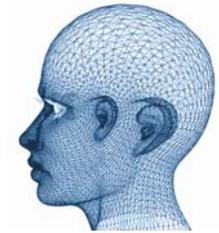


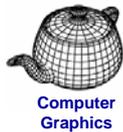
A Brief History of Computer Graphics



Ing. Luca Gardelli

lgardelli@deis.unibo.it
luca.gardelli@unibo.it

DEIS - Dipartimento di Elettronica Informatica e Sistemistica
Alma Mater Studiorum--Università di Bologna sede di Cesena
Via Venezia 52, 47023, Cesena (FC) Italy
Ph: +39 0547 339210 Fax: +39 0547 339208



1st Graphic Computer - Whirlwind

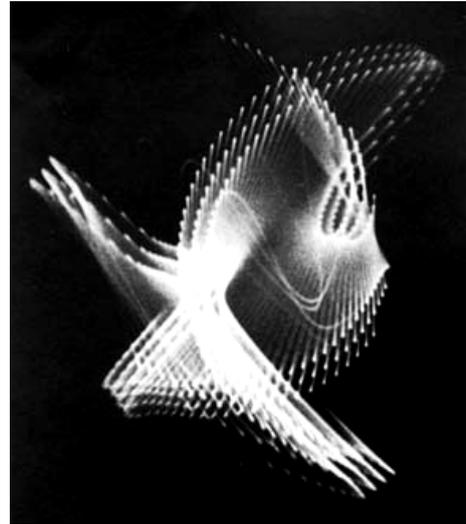
- Whirlwind development began in 1945 at MIT as part of a Navy project
- Whirlwind computer was ultimately adopted by the U.S. Air Force for use in its new SAGE air defense system in 1958
- It provided the CRT as a viable display and interaction interface, and introduced the light pen as an important input device





First Graphic Image

- Ben Laposky was a mathematician and artist from Iowa
- In 1950, he created the first graphic images generated by an electronic machine
- Manipulated electronic beams displayed across the fluorescent face of an oscilloscope's cathode-ray tube and then recorded onto high-speed film



Laposky's Oscillon 4



About Programming

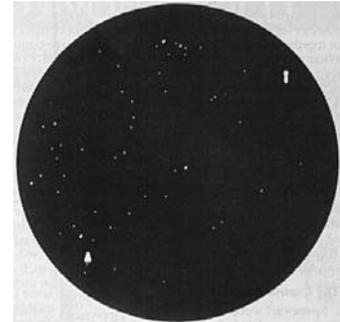
- Grace Hopper was a programmer which introduced the concept of software reusability
- In 1952 published a paper laying out the general concepts of language translation and compilers





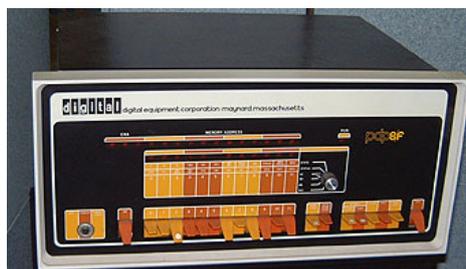
Industry - DEC

- 1957 - Olsen founded the Digital Equipment Corp. (DEC) – they developed the first commercial interactive computer the PDP-1
- The PDP-1 OS allowed more than 1 user!
- Steve Russell (1961) at MIT created the first computer game, *Spacewar* - it took about 200 man-hours
- A student of Russell later founded the Atari Corp.



