ARCHITECTURE MACHINATIONS

A weekly newsletter of the Architecture Machine Group, Department of Architecture, M.I.T., Room 9-518, Lee Nason, editor.

Vol. II., No. 6. February 8, 1976

IN THIS ISSUE:

NICHOLAS' VISIT TO LATIN AND SOUTH AMERICA by Nicholas Negroponte of course

Reported to be an MIA in Latin and South America, I feel I owe a brief account of my two weeks of absence during which I conducted a heavy dissemination program (as Howard Moraff would call it). My trip is in reverse chronological order.

The last week of January was the first week of a fortnight of seminars conducted in two waves of faculty pairs from our Department: Stan Anderson and I the first week and Imre Halasz and Wayne Andersen the the second (this past) week. The seminars were organized by the Colombian Society of Architects who are interested in current trends in architecture and architectural education. Of the 130 participants, six were Deans of Schools of Architecture, twenty-five were professors, and the rest formed part of an important professional community. Stan and I found the schedule grueling (3-1/2 hours of lecture per day) and the audience stayed glued to the topics with relentless stamina. The introduction of computer aided design in developing countries is no longer quite so fanciful; mini-computers have obviously lowered the costs, and Computervisions and Applicons have done some of the software.

The previous week ended in Guatamala. Unlike the sequence of ten Colomibian lectures, this was a one-shot presentation of "flavor" for computer applications. Some cronyism was involved in that the Dean of the School of Architecture was a classmate of mine who is currently enjoying an economic boom from tourism. Guatamala is apparently the only non-oil-exporting country in a period of financial growth.

Prior to that I spent two days at the Metropolitana University in

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Mexico City. This University was conceived during the period of student unrest at the National University three years ago. Three campuses were built in three months! And they are expected to grow to 20,000 students each. The University has a reputation of having more money than they really do, more activities than they really do, and more academic momentum than they really do. The most active member of their faculty in our area is Mr. Caranza. Outside the University, in a Government Ministry for Education, he heads an Imlac facility to be used for computer animation in education. They have a huge Imlac with a defunct Graf Pen.

Finally and first, I spent a day at the National University of Mexico. Among other things, I had the occasion to spend some time with Adolfo Guzman of MIT-AI-vision fame. He is currently using LANDSAT data for computer recognition and estimation of crop kinds and productions. They are building a color raster scan display (256x256 pixels) with -- brace yourself -- an Interdata 7/32.

I save the National University visit for the last because we may collaborate with them on an experiment of architecture-by-yourself to be conducted next winter. I have proposed that they build a twin system (of sorts); we staff if for a time; and Yona Friedman orchestrate a test. From our point of view the following aspects are important:

(1) housing has more continuing meaning in their culture,

(2) the user would be illiterate
  (a) light buttons would be pictograms
  (b) input would be through a touch sensitive tablet (screen), and

(3) the application may have an actual site, building system, and risk.

Guy's team has recently suffered losses in personnel. Let it be known that work on Architecture-By-Yourself probably leads to eight weeks in the sun during next winter's first blasts of cold.

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HARDWARE DEPARTMENT NEWS

Model 85 work is progressing rapidly. The memory system now runs 256K of extended memory and, starting Monday, Larry Stewart and Andy Lippman will bring up video. You may expect the machine to be down for most of the week, since the modifications required for video to work on the new system are extensive. Hardware people will try to leave the machine running during the off hours.

Note the machine configuration sheet issued last week is now incorrect due to the 85 work. The model 70 will retain the moving head disk. All other changes will take place Monday morning at 10:00 AM. The corrected sheet is posted next to the sign-up board.

Hardware has made a decision not to have the third Dataflux drive fixed. This means that there will never be three disks on the fixed head system again. This decision was based on the poor long-term reliability of the Dataflux drives and the poor response from the factory when they needed to be fixed. The money being saved from the above is being allocated towards the purchase of another 2314.

