

PROGRAMIRANJE KORISNIČKOOG INTERFEJSA

Organizacija predmeta

- Predavanja
 - Teorijske osnove razvoja korisničkog interfejsa
 - Praktični primeri iz komercijalnih aplikacija
- Vežbe
 - Rad na računarima
 - Naglasak na C#

Ispit

- Projekat – 70 poena, 3 faze
 - Analiza korisničkih zahteva iz ugla razvoja korisničkog interfejsa – 15 poena –
 - Realizacija prototipa sistema – 20 poena
 - Implementacija sistema – 35 poena – na ispitu
- Pismeni deo ispita – 30 poena

Projekat iz prethodnih godina

- Realizacija sistema za rezervisanje sala
- Postoji proizvoljan broj sala sa definisanim brojem slobodnih mesta
- Postoji proizvoljan broj korisnika
- Korisnik može da rezerviše salu u periodu od 10h – 20h
- Korisnik traži sale za određeni broj mesta u određenom periodu

UI

- SI inženjeri još uvek moraju da vode računa o dizajnu korisničkog interfejsa, kao i o dizajnu samog softvera.
- Često je dobar dizajn korisničkog interfejsa kritičan za uspeh celog sistema.
- Interfejs težak za korišćenje, prouzrokovavaće veliki broj korisničkih grešaka.
- U najgorem slučaju korisnik će odbiti da nadalje koristi softver - mogućnost promene podataka ili rušenje sistema.

UI - greške

- The Therac-25 was a radiation therapy machine for treating cancer patients. It had an electron beam with two settings: a low-energy mode, beamed directly onto the patient, and a high-energy mode in which the beam was blocked by an X-ray generating filter.
- Tragically, the system's design had a race condition between the user interface and the beam controller. If the operator chose a mode, and the machine started configuring itself, and then the operator backed up and made a different choice within the 8-second interval it took for the machine to swing its magnets into place, then part of the system wouldn't receive the new setting

UI - greške

- As a result, a fast, experienced operator could inadvertently give severe overdoses, and several patients died. (Nancy Leveson, “Medical Devices: the Therac-25”, 1995)

UI – greške 2

- In 1988, the USS Vincennes guided missile cruiser shot down an Iranian airliner over the Persian Gulf with almost 300 people aboard. There were two failures in this incident.
- The radar operator interpreted the airliner as an F-14, descending as if to attack, rather than (in reality) a civilian plane that was climbing after takeoff.
- Both failures seemed to be caused by user interface.

UI – greške 2

- The IFF system was reporting the signal from an F14 on the ground at an airport hundreds of miles away, not the signal from the airliner; and the plane's altitude readout showed only its current altitude, not the direction of change in altitude, leaving to the operator the mental comparison and calculation to determine whether the altitude was going up or down.
- (Peter Neumann, "Aegis, Vincennes, and the Iranian Airbus", Risks v8 n74, May 1989).

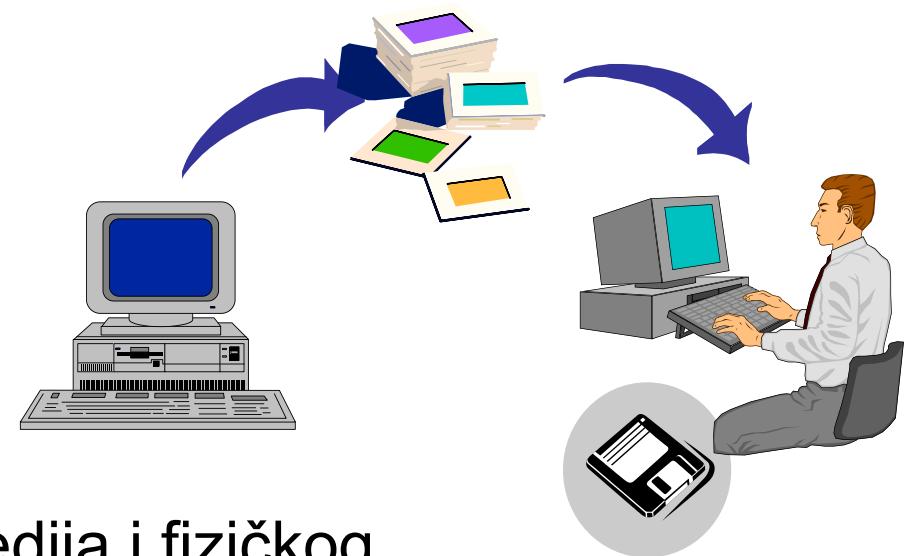
Interakcija čoveka i računara

- Interakcija između računara i čoveka se nije bitno promenila poslednje dve decenije, pa više ne odgovara niti naraslim mogućnostima računara, niti novim potrebama korisnika.
- Korisnički interfejs je usko grlo u komunikaciji.
- Nije se vodilo mnogo računa o specifičnostima čovekovih komunikacionih sposobnosti, što ograničava mogući kapacitet kanala između čoveka i računara.
- Da bi se došlo do poboljšanja treba uvažiti niz faktora prilikom kreiranja korisničkog interfejsa.

Interakcija čoveka i računara

Da bi se novi korisnički interfejs približio komunikaciji čoveka i računara, treba uzeti u obzir sledeće faktore:

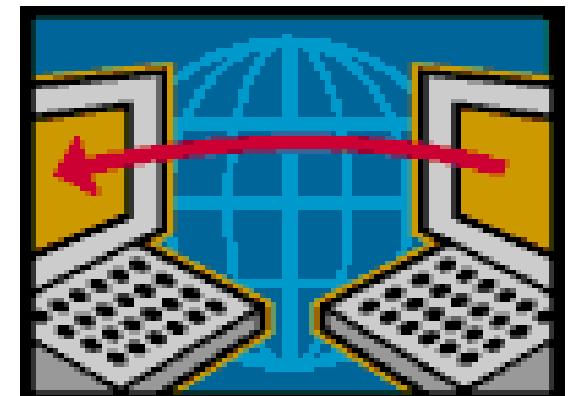
- čovekovu senzorsku fiziologiju,
- čovekovu anatomiju,
- čovekovu percepciju,
- saznajne mehanizme, i
- socijalnu interakciju.



Treba uzeti u obzir i karakteristike medija i fizičkog okruženja korisnika.

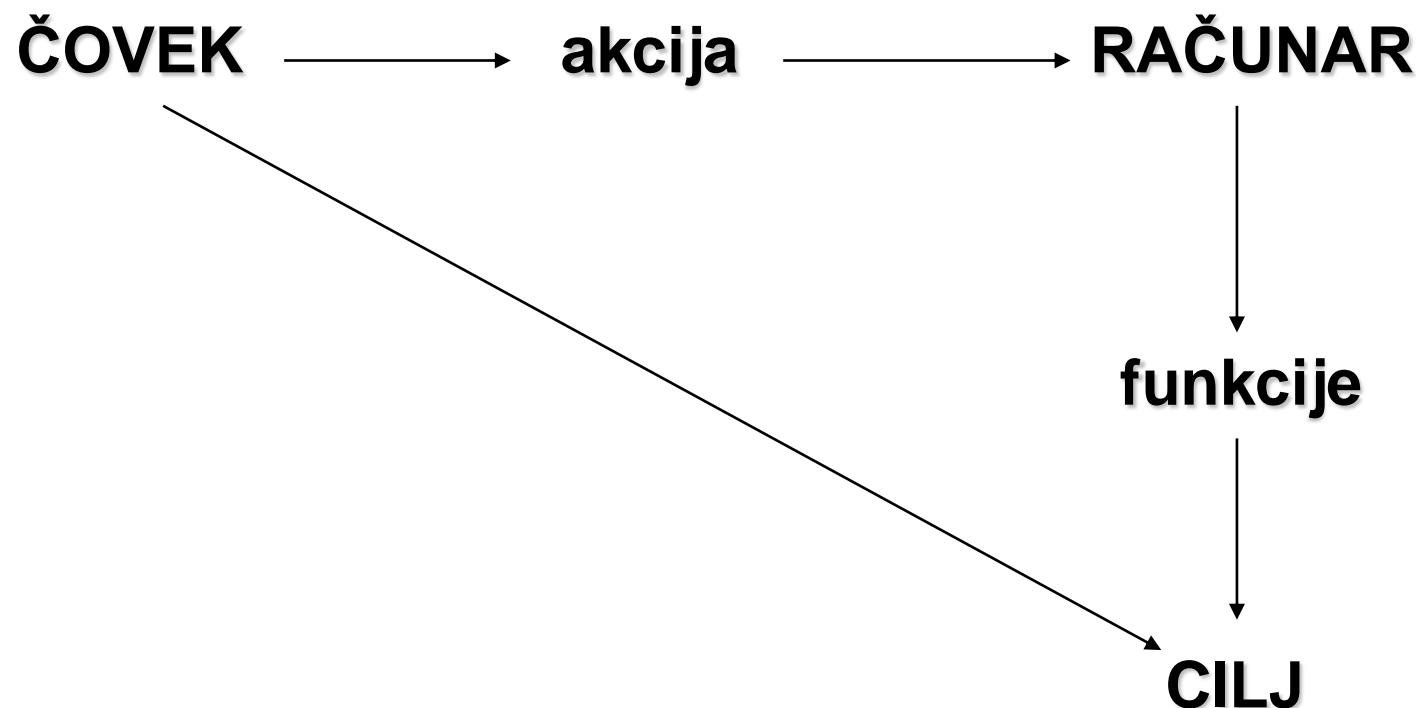
Interakcija čoveka i računara

- Sa druge strane, razvoj korisničkog interfejsa treba da uvaži i:
 - karakteristike hardverskih uređaja koji se koriste u komunikaciji sa korisnikom,
 - dostupne softverske resurse, i
 - karakteristike programskih sistema koji treba da koriste korisnički interfejs.



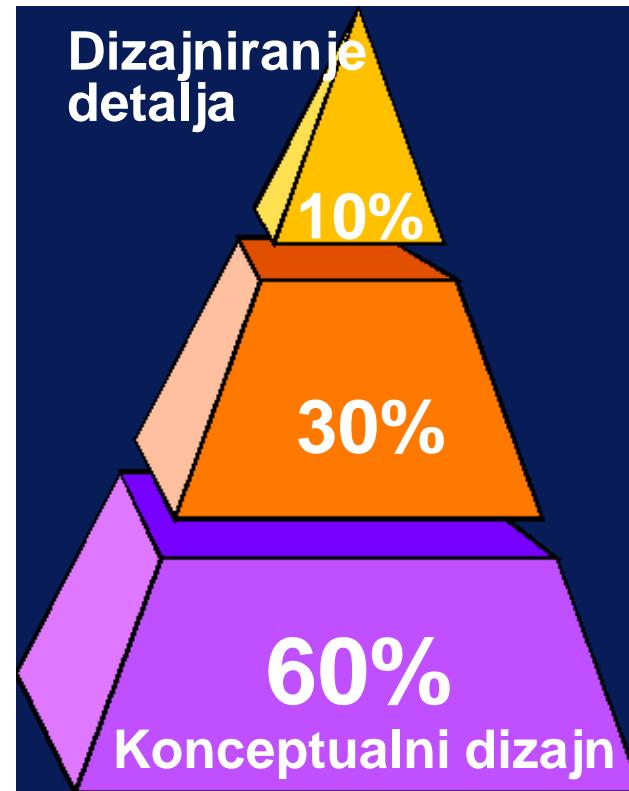
Zadatak interakcije čoveka i računara

- Što se tiče zadatka, njen zadatak je da optimizuje performanse čoveka i računara kao jedinstvenog sistema.



Balans između konceptualnog dizajna, interakcije i prezentacije grafičkog korisničkog interfejsa

Prezentacija



Interakcija

Koncept

Interakcija čoveka i računara

- Konceptualni dizajn – 60% sveukupnog dizajna
 - Odlučuje se o vrsti podataka, o funkcijama i njihovoj upotrebljivosti. Odlučuje se koje objekte grafički interfejs treba da ima (tastere, tastaturu, itd.), kako ih postaviti i koja je veza između njih.
- Interakcija – 30% sveukupnog dizajna
 - Kako grafički interfejs “oseća” korisnika? Kako se aktiviraju komande – pritiskom na dugme ili pomoću menija? Da li korisnik treba da ukucava podatke?
- Prezentacija – 10% sveukupnog dizajna
 - Kako interfejs izgleda? Kako se informacije prezentiraju? Koje se boje koriste? Koja je veličina objekata? Kakvi su tasteri?

Vrste korisničkih interfejsa

Prema korišćenoj tehnološkoj bazi i paradigmi interakcije, pristupi rešavanju problema komunikacije između čoveka i računara mogu da se podele u sledeće grupe:

- Hardverske korisničke interfejse,
- Terminalske korisničke interfejse,
- **Grafičke korisničke interfejse,**
- Percepcijske korisničke interfejse,
- Korisničke interfejse zasnovane na pažnji i
- Elektro-fiziološke korisničke interfejse.

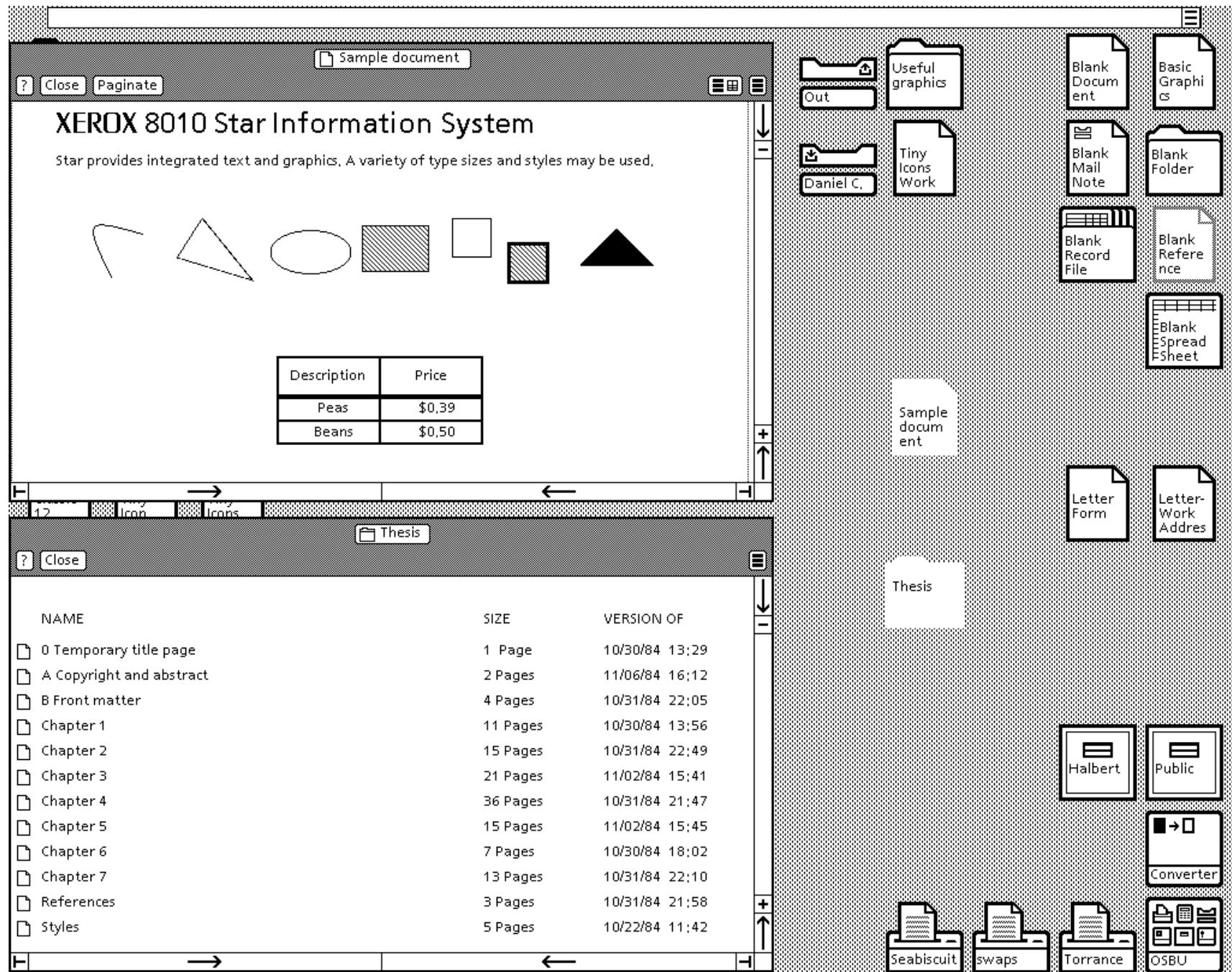
Grafički korisnički interfejsi i WIMP paradigma

Većina korisnika je danas u interakciji sa računarima putem kucanja, pokazivanja i "kliktanja" korišćenjem grafičkih korisničkih interfejsa (eng. *graphical user interfaces - GUI*).

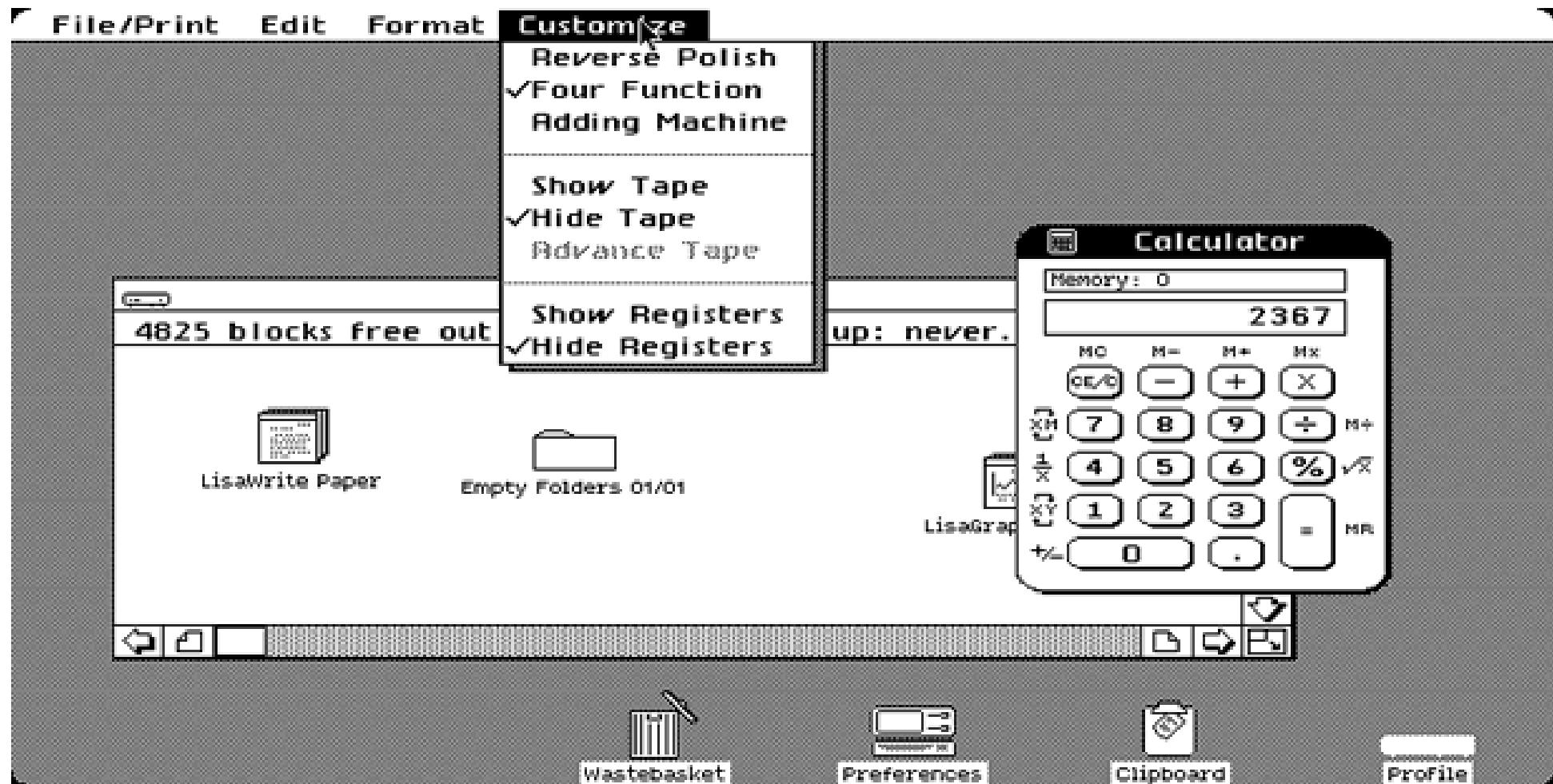
Komunikacija zasnovana na:

- upotrebi **prozora** kao radne površine,
 - **ikona** kao reprezenta mogućih aplikacija,
 - **menija** kao mehanizma odlučivanja i
 - **pokazivača** kao reprezenta položaja korisnika u virtuelnom svetu generisanog programskom logikom,
- često se naziva i **WIMP paradigm** (eng. *windows, icons, menus, pointer*) prema osnovnim konceptima na kojima se zasniva.

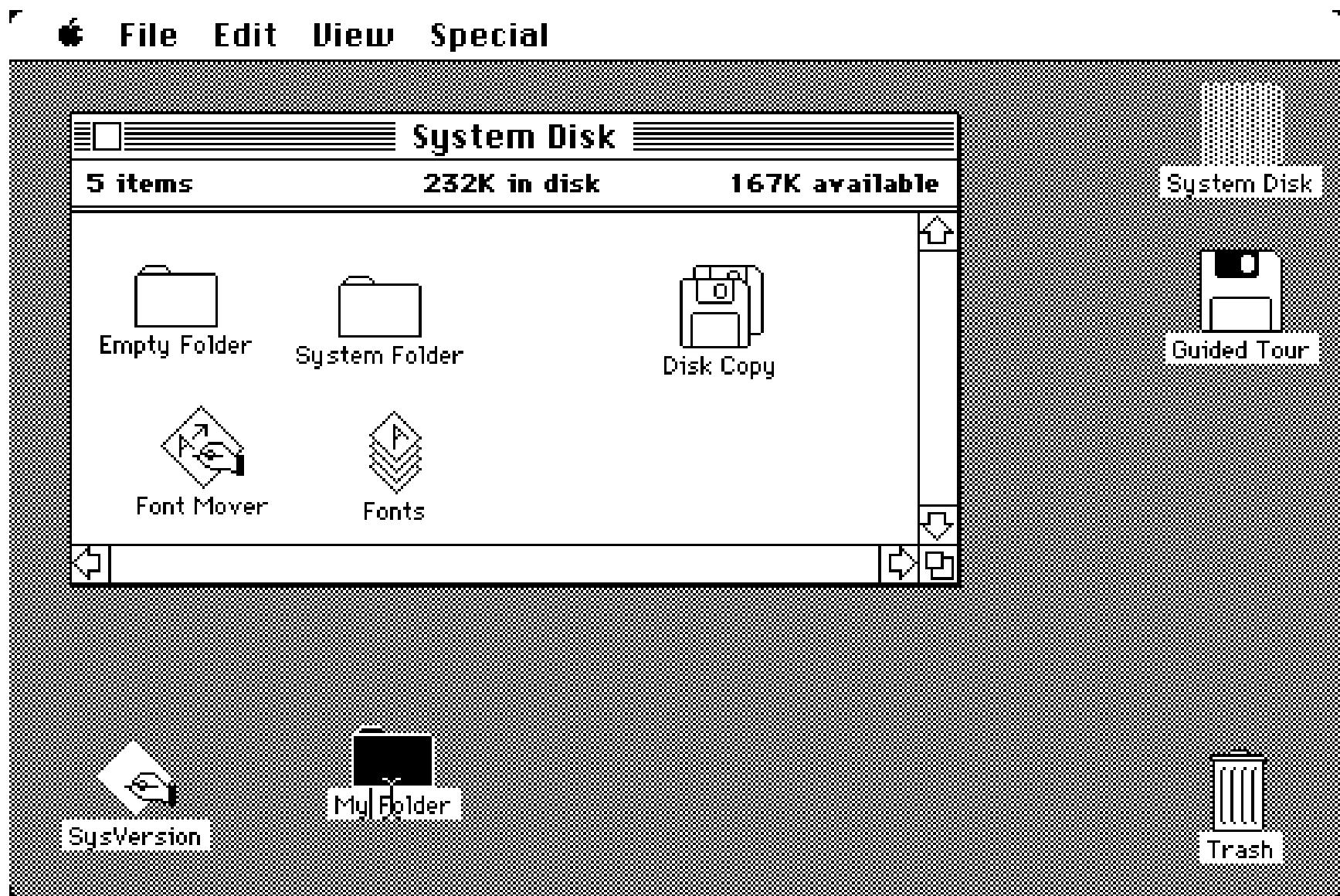
Xerox 8010 Star 1981



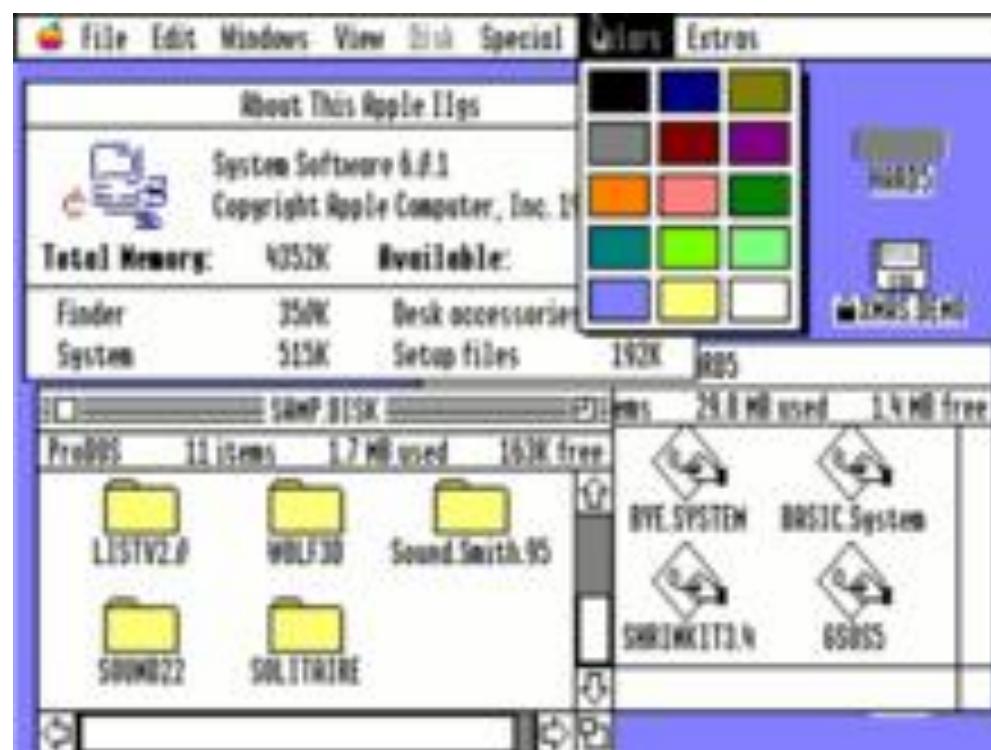
Apple Lisa Office System 1 983



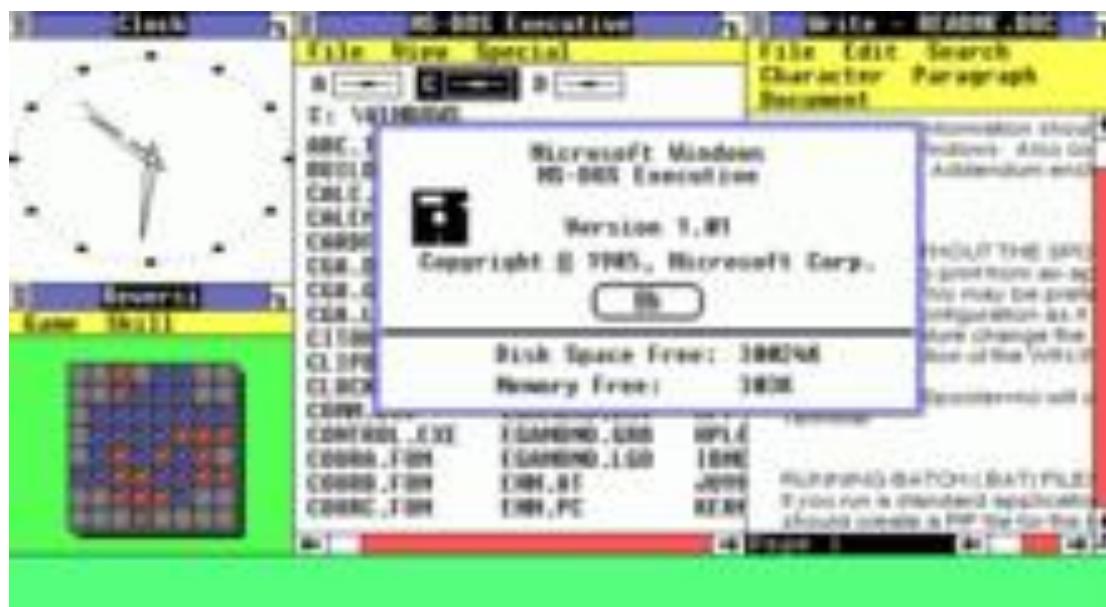
Macintosh 1984



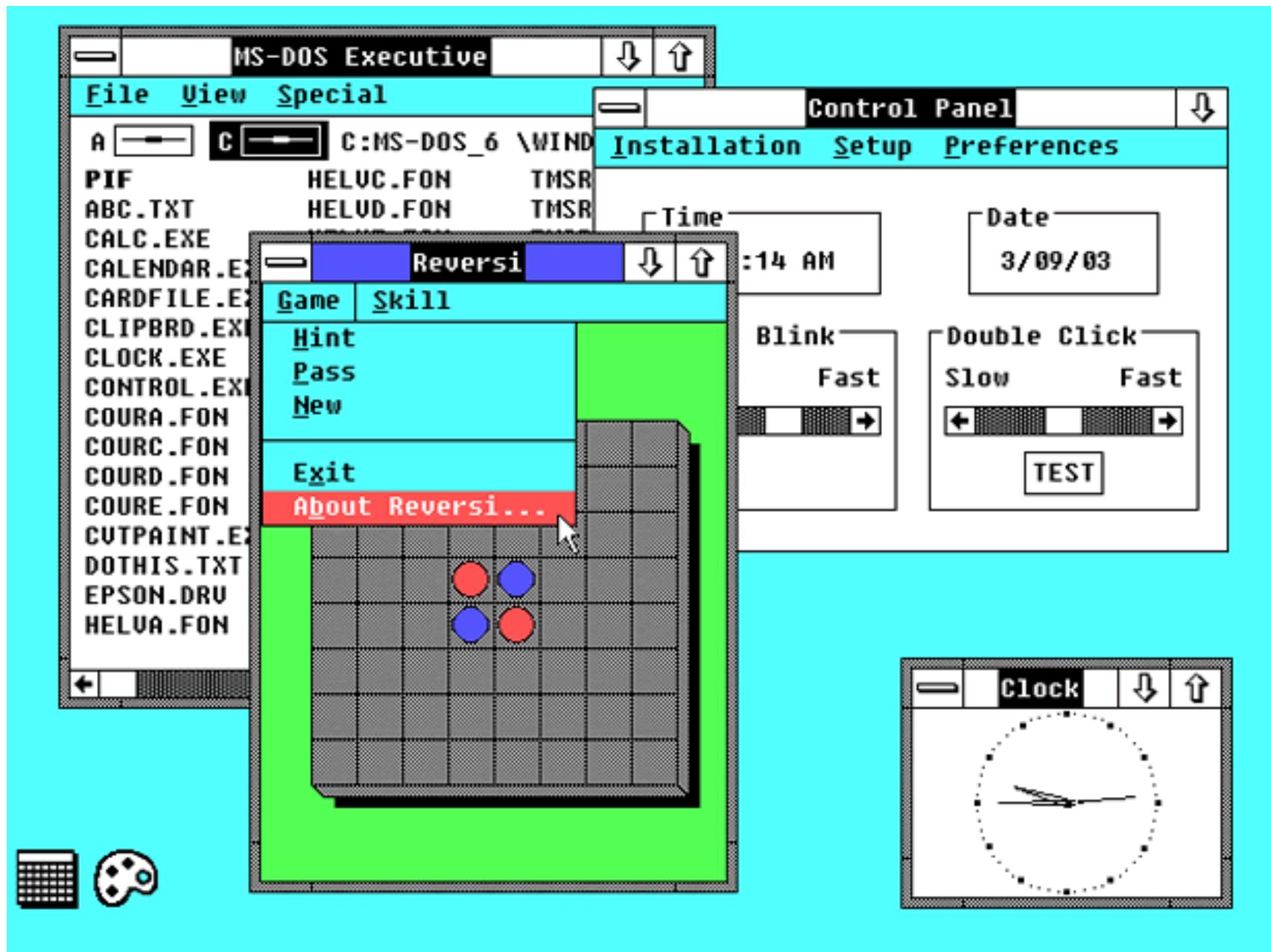
Apple1986



Windows 1.01 - 1985



Windows 2.0x 1987



Pokazivački uređaj

- Danas uobičajena neposredna interaktivna komunikacija se zasniva na korišćenju nekog **pokazivačkog uređaja poput miša**. Interaktivna komunikacija u kojoj se direktno manipuliše grafičkim objektima na ekranu,
- 1962. Douglas Engelbart (Stanford) drvena kutija sa točkićima – “x/y position indicator”
- *Sketchpad* sistem je razvio Ivan Sutherland 1963. godine, kao deo svoje doktorske teze sa svetlosnom olovkom kao pokazivačkim uređajem – pomeranje objekata, promena veličine, ...

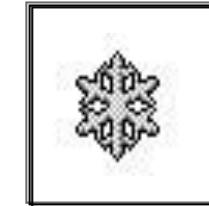
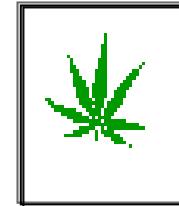
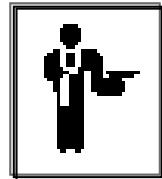
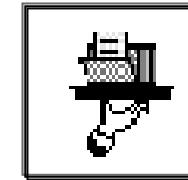
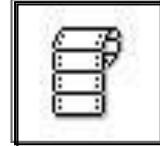


Pokazivački uređaj

- Prva grafička video igra – Space War 1962
- MIT projekat - uključivao je prvi džojstik
- **1968. Engelbart kreira NLS (oNLine System)**
- Hipermedija sistem
- Upotreba miša za grafički rad
- Više tile prozora
- adresiranje objekata
- Korišćenje linkova
- Videokonferencija
- E-mail

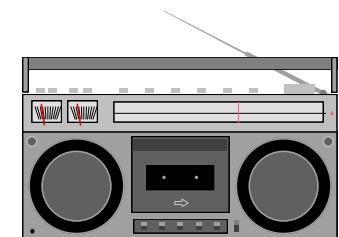
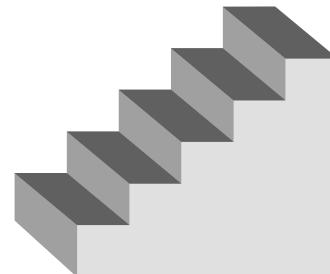
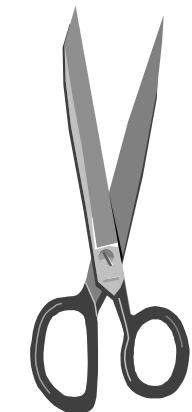
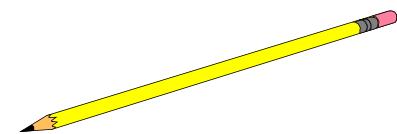
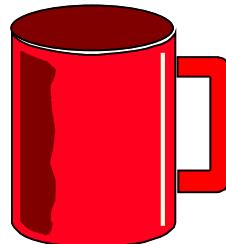
Ikone

- David Canfield Smith je u svojoj doktorskoj tezi 1975. godine uveo u upotrebu termin "ikona", koji je primenio u okviru sistem interaktivnog grafičkog komuniciranja, poznat pod nazivom *Pygmalion*. Kasnije je postao glavni projektant Xerox Star sistema, i zaslužan je za širu upotrebu ikona u grafičkim korisničkim interfejsima iz kojih su preuzeti osnovni koncepti u kasnijim realizacijama.
- Prvi komercijalni sistemi koji su koristili koncept interaktivne grafičke komunikacije bili su **Xerox Star** 1981. godine, **Apple Lisa** 1982. godine i **Macintosh** 1984.godine.

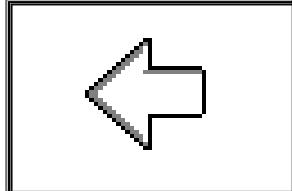


Ikone

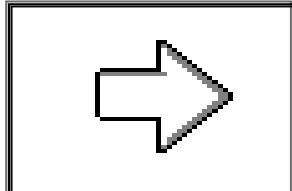
- Za prikazivanje objekata treba kreirati ikonice ili sličice koje su slične stvarima iz svakodnevnog života.



Pitanje

- Zašto ikona  znači

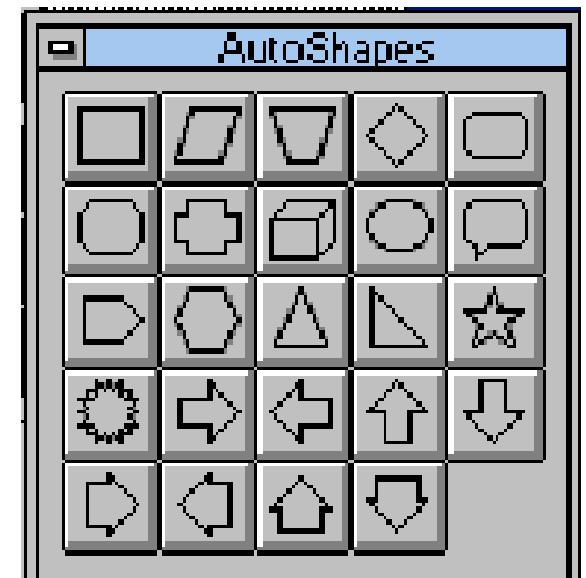
NAZAD ili PRETHODNI?

- Zašto ikona  znači

NAPRED ili SLEDEĆI?

Definicija ikona

- **Slikoviti simboli – laci za pamćenje**
 - **Reprezentuju**
 - objekte
 - strukture podataka
 - procese
- u formi koja odgovara realnom svetu.**



Da li nešto nedostaje?

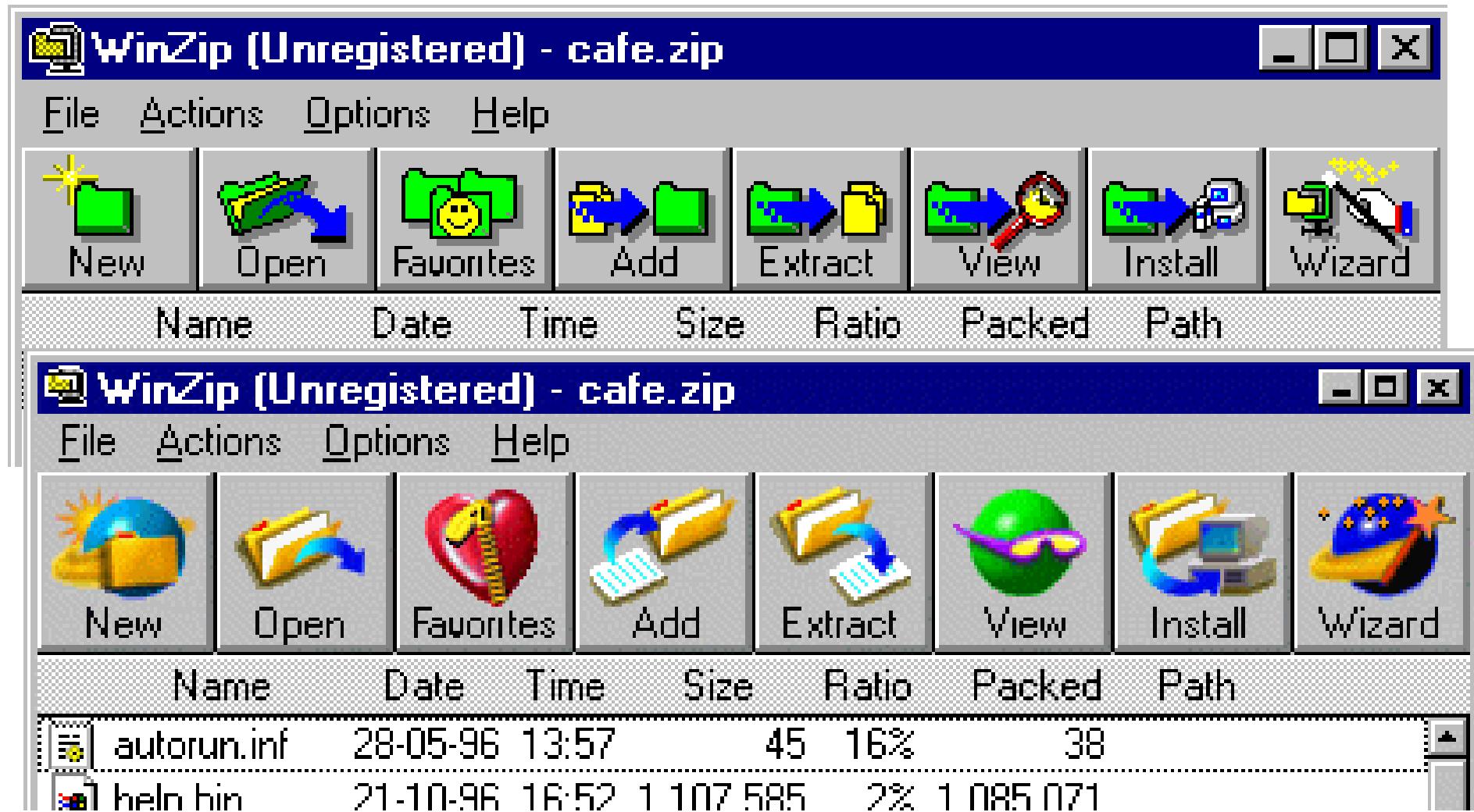


Dodatak tekstualnih komentara!

Dobro ili loše?



Dizajniranje i redizajniranje ikona



Prozori - Windows

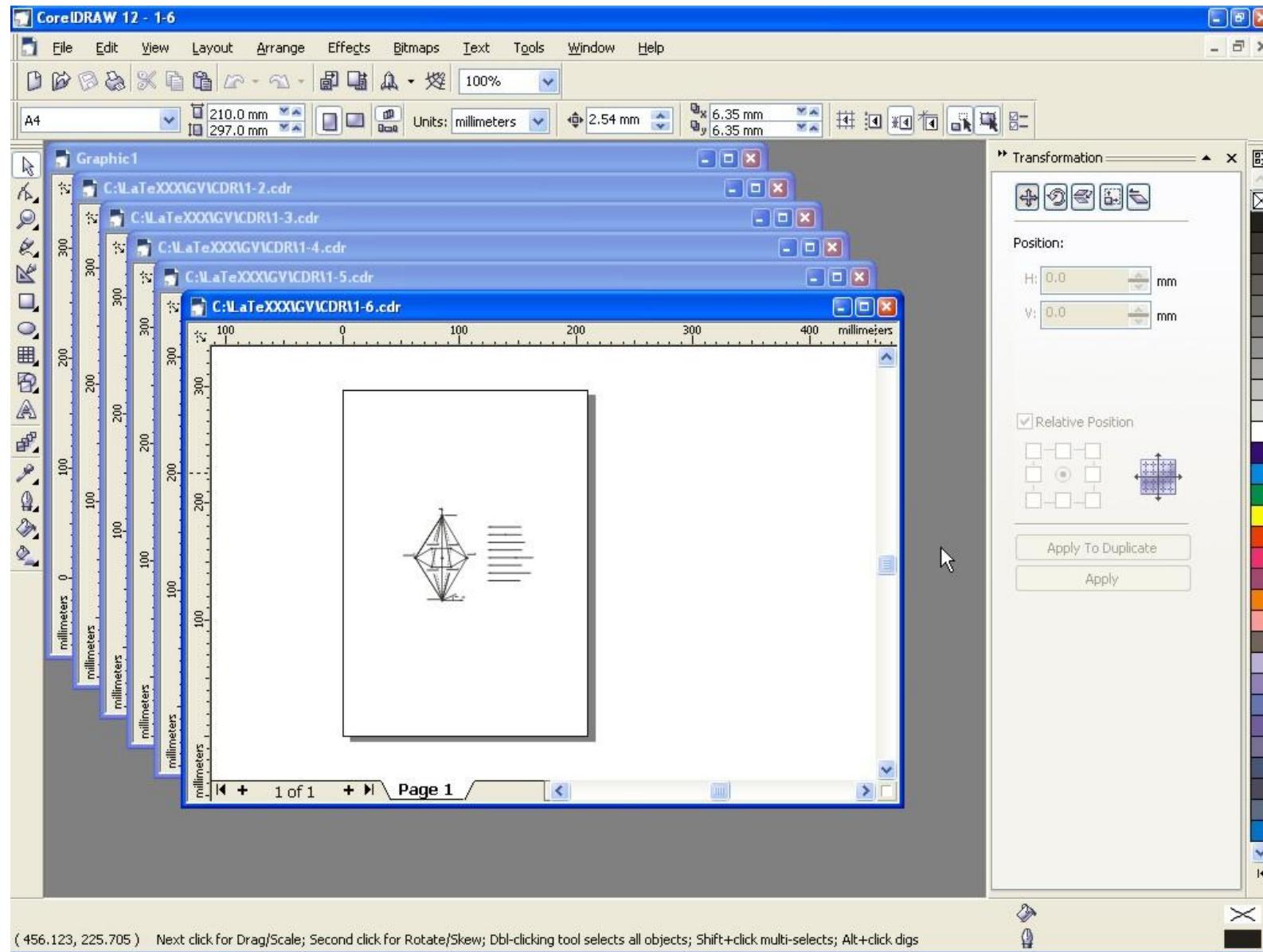


Sledeći bitan element tehnologije korisničkih interfejsa jesu **prozori** (eng. *windows*). Prva demonstracija sistema **sa više prozora u obliku pločica** (eng. *tiled windows*) prikazana je **1968. godine** u Engelbart-ovom NLS sistemu.

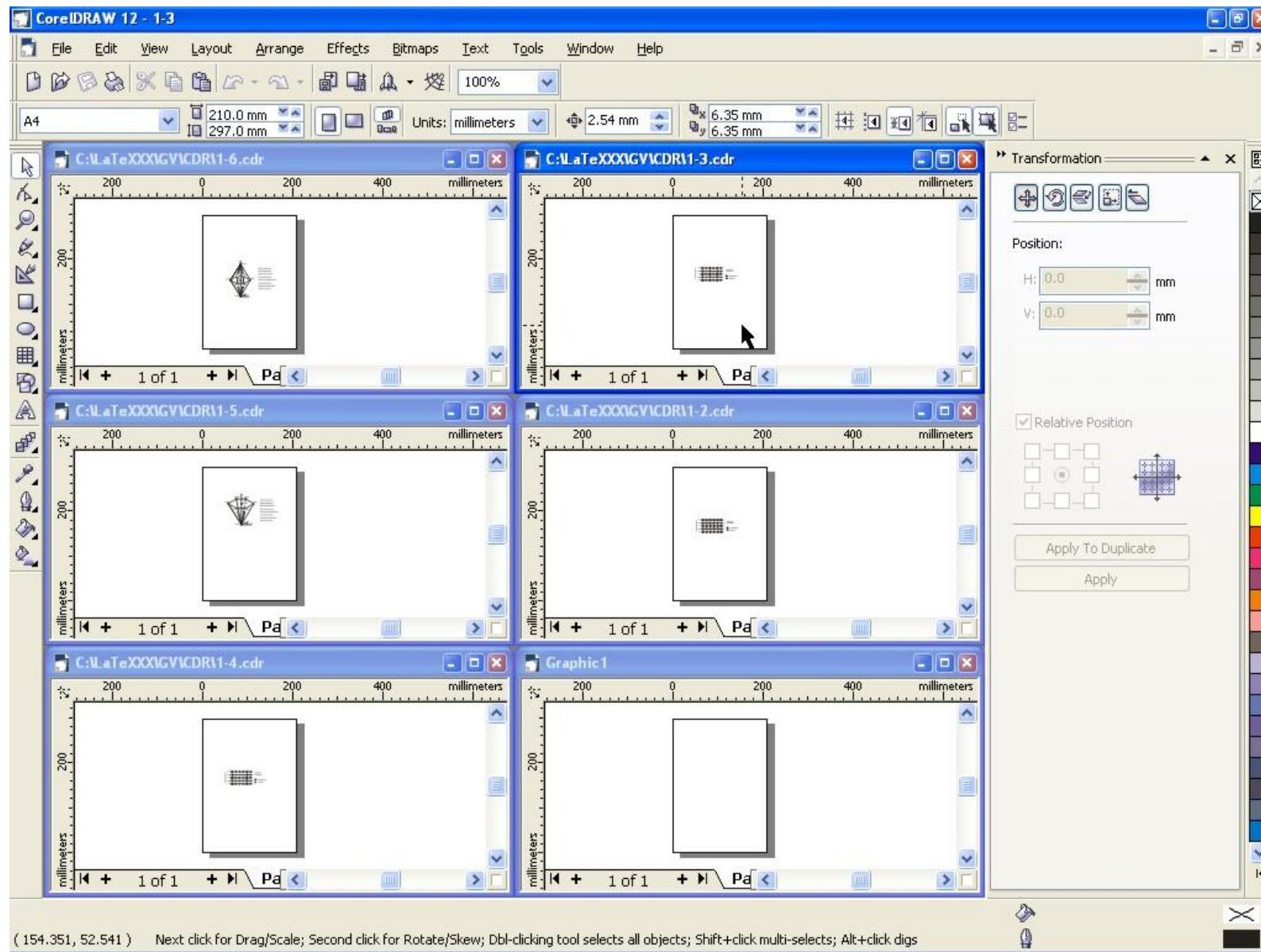
Alan Kay je **1969. godine** u svojoj doktorskoj tezi prvi predložio ideju **preklapajućih** (eng. *overlaped*) prozora.

Iako je i ranije bilo nekih komercijalnih upotreba prozora, glavni sistemi koji su popularizovali prozore bili su XeroxStar 1981. godine, Apple Lisa 1982. godine i **možda najvažniji Macintosh** 1984. godine. Rane verzije *Start* sistema i *Microsoft Windows-a* koristili su prozore kao pločice, ali su kasnije i oni prešli na koncept preklapajućih prozora.

Prozori - Windows



Prozori - Windows



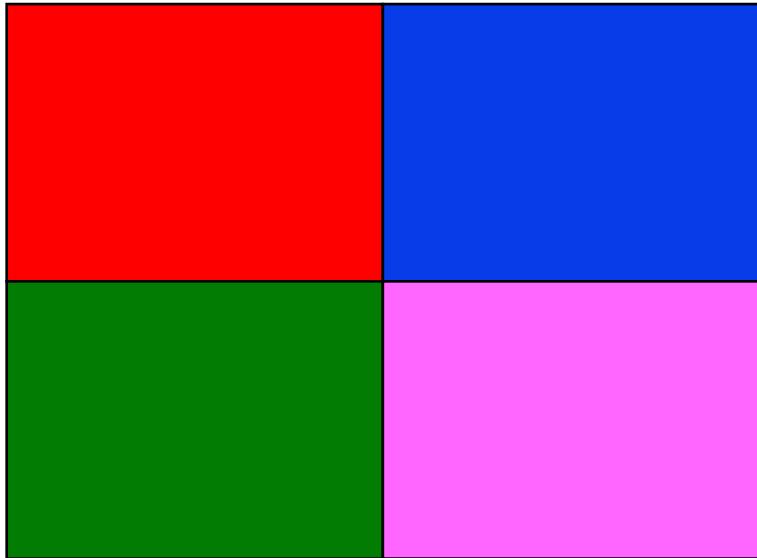
I dalje...

- Paralelno sa razvojem tehnologija grafičkih korisničkih interfejsa, išao je i razvoj novih aplikacija koje eksploratišu mogućnosti i prednosti ovih tehnologija.
- Prvi od takvih programa su programi namenjeni crtaju i projektovanju uz pomoć računara (**CAD**). Ivan Sutherland je u svom *Sketchpad sistemu* 1963. godine demonstrirao većinu tehnologija koje se danas koriste u programima za crtanje i projektovanje.
- Današnji operativni sistemi poput Windows, Macintosh i Linux sistema u svojim grafičkim okruženjima koriste rezultate navedenih istraživanja, ne donoseći mnogo novina.

Veličina slova i boje

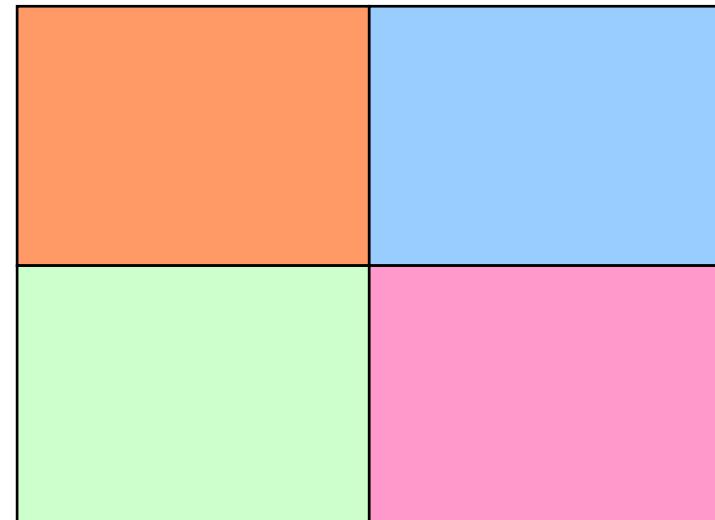
- Intensity (**brightness, lightness**)
- Shape e.g. box frame
- Colour and/or **shading**
- Underlining
- Blinking/animation
[video]
- Character size and *font*
- Movement e.g. ‘micons’
- Sound and/or synthesized speech

Boje...

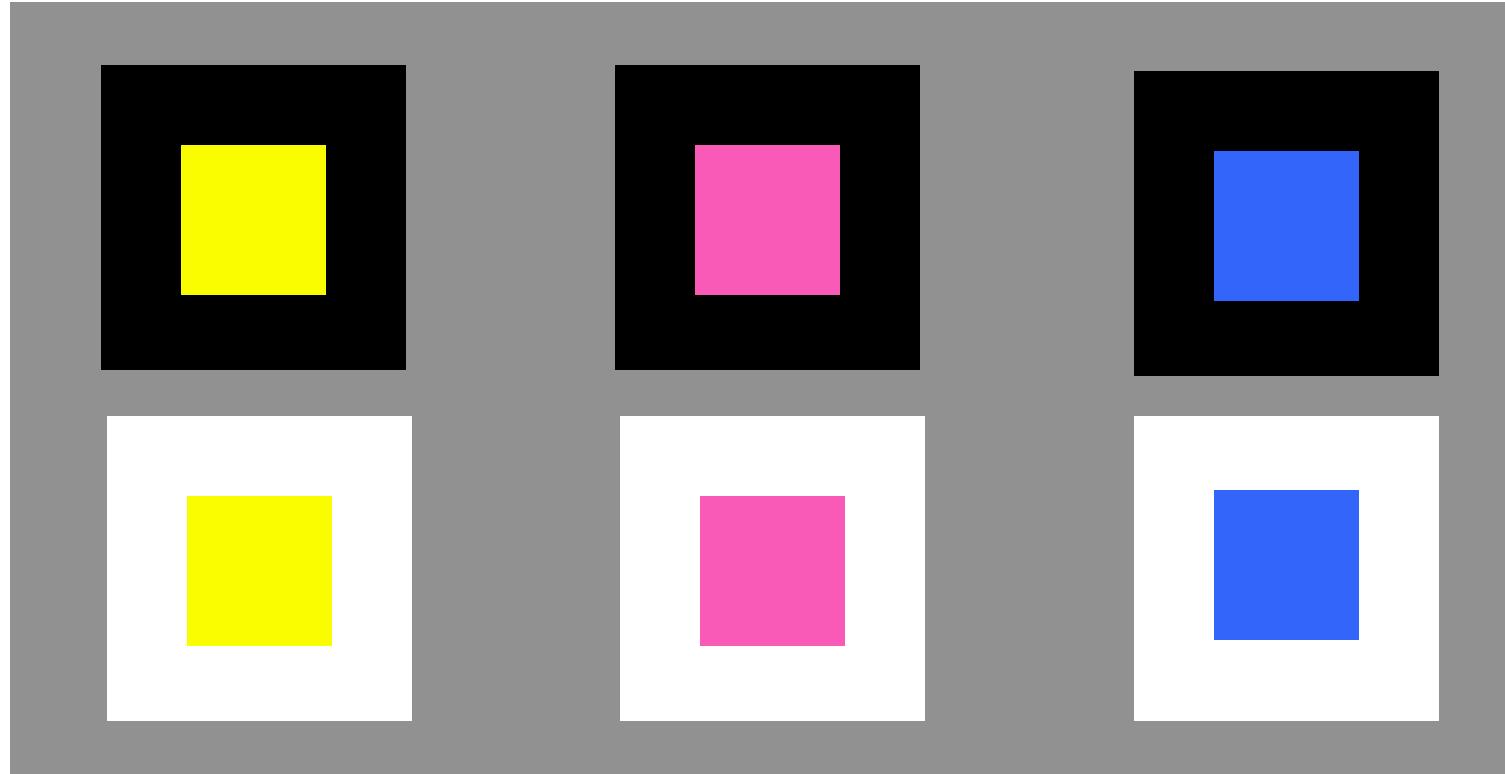


Jarke boje

Nežnije boje



Boje...



- Boje izgledaju tamnije i manje u odnosu na belu boju.
- Boje izgledaju svetlige i veće u odnosu na crnu pozadinu.

Boje...

Background Color	Suggestions for Foreground Colors
Black	White Yellow Pink Green Blue Cyan Gray Red
Blue	White Yellow Green Red Cyan Gray DarkRed Pink
DarkBlue	White Yellow Pink Green Cyan Red Gray
Brown	White Black DarkBlue Cyan Green Blue DarkRed
Cyan	Black Blue DarkBlue Brown DarkPink Pink Red
DarkCyan	White Black Yellow DarkBlue Blue Cyan Red DarkRed
Gray	Black Blue DarkBlue Pink DarkPink DarkRed Red
DarkGray	White Black Yellow Green Cyan Red DarkRed
Green	White Black Blue DarkBlue DarkPink Red DarkRed
DarkGreen	White Black Yellow Cyan DarkBlue Red DarkRed
Pink	White Black Yellow DarkBlue Cyan DarkRed Green
DarkPink	White Black Yellow Cyan Gray Green
Red	White Black DarkBlue Blue Green Cyan
DarkRed	White Yellow Blue Cyan Green Gray
White	Black Blue DarkBlue Red DarkRed Pink DarkPink
Yellow	Black Blue DarkBlue DarkGreen Red DarkRed

Kako izgleda ovaj radni ekran?

DWJMIC03 ISYS - INFORMATION SYSTEM FOR YOUTH SERVICES 10/27/94 15:04
INQCASE CASE DETAIL INQUIRY WJUM03

YOUTH NUMBER: 000123456 CASE NO: 09/14/93 - 01
NAME: FRST XXXXXXX MID XXXXXXX LST XXXXX SUF
DOB: XX/XX/XX VERIFIED (Y/N): N RACE: X SEX: X COUNTY: 24

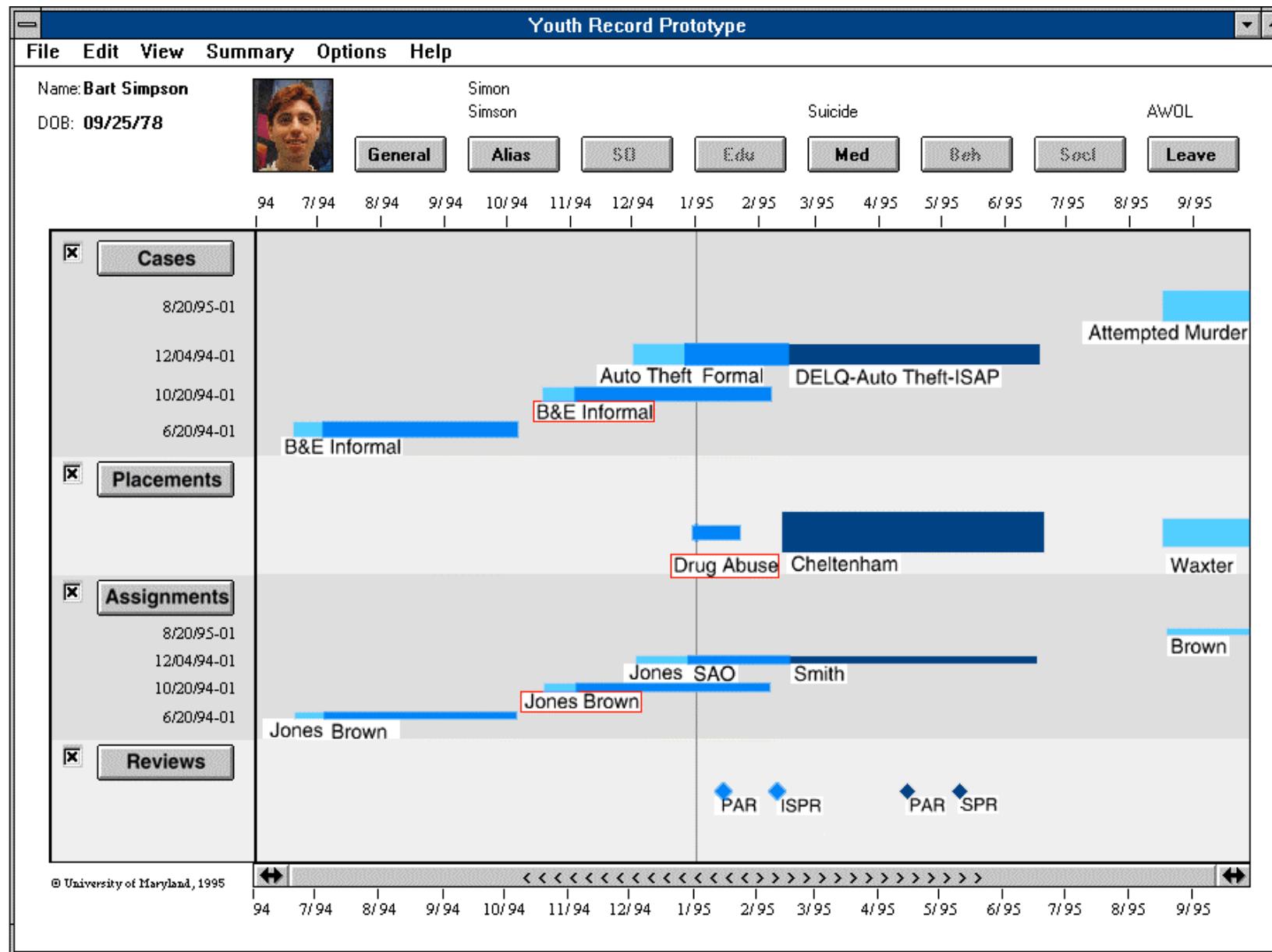
CASE

RECEIVED: DATE 09/14/93 SOURCE POLC REASON DELO OFFICE 71610
INTAKE DECISION: DATE 09/14/93 CODE CCAL AGENCY REF TO
INTAKE REASON:
APPEALED: / / APPEAL DISP CODE: APPEAL DISP DATE: / /
LEGAL COUNSEL: JUDGE/MASTER:
COURT FINDING: DISP DATE: / / DISP CODE:
TERM/COND: WARN
TERMINATION: FIXED / / ACTUAL 09/19/93 LAST UPDT: 010/07/93 TEXT: N
CONSENT GIVEN (Y/N): START DATE: / / EXPDT DATE: / /

ALLEGED OFFENSE: 01 DATE 09/14/93 CODE RNWY CTY 16 POL CMPLNT NO: 93045011
DESC/OFF RAN AWAY FROM MOM UPON RELEASE FROM CSC ARREST DATE 09/14/93
LOCATION STREETS OF OXON HILL M.D. ZIP 20745 0000 OTH INV(Y/N) Y
POLICE ID 1777 POLICE NAME NICