



Graphical User Interface Design and Programming

User interfaces
history and design processes



Overview

- The history of user interfaces
- User-centered design
- LUCID model
- User interface builders



User interfaces needs

- Komputer lebih kompleks daripada physical devices lainnya.
- Kebanyakan aplikasi komputer membutuhkan komponen yang mampu memberikan interaksi langsung dengan user.



User interface evolution

50s - Interface pada tingkat hardware - switch panels

60-70s - Interface pada tingkat programming - COBOL, FORTRAN

70-90s - Interface pada tingkat terminal - command languages

80s - Interface pada tingkat interaction dialogue - GUIs, multimedia

90s - Interface at work setting - networked systems, groupware

00s - Interface menjadi pervasive - RF tags, Bluetooth technology, mobile devices, consumer electronics, interactive screens, embedded technology



Graphical user interface evolution

- Pada mulanya CRT and pen devices mempengaruhi perkembangan bidang computer graphics.
- Perkembangan dari algorithms dan hardware membuat display & manipulation lebih realistik.
- Pentingnya membuat GUI termasuk juga mouse, bitmapped displays, personal computers, windows, desktop metaphor, dan point-and-click editors.



Text mode interface

```
Darkness                                     Score: 0      Moves: 1

THE HITCHHIKER'S GUIDE TO THE GALAXY
Infocom interactive fiction - a science fiction story
Copyright (c) 1984 by Infocom, Inc. All rights reserved.
Release 31 / Serial number 871119 / Interpreter 6 Version E

You wake up. The room is spinning very gently round your head. Or at least it
would be if you could see it which you can't.

It is pitch black.

>stand up
Very difficult, but you manage it. The room is still spinning. It dips and
sways a little.

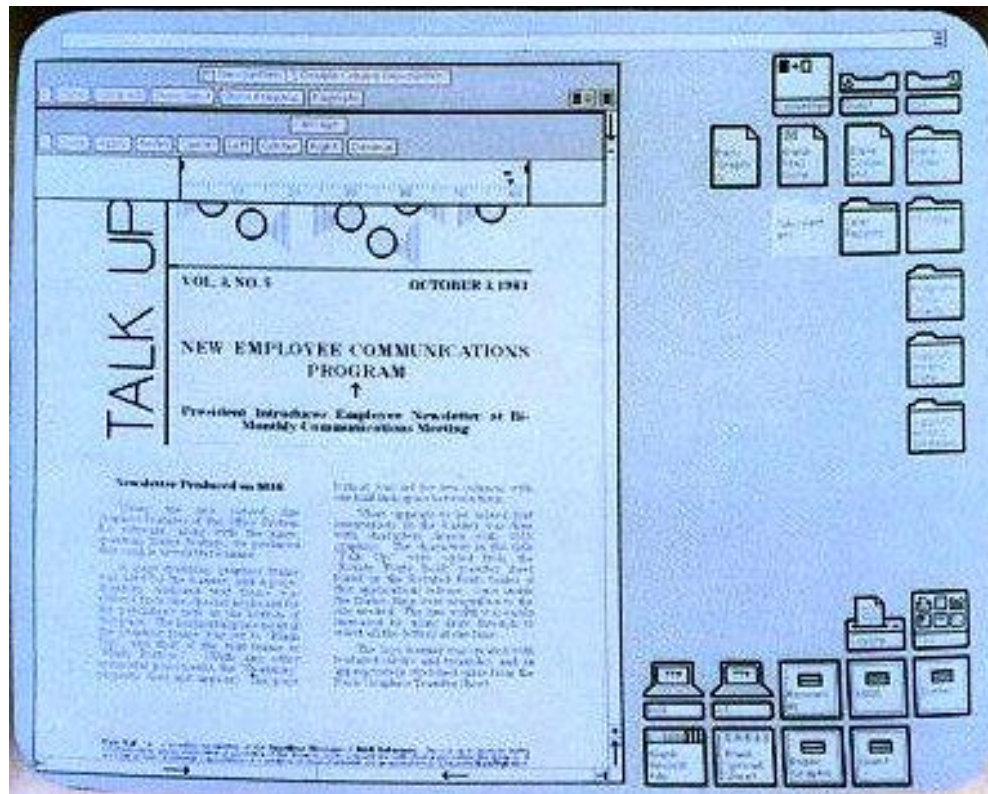
>turn on light
```

(From <http://toastytech.com/guis/>)



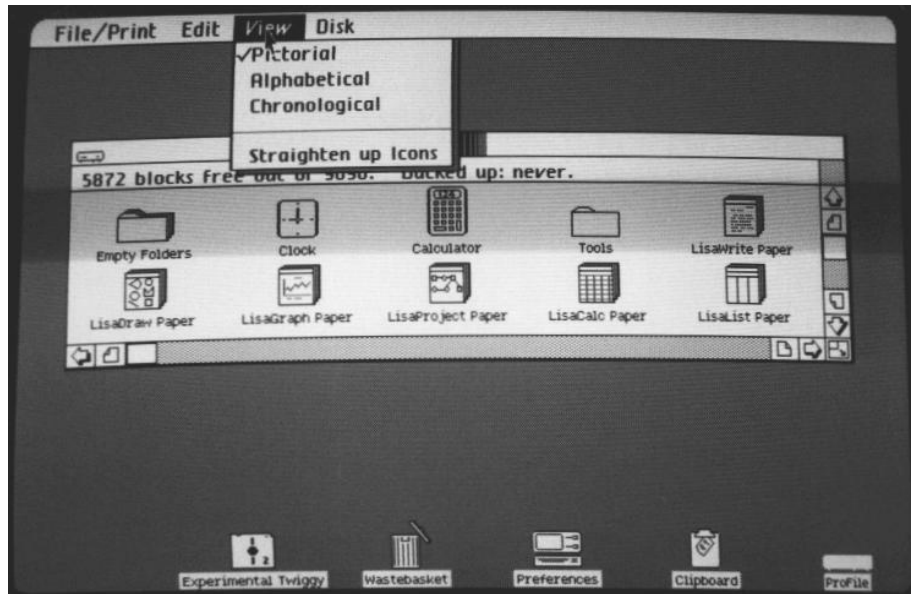
(<http://toastytech.com/guis/>)

