinical operation. Depending on the motion and the density of of the moving object the reconstructed image may contain so much artefact as to render it useless for diagnostic purposes. We have developed a method for correcting the artefacts due to the motion in the cross-sectional plane, with the assumption that the motion can be described. The basic objective of the project is to develop a method of image reconstruction from projections of an object in motion.

H. C. Lee, C. H. Leung

Detection of Osteogenesis Imperfects by Automated Texture Analysis

An automated system for detecting Osteogenesis Imperfecta (OI), an inheritable disorder of human connective tissue, is described. The approach is one of texture analysis, founded on standard statistical recognition of co-occurrence-based texture descriptors. Our contribution is to show that texture descriptors derived from gray level co-occurrence matrices can be used in conjunction with descriptors derived from generalized co-occurrence matrices of local image features to increase performance. In fact, for the OI problem, our system demonstrates a level of performance which is significantly better than that of medical specialists.

Demetri Terzopoulos, Steve Zucker

RESEARCH PROJECTS: COMPUTER GRAPHICS

A Parallel Microprocessor System for Real Time Computer Animation

The general objective of this research is the application of paralleled microprocessor units for rendering and animation color TV raster images in real time. The configuration and evaluation of a modular, multiprocessor system is a recent development

offering greatly improved bandwidth per dollar but requiring significant new research in software. Continued evolution toward cheaper hardware systems precipitates new challenges such as increasing the size of the databases of models, their additional complexities when special lighting and texture effects are included to incorporate more "realism", and finally the human preceptual aspects associated with these animated displays. An additional long term goal for this system of parallel microprocessor units involves real time image analysis applications with the addition of a TV camera and frame grabber hardware in place of the color display monitor. Currently, the hardware construction and debugging of a prototype color display system is underway. The notable feature of this system is its ability to support real time animation of computer generated images using the raster scanned television monitor for obtaining full color ranges in the images. Since the task of animating a raster color image exceeds the memory bandwidth of a single computer, a superior architecture was adopted using multiple databases, and supporting the concurrent operation of paralleled processor units. The system uses a video frame buffer which is read out continuously to a television display system while offering random picture address access to the microprocessors. The design is modular so that the number of paralleled microprocessors as well as the number of planes used in the video frame can be expanded to suit the requirements of a particular problem. The display system can operate in two resolutions: 256 x 256 or 512 x 512, and is programmable using a command register to support increasing display capabilities as the number of installed video memory planes is increased from one to a maximum of fifteen. The display system hardware involves five functional sub-assemblies: the microprocessor units, the graphics controller, the frame buffer memory, the television sequencher, and the interface to the host computer. Additional details and operating characteristics of the overall graphics system appear in the individual project summaries given below.

A. S. Malowany

The GRADS Graphic Controller

This project involves the design and evaluation of the graphics controller system. Its main functions are the arbitration of the Microbus to the paralleled microprocessors and the video bus to the video frame memory, as well as the execution of DMA block transfers. In order to minimize the number of words as well as the computational overhead associated with the block transfers, four instruction formats are supported: point, solid color, shaded color, and readback modes. Video memory color contents may be overwritten or additively mixed using an opague/transparent mode selection.

S. Carayannis, A. S. Malowany

A Microprogrammable Microprocessor Module

The project involves the design and evolution of a micro-computer module based on the 2900 bit-slice microprocessor. A 20 bit word size is designed for directly addressing the image in 512 x 512 resolution. The microcoding memory contains 1K words of 40 bit RMA which can be dynamically overlayed from the host computer system to support graphic instructions. The local memory of 4K words of 20 bits supports the graphics programs as well as double buffers, for output data destined to the video frame. Three ports allow this local memory to be serviced by the host computer interface, the graphics controller and the 2900 ALU. Interrupt capabilities are included.