As regards last week's memo on the color Xerox, we are now soliciting for operators to run a mini-copy service. This service will essentially be open to friends and MIT people, and will be arranged by one's making an appointment with the operator to run one's slides or leaving them with him for copying. The charge will be higher than it is now, but we are not sure exactly how much yet. Emeca may become the operator.

If you come into the machine room and it is extra-ordinarily hot, this means that the air conditioning has broken. This has been happening a lot lately. You should call 3-1500 and report it. This is the work control center, and we get the best response by calling them directly. Please note on the gripe board that you have done so, and leave them your name and extension if they ask.

RICHARD RIESENFELD RECEIVES PROMOTION

On January 13 the University of Utah exhibited good wisdom in granting Prof. Richard Riesenfeld tenure and promoting him to Associate Professor. Rich helped us four years ago in our beginning work on curve recognition and fitting. A.M. congratulates Rich, king of B-splines and as Coonsian as the surfaces. We look forward to continued collaboration.

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IDIOSYNCRATIC SYSTEMS by Nicholas Negroponte

Richard Bolt and Paul Pangaro have started to take over the Idiosyncratic Systems contract. In conversations on the topic (which have until now occurred all too infrequently), human partnerships were ennumerated: Bob and Ray, Husband and Wife, Gilbert and Sullivan, Nureyev and Fontaine, Pilot and Co-pilot, Boss and Scretary, Director and Actor; each illustrates a different class of idiosyncrasies at work. The following text is from my own article on Idiosyncratic Systems and the Cartoon is from this month's Gourmet Magazine.

> In his most recent treatment of "conversation theory", Pask (1975) illustrates the proverbial syntactic-semantic distinction with the numeral 5 (i.e.: a chocolate cream pie). He remarks: "5 is a prime number" and "5 is a lucky number." This distinction is clear and, in the case of 13, we can find examples of what you might call a cultural semantic.
>
> Disregarding the presumption of calling our method an "idiosyncratic systems approach" to the number 5, consider that 5 might have been your cabin number on your honeymoon cruise, the number of weeks left to your forty fourth anniversary, or a menu's item number in which you always delight. As isolated facts, these assertions are no less syntactic than "5 is a prime number." What distinguishes them is their use in inference making, interacting with those who know you.
>
> For example, let us assume that item 5 on the menu of Chez Soup is your cherished stuffed veal. When you enter the restaurant you say "the usual" or you may have to say nothing at all, and the proper dish arrives. From the previous discussion of acquaintanceship note here the completeness of the inference making procedure: 1) the waiter knows that you want number 5, 2) you know he knows, 3) he knows you know he knows. The hypothesis is extremely personal and exemplifies a simple behavior of an idiosyncratic system - the waiter. The illustration can be embellished: as a Catholic you don't eat meat on Fridays (or they don't serve it), in the presence of a lady guest you like to peruse the menu feigning knowledge of all offerings, or in the event of grouse season you will take that when you can.
>
> The waiter story has additional exemplary value. Consider that the restaurant is populated by regular customers. The waiter

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<u>SKETCHING IN 3-D PART TWO</u> by Steve Mann

Part One (<u>A.M.</u>, Vol. II., No. 4.) introduced one implementation of sketching <u>in 3</u>-D: the STRAIN → SURFACE system. The characteristic of that process is to increase the specificness of the interpretation of the input drawing through discrete stages until a formal geometric description results. These transformations are outlined below:

SUBPROCESS	DATA REPRESENTATION	VAGUENESS
DRAW	Sequentially Sampled Points	
↓	↓	
STRAIN	2-D lines, curves	
↓	↓	
LATCH	2-D edges, vertices	
↓	↓	
GUESS	3-D edges, vertices	
↓	↓	
SURFACE	3-D surfaces	
↓	↓	
MAKE	Relational Structure	

THE STRAIN → SURFACE PROCESS

This system allows us to communicate our initial design intentions through the graphical medium. The expectations on us at the start of the process are not mild: we must draw a reasonably complete sketch of a structure, and restrict ourselves to a limited range of orthographic contexts.

