Università di Pisa

Laudatio di Alan Kay

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Back to 1975

Back to 1975 - History

- **April: end of the Vietnam War**
- **June: UK votes yes in a referendum to stay in European Community**
- **November: Juan Carlos becomes king of Spain after death of Francisco Franco**
- **World population: 4 billion**

Back to 1975 - Computers

- **Altair 8800 is released**

- **Bill Gates and Paul Allen develop a BASIC program for the Altair 8800. They form a company called Micro Soft**

Computers: IBM 360

Time Sharing

A technique that allowed several people to share a single computer, accessing it through teletypes.

Prevailing Attitude

- **machines were fast and people slow**
- ***time-sharing* was the suitable solution to serve many slow people with a single fast machine**

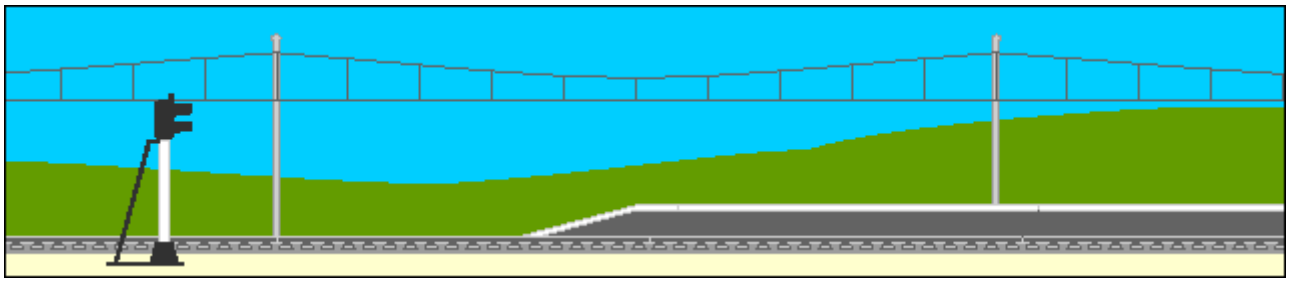
People wrt computers

- **People had to adapt to the need of computers**
- **People had to learn languages conceived for computers, not for the human mind**
- **Submitting tasks to computers was laborious and error prone**
- **Computers were conceived to process data, not to interact with people**

Still …

Using computers was challenging and fascinating

Computers had to keep running



Idle computer

Inverting the Man-Computer Relationship

- **Required extraordinary imagination and bravery**
- **Required rethinking the computer architecture**

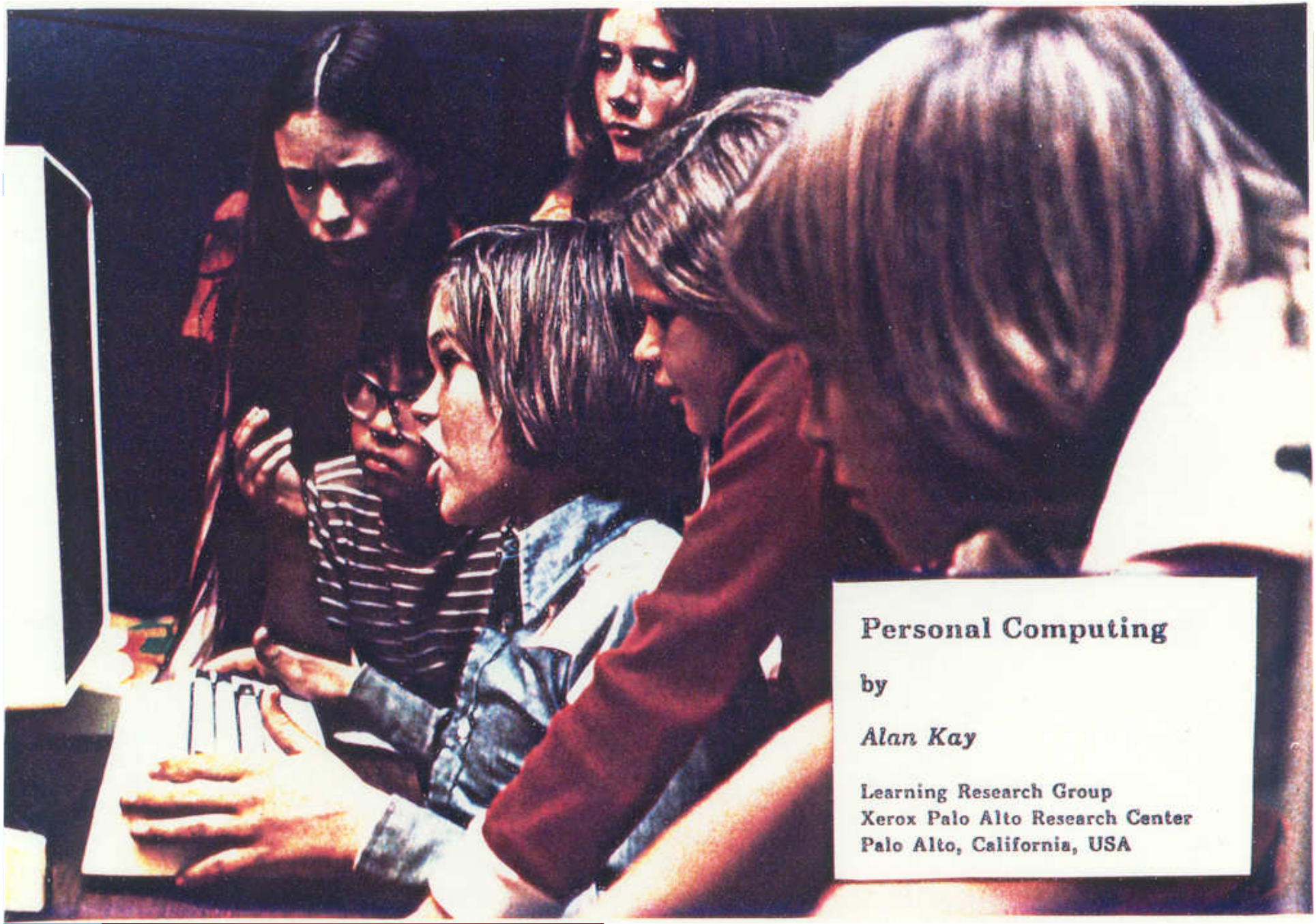
- **Computers were indeed slow and inadequate to sustain the rhythms of information handling that people are capable of**