R. Pancholy and A. S. Malowany

A Microcoding Trace Facility for the 2900 Microprocessor

This software package is designed to permit testing of microcoding on the 2900 prototype microprocessor. It runs on the Z80 8 bit host computer microprocessor system using parallel I/O interface cards, a CRT console, and a floppy disc. The program's functions include the initial loading and verification of microcoding and graphics programs from Cromemco's CDOS floppy disc files. Typical debugging functions include displaying the 2900 registers, microcode breakpointing, microcode disassembly, single or multiple instruction executions, and optional hard copy printouts. The tracing output can be interactively selected by the user and is formatted automatically. The package includes a multitasking operating system for the Z80 microprocessor system allowing the user to execute other programs concurrently during the tracing.

A. Mignot, R. To, A. S. Malowany

An 8086 Microprocessor Module

The project involves the design and evaluation of a 16 bit microprocessor module for supporting 256 x 256 resolution displays. The local memory has been expanded to 8K - 16 bit words. Three access ports are maintained just as in the 2900 microprocessor version. A PL/M compiler is available for program development.

R. Ampudia, A. S. Malowany

The Host Computer Interface

This module is responsible for efficiently linking up the multiple computers in GRADS. It realizes a DMA facility, linking all the computer memories. Packing and unpacking facilities

accommodate the 8, 16, 20 or 40 bit work size. Any computer in the GRADS system may request the DMA machine and command transfers between any of the memories once the arbitration has granted its use.

R. Bridgeman, A. S. Malowany

An Operating System for Animating Color Displays

This project involves the design of the operating system requirements for GRADS. Here a host computer system supervises the execution of high level graphic instructions being executed on an array of paralleled microprocessor modules feeding a color display system based on a frame buffer. The intended applications involve real time animation of computer generated images.

J. Larsen, N. Partovi, A. S. Malowany

Object Coherence in Graphics Animation

One of the computationally most expensive aspect of graphics animation algorithms is the exhaustive elimination of hidden surfaces. In certain domains, however, there is a large amount of object coherence, or, in other terms, continuity in active occlusion relationships. The purpose of this project is to develop algorithms that take advantage of these relationships, so that animation can take place at a pace more acceptable to human observers. Ultimately the algorithms will be applied to the display of computerized tomographic imagery, but currently they are based on the assumption that the universe consists entirely of convex polyhedra.

Harold Hubschman, Steven Zucker

RESEARCH PROJECTS: HUMAN PERCEPTION AND PSYCHOPHYSICS

The Symbolic Side of Human Texture Discrimintion

The Ehrenstein illusion has been used to demonstrate that constructive aspects of early visual information processing, in particular, subjective figures can play an essential role in texture discrimination tasks. It is argued that neither receptive field structure nor spatial-frequency domain filters can adequately account for the observed discrimination results. A second alternative, that texture discrimination can be based on the abstract representational structures constructed by similarity grouping processes, therefore seems more likely.

Patrick Cavanagh (Universite de Montreal), Steven Zucker

Color and Early Grouping Processes

One of the main contributions that the computational approach to vision can make to the study of human perception is an explication of the problems underlying any visual system together with the constraints that are potentially active in solving it. Our group is studying early grouping processes, by both modelling them and by determining the information on which they depend. One major decoupling is being considered, that between intensity and color information, because of the neurophysiological evidence indicating separate systems for each. Surprisingly, it appears that several of the more primitive grouping processes do not use color information at all, but are dependent only on subjective intensity differences. These grouping processes take place both in space and in time, and are described below.

Spatial Grouping of Dot Patterns

Random dot Moire patterns provide a class of stimuli in which apparent structure is explicitly dependent on the grouping of local pairs of dots. For example, a circular structure is seen when two identical random dot patterns are superimposed, with the second one rotated slightly with respect to the first. Are such grouping processes influenced by color? The answer appears to be no, as has been demonstrated by varying the color of the two dot patterns. Rather, it seems to depend only on perceived intensity differences.