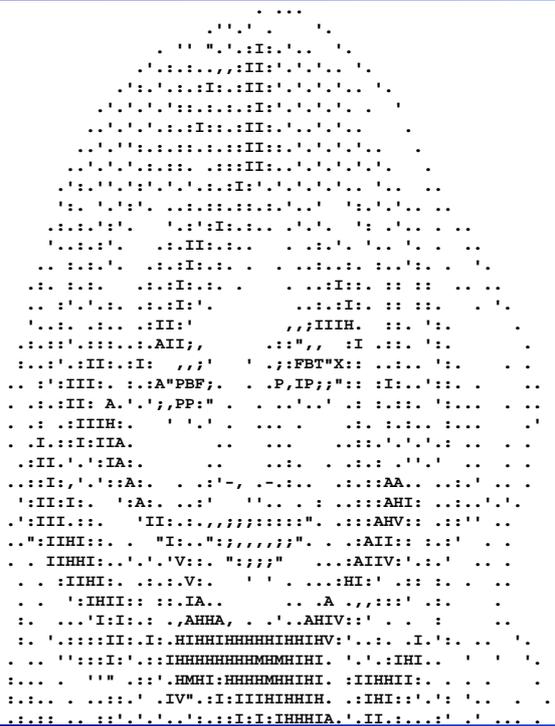
Industry - DEC

- PDP-8 (1964) a 12-bit word machine that sold for about \$16,000 – it is regarded as the first minicomputer.
- PDP-11 switched to a 16-bit word and 64K address space
- Bell Labs developed the UNIX OS for the PDP-11 – PDP-11 influenced the development of C language

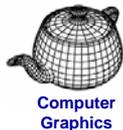




Graphics with Plotters



- Before vector and raster, graphics was printed as a combination of characters (late 1950s)
- This approach is now known as ASCII art and quite diffused among computer geeks



Sutherland's Sketchpad

- Sutherland wrote the first computer drawing program during his PhD in 1963
- His software used a lightpen to draw on a CRT display
- He developed many aspects like line-drawing, zooming, data structures
- He is now acknowledged as the grandfather of graphic interfaces

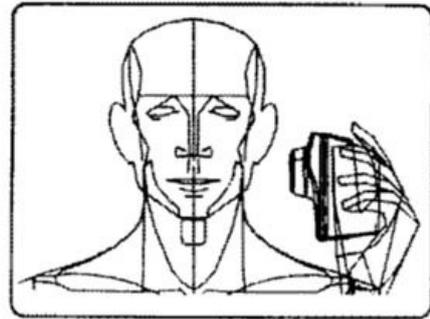
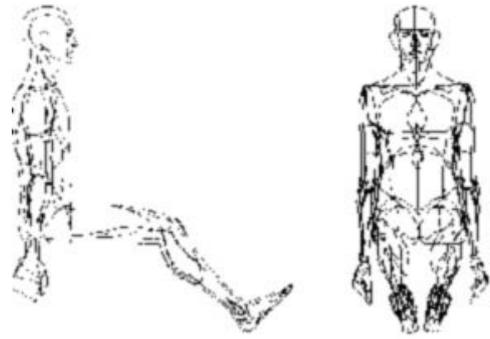


copyright: SUN Microsystems



Drawing with a Computer

- **William Fetter was a graphic designer for Boeing Aircraft Co. and in 1960**
- **He is credited with coining the phrase "Computer Graphics"**



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Industry - IBM

- IBM in 1964 developed the first CAD application the DAC-1 for General Motors using IBM hardware equipment
- It already possessed some features common in modern 3D CAD software
- IBM developed also the CRT display 2250 which was a *vector device* with 1024x1024 resolution over a 12x12 inch display screen

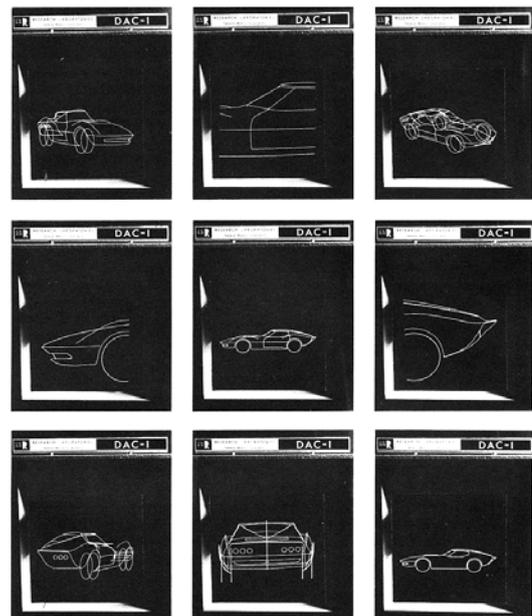


FIG. 1-8 Scale expansion, rotation, and partial views in a DAC-1 design exercise.

