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Travel Report USA - Man-Machine Interaction

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TRAVEL REPORT - USA - MAN-MACHINE INTERACTION

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DEPARTMENT OF AUTOMATIC CONTROL
LUND INSTITUTE OF TECHNOLOGY

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Title and subtitle

Travel Report – USA 1981 – Man-Machine Interaction

Abstract

A visit to the USA in November 1981 is reported. The main interest was on computer graphics, programming environments and scientific personal computers. New types of hardware for graphics is designed for VLSI at Stanford University. Such developments will make advanced, fast graphics capabilities much cheaper in the future.

The ACM annual conference in Los Angeles was also attended.

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Travel Report - USA, 1981

Man-Machine Interaction

Hilding Elmqvist

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1. INTRODUCTION

Our project on languages and software tools for implementation of control systems has been more and more oriented towards man-machine interaction. The main reason for this visit to the USA was therefore to meet research groups in order to find out about trends in man-machine interaction. I was especially interested in computer graphics and scientific personal computers.

The round trip was combined with attending the ACM annual conference in Los Angeles.

2. ACM ANNUAL CONFERENCE

SUNDAY November 8

ACM Professional Development Seminars

The hosting ACM chapters were sponsoring professional development seminars preceeding and following the conference. My plan was to attend the seminar on Computer Graphics. Unfortunately, this seminar was cancelled. Someone said that only five persons had preregistered for it. Strange!

I chose, instead, to attend

Software Engineering Economics
by Barry W. Boehm, TRW

He discussed models, based on 63 software projects, for estimation of software costs. The material originates from his recent book:

Boehm B: Software Engineering Economics.

The book and the overheads were handed out. His basic COCOMO-model (COnstructive COst MOdel) is

$$MM = 2.4 * KDSI^{**}1.05$$
$$TDEV = 2.5 * MM^{**}0.38$$

where

KDSI – Thousands of Delivered Source Instructions (not test programs, not comments), (lines of code, independent of language assuming the most suited is used for each module).

MM – Number of Man-Months (152 hours) (product design phase – integration and test phase), (includes management, documentation)

TDEV – Development schedule (months)

The following figures are obtained for some standard size projects.

Project size KDSI	Effort MM	Productivity KDSI/MM	Schedule TDEV	Average staff
2	5.0	0.400	4.6	1.1
8	21.3	0.376	8.0	2.7
32	91.0	0.352	14.0	6.5
128	392.0	0.327	24.0	16.0

This model is refined in many different ways. However, everything is based on Project size (KDSI). The problem of how to estimate KDSI is not treated.

I did not find the material presented useful.

MONDAY November 9

ACM Annual Conference

Opening of the conference, 9.00 - 12.00

The keynote speaker was Ray Bradbury, science fiction writer. He has among other things written Fahrenheit 451. It was a very exciting speech. He gave a very optimistic view of the future. A main theme was about using fantasy when setting up goals for computer science. Other topics were excellence and the needs for metaphors. In connection to this, he talked about Walt Disney and his achievness. Bradbury told that he had been working with the design of a new "Fantasy Land" at Disneyland. It will open in October, 1982.

Peter Denning, ACM president, talked about the status of ACM and the lack of crediability of the association compared to, for example, Physics association. That is in agreement with my personal observation that the well-known computer scientists were not there. Furthermore, the level of the presentations turned out to be low in general.

The Turing Award was given to E.F. Codd, IBM Research, San Jose for his work on relational data bases. The Turing lecture was a disappointment. He introduced the concepts of relational data bases. There was almost nothing about generalizations, future development or connections to other disiplines.

Local Networks, 13.30 - 15.30
D. J. Kaufmann

Among several parallel sessions I chose the tutorial on Local Networks. It was mostly a presentation of basic concepts of data communications (comparable to what we teach in our course in Real Time Programming).

An Introduction to Ada - Part I, 16.00 - 18.00
S.H. Saib

This was really an introduction.

The Ada introduction continued 19.00 - 22.00. Instead of listening to that, I checked in on Careers for Computing Professionals and the chess tournament. I then went to the "Hosting chapters reception" (wine and cheese). There I met Prof. Davidson from Santa Clara who visited Lund a couple of months ago.

