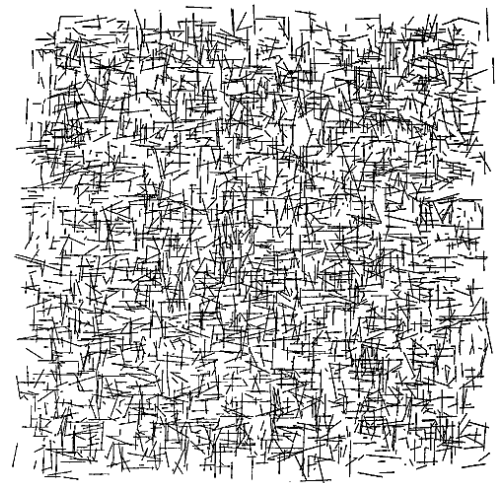
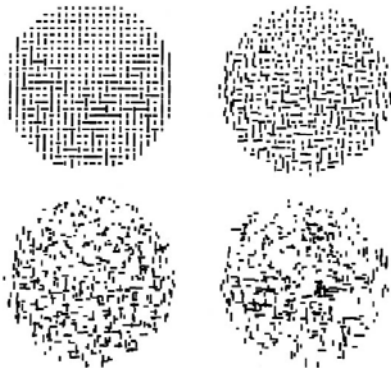


## computers and visual art



Vera Molnar



A. Michael Noll



Joan Truckenbrod



AARON / Harold Cohen

## computers and art

“In my mind, the creative aspects of science and art involve many of the same ‘how, why, and what’ questions. Both disciplines deal with theories, set up problems, experiment with possibilities and help us understand the world we live in.”

- Karen Guzak, from “Between Geometry and Gesture”, Leonardo, Vol. 30, No.1, 1997

## computer art: a brief history

“history of computer art is interwoven with the history of computer technology and its uses”

– Anne Morgan Spalter

## pre-computer art

- Jacquard loom could weave patterns according to instructions encoded in punched cards (early 1800s)
- general-purpose computing devices envisioned by Charles Babbage, Ada Lovelace (mid 1800s)
- first electronic computer, the ENIAC, completed in 1946, motivated by goals of mathematical calculations and military research

## 1950s

- computers were used primarily for mathematical calculation
  - a historical accident?
- IBM concludes that five computers sufficient for U.S. market
- little access to computers for artists

## mid 1950s – early 1970s

- computer-driven pen plotters enable computer line drawing
  - like big Etch-a-Sketch machines
  - incapable of filling areas
- images produced using line-drawing algorithms
  - access, programming expertise needed

## pen plotter



## 1960s - early 1970s

- first computer graphics group at Boeing
- early examples of computer animation
- computers used to explore conceptual art, “laws of aesthetics”

## Vera Molnar

- line drawing, geometric art
- “This may sound paradoxical, but the machine, which is thought to be cold and inhuman, can help to realize what is most subjective, unattainable, and profound in a human being.”  
- Vera Molnar
- <http://www.dam.org/molnar/>
- <http://eventos.fct.unl.pt/iaea2004/vera.htm>

“Vera Molnar holds that the computer can serve four purposes. The first concerns its technical promise - it **widens the area of the possible** with its infinite array of forms and colors, and particularly with the development of virtual space. Secondly, the computer can **satisfy the desire for artistic innovations** .... Thirdly, the computer can **encourage the mind to work in new ways**. Molnar believes that artists often pass far too quickly from the idea to the realization of the work. The computer can create images that can be stored for longer... Finally, Molnar thinks that the computer can **help the artist by measuring the physiological reactions of the audience**, their eye movements for example, thus bringing the creative process into closer accordance with its products and their effects.”

– Frank Popper

## A. Michael Noll's experiment

- used computers to explore roles of randomness and chance in "laws of aesthetics"
- used random number generators to add variation to drawings
- generated fake Mondrian drawings: examined people's preferences
- see [www.dam.org/noll](http://www.dam.org/noll)

## technology developments in the 1960s

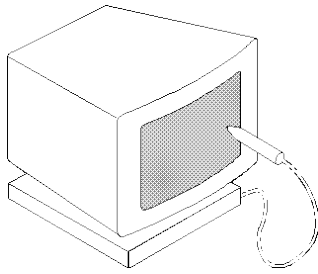
- development of *raster graphics* systems
- also new input devices, such as tablets, light pen, mouse

## raster graphics

- screen is a 2D array of phosphor dots, turned on/off by a beam that sweeps the screen
- beam sweeps row by row (raster by raster)
- areas can be filled in, unlike plotter-like systems
- digital representation of images has changed

- raster graphics enabled visually realistic interactive graphics
  - technology accessible beyond programmers
  - capabilities to flip, scale, juxtapose pictures
  - new ways to experiment with colour
- Sketchpad developed by Sutherland in 1960s
  - allowed images to be drawn interactively with a light pen
- innovations at Xerox PARC in early 1970s lead to GUIs

## light pen



## computer art in 1970s and 1980s

- use of computer graphics in fields of design, architecture
- experiments with photographic images
- use of computers in art analysis
- still expensive, also some stigma

## Lillian Schwartz

- early computer artist
- pioneer in use of computer for *analysis of art*, techniques and creative processes of artists
- see [www.lillian.com](http://www.lillian.com)

## Joan Truckenbrod

- line-drawing art in 1970s
- used early Apple computer to generate algorithmic images that were transferred to textiles
- early work on manipulation of photographic images
- see [www.dam.org/truckenbrod](http://www.dam.org/truckenbrod)

## 1990s

- computers increasingly affordable and powerful
- huge investment in graphics technology (spurred by movie industry, as well as design world)
- many, many new technologies:
  - 3D graphics and animation tools
  - world wide web
  - immersive (CAVE) environments
- steep learning curve for many new technologies

## themes/forms of digital art

- artificial life, artificial worlds
  - e.g., [www.dam.org/mantz/landscape.htm](http://www.dam.org/mantz/landscape.htm)
- internet art: building on internet medium
  - e.g., <http://art.teleporacia.org>
  - e.g., [www.netomat.net/original](http://www.netomat.net/original)

“In today's world of internet browsers, netomat(TM) has the feel of an anti-browser... It atomizes text, images and audio loosening them from web sites and web pages. This allows the data to be recombined or viewed independently in a context determined by you.”

- and much more!

## Harold Cohen's AARON

- Harold Cohen, a successful English painter, started experimenting with computers in 1968
- began working on developing artificial intelligence (AI) systems for painting in 1973, leading to "robot painter" AARON
- see [dam.org/cohen/](http://dam.org/cohen/)
- *Food for thought: From whose creativity spring AARON's paintings?*

"[...] I came to computing after a reasonably successful twenty-year career as a painter, at a stage in which I was feeling increasingly frustrated by my own lack of understanding of how painting "works" [...]

**My need wasn't to make art** — I knew very well how to do that — **but to understand what art is.** [...] It is nonsense (left-brain, right-brain bla-bla) to say that programming is too difficult for artists to learn. **Anyone can learn anything if they really need to be able to do it.** And if the need is powerful enough it really doesn't matter how long it takes. It's a sight harder to learn programming when you're forty, as I was, than when you're twenty — and it was a sight harder thirty-five years ago than it is today.

– Harold Cohen

## resources

- "The Computer in the Visual Arts"  
by Anne Morgan Spalter  
– [www.cs.brown.edu/people/ams/](http://www.cs.brown.edu/people/ams/)
- Leonardo: Journal of the International Society for the Arts, Sciences and Technology
- Internet Art Database: <http://dart.fine-art.com>
- the Digital Art Museum: [www.dam.org/](http://www.dam.org/)
- Ultimate Paint home page: [www.ultimatepaint.com](http://www.ultimatepaint.com)

## projects

- Sid Fels, ECE, UBC
  - several projects that explore human-computer interaction through art, see [www.ece.ubc.ca/~ssfels/introduction.html](http://www.ece.ubc.ca/~ssfels/introduction.html)
- Holger Hoos, CS, UBC
  - digital paintings: [www.cs.ubc.ca/~hoos/art.html](http://www.cs.ubc.ca/~hoos/art.html)
- graphics projects at UBC
  - <http://www.cs.ubc.ca/labs/imager/imager-web/Research/graphics.html>
- graphics projects at U. Washington
  - <http://grail.cs.washington.edu/projects/>