Peter Sander, Kent Stevens(MIT), Steven Zucker

Motion correspondence Grouping of Dot Patterns

A primitive form of motion perception has classically been studied with dot patterns by rapidly displaying one frame of dots after another. The Gestalt psychologists discovered certain dot configurations which appear to change drastically with small perturbations in the presentation conditions. We are working with one of these, the so-called Terbus configuration, to determine the effects of color changes on the interframe dot correspondences (or grouping in time). More specifically, depending on the presentation conditions, the pattern appears either as a pair of dots moving together, or as one stationary dot and one jumping dot. Similarity in color should contribute to the former kind of behavior, but apparently does not, thereby suggesting that only luminence information matters for this task.

Alex Weiss, Steven Zucker

RESEARCH PROJECTS: COMPUTER SYSTEMS

A Micro-Processor Controlled Image Device Interface

With the retirement of the DEC PDP-15 computer that was used in the Computer Vision and Graphics Laboratory in previous years, the image devices were to be retained and interfaced to the DEC VAX11/780 computer system. Simultaneous with the transfer to the new computer, several of the devices were to be updated in their functions and their features. For this reason, it was decided to interface a micro-processor to the VAX computer by means of a DR-11B to maintain host computer integrity. All special devices could then be interfaced to the micro-processor bus and controlled by ROM program, instead of hard wired sequential logic. A Z-80 micro-processor was chosen for its flexibility and because of previous experience with it. A special micro-computer board was designed and other boards were wired to contain control registers for the devices being interfaced. Software development was done on separate S-100 bus micro-computer running the CP/M operating system. This general purpose image device interface is currently being tested. Maintenance will be minimal, and is facilitated by documentation imbedded in the source program for the ROMs controlling the micro-processor.

F. Ferrie, J. Leemet, M. D. Levine

Device-Independent Software for Digitizers

A software system is being developed to facilitate the use of two different picture digitizers, one a Grinnell Frame Grabber, the other an Optronics Drum Scanner. The Software is being designed to allow for the Digitization of pictures, or any arbitrary segment of a picture in either color or black and white. The specific tasks are defined in an interactive session at the computer terminal. The system is being structured in such a way as to minimize the device dependence as much as possible.

F. Ferrie, Y. Leclerc, M. D. Levine, R. Rabipour

A Browsing Approach to Documenting Documentation

A dedicated research facility, such as ours, contains a wealth of system programs, research software, user information, and documentation that needs to be accessable to all users. However, the extent and variability of this information makes hard-copy lisings an inappropriate medium, and burdens a small core of expert users with the task of information dissemination. To relieve this burden, an on-line system has been developed in which any user can browse through all of the above information quickly and easily. The system is based on keyword matching and graph traversal, and attempts to allow for both novel and experienced users. In addition, it provides a framework in which

all future systems software and documentation are to be prepared.

Yvan Leclerc, Steven Zucker

McGILL REPORTS
(copies of reports may be available from the authors)

1. Agarwal, V. K., Multiple Fault Detection in Programmable Logic Arrays, TR-79-4R.

2. Agrawal, D. P., and Agarwal, V. K., On-Line Fault Detection and Correction in Microprocessor Systems, TR-79-5R.

3. Agarwal, V. K., and Masson, G. M., Generic Fault Characterization for Table-Look-Up Coverage Bounding, TR-80-1R

4. Agarwal, V. K., Fung, A. S., Multiple Fault Coverage Predictions, TR-80-3R

5. Ferrie, F., Levine, M. D. and Zucker, S. W., Cell Tracking: A Modeling and Minimization Approach, TR-80-4R.

6. Haralick, R., Mohammed, J., and Zucker, S. W., Compatibilities and the Fixed Points of Arithmetic Relaxation Processes, TR-79-16R.