High Data Rates

- **Display pages of text at high resolution**
- **images and pictures, audio, video and animations**
- **fast scrolling and search**
- **sharing of information**
- **interaction with others in real time through a network**

1975 - Pisa

- **Conference to celebrate 20 years of computer research in Pisa**
- **Organized by prof. Ugo Montanari, of the IEI, directed by prof. Gianfranco Capriz**
- **Alan Kay, invited by Luigia Carlucci and Mario Aiello, presented the paper “Personal Computing”**



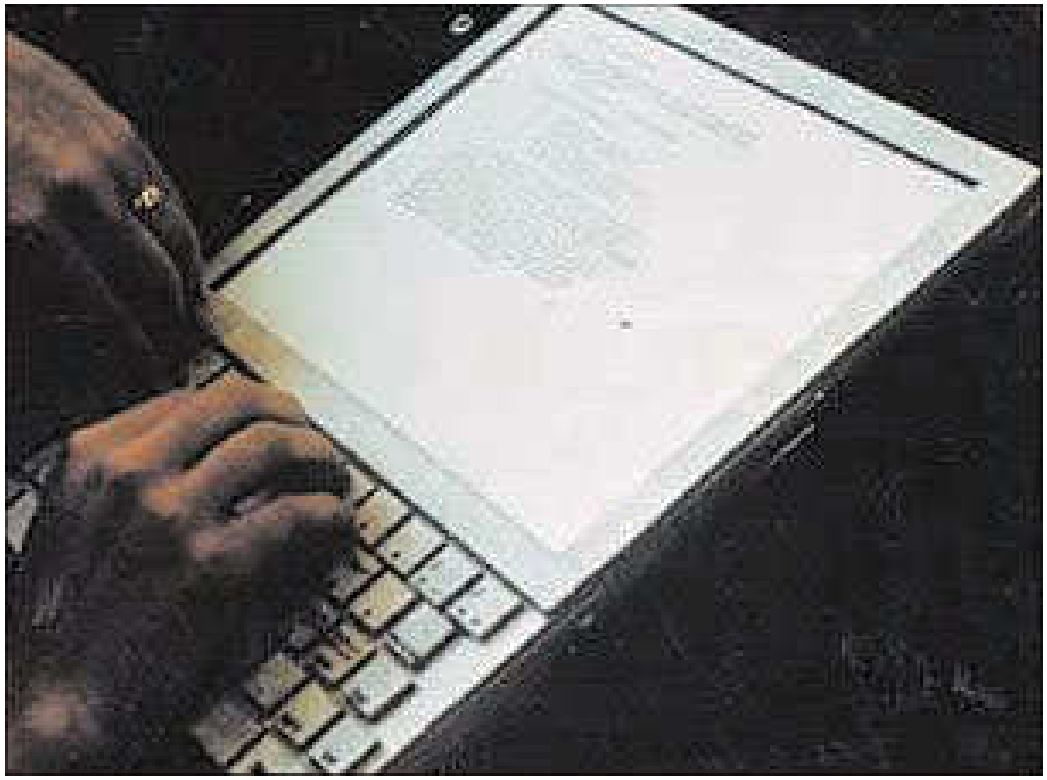
Personal Computing

by

Alan Kay

Learning Research Group
Xerox Palo Alto Research Center
Palo Alto, California, USA

The DynaBook Concept



Kay's Personal Computer

- **A quintessential device for expression and communication**
- **Had to be portable and networked**
- **For learning through experimentation, exploration and sharing**

New Technologies Required

- **Graphics**
- **Networking**
- **Media handling**
- **Signal processing**
- **Interactivity**

Long process

- **Took about 30 years to fulfill**
- **Alan Kay and his colleagues have the merit to have indicated the direction**
- **Fundamental steps already present in the Alto design:**
  - **Special graphics support (BitBlt)**
  - **Object-oriented design**