Xerox Star (1981)



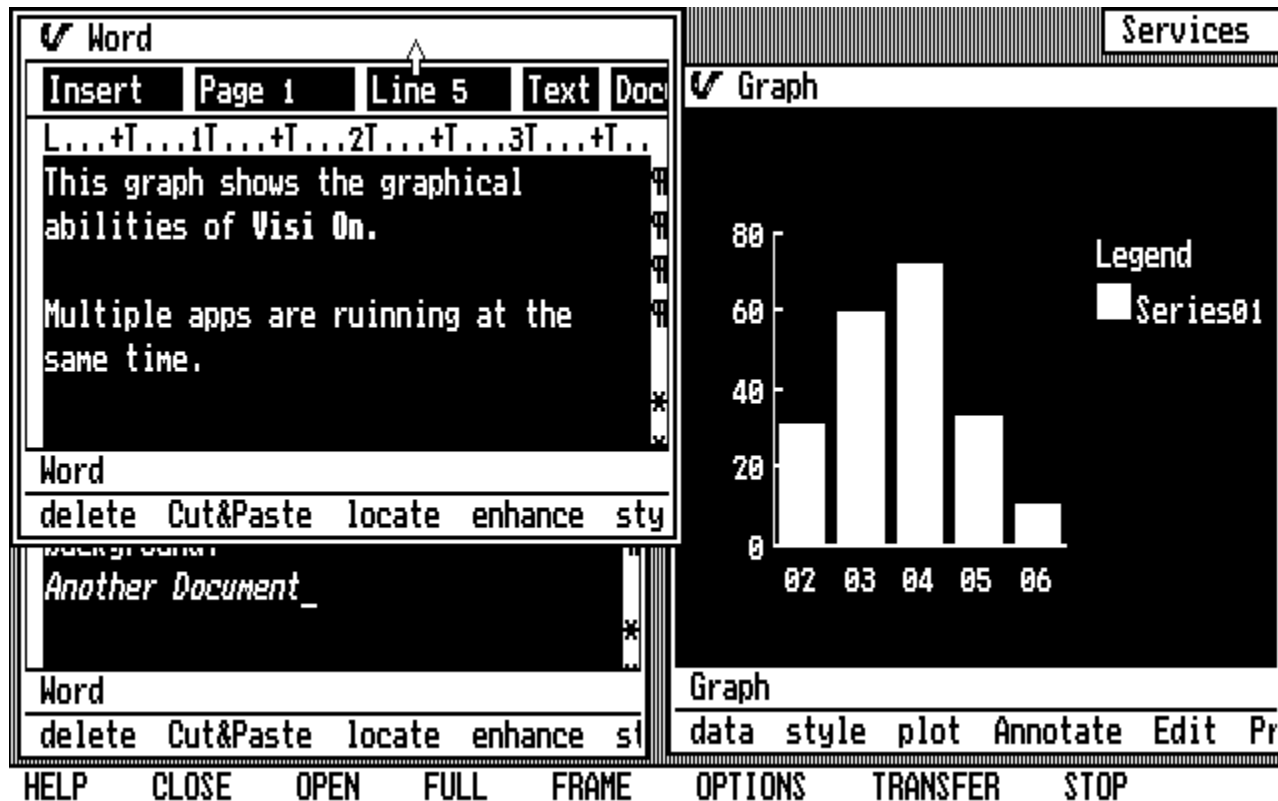
(<http://toastytech.com/guis/>)

Apple Lisa (1983)