TUESDAY November 10

Plenary session, 9.00 - 10.00
How to be a good subordinate
Renn Zaphiropolous, Xerox-Versatec

Zaphiropolous is co-founder and president of Versatec. The title of
his speech made me curious. As I understood it, his main message was
to take it easy, not to strive for priveliges such as the key to the
executives bathroom. He also talked about what to do when you
seriously disagree with your boss. Three alternatives: quit, start a
mutiny or make a confrontation. Of course, he recommended the last
alternative: bring the problem up, talk it over, solve it. What else
to say? I don't really understand why he was invited to hold the
speech at a conference like this. I dont't think he had got many
applause if he had held the speech in Sweden.

Speakers and panel, 10.30 - 12.00
Local Networking by Ring, Ethernet, Broadband and PABX,
  Perspectives from the field

I first went to "Color Graphics in Education, Art and Industry" by
E.P. Miles. A very old man presented how he constructed color patterns
with mathematical methods: color = f(x, y). I left after ten minutes.

The networking session revealed that there is still much to do in this
area. A drawback with Ethernet, that was brought up, is that the
cable-TV networks can not be used as a transmission media. Other
broadband approaches allow this.

David Clark talked about the mess they had at MIT with several
different local nets connected together.

Panel 13.30 - 15.30
Ada after one year: How have government politics, industry
concerns and academica mixed?

There was a general agreement that "Ada is doomed to succed" as Hoare
put it last year at ACM. There was some concern about efficiency and a
discussion about the need for subsets. Druffel from DoD argued against
subsets and supersets. There are indications that Dec will soon have
Ada on the Vax.

Panel and reviewed papers, 16.00 - 18.00
The technical issues confronting Ada.

The most interesting talk was given by Edmund Schonberg from New York
University about the NYU implementation of Ada. The compiler is about
30 000 lines (17 000 comments) in the language SETL.

WEDNESDAY November 11

Plenary session 9.00 - 10.00
The computer revolution and the government
S. Ramo

Panel 10.30 - 12.00
The computer software products industry in the 80's.

Reviewed papers, 10.30 - 12.00
Man/machine interfaces

I switched several times between these two sessions. W. Haas from
Siemens, Germany read a paper in the second session called "Pictorial
Man-machine communications". They had built a combined image
processing and graphical system using an array processor.

Conference luncheon, 12.00 - 14.00
The information age: A benign revolution
S. Buchbaum

Panel and demonstration, 14.00 - 15.30
Computers in Hollywood

A fantastic computer-generated film was shown. Very high quality
graphics including for example models for reflexion in metals. Each
frame took between 1 - 5 min to generate on a PDP-10.

Demonstration, 16.00 - 17.00
Demonstration of a Videodisc system for the classroom.

The demonstration included computer assisted instruction of how to
handle an oscilloscope. Pictures of for example the different knobs of
the oscilloscope were stored on the video disc and retrieved by
command from the computer.

3. VISITS AT UNIVERSITIES AND INDUSTRIES

THURSDAY November 12

Caltech - California Institute of Technology

Dan Whilan, 10.00 - 12.00

I was shown around. They had just got Apollo workstations. Hardcopies of VLSI-designs were taken on TRILOG (Printronix) printers. Dan was building a graphical system based on a chip from NEC (7220). It was not available yet. He showed me a graphical editor for VLSI-design. It had features for compressing circuits still maintaining the design rules.

Lunch, 12.00 - 13.00
Lennart Johnsson, Dan Whilan

Lennart Johnsson, 13.00 -14.30

Lennart gave me a general overview of the activities at the group. I got a very interesting paper about a language called HARMOS for description of VLSI-circuits. The language has elements from concurrent programming such as processes and message passing. The connection mechanisms of processes have similarities with Dymola.

Jim Kajiya, 14.30 - 15.00

I asked about the use of Petri Nets for analysis of "concurrent subcircuits". Sofar, they were involved in basic research concerned with finding algebraic foundations for Petri Nets.

FRIDAY November 13

Computer Science Department, 9.00 - 15.00
University of Utah

Al Davies
Steve Lowder
Gerald Maquire

When I showed Chuck Sites the LICS-system he told me about the work on
data-flow programming that was going on at University of Utah. Al
Davies was the leader of the project which was sponsored by Burroughs.
It had been going on for 10 years. However, their sponsoring ends
December 1981. They had discussions with Livermore Lab about
programming Cray-1's with their system. However, one week earlier they
decided not to support the system. The mood at the department was sad.
About five people were looking for new jobs.

They had a graphical system for data-flow programming. A Tektronix
4015 storage screen with resolution 4096 x 4096 was used. They could
edit the data flow graph by the use of joystick and cross hair. The
graphs were hierarchically decomposed and there were commands at the
keyboard to go up and down in the tree.

There were restrictions on how nodes could be connected which they
claimed ensured livelyness.

Two years ago, they made an interactive model using the Evans &
Sutherland MPS1 graphical system. It has hardware continuous zoom. A
problem was flickering when having much text on the screen.
Furthermore, they considered it too expensive to use as a workstation
(about $ 100 000). Before the project was cancelled, they considered
using a Perq workstation.

The department seemed to have good computer facilities: Dec-20, 2
Vax-11's and many PDP-11's. They used a local network: Sytek,
broadband, $ 1100 for node for two terminals, 128 kbit/sec/channel.
They had one Perq and two Apollo-workstations: Motorola 68000, $ 34000
with 33 Mbyte disc, high resolution screen, simple RasterOp (only
copy), local net.

The Computer Graphics Lab. had Evans & Sutherland Picture System,
Grinell and Megatek. The Megatek was very impressive. It has hardware
for fast vector handling combined with a raster memory. It thus allows
real time continuous zoom. It would certainly fit very well in the
LICS-project.

Bob Keller, 15.00 - 15.30

I had a short talk with Bob Keller. He told me about their work on function graphs which are related to data flows.

Evans & Sutherland, 15.45 - 16.30
Henry Cabal

Stewe Lowder accompanied me to Evans & Sutherland. I wanted to see their Picture System 3000. Unfortunately, they were just moving the system and the host computer to another room, so nothing was connected. Henry Cabal showed me color pictures taken from another system used for environment pictures for pilot training. Very realistic. A price of about 1 million dollars was mentioned. The simpler system PS 3000 costs about $ 85 000.

MONDAY November 16

IBM Research Lab., San Jose

Seminar, 10.00 - 11.00
A Programming Environment for Implementation
of Control Systems

I talked about our department and the LICS project.

Weller, 11.00 - 11.30

He showed their "Picture Building System". It was based on a
relational data base. One had to fill in different types of tables for
description of the graphical objects. Some degree of parametrization
of the graphical representations was possible. He demonstrated the
system on a Tektronix 618 storage screen. It was not impressive.

Jim Rhyne, 12.30 - 13.30
TELL

Jim showed me their TELL system. It used a Grinell color system. The
application he showed concerned signal processing. Block diagrams with
connections between modules could be drawn. The connections were done
automatically using a routing algorithm designed for circuit layout.
All information was stored in the relational database.

We also talked about windowing as in the Smalltalk environment. He did
not like the idea about windows overlaying each other. Instead, he
wanted to set priorities on the different parts of a window depending
on the importance of the information. In that way, the windows could
scrink in a suitable way if there wouldn't be enough space on the
screen. The placing of the windows would be automatic.

Genisco, 13.30 - 14.30

The research lab were about to buy a Genisco graphical system. A
representative from Los Angeles unexpectedly arrived. He made a
presentation of their system. The lab was going to buy a G6000. It had
character and vector generator in hardware. Resolution was in the
range 512 x 512 - 1024 x 1024. The price for the system at IBM would
be $ 28000. He also talked about their new advanced product
"Spacegraph". It shows graphical pictures in true three dimensions. It
is based on a vibrating mirror. You can really se behind things by
moving your head, he said. I had read an article about Spacegraph in

"High Technology". The price is about $ 100.000.

Jim Rhyne had the opinion that Genisco was the leading company in the computer graphics buisness. Their German representative is

    Ruth Robben, E A Mulder
    Applied Dynamics Deutschland GmbH
    Zollenstrasse 4
    5860 Iserlohn
    Germany
    Phone: 02371-6625

Jim Rhyne, 14.30 - 15.30

We continued to talk about the relation between our projects. He meant that continuous zooming would be nice but was concerned about the hardware cost because of the required speed.

I also met Pat Mantey, the manager of the group. He had worked with automtic control earlier. We talked about cooperation. He was positive to that. It had to be formally agreed through IBM Sweden.

Action: Send Jim material about simulation.

Wolfgang Koening, 15.30 - 16.00

He was a postdoctoral visitor from Germany. He was going to show me a system for VLSI-design. He did not succeed.

Sten Andler, 16.00 - 17.30

He told me about their workstation concept. It contained five tightly coupled Motorola 68000. They would have different tasks such as communication, graphics, file handling. The Genisco color system should be used for it. Sten was working with communication. They had a 2 Mbit/sec ring connecting four IBM-computers.

Sten showed me their image processing lab. We played around with a video disc system. The disc contained Sears catalouge. It contained more than 10 000 frames. Some parts were movies with sound, others were pictures of products. You could easily go back and fourth among the pictures. They were interfacing a micro computer for controlling it. Video discs might be useful in our interactive environment by storing pictures of different physical objects.

TUESDAY November 17

STANFORD UNIVERSITY

John Hennessy, 10.00 - 10.30

John told me about their VLSI-effort. He had designed a language for
microprogramming called SLIM. He introduced me to the effort on the
SUN-workstation. It has a Motorola 68000 and a screen of 800 x 1024
pixels. They will have a color version with resolution 512 x 512. The
workstation will be manufactured by (among others):

  Cadlink
  8600 West Brynmaur Ave
  Suite 725 South
  Chicago, Ill 60631
  Phone: (312)693-6700

Stanford will have lots of SUN work-stations. The first will be
delivered in march-april 1982.

Vaughan Pratt, 10.45 - 11.30

Pratt had one of the prototype SUN-stations. He showed me a lot of
impressive programs exercising the graphics. Quite fast. They used
Unix. The interaction was done through windows (not as flexible as the
Smalltalk environment). He showed how he could logon at different
computers at the campus having the dialouges at different windows.
They used Ethernet.

James Clark, 11.40 - 11.50

I asked John Hennessy if anyone were working with Computer Graphics.
He then introduced me to James Clark in the next room. James told me
about a design of a Geometry Engine and a Image Memory Processor. He
was just going to a meeting but I got two articles. We decided to meet
later in the afternoon.

Lunch

I read the papers by James Clark. TERRIFIC. Exactely what I need for
the zooming capability. More about that after this:

David Luckham, 2.00 - 2.30

David told me about their Ada-project. The compiler was not complete.
Some work on a syntax oriented editor was going on. One student worked
on run-time detection of deadlock in Ada programs. They had defined a
higher level language based on Ada called ADAM.

Brian Reid, 2.30 - 3.10

Brian was new at Stanford. His thesis was about the type setting
system SCRIBE at Carnegie Mellon. He was involved in a project to
introduce automation in fabrication of IC-circuits. He mentioned that
HP, Texas and Fairchild had failed to do that and he had the opinion
that Xerox would also fail. One reason was that modern computer
science was not used (instead: Fortran etc.). A problem was
measurements on the wafer. They were indirect and was obtained long
time after a control action (e.g change of temperature) was made.
Probably an interesting problem for our department.

Action: Send material on identification and adaptive control to Brian.

Tom Binford, 3.30 - 4.10

Lars Nielsen asked me before I left to find out what Tom Binford at
Stanford was doing on Image Processing. He was one day at a week at
SRI (Stanford Research Institute). That day. I had a rented bicycle (3
miles). He did not study dynamic image processing. However, he refered
to a survey paper by Nargel, Hamburg in a journal on pattern
recognition. He will send material.

James Clark, 4.30 - 5.00

They had designed two VLSI-circuits for graphical applications:
Geometry Engine and Image Memory Processor (IMP). The Geometry Engine
performs

    object transformations (real coordinates, 4 x 4 matrix)
    clipping (three dimensions, planes)
    viewing transformations

It can hadle about 3000 lines/frame.

The IMP is used to obtain a Smart Image Memory System. An IMP is
associated with each memory chip. This gives distibuted processing and
high speed. The IMP's takes information from the Geometry Engine and

performs scan conversion of lines, polygons and characters.

The previous week, they got the first manufactured copies of the Geometry Engine. They found some errors which are fixed. Xerox PARC are manufacturing the chips now. They will later cost about $ 2000.

WEDNESDAY November 18

Xerox Palo Alto Research Center (PARC)

Seminar, 10.00 - 11.00
Jim Meindl: Center for Integrated Systems

Jim Meindl who is director of the Center for Integrated Systems (CIS)
at Stanford gave a seminar at Xerox about their plans. The center has
14 sponsors (Xerox, Intel, IBM, Dec, HP, etc.). Each one pays
$ 750 000. A building containing a clean area for fabrication will be
built.

Stig Hagstrom, 11.00 -12.00

Stig told me about PARC and showed me the laboratory. It was very
impressive.

Don Scharfetter, 13.30 - 14.00

Don was director of the VLSI-center at PARC. We talked about the
problems of controlling wafer fabrication.

Seminar, 14.00 - 15.00
A Programming Environment for Implementation
of Control Systems

I talked about our department and about LICS.

Rich Barth, 15.00 - 16.00
Automatization of wafer fabrication

Rick was developing software on a Xerox Star for handling receipts for
wafer fabrication and collection of knowledge about the process for
the operators. The programs were based on a mailing system.

THURSDAY November 19

De Anza, San Jose, 9.00 - 11.00
Weiman

I visited DeAnza in San Jose. I had heard a lot about their image processing systems. An impressive demonstration. Their systems include special hardware for operations on the stored image. The price of an IP-64000 is between $30000 and $60000 depending on options selected.

They were designing a graphic system GS 1280 for delivery in july-aug 1982 ($30000).

Grinell, San Jose

I was in telephone contact with Tom Seitzer at Grinell in order to get a demonstration of their products. Unfortunately, the disk drive of their system was down (?). He told me that Teleinstrument in cooperation with Tecexport were representatives in Sweden.

Stanford, 13.00 - 16.00

I made plans for how to use the graphics from Stanford for my idea on zooming (see appendix 1).

Meeting, 16.00 - 17.30
Software for SUN-workstation

I attended a meeting with students on software for SUN.

FRIDAY November 20

Xerox PARC, Learning group, 9.00 - 11.00
Ted Kaehler

The Smalltalk environment has served as inspiration for many efforts on programming environments for work stations. I was especially interested to see their windowing technique with overlapping windows. The group are now promoting installation of Smalltalk on other machines than Xerox. A virtual machine has been defined. A liscence has been obtained by Dec and he thought Smalltalk would soon be available on Vax. They were finishing a book on Smalltalk now.

Mark Grossman, Stanford, 11.00 - 12.30

Mark worked together with Jim Clark on the graphics for SUN. He was designing the parent processor (bit slice). We talked about character handling and the special problems with zooming. They had only 8 kbyte of memory for fonts. I told him about the limitations and we talked about cooperation based on our knowledge from the "zoom terminal".

Computer Science Library, 14.00 - 15.00

Tom Davis, 15.30 - 16.30

Tom was a graduate student who just had started to develop a program for VLSI-design on SUN.

John Hennessy, 18.00 - 18.30

John Hennessy and Jim Clark had been in Los Angeles Thursday and Friday. I wanted to talk more about cooperation on the graphics with zoom. I telephoned John in the evening. He was very positive about cooperation and indicated that we would be able to get a SUN work station from Cadlink faster with their help. We would get the design of the parent processor and the chips when they were available.

MIT
Richard R. Bolt
Architecture Machine Group
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

Telex: 921473 MIT CAM

MIT, Lisp Machine Inc.
Greenblatt

Phone: (617)876-6819
        253-6765 (AI Lab)

Travel: Boston 19.55 - Albany 20.40

Thunderbird Motor Hotel
Lathen Circle

Phone: 785-6626

TUESDAY November 24

Dean Frederick
Rensselaer Polytechnic Institute
Troy, New York 12181

Phone: (518)270-6485 (RPI)
        (518)385-3541 (General Electric)
        (518)877-8674 (home)

Picked up at 8.30 at hotel.
Seminar at 13.00.

At Dean Frederick's place.

WEDNESDAY November 25

Travel: Albany 7.00 - Pittsburgh 8.06
        Limousine service 9.00 - 9.40

Carnegie Mellon University

Anders Ardo
c/o Niel Ostlund
1003 Mellon Street
Pittsburgh, Pennsylvania 15206

Phone: (412)362-8935 (home)
       (412)578-3620 (office)

SATURDAY November 28

Travel: Pittsburgh 14.20 - New York 15.38

        New York 19.00 (17.30) - Copenhagen 8.30 (sunday)