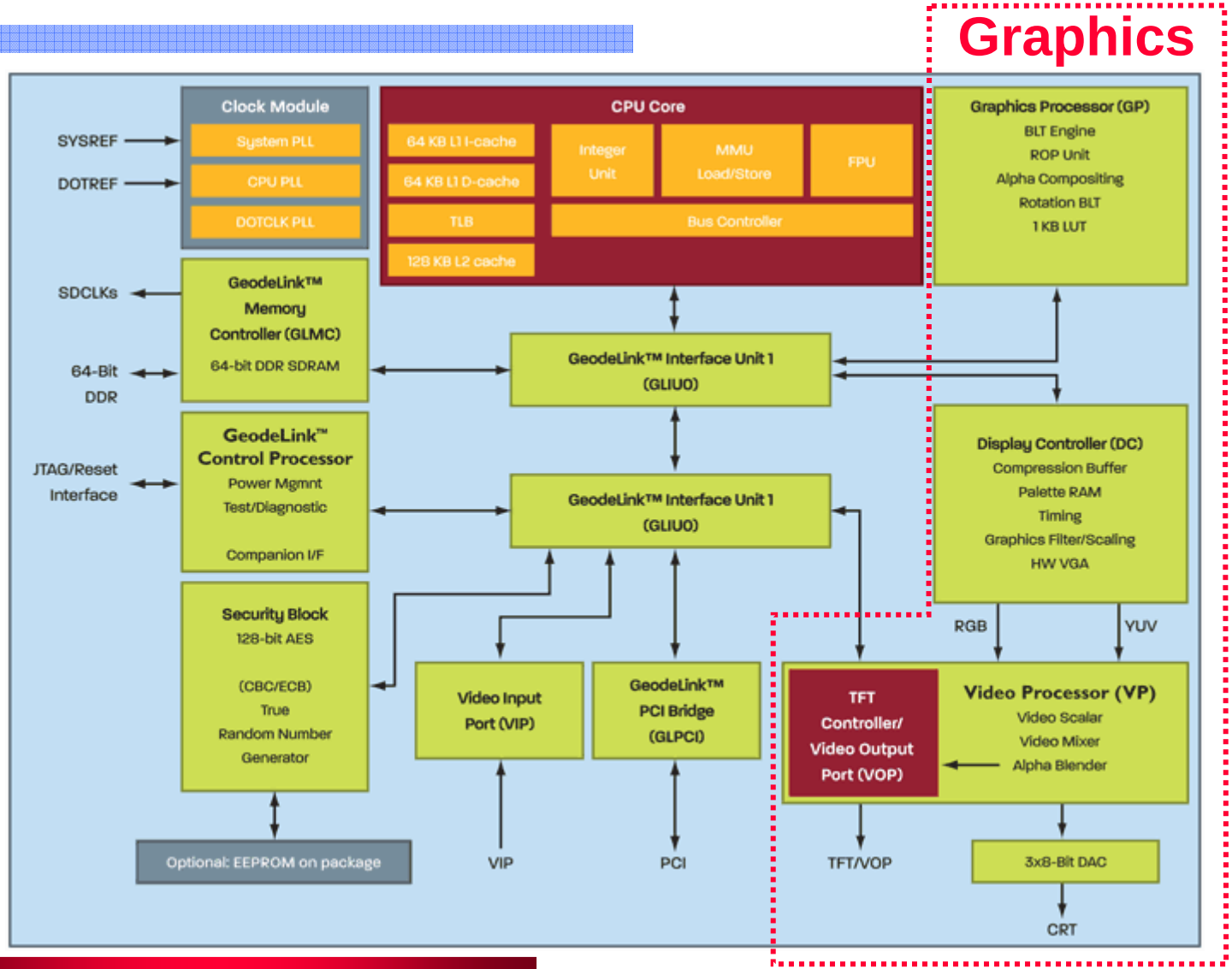
Graphics and Communication

- **Current PCs are equipped with dedicated graphics processors**
- **Capable of generating 3D animation in real-time**
- **Dedicated Media and Communication Processors handle audio/video and high speed networking**

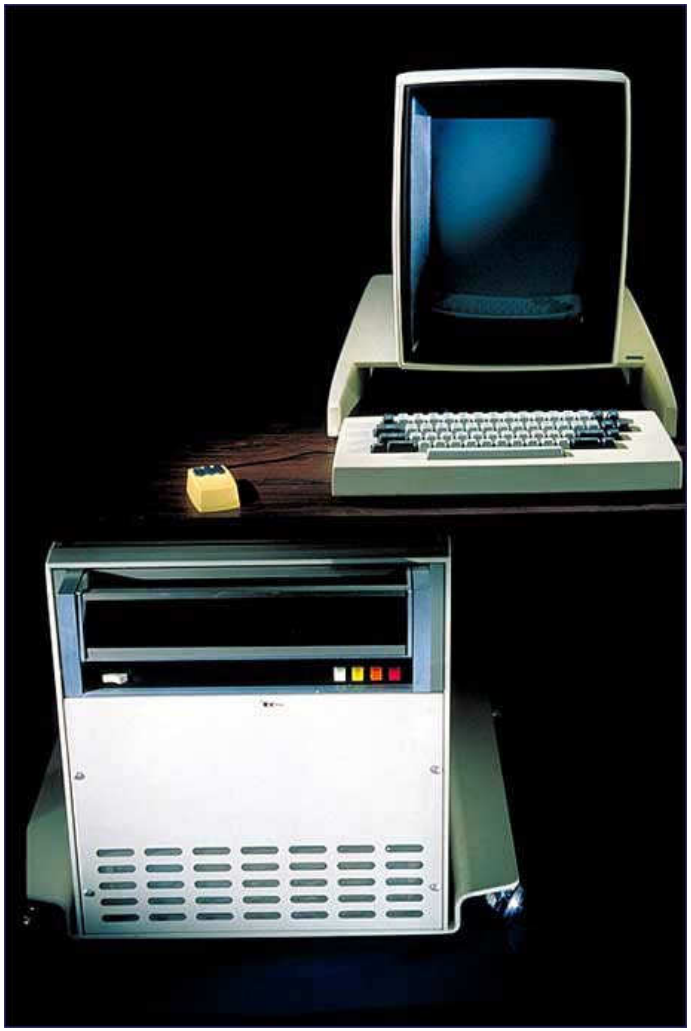
One Laptop Per Child

- **For the $ 100 laptop a processor was chosen which integrates CPU and GPU into a single chip**

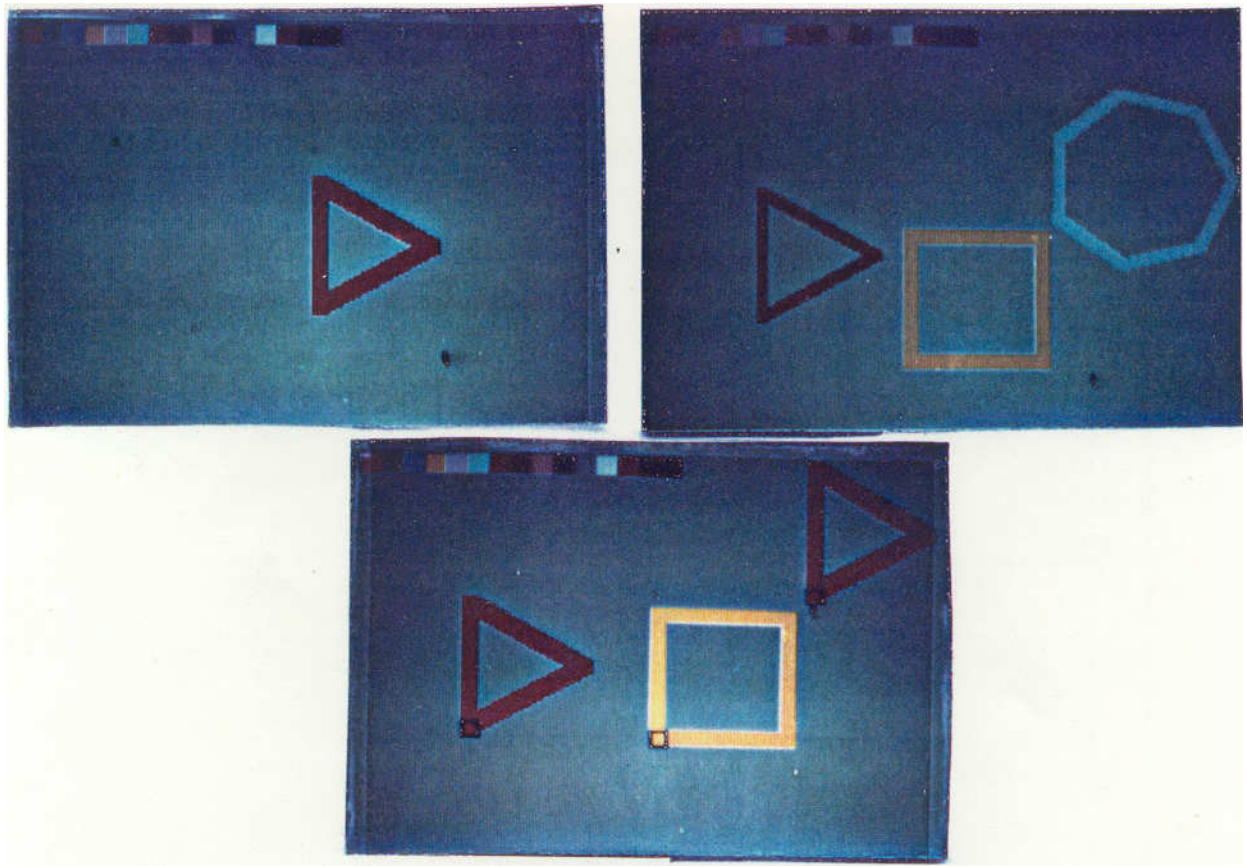
OLPC Geode Processor



Alto: The Interim DynaBook

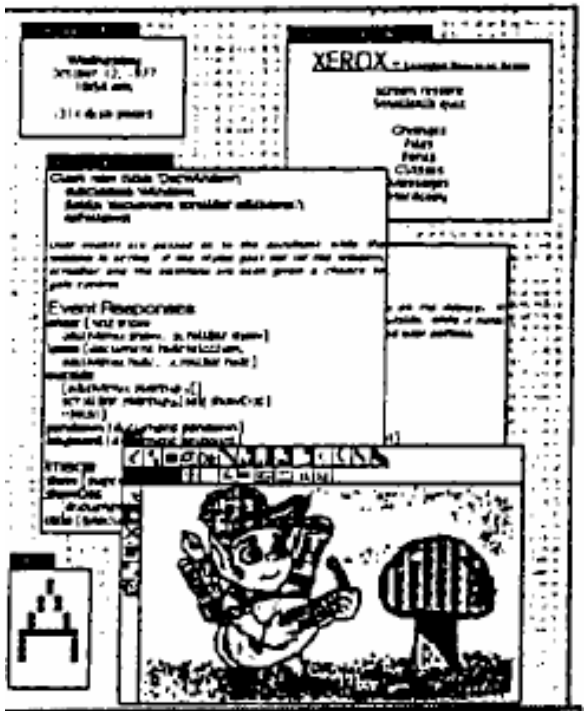


A Drawing Program



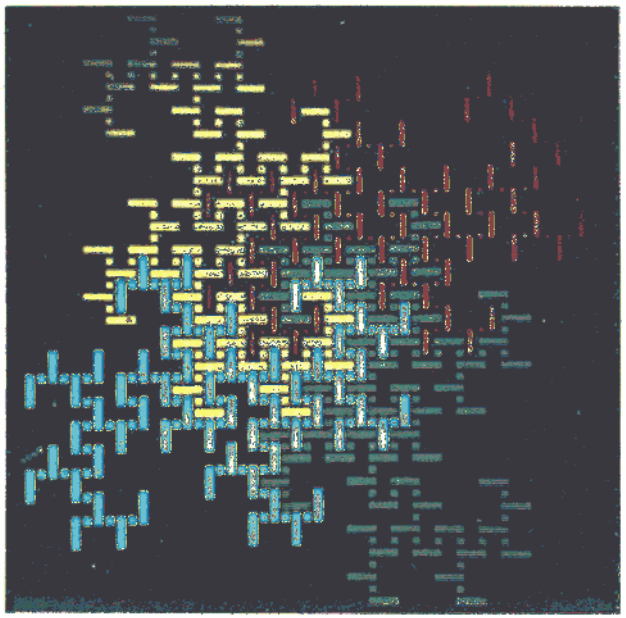
WYSIWYG Document Processing

What You See Is What You Get

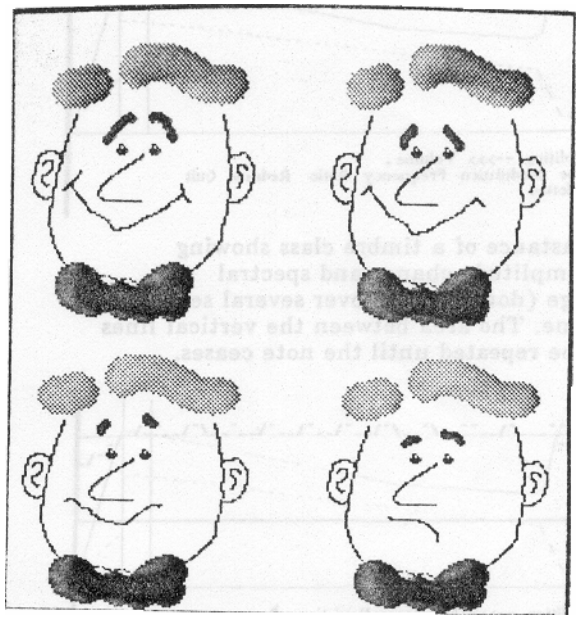


Smalltalk-76 User interface with a variety of applications, including a clock, font editor, painting and illustration editor with iconic menus and programmable radio buttons, a word processor document editor, and a class editor showing window interface code.

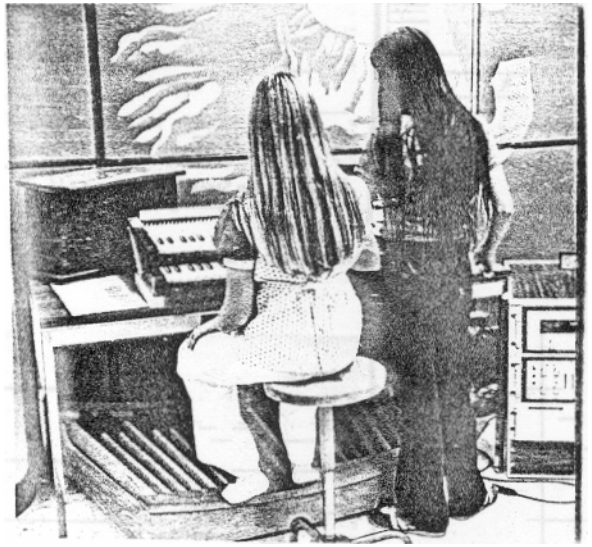
Turtle Graphics

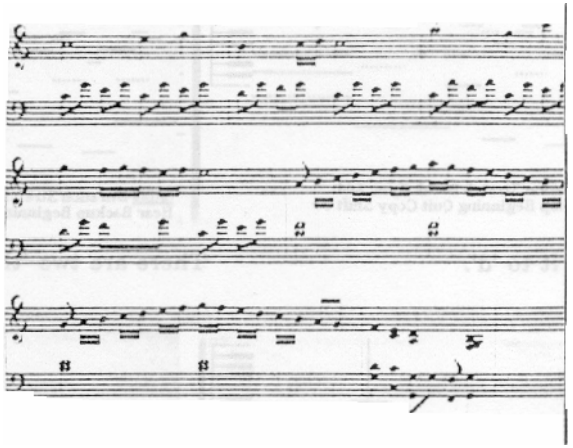


Picture Animation



Music Composition





Key User Interface Concepts

- **Direct Manipulation**
  - **with the mouse**
  - **point-and-click**
    - **Object-verb metaphor**
    - **Select, then act**
- **What You See Is What You Get**
  - **graphics, text, and media in the same document**

SmallTalk

- **An object-oriented programming language**
- **Inspired by Simula, SketchPad and Logo**

Fast forward to 2007

Personal Computer in the hands of billions of people is one of the major contributions of Informatics to our society

- Dedication of thousands of people
- Producing innovations and bringing them to fruition
- in one of the most dynamic industrial sectors
- Based on the scientific metaphor of communities which discuss, compete and share results
- Open Source Community

It was not inevitable

Grosh's Law

- **Computer performance increases as the square of the cost:**

  $$P = C^2$$

- **Hence, bigger computers are better.**
- **1965, by IBM's Herbert Grosch.**

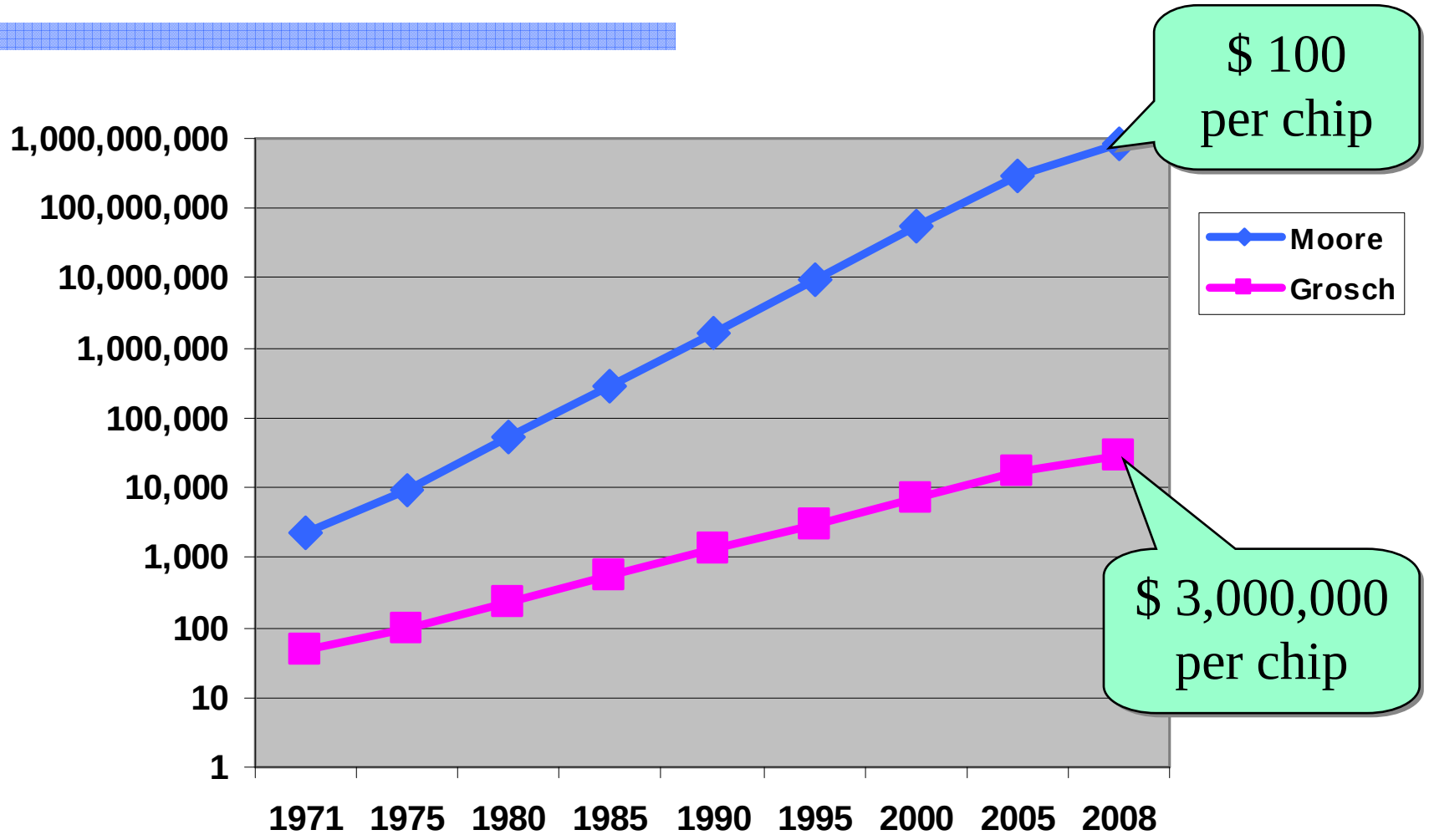
Moore's Law

- **Transistors densities double every two years at the same cost:**

  $T = 2^{y/2}$

- **In other words, in computing smaller is better.**
- **1965, by Gordon Moore of Intel.**