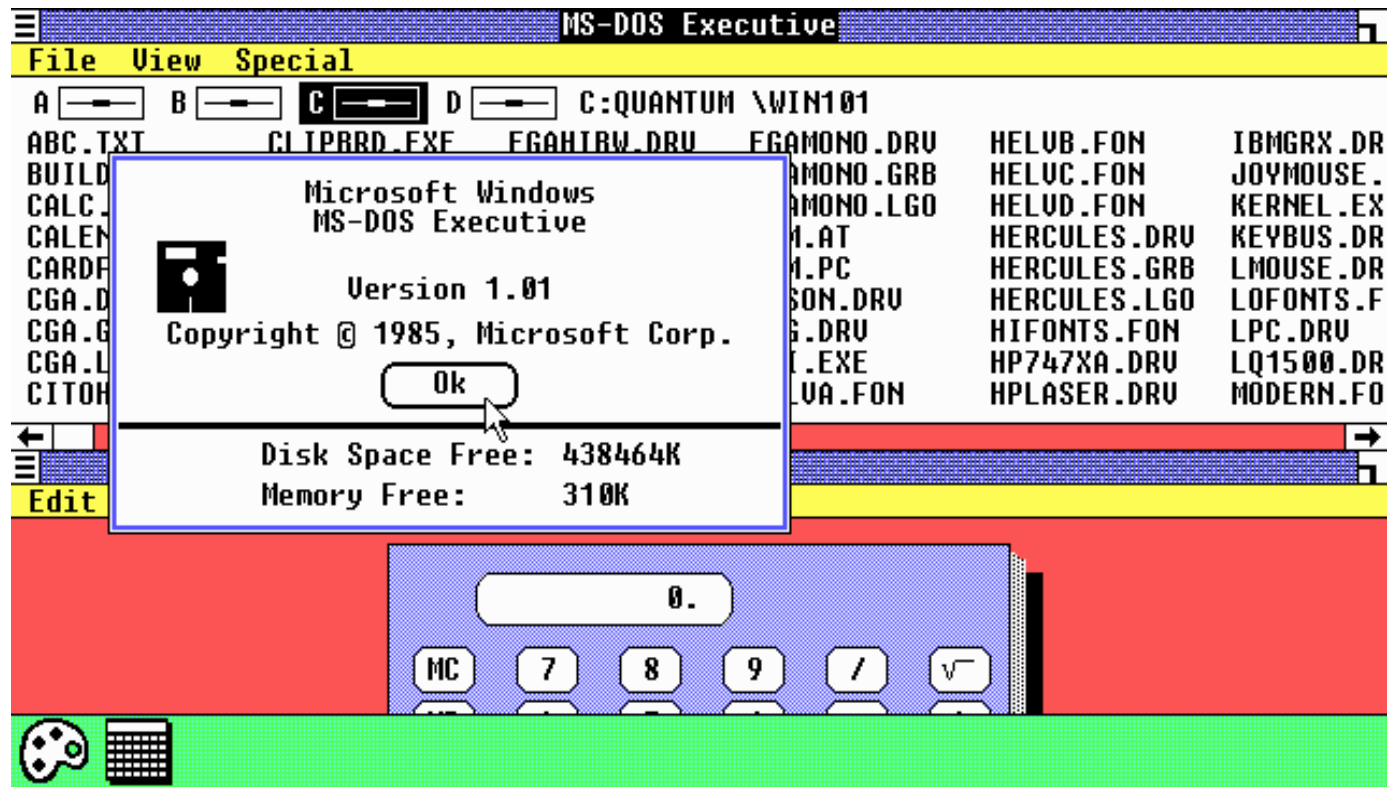
(<http://toastytech.com/guis/>)

Visi Corp's Visi On (1983)



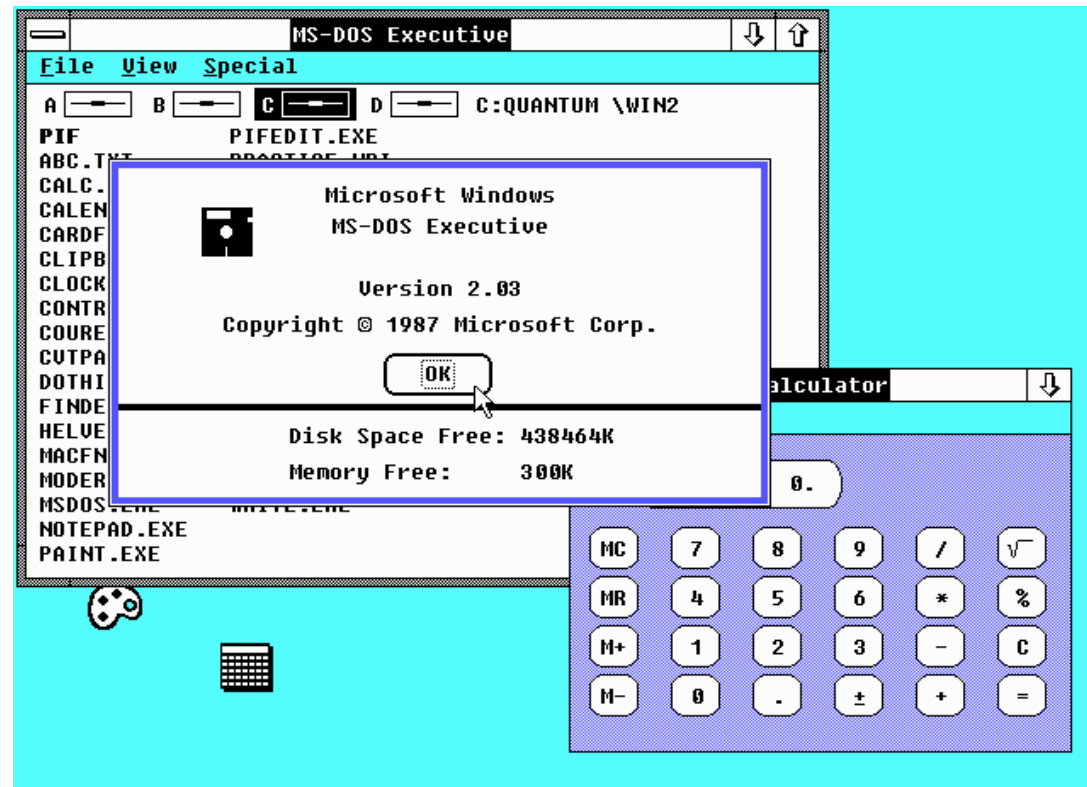
(<http://toastytech.com/guis/>)

Microsoft Windows (1985)