The choice of what the process' expectations of the user will be is arrived at by trading off the difficulties of dealing with vagueness (the assumptions of what the initial input is) with the loss of expressive ability encountered with increasingly constrained systems of representation.

The FORTRAN STRAIN → SURFACE graphical input system falls about midway between the limits of vague and specific systems.

Vague systems, such as a hypothetical sketch recognition machine which first figures out what you're drawing and then helps you in

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an appropriate manner, offer the possibility to view the input to them in many ways. Specific systems may be easier to implement but have a narrower scope of applications.

The performance of STRAIN → SURFACE as a 3-D input system improves when the input resembles the desired output more closely. When we take care to draw along orthogonal axes, make precise endpoints, and think out our design a bit, we get good results. We initially constrain the input in ways the process desires. Obviously we're on the wrong end of the idiosyncracy here.

There appears to be a delicate balance between the usefulness of a system in terms of generality of input and the amount of expectations such a system has about its input. This sensitivity to initial conditions is a function of the later transformation's demands for increasingly particular input.

Additional side-effects of increasingly constrained systems are: (1) Results of similar inputs tend to be exactly the same and we lose a sensitivity to small differences. This is particularly bad when aesthetics are concerned -- where small changes make big differences in perception. (2) The "signature" of the process is strong. (3) Such systems evolve towards greater specificity to increase performance.

In order to achieve our desire for a general input system that preserves the wealth of interpretations of our initial design, we should look for ways of preserving generality (vagueness, if you will) as far into the process as possible. In doing so, we might avoid the side effects of constrained systems. The remedy for the problems of constrained systems is generous application of vagueness.

With the preservation of vagueness in mind, I've been redesigning the final transformation process, SURFACE. My intentions are to allow for incomplete inputs and results, and to utilize the failings of the process as feedback to its predecessors.

In part one, I illustrated the severity of context restriction that the old SURFACE imposes by the cubes-joined-at-edge problem. In that case, we perhaps wanted the cubes to represent volumes; later on these volumes would be given containment by a particular structural

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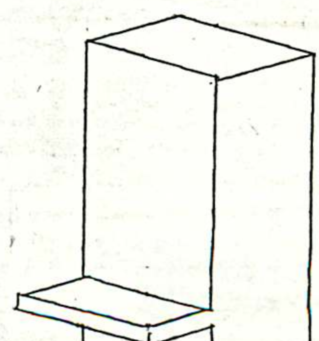
SKETCHING IN 3-D PART TWO continued

system. However, we didn't even get beyond SURFACE because the structure didn't fit the constraints.

"Special cases" can be treated on an ad hoc basis or they may be treated by relaxing the constraints of the system until such things are engulfed by the "general case." Paradoxically, when this is done, what passed previously as the general case becomes a special case: the old SURFACE objects which conform to Euler's law and consist entirely of structural vertices and edges become with constraint relaxation special cases of all things which include circles and arrows and text. In addition, in the new general case nothing restrains us from interpreting a host of vertical arrows as a fir stand, where another system geared for arrows would only allow one interpretation.

In the SURFACE problem, relaxing constraints means redefining what constitutes a surface. In the new SURFACE all lines which are connected that lie in the same plane are called surface. In addition, any collection of surfaces which are connected by their member edges are defined to be a body. Objects which conform to Euler's law are a particular subset of all possible objects which can be bodies under this definition.

With these new entities (relaxed bodies and relaxed edges), different data structures are needed that allow the extra flexibility in interpretation without increasing in complexity. These new entities are basically NETWORKS, and bit maps are appropriate data structures for them.



THE RACK

The following discussion will be illustrated with the example of an object which looks something like one of the equipment racks from the machine room.