7. Hummel, R. A., and Zucker, S. W., On the Foundations of Relaxation Labeling Processes, TR-80-7R.

8. Knoll, A., A Real-Time System for Tracking and Quantifying Blood Cell Motion, TR-79-12R.

9. Levine, M. D., A Knowledge-Based Computer Vision System, TR-77-3R.

10. Levine, M. D., Youssef, Y. M., A Real-Time Laboratory Device for Tracking and Quantifying Blood Cell Movement, TR-78-2R.

11. Moshtagh, V., AMD 2900 Microcomputer Cross Assembler, M. Eng. Report.

12. Nazif, A., A Survey of Color, Boundary Information, and Texture as Features for Low-Level Image Processing, TR-78-7R

13. Pedanult, E., Zucker, S. W., and Muresan, L., On the Independence Assumption Underlying Subjective Bayesian Updating, TR-79-15R.

14. Shaheen, S. I., An Implementation of a Relational Database and An Algebraic Sublanguage for Computer Vision System, TR-78-12R.

15. Terzopoulos, D., and Zucker, S. W., Detection of Osteogenesis Imperfecta by Automated Texture Analysis, TR-80-8R.

16. Zucker, S. W., Leclerc, Y. G., and Mohammed, J. L., Continuous Relaxation and Local Maxima Selection: Conditions for Equivalence, TR-78-15R.

17. Zucker, S. W., and Hummel, R. A., An Optimal 3-dimensional Edge Operator, TR-79-10R.

18. Zucker, S. W., and Terzopouos, D., Finding Structure in Co-Occurrence Matrices for Texture Analysis, TR-79-13R.

19. Zucker, S. W., Motion and the Mueller-Lyer Illusion, TR-80-2R.

20. Zucker, S. W., Labeling Lines and Links: An Experiment in Cooperative Computation, TR-80-3R.

21. Zucker, S. W., and Cavanagh, P., Constructive Texture Perception: Orientation Anisotropies in Discrimination, TR-80-9R.

THESES

1. Bridgeman, R. A., An Interface for a Color Display Animation Sytem Using Microprocessors, M. Eng. Thesis, 1980.

2. Ferrie, F. P., Experiments in Tracking the Morphologies of Proliferating Cell Cultures by Automatic Picture Processing, M. Eng. Thesis, 1980.

3. Lamarre, J. Y., A Multiprocessor Interface for a Color Graphics Display System, M. Eng. Thesis, 1979.

4. Leclerc, Y. G., Continuous Relaxation and Local Maxima Selection, M. Eng. Thesis, 1979.

5. Luk, S. F., A Sub-Template Matching Algorithm for the Recognition of Nerve Fibres in a Section of a Nerve Trunk, M. Eng. Thesis, August 1978.

6. Papapetros, A., The Design of a Color Display of a Color Display System for Real Time Animation Using Microprocessors, M. Eng. Thesis, 1977.

7. Ramji, A. S., A Color Graphics Display System for Real-Time Animation Using Microprocessors, M. Eng. Thesis, 1979.

8. Shaheen, S. I., Image Segmentation and Interpretation Using a Knowledge Database, Ph.D. Thesis, 1979.

9. Ting, D., Intermediate Level Processing for a Computer Vision System, M. Eng. Thesis, 1979.

10. Youssef, Y. M., An Automatic Picture Processing Method for Tracking and Quantifying the Dynamics of Blood Cell Movement, M. Eng. Thesis, June, 1977.

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ACTIVITIES IN COMPUTER GRAPHICS SECTION
DIVISION OF ELECTRICAL ENGINEERING
NATIONAL RESEARCH COUNCIL

The laboratory program in the Computer Graphics Section has in the past followed two main directions with roughly equal effort in each. The first is concentrating on interactive computer graphics and applications and the second is devoted to image processing, pattern recognition and applications. These two disciplines are part of a computer technology research program, the present goal of which is to make a contribution to the area of intelligent robotics and flexible manufacturing.