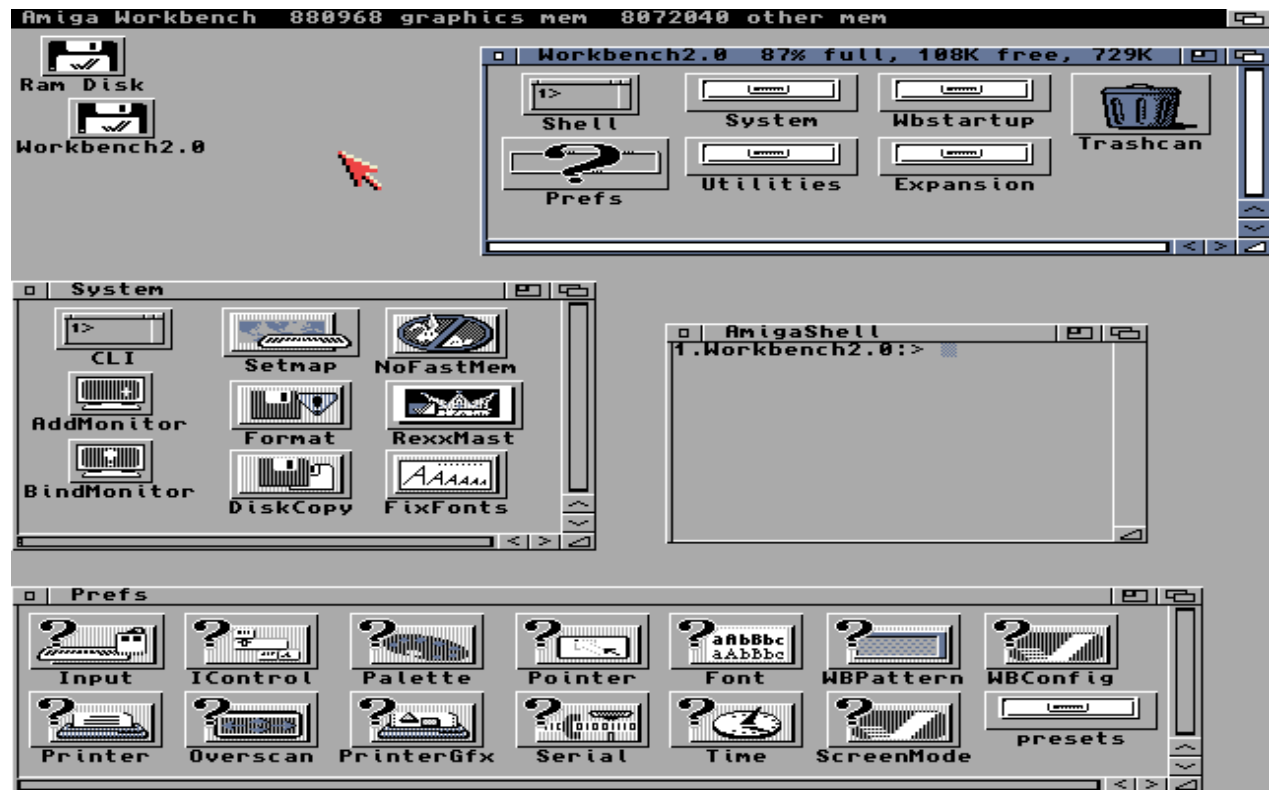
(<http://toastytech.com/guis/>)

Microsoft Windows (1987)



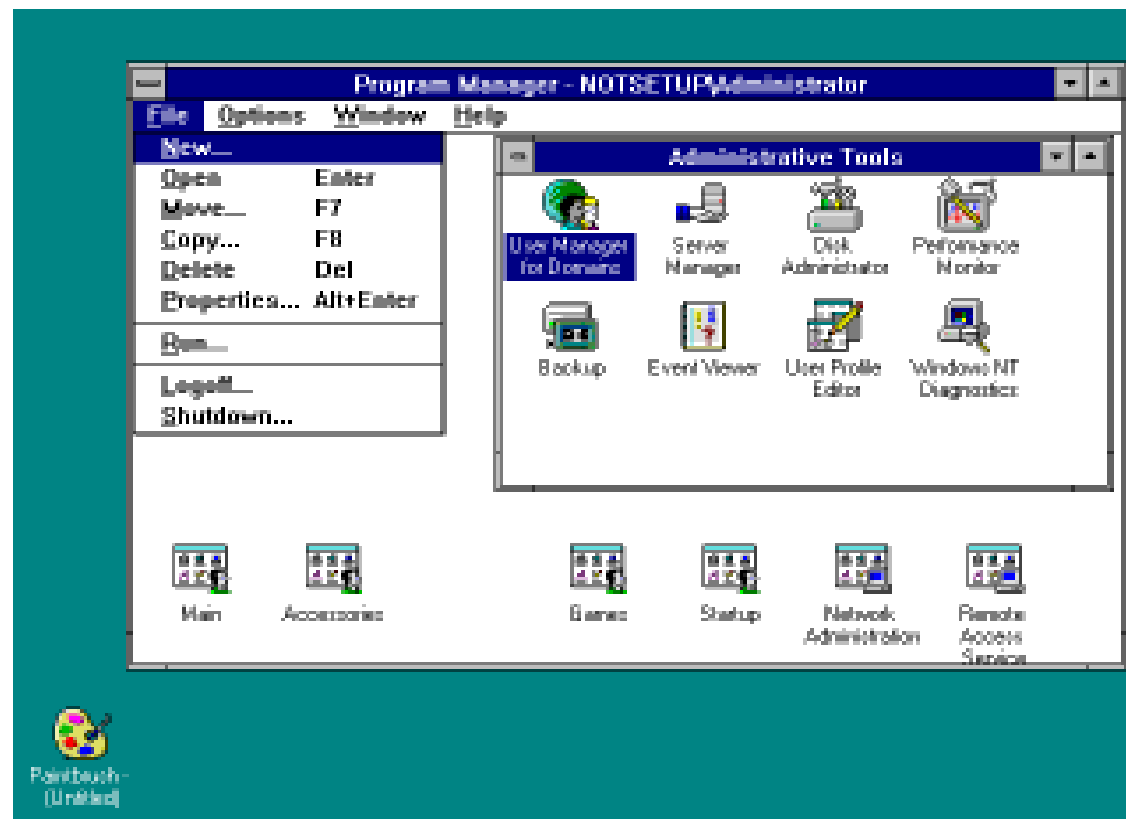
(<http://toastytech.com/guis/>)

Commodore's Amiga Workbench (1990)



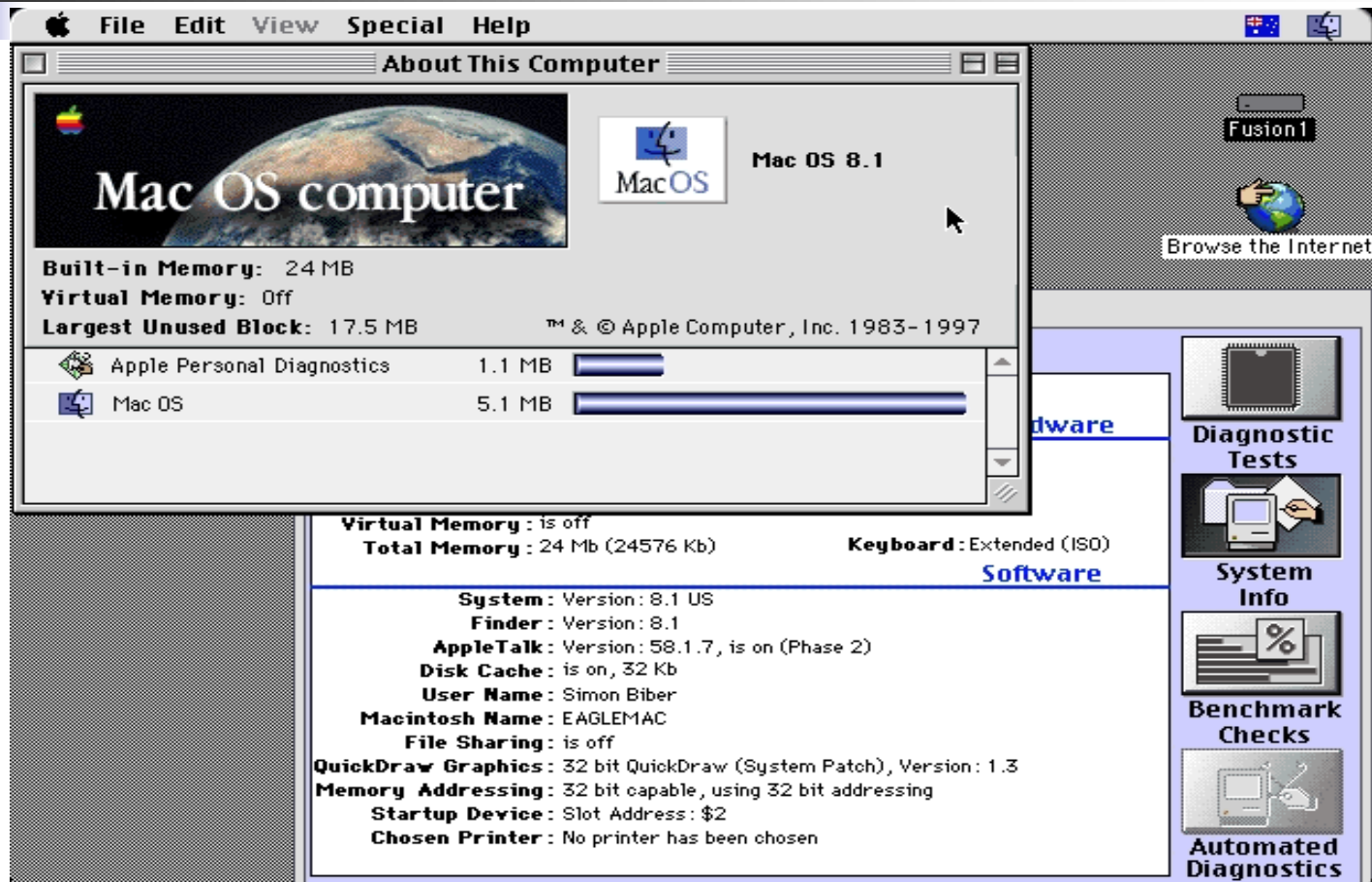
(<http://toastystech.com/guis/>)

Microsoft Windows NT (1993)



(<http://toastytech.com/guis/>)

Apple Mac OS (1997)



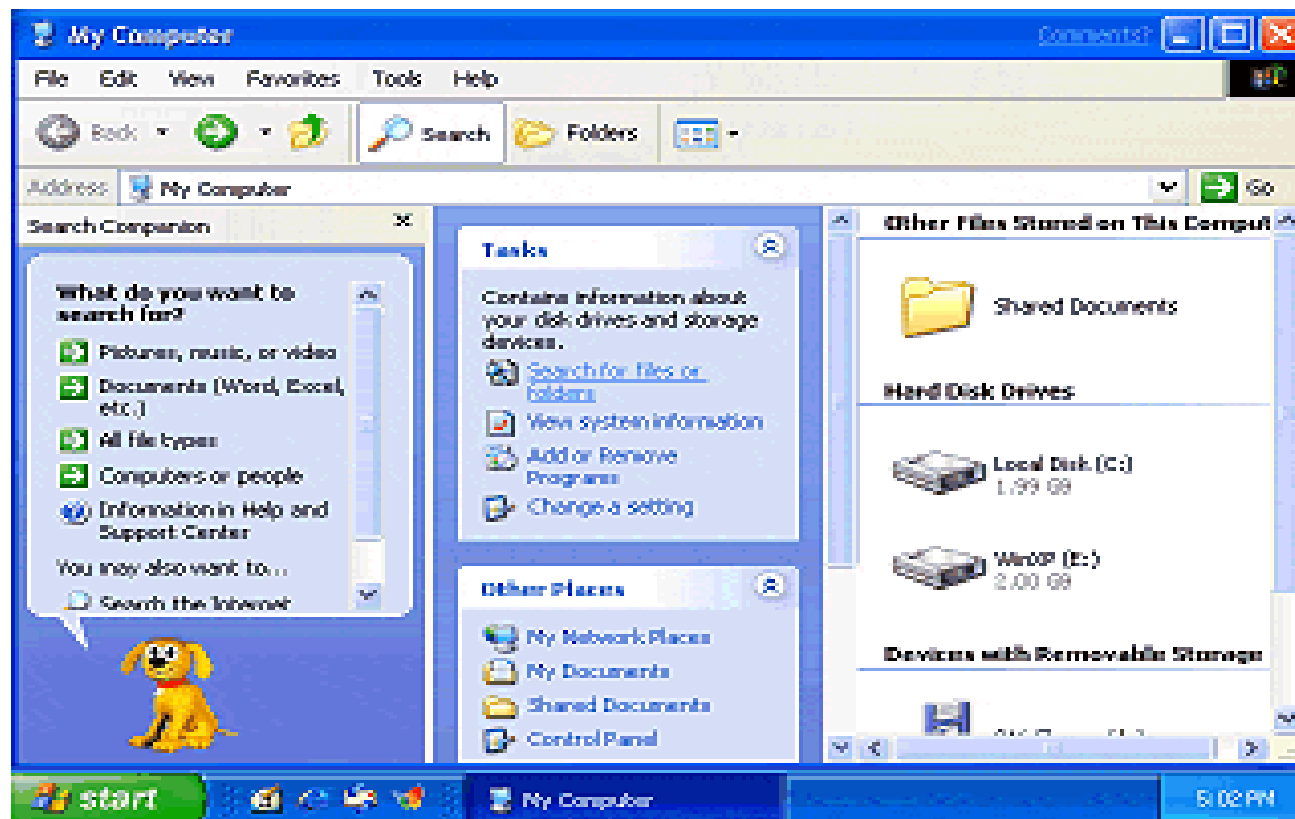
(<http://toastytech.com/guis/>)

Apple Aqua (2000)



(<http://toastytech.com/guis/>)

Microsoft Windows XP



(<http://toastytech.com/guis/>)



User interfaces

- Beragam interfaces diimplementasikan sepanjang 30 th terakhir.
- Ini adalah bidang ilmu baru
- Penekanannya saat ini pada standarisasi untuk mengurangi “learning time” bagi aplikasi baru → Microsoft standards



Software development cycle

- Keseluruhan software development life cycle adalah satu dalam dirinya sendiri
- Fokus utama adalah pada interface design.
- Formal metodologi dibutuhkan untuk proses pembuatan interface design.



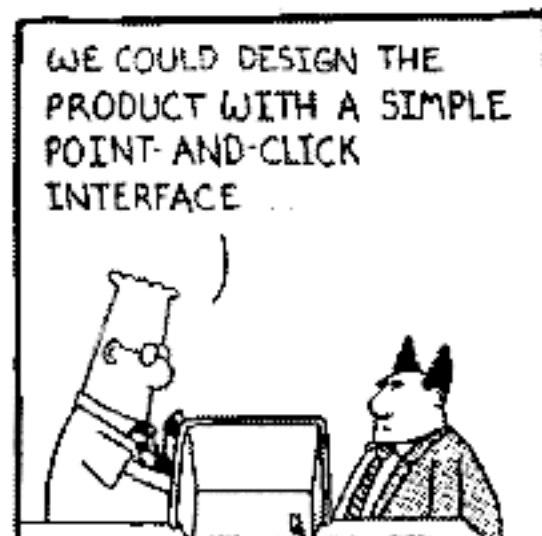
System-centered design

- Apa yang dapat dibangun dengan mudah pada suatu platform?
- Apa yang dapat kita buat dari tools yang ada?
- Apa yang dapat aku lakukan sebagai programmer agar menemukan sesuatu yang menarik dalam system?



User-centered design

- Disain yang didasarkan pada user:
 - abilities and needs
 - context
 - work
 - tasks
- Design Process haruslah
“*collaboration between designers and customers*”.



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Principles of user-centred design

- User, tasks dan goals sebagai kekuatan pendorong dan bukan teknologi.
- Kebiasaan-kebiasaan dan konteks yang digunakan user harus dipertimbangkan.
- Desainer harus dapat menangkap karakteristik user dan mendisain untuk itu.
- Komunikasi dengan user harus terjadi dalam setiap stage-nya.
- Segala keputusan yang menyangkut disain haruslah mengikutsertakan user, pekerjaan mereka dan lingkungan kerja mereka.

(Preece, 2002)



User-centred design: keuntungan

- User memberikan segala informasi penting dari system.
- Disainer dapat memperoleh pengertian yang lebih baik dari “users needs and goals”.
- User adalah penilai paling baik dari disain system yang sedang dikerjakan.
- Mewujudkan harapan user
- System yang dihasilkan akan lebih dapat diterima dengan lebih baik oleh user.



User-centred design: kerugian

- Highly cost – longer time.
- Sulit untuk mendapatkan “a good of end users”.
- Disainer biasanya lebih expert dari user.
- Organisasi perusahaan biasanya juga ambil bagian dalam pengambilan keputusan



Interface design process

Shneiderman's Three Pillars of Design.

1. **Guidelines documents and processes** – records decisions => ensure consistency
2. **User Interface software tools** - allow rapid prototype development
3. **Expert reviews and Usability Testing** – integrated into iterative design process



Guidelines documents

- Buat sekumpulan “specific working guidelines” untuk interface.
- Harap dipertimbangkan:
 - Language & graphics
 - Screen layout
 - Input/output devices
 - Action sequences
 - Help & training



User interface builders

- Banyak tools yang saat ini diberikan oleh “specialized software applications”.
 - VS.net
 - Java
 - Macromedia
- Setiap aplikasi mempunyai proses/fungsi yang berbeda
 - construct mode
 - test mode



Keuntungan dari interface tools

- Beberapa tools berguna untuk “initial system specification”
 - English-like language
 - drawing tools.
- Terpisah dari kompleksitas “application programming” → rapid prototyping.
- Mengijinkan cross-platform development.
- Memberikan focus pada interface guidelines and standards.



Visual development tools

- Tools for rapid GUI development
 - Microsoft Visual Studio
 - Delphi
 - Java
 - Dynamic HTML / PHP
- Tools for graphical design
 - Macromedia
 - Corel draw
 - Front page.
- Membuat interface dengan drag and drop buttons, fields, combo boxes. Coding dapat ditambahkan kemudian



Usability testing

- Produk butuh untuk di-test secara terus menerus dengan berbagai macam cara.
- Assesor :
 - expert programmer
 - Users
 - Surveyors / third party persons
 - Analysis using automated tools / third party applications



LUCID system development method

- Logical-User Centred Interaction Design mengidentifikasi 6 tingkat dalam user-centered development.
- Menggunakan “rapid prototyping and iterative usability testing”.
- Setiap stage dievaluasi berdasar pada 12 area aktivitas – see Shneiderman, p. 122.



LUCID model (ED3BR)

1. **Envision** - develop the product concept
2. **Discovery** - research and needs analysis
3. **Design Foundation** – conceptual model and screen prototype
4. **Design Detail** - refinement and design detail
5. **Build** - implement software
6. **Release** - provide roll-out support



Stage 1: Envision

- Definiskan
 - high level language
 - business objectives of the system.
- Identifikasikan
 - companies
 - stakeholders.
- Kembangkan dan temukan visi diantara para stakeholders.
- Identifikasi
 - technical constraints
 - environmental issues



Stage 2: Discovery

- Temukan “clear understanding” – human factors
 - The users of the application
 - The tasks involved
 - The application environment -
- Analisa kebutuhan data dengan mengembangkan “list of requirements”.



Stage 2: Discovery

- Fokus pada :
 - basic human factors design
 - use of conceptual model and metaphors
 - use and remember interface functionality.
- Gunakan “user in mind”
 - different types of users
 - varying degrees of knowledge, skill & motivation to the computer interface.



User profiles

Novice/first time users.

- Novice user diandaikan
 - a first time user
 - minimal knowledge of both task and interface
- Dibutuhkan
 - simply interface
 - easily accessible help
 - online tutorials.



User profiles

Intermediate user.

- Mengetahui bermacam systems
- Kemampuan untuk transferable knowledge
- Tidak mengetahui detail system
 - posisi items dalam menus, etc.
- Penekanan Interface pada
 - recognition not recall
 - consistency



User profiles

Expert user

- Familiar dengan “task and interface”
- Menginginkan “minimal prompts and reminders”.
- Butuh
 - fast response
 - brief feedback
 - short cut availability.



Stage 3: Design foundations

- Mengembangkan conceptual model.
- Buat interface guidelines – workflows
- Pilih navigational model and design metaphor.
- Identifikasi “key screens” – default
- Buat prototypes - essential tools. Dapat berupa “paper based” kemudian dikembangkan ke dalam “screen based”.



Design Process

- **Low fidelity prototypes**
 - Brainstorm different representations
- **Medium fidelity prototypes**
 - Choose a representation
 - Rough out interface style
 - Task centered walkthrough and redesign
- **High fidelity prototypes**
 - Fine tune interface, screen design
 - Heuristic evaluation and redesign
 - Usability testing and redesign
- **Working systems**
 - Limited field testing
- **Alpha/Beta tests**



What is a prototype?

“A prototype is a limited representation of a design that allows users to interact with it and to explore its sustainability”

(Preece, p241)



What is a prototype?

- Prototype dapat berupa
 - Screen sketch
 - Storyboard, seperti cartoon-like series of scenes
 - Powerpoint slide show
 - Video simulasi penggunaan system
 - Part of software dengan fungsi yang terbatas



Prototyping

- Alat bantu yang paling berguna untuk mengkomunikasikan ide
- Memberikan mekanisme untuk mencoba aktualisasi ide
- Mengklarifikasi segala macam kebutuhan dan task
- Mengijinkan user untuk berinteraksi dengan system dan mengadakan perubahan
- Mendorong untuk melakukan refleksi atas system



Prototypes

- Low-fidelity prototypes
 - brainstorming
 - memilih tampilan system
- Medium-high fidelity prototypes
 - fine-tuning the design
- High fidelity prototypes
 - field tested to find minor problems before release.
(beta versions)



Low fidelity prototyping

- Paper-based
- Memberikan paper mock-up dari interface look, feel, functionality
- Simple, cepat dan murah dalam menyiapkan dan memodifikasi system
- Tujuan :
 - Menggambarkan design ideas
 - Alternatif untuk brainstorm
 - Memancing reaksi user
 - Memancing pertimbangan dan modifikasi
- Contoh: sketches, storyboards, screen mock ups, PICTIVE, CARD



Sketches & Storyboards

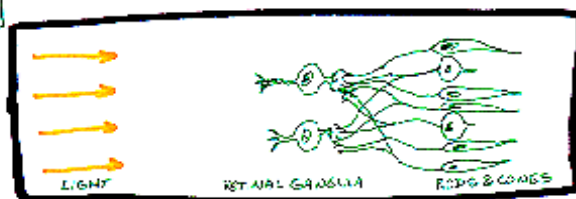
- Sketches – menggambarkan tampilan dari sistem yang diinginkan
 - Memaksa user untuk berkonsentrasi pada high level concepts.
- Storyboards - series of key frames.
 - snapshots dari interaksi user dengan system interface pada titik tertentu
 - Menunjukkan alur tertentu melalui “task”.



Contoh storyboards

- Interactive educational program yang mendemonstrasikan fungsi dari retina mata
- Interactive program tentang cara kerja mobil

INTRODUCTION



THIS MODULE WILL SHOW A SIMULATION OF:

- STIMULATION OF **RECEPTOR CELLS** IN A RECEPTIVE FIELD
- HOW SETS OF CELLS OUTPUT TO A SINGLE RETINAL GANGLION CELL
- HOW THIS PROCESS DECODES AN IMAGE

4P

HIGHLIGHTED WORDS: CLICK WILL

Retinal Function

light retinal ganglion interneurons receptors cells

For an in-depth and more accurate look at the actual anatomy of the retina see the PsyCLE Retinal Anatomy module

Retinal ganglion cells are designed to detect edges in an image, because this is the most efficient way to encode the useful information that the image provides.

This demonstration aims to explain how retinal ganglion cells actually work, and how their receptive fields provide a very effective way to detect the edges in an image.

We will look at a simulation of what happens when light stimulates a cell's receptive field and a simulation of how a set of cells work together to decode an image. This process is known as 'convolution'. Because the retina is a complicated piece of anatomy we are going to simplify it here so the processes that are going on are easier to think about.

Understanding Your Automobile



Card Info

Card Name Title
 Card Number
 No. of Buttons 1
 No. of Fields

Background Name

Button Info

If	then
Right arrow	go next

Comments Background color: Dark Blue
 Text Font: Georgia 48pt bold Right aligned
 Animation: Red arrow = pressing car
 Recommendation: The car when in a wheel turnings, will move
 from left to right as the screen when it reaches the
 right side, the screen will automatically go to
 the next screen.

Audio: Sound of car motor running while car
 moves across the screen

Program Name: Unlocking Your Automobile


Page: 2

Card
Card Name <u>First time</u>
Card No. _____
No. of buttons <u>2</u>
No. of fields _____
Background Name _____
Stack Name _____
Script Name: _____

Button	
1 <u>Car Icon</u>	then <u>go to</u>
2 <u>Right arrow</u>	then <u>End</u>
3	then
4	then
5	then

Frame No. _____
Production Notes:
Background: <u>Deep Blue</u>
Text Font: <u>Geneva 20 pt bold bright yellow</u>
Buttons: <u>Car icon (red) takes user to next screen which is navigation help</u>
<u>Right arrow (yellow) takes user to Enter</u>

Computer Screen

If this is your first time using the program, click here . If you have used the program before, click the right arrow to continue.



Video Screen

Script:

Audio 1:

Audio 2:



Medium fidelity prototypes

- Tujuan
 - Memberikan “sophisticated but limited scenario” pada user untuk dicoba
 - Memberikan “development path” (dari screen kasar ke functional system)
- Kelemahan medium fidelity prototypes
 - user tidak banyak memberikan komentar
 - user reluctant untuk mengubah disain itu sendiri
 - Pihak manajemen merasa bahwa prototype ini sudah jadi



Medium fidelity prototypes

- **scenario**
 - Script khusus dan sudah fixed yang digunakan untuk menjelaskan system; tidak diijinkan adanya penyimpangan
- **vertical prototypes**
 - Kedalam dari fungsi-fungsi item
- **horizontal prototypes**
 - Penjabaran dari fungsi-fungsi item



Stage 4: Design detail

- Desain yang iterative dan prototypes yang sudah jadi dan diperluas ke dalam spesifikasi yang penuh
- detail screen layouts.
- style guides yang lengkap untuk interface design.
- usability evaluation.



Stage 5 & 6: Build and Release

- Stage 5: Build
 - coding
 - redesign
 - usability evaluation of critical components.
- Stage 6: Release
 - delivery
 - development of help/training
 - evaluation of user satisfaction.



References

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