The pathfinding approach to surface definition is appropriate to input which we expect to behave according

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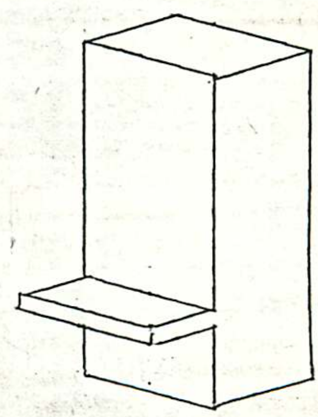

THE RACK

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SKETCHING IN 3-D PART TWO continued

to Euler's law. A simple method which employs fundamental set theory and logical operations will suffice to define the new entities.

The connectivity relationship between lines in the data remains constant after the LATCHING process is applied. Ass-backwards system design methods allow us to predict that the future latcher will produce a bit map matrix which describes the connectivity of our data.

For the rack, this bit map looks like the diagram shown to the right.

Given the connectivity, all possible planes and the lines which lie in them can be produced with this result also stored in a bit map. Each row of this map corresponds to a unique plane, each column to one of the lines in the data.

The connectivity bit map can be easily worked over to yield bodies by isolating connected chains of lines. The resulting bit maps for each body and the bit map for planes can be operated upon in a simple manner to yield for each plane the groups of lines which form surfaces.

This final result contains much important information that was unavailable from the specific data structure used to represent the expected topological relationship of the old body/surface entities. First, the topology is still represented (and much more concisely than before), whereas pointers were

```
-X-----X--------X-X-----
X-X---------------XX----
-X-X---------------XX---
--X-X---------------XX--
---X-X---------------XX-
----X-X---------------XX
-----X-X---------X-----X
X-----X---------XX------
---------X-----XX-X-----
--------X-X-------XX----
---------X-X-------XX---
----------X-X-------XX--
-----------X-X-------XX-
------------X-X-------XX
-------------X-X-X-----X
--------X-----X-XX------
X------XX------X--------
------XX------XX--------
XX------XX--------------
-XX------XX-------------
--XX------XX------------
---XX------XX-----------
----XX------XX----------
-----XX------XX---------
```

BIT MAP

```
XXXXXXXX----------------
X-------X-------X-X-----
-X-------X--------XX----
--X---X---X---X--X-XX--X
---X-------X--------XX--
----X-------X--------XX-
-----X-------X--------XX
-------X-------XXX------
--------XXXXXXXX--------
```

PLANES BIT MAP

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SKETCHING IN 3-D PART TWO continued

necessary to indicate the links which made up the network. Second, the possible incompleteness of the representation is fully preserved or discovered. This method, having few expectations to satisfy, is more accepting of its input. Third, there are many possible interpretations for what these results mean. At this stage of interpretation we can still look for characters, arrows, or fir trees. Some of the results may suggest closer inspection of assumptions made earlier in the process.

```
XXXXXXXX----------------
X-------X-------X-X-----
-X-------X--------XX----
--X-------X--------XX---
------X-------X--X-----X
---X-------X--------XX--
----X-------X--------XX-
-----X-------X--------XX
-------X-------XXX------
--------XXXXXXXX--------
```

SURFACES BIT MAP

Equally important as the preservation of generality in a way which doesn't compromise the potential to reach specific conclusions about our original designs, is the fact that there can be many interpretations for the meaning of the process itself. For instance, a graphical input system developed along these lines is in the general case a network development system!

ABOUT THE FIGURES:

The fourth line of the planes bit map indicates there are 8 edges in that plane. These 8 edges form two surfaces indicated by the fourth and fifth lines in the surfaces bit map.

DOCUMENTATION

New MAGIC PL/1 SUBROUTINES have been issued for OC (issues an output command to a specified device), SS (senses status on a specified device), WD (writes out one byte of data to a specified device), CLRIH (removes the interrupt handler for a specified device from the system interrupt table), and SETIH (sets up an interrupt handler for a specified device). New GRAPHICAL INPUT SYSTEM PROGRAMMER'S MANUAL commands have been issued for CLONEL (copy a string of lines from one level to another) and TRACK (returns the location of pen or tracking cross and the status of the pen or cross). These may be found in the appropriate correction files.