

Vector Graphics in Cuis

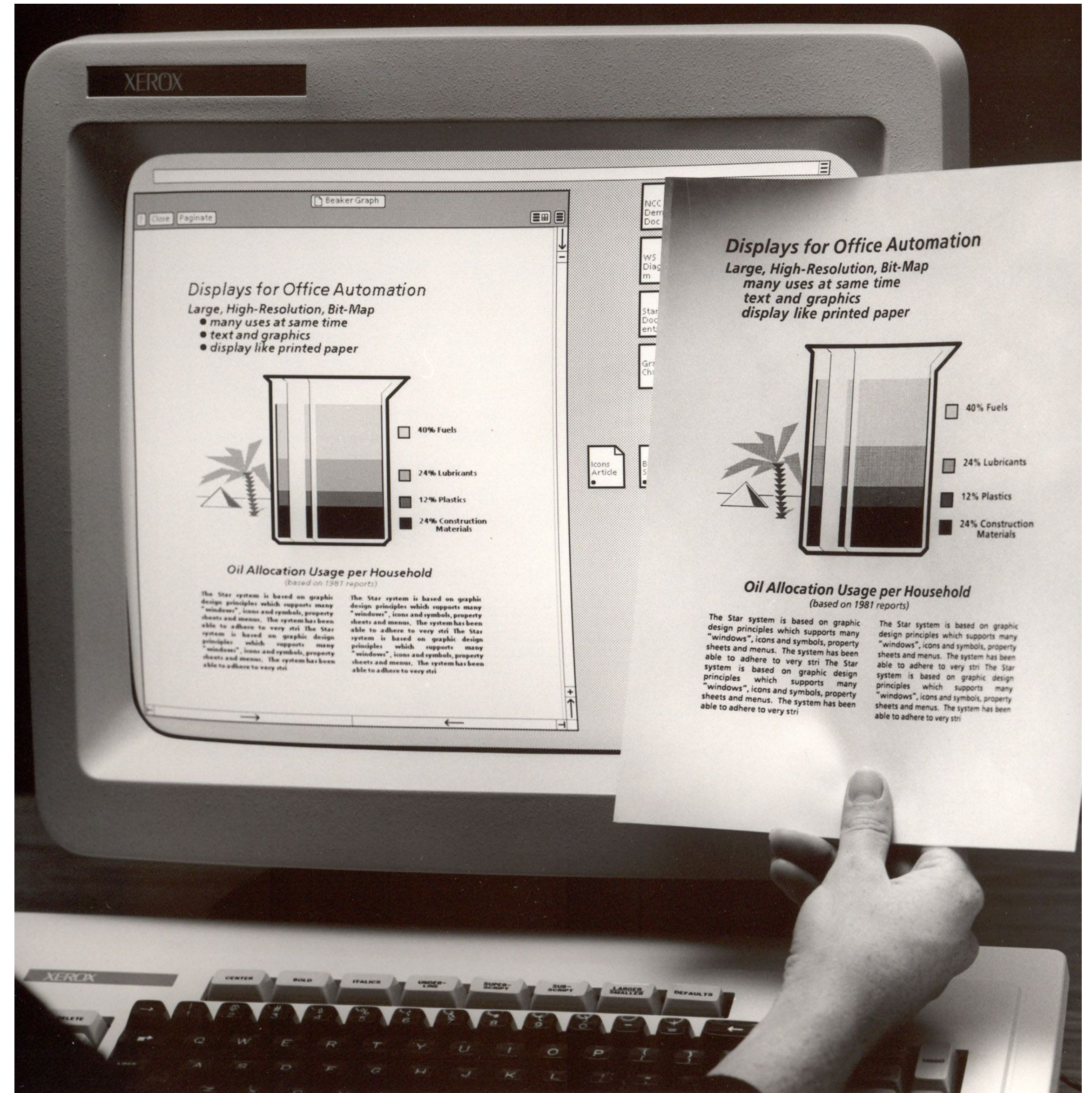
A pixel independent Zoomable User Interface

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Computer Graphics

And Printer Graphics!

- Xerox Alto and Star
- “What you see is what you get”
- Display and printed page show the same content.
- Display: 1 bpp, 80 dpi
- Printer: 1 bpp, 300 dpi



But they diverged over time

Computer Displays

Got better at... (But not at...)

- + Interactivity
- + Speed (many display updates per second)
- + Gray and Color depth (several bits, many possible colors in each pixel)
- - Stayed low resolution
- - Resolution independence of content (UI is pixel resolution specific)
- - Portability (UI is specific for each computer platform)

Printers

Got better at... (But not at...)

- + Pixel resolution and quality
- + Resolution independence (same content on different printer models)
- + Portability (Tex, Postscript, PDF)
- - Gray and Color depth (sticking to 1 bpp and halftoning)
- - Speed (may take more than one second to print a page)

But in recent years

- Computer got way faster
- Displays have much higher resolution (although software doesn't know what to do with that!)

It is now possible to build GUIs that

- Have the rich content and graphic quality of a good printed page
- Are scalable to whatever zoom level the user prefers
- Are interactive and react quickly to user actions
- Look well on any kind of Display and pixel resolution

Vector Graphics User Interface

**A rather old idea (remember NeWS and Display Postscript)
Whose time has finally come**

For this I built

A new Smalltalk system, open to evolution: Cuis

A new, redesigned UI framework: Morphic 3

**A new, high quality + high performance vector
graphics engine**

Cuis Smalltalk

An Open Source Smalltalk system

- Simple enough to continue evolving instead of becoming legacy software
- Without becoming simplistic: a complete and portable Smalltalk system
- Running on the OpenSmalltalk virtual machine
- A practical system, used for teaching, Satellite image processing, research in signal, image and audio processing, research in programming languages, and many other areas of application
- <https://github.com/Cuis-Smalltalk/Cuis-Smalltalk-Dev>

Morphic 3

A Vector Graphics redesign of Morphic

- All coordinates are Floating Point (they don't specify pixels)
- All coordinates are relative to a Morph's local Coordinate System
- Coordinate Systems can be scaled and rotated (resolution independence)
- Vector Graphics primitives and art preferred to pixel oriented ones
- Rasterization done with a new Vector Graphics engine

Vector Graphics Engine

“Prefiltering Antialiasing for General Vector Graphics”

- Existing rasterizer such as Skia or Cairo are based on pixel coverage antialiasing. This are conventional Computer Graphics algorithms, where each pixel is considered a square area on the display.
- Instead, we use a novel technique based on Signal Processing theory, where each pixel is considered a sample in a signal.
- This allows much greater flexibility in the design of the antialiasing filter.
- The result is natural looking results without pixellation at any pixel resolution.
- https://www.researchgate.net/publication/267152327_Prefiltering_Antialiasing_for_General_Vector_Graphics

Demo

Based on chapter 7 of “The Cuis Book”

- <https://cuis-smalltalk.github.io/TheCuisBook/>
- <https://github.com/Cuis-Smalltalk/TheCuisBook/releases/download/20201230/TheCuisBook.pdf>
- Book written by Hilaire Fernandes with Ken Dickey and Juan Vuletich