The areas of graphics that have been pursued are graphics for modelling, man-computer communications, and the development of hardware primarily through industrial contracts. One goal and a theme has been the development of methodologies for effective use of graphics tablets. They have been the dominant input devices in our lab for a number of years and we are now in the process of writing up the accumulated experience in this area. The work in graphics for modelling has produced the ACTION system which we are now in the process of porting to two NRC labs for applications in process modelling.

The redirection of our effort towards robotics CAD/CAM and flexible manufacturing has stimulated our interest in geometric modelling, sculpted surfaces and parts description. Initial emphasis is on input techniques and on visualization.

An on-going project not related to the above application areas has been directed at applications of computer graphics to cardiac studies, in collaboration with a local hospital. One area has been the study and visualization of the wall motion of the heart.

Picture processing in the laboratory has been directed to studies in image restoration of blurred images, both with space invariant blurring as well as with defined variance. Another project is directed to developing an interactive tool for karyotyping of plant chromosomes, primarily of grains, in collaboration with the Division of Biology. Another project has involved the study of objects composed of thin lines as exemplified by Chinese characters.

A project that has been on-going in our Lab in collaboration with the Geological Survey Branch of EMR is the study and quantification of geological maps as well as of microscopic images of rocks. In both cases,the study concentrates on processing binary images using binary transformations.

With the change of emphasis in our laboratory we are directing our effort to applications in intelligent robotics. Preliminary studies are underway to establish the specific technical directions to be pursued.

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CALL FOR PAPERS

Fourth National Conference
of
Canadian Society for Computational Studies of Intelligence/
Societe Canadienne pour Etudes d'Intelligence par Ordinateur

University of Saskatchewan
Saskatoon, Canada
17, 18, 19 May 1982

In Conjunction with:

The 1982 National Conference of the
Canadian Information Processing Society

Papers are solicited in all areas of Artificial Intelligence. Some suggested, although not exclusive, topics of interest include: expert systems, natural language understanding, knowledge representation, heuristic problem solving, automatic programming, computer perception and vision, image analysis and understanding, robotics, programming systems for AI, psychological aspects of AI, automatic theorem proving, learning, social implications of AI, and advanced applications.

You are invited to submit four copies of an extended abstract to the program chairman before 7 December 1981.

All submissions will be read by several members of the program committee and evaluated on the basis of significance, originality, and overall quality. The extended abstract should be between 1500 and 2000 words (8-10 double spaced typed pages). Each accepted paper will be allotted 25 minutes (presentation plus brief question period). To make refereeing possible it is important that the abstract summarise the novel ideas, contain enough information about the scope of work, and include comparisons to the relevant literature.

The deadline for submissions of abstracts is 7 December 1981. Authors will be notified of acceptance or rejection by 31 January 1982. The accepted papers, typed on special forms, will be due 21

March 1982, and should be sent to the program chairman.

Information concerning local arrangements will be available from the general chairman. Proceedings will be distributed at the conference, and will be subsequently available for purchase from CIPS.

Program Committee: James Allen, Norma Badler, Mike Bauer, Wayne Davis, Mark Fox, Bill Havens, Hector Levesque, Charles Morgan, John Mylopoulos, Zenon Pylyshyn, Reid Smith, Doug Skuce.

Proceedings Editor: Brian Funt

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CMCCS Annual General Meeting
June 10, 1981
Waterloo, Ontario

Agenda

a. Reports

   1) Membership

   2) Conference '81

   3) Financial

   4) CIPS Affiliation Status

b. Toronto NCGA

c. Future CIPS Negotiations

d. Executive Proposal

e. Future Conferences

MINUTES

a. Wayne Davis chaired the meeting. The Chairman reported that CMCCS had a paid-up membership of about 300. A preliminary report on the 1981 conference was presented by the Chairman indicating the number of registrants, etc. More complete information would be available after the conference. The Treasurer presented the financial report. The current balance is $3062.22. Proceeds from the Conference have yet to be included. Some discussion took place on the relationship between CMCCS and CIPS. CIPS is producing a document which will contain terms and conditions from its points of view for Affiliated Societies.

b. Some discussion took place regarding the newly formed National Computer Graphics Association. It was left to Wayne Davis and Ron Baecker to come up with alternatives for the CMCCS attitude towards NCGA. Wayne Davis would be meeting with the President of the U.S. NCGA within a few days and more facts would be available. Points of view ranged from opposing NCGA head-on to cooperating fully with NCGA. Some opinions were expressed that NCGA was more of a trade organization while CMCCS was more research and application oriented.

c. Some dissatisfaction was expressed with the current relationship with CIPS. It was decided to wait and see what CIPS is going to state in its Affiliated Society document which is currently being produced.

d. A slate of officers was proposed, additional nominations called for, and the following slate of officers elected:

President	Wayne Davis
Vice-President	Peter Tanner
Secretary-Treasurer	Fred Peet
Directors	G. Thompson, BNR
	D. Thalman, Univ. de Montreal
	T. Rossi, Shape
	D. Collins, Concordia
	U. Lama, DOE
	R. Baecker, HCR
	M. Wein (Editor), NRC

e. The question of the next conference was discussed. It was generally felt that a conference every two years was too infrequent and that one year would be more appropriate. The place and time were discussed and several points were raised: joint conference with CIPS or NCGA or CIPPRS, the proximity of future SIGGRAPH conferences, and east-west alternation. It was left to the Board of Directors to contact other parties and make an appropriate decision.

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CMCCS Financial Statement for the Period

December 15, 1980 to June 3, 1981

Bank Balance December 15, 1980			$2956.18
Revenue:	Interest (Savings)	$65.83	
	Interest (Chequing)	0.86	
		$66.69	
Expenditures:			
	John Beatty (Conference Advance)	$1500.00	
	U. of A. Printing Charges (Newsletter)	70.00	
	Bank Service Charges	.60	
		$1570.60	
Bank Balance June 3, 1981			$1452.27
CIPS Account Balance April 21, 1981			$1718.41
Revenue			
	Nil		
Expenditures:			
	Printing Charges (Letterhead)	$ 108.46	
CIPS Account Balance June 3, 1981			$1609.95

Total CMCCS Funds June 3, 1981: $1452.27 + $1609.95 = $3062.22

Note: The question of CIPS charges for non-CMCCS members has yet to be resolved.

Respectfully submitted,
Fred Peet,
Secretary-Treasurer.

****

CALL FOR PAPERS

GRAPHICS INTERFACE 82

Conference and Exhibition, 17-21 May 1982, Toronto, Ontario

Contributions are solicited describing research results and applications experience relating to the following areas:

Man-Computer Interaction	CAD/CAM
Human Factors	Computer Assisted Engineering
Graphics Hardware	Videotex
Graphics Languages	Business Graphics
Animation	Office Automation
Graphics Algorithms	Mapping and Cartography
Image Processing	Medical Graphics
Speech Processing	Robotics

500-1000 word summary due before 16 November 1981. Authors will be notified by 15 January 1982. Full paper due 15 March 1982.

Send Summaries to:

Prof. Alain Fournier
Comuter Systems Res. Group
University of Toronto
Toronto, Ontario
Canada. M5S 1A1
Tel: (416)978-6893

Conference & Exhibition Info:

Rich MacKay
Dataplotting Services Inc.
160 Duncan Mills Road
Don Mills, Ontario
Canada. M3B 1Z5
Tel: (416)447-8518

Authors are reminded that if it is desirable to publish the material elewhere, a summary is sufficient for inclusion in the proceedings. This conference is being held in association with the Canadian Image Processing and Pattern Recognition Society, the IEEE Computer Society, and other professional societies.

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Research Reports

The Editors would like to remind you to submit your research reports as soon as possible.

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This newsletter is published by CSCSI/SCEIO, CMCCS/ACCHO, and CIPPRS at the University of Alberta, Department of Computing Science, Edmonton, Alberta, T6G 2H1.

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