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Industry - DEC

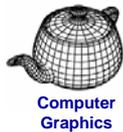
- In 1978 DEC developed the VAX 11/780 which conquered the mini-computer market... for a while...



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Industry – Display devices

- The industry from the late 60's developed several type of screen most based on CRT
- On the right see the Tektronix 4010
- In 1964 was developed the first *plasma panel* at the University of Illinois. The technology used arrays of cells filled with neon gas, sandwiched between glass. Capacitors at each cell provided the driving circuitry to address and activate each cell.
- Although, it was too early for the plasma panel to take over the market of computer displays...



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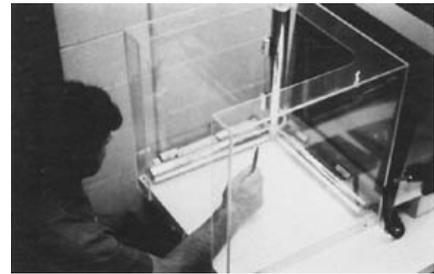
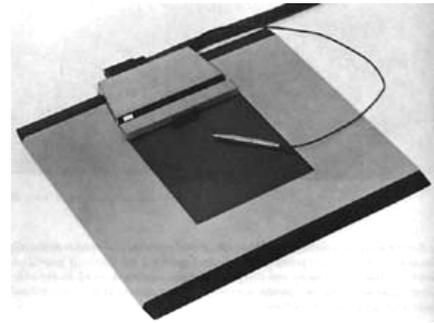
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Industry – Input Devices

- Tom Diamond in 1957 worked on handwriting recognition using a tablet that detected the regions of interaction
- The *Rand Tablet* consisted of a matrix of crossed conductors coding individual locations
- The *sonic pen* (1970) instead used triangulation and microphones to locate in a 3D space a stylus emitting sounds



Industry – The mouse

- Between 1960s and 1970s Douglas Englebart developed a device to ease computer interaction
- The first mouse, when rolled over a surface, was able to measure change in speed and position
- A button press generated a selection event





Research - MIT

- Coons (1950s-1960s at MIT) developed the formulation of “surface patches” to improve the process of design
- He laid the foundation for the mathematical description of surfaces – later refined by Bezier at Renault
- A patch was a surface resulting from interpolation of boundary curves
- Lawrence Roberts (1965 at MIT) wrote the first algorithm to eliminate hidden or obscured surfaces from a perspective picture
- Sutherland in the late 1960s developed expertise in human-computer interaction and augmented reality



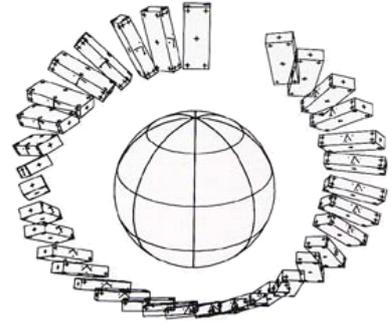
Computer Graphics at MIT

- Gyorgy Kepes founded The *Center for Advanced Visual Studies* at MIT (1967) - combine the efforts of the disciplines of art and science
<http://cavs.mit.edu/>
- Nicholas Negroponte and Jerome Wiesner founded in 1980 the *Media Lab* at MIT to explore aspects related to multimedia and human-device interaction by combining expertise developed in different disciplines <http://www.media.mit.edu>



Research – Bell Labs

- At Bell Labs during the 1960s were developed a lot of techniques about human perception and animation
- E. Zajac produced one of the first computer generated films in history in 1961
- Images were represented as characters or dots
- First experiments on scientific visualization



Research – University of Utah

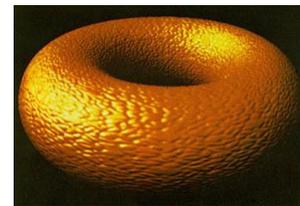
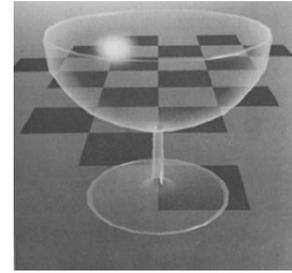
- Evans led the research in CG at University of Utah shaping and promoting the field (1970s)
- His group developed a lot of techniques hidden surface removal, scan line coherence, rendering, z-buffer, patch rendering, texture mapping, shadows, antialiasing, lighting and shading, atmospheric effects, facial animation, splines
- The group included people like Blinn, Phong, Catmull, Newell and others :)