Grosch wrong, Moore correct



Metcalfe's Law

- **The value of a network is proportional to the *square* of the number of its nodes:**

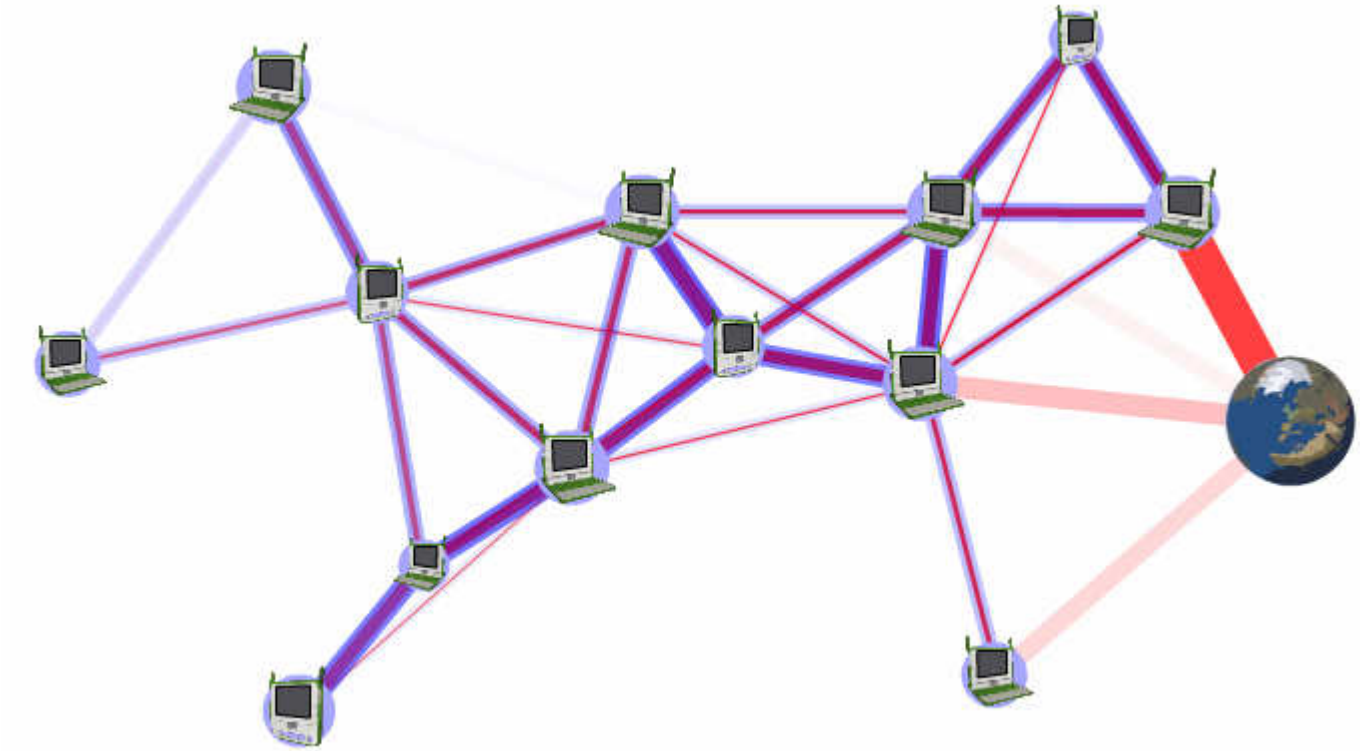
  $V = N^2$

OLPC networking

How to provide networking in countries where there is no telecommunication infrastructure?

Hopping through the pond

OLPC built-in wireless



Metcalfe

“Over the last 30 years, using Moore's Law and Metcalfe's Law, we have gone from zero to 1 billion people on the Internet.

Social networking is proliferating and evolving.

New collaboration modes are disrupting science, media and politics – for the better, I think.”

Inspiration

Luca Cardelli

- **2006 AITO Dahl-Nygaard Price for his contribution to the theory and practice of object-oriented languages**
- **He participated to the design of**

  Structured-Machine Object Oriented Machine

- **which influenced his:**
  - **abstract ML machine**
  - **Amber**

SMOM

MULTIPROCESSING IMPLEMENTATION OF A HIGH-LEVEL MACHINE LANGUAGE

LUCA CARDELLI^, GIANFRANCO PRINI^^, MARCO VANNESCHI

^ DEPARTMENT OF ARTIFICIAL INTELLIGENCE-UNIVERSITY OF EDINBURGH
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CORSO ITALIA 40 - I-56100 PISA - ITALY

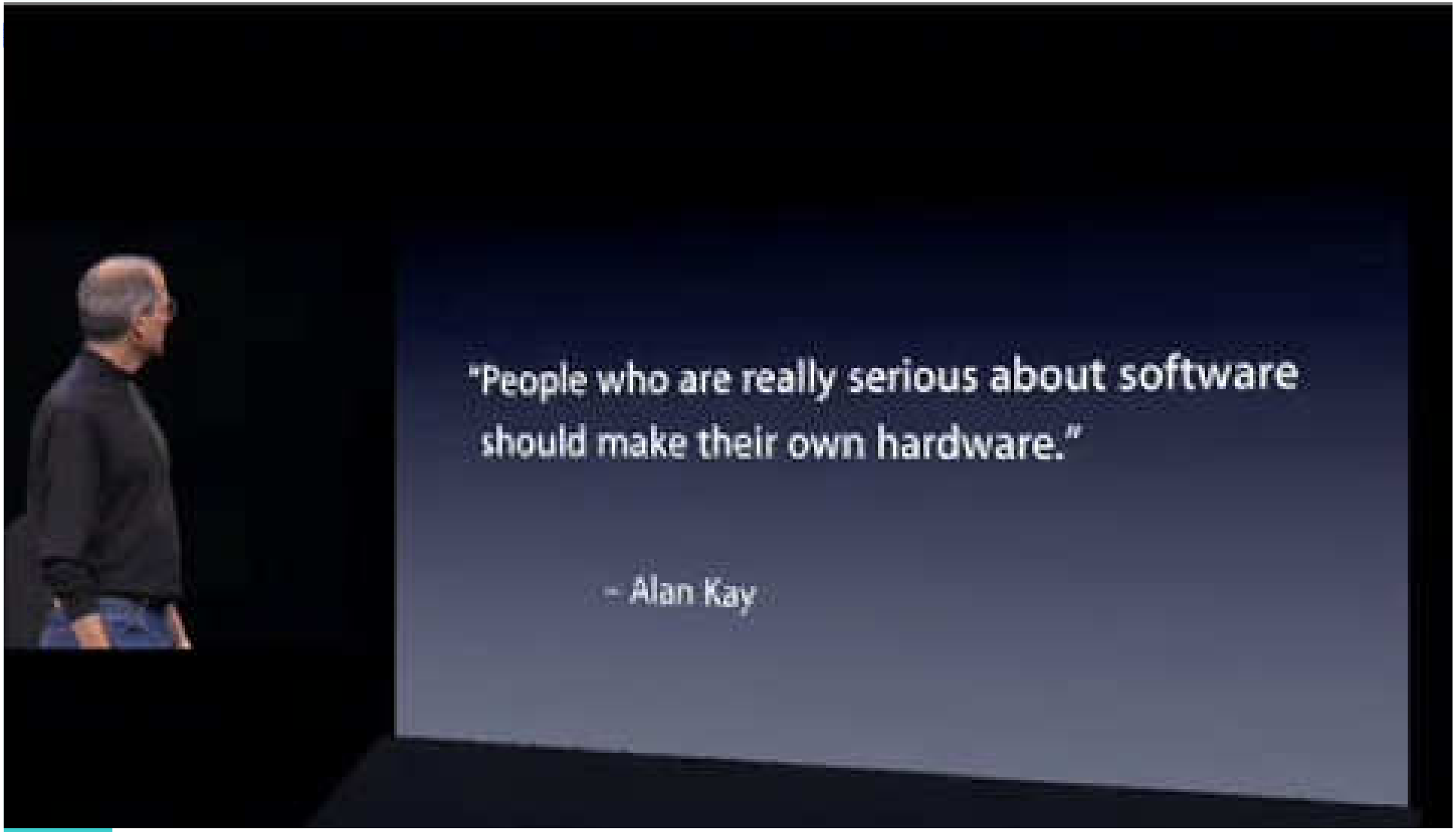
We present a high-level machine language called SMOM. It is a conventional zero-address machine language containing several high-level functions for defining and manipulating data types. Though SMOM does not allow parallel

Alan Kay's legendary quotes

"The best way to predict the future is to invent it!"

- Alan Kay

Steve Jobs keynote on iPhone



Special traits of Informatics

- **Not limited by physical and material constraints**
- **Offers the possibility of creating anything one can imagine**
- **Even entire new worlds (e.g. Second Life)**

Computer Science will never end to surprise while there are imaginative people willing to undertake new challenges.

Nicholas Negroponte and Alan Kay propose one such grand challenge:

a $ 100 laptop for all children

Priorities

- **In a globalized world where different cultures and societies confront each other and the problems of sustained development have become explosive, a top priority emerges:**

Education

Education and Peace

“Building Peace is the work of education, politics can only avoid War.”

– Maria Montessori

Education indirect effects

Emmanuel Todd's empirical truths:

- **in countries where the level of education is higher, the rate of birth decreases**
- **no two democratic states with a high degree of freedom and culture, have ever entered war with each other.**

Alan Kay dedication to developing tools for learning, discovering and sharing knowledge transcends a purely scientific and technological context.

Kay proposes us a dream and a hope

That people enlightened by knowledge might form peaceful communities where wealth, exchanges and knowledge will flourish

Wish

We wish to Alan Kay that his commitment towards the people of all the world and of all ages will succeed.

- **Valentina Conte. La Nazione**