Research – University of Utah

- They developed the first motion-capture system and a famous software raster package for editing images in Unix OS
- People involved in Utah later were in industry: Silicon Graphics, Adobe, Atari, Netscape, Pixar, etc.
- The research now continue in the Geometric Design and Computation group <http://www.cs.utah.edu/gdc/>



Research – 1970s-1980s

- Several Universities devoted to CG
- Cornell – illumination, rendering and radiosity
- NYIT – developed painting software talents were hired by Lucas to work on SFX and started Pixar
- University of North Carolina – worked on hardware acceleration, virtual reality
- Cal Tech – several people involved in different fields – rendering equation





Research - GUI

- GUI – Graphical User Interface is an interface for issuing commands with a pointing device
- The idea of GUI was presented by Alan Kay at University of Utah in the 1970s
- Then the research on GUIs was developed at Xerox PARC labs
- The objective was to reach a WYSIWYG between computer edited documents and printed ones

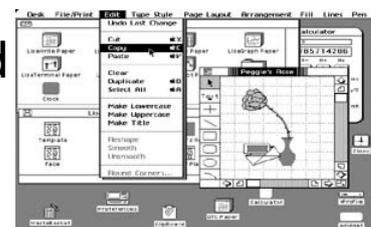


Xerox Star -1982
First commercial computer to use GUI and desktop metaphor



Industry - GUI

- Steve Jobs liked what PARC had done with the GUI
- In January 1983, Apple Computer officially unveiled the Lisa
- The Apple Lisa did not sell well because, like the Xerox STAR, it was too expensive
- Macintosh was the first personal computer with a GUI to be marketed successfully because of its more reasonable price





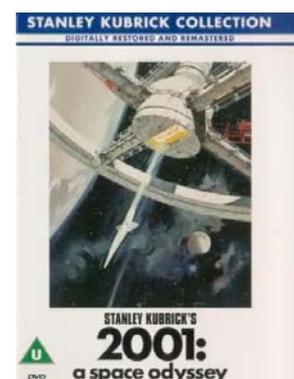
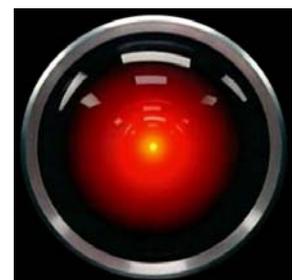
Industry - GUI

- The IBM PC was more popular with businesses than the Mac even though it didn't have a GUI
- Later Windows appeared to copy many of the same metaphors and icons as the Mac GUI with just the names changed
- Windows became more popular not because it was better than the Mac OS, but because it was more open, and could run on millions of IBM PC



Industry - Movies

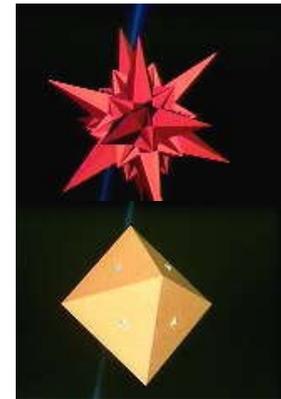
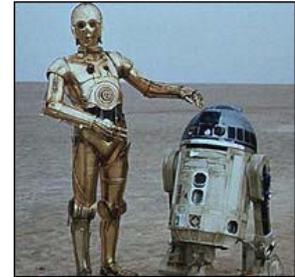
- Contrarily to what is widely believed *2001: A Space Odyssey* (1968) is not the first movie using CG SFX
- Although, they tried to guess how the computer would have been in the future – HAL 9000
- The first movie using CG SFX probably is *Westworld* (1973)
- Later *Futureworld* (1976) included an animated scene of a human face





Industry - Movies

- In the late 1970s George Lucas founded Industrial Light and Magic (ILM) to develop SFX for his movie Star Wars (1977)
- Wal Disney's *Tron* – a combination of CG and live action (1982) – on the right the *bit character* (2 states)



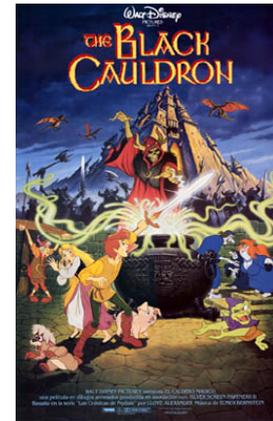
Industry - Movies

- In 1980s started a lot of companies in the hardware and software field like
 - Silicon Graphics Inc. (SGI)
 - Wavefront
 - Alias
 - Autodesk
 - Softimage
- The process of creating art for movies got a speedup with these powerful tools



Industry - Movies

- “Where the wild things are” (1982-83) - A pioneering 35mm film test, digitally compositing 3D CG backgrounds with traditionally animated characters.
- The first movie featuring 3D animation was Disney’s *The Black Cauldron* (1985)
- In *The Young Sherlock Holmes* Lucasfilm developed the animation of a knight (1985)



Industry - Pixar

- In 1986 Pixar was formed when Steve Jobs (the actual CEO of Apple!) purchased of Lucasfilm CG by from George Lucas
- They produced Renderman, the famous photo-realistic rendering engine
- Then they feature a lot of movies *Luxo Jr.* (1986), *Red’s Dream* (1987), *Tin Toy* (1988), *Knick Knack* (1989), *Toy Story* (1995) which is the movie they have been recognised worldwide





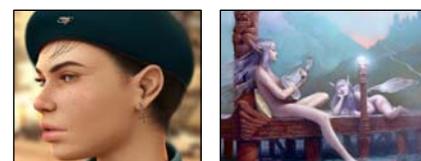
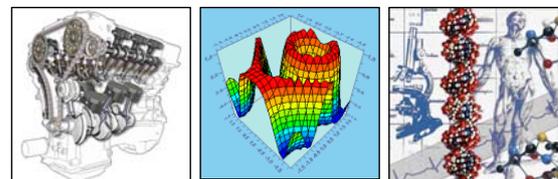
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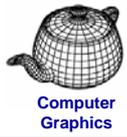
- **Computer Graphics** is concerned with the editing, acquisition and visualization of images mediated by electronic devices
- It's a very active field combining techniques developed in several disciplines
 - Electronics, Computer Science
 - Mathematics and natural sciences
 - Psychology
 - Mechanics
 - Drawing, Sculpting, Photography



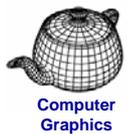
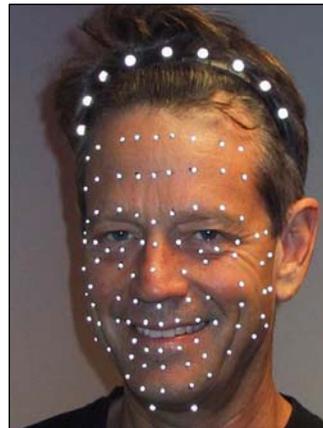
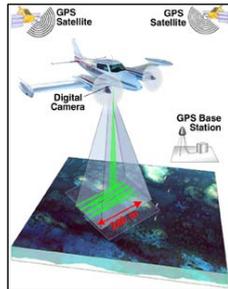
Applications

1. Entertainment
 - Movies
 - Videogame
2. Medical / Scientific
 - Data visualization
 - Prototyping
 - Virtual Reality
3. Mechanics / Architectural
 - Design (CAD/CAM)
4. Art / Industrial Design
 - Support to traditional arts
 - New kind of arts??

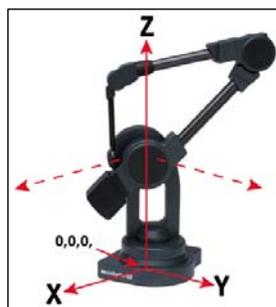


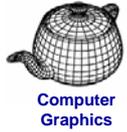


Hardware



Hardware - Scanner 3D





Resources

- There still not exist a book dedicated to the history of computer graphics, since the facts are relatively recent
- You can found interesting infos in online computer history museums like <http://www.computerhistory.org>
- A more specific resource is *A Critical History of Computer Graphics* by Wayne Carlos <http://accad.osu.edu/~waynec/history/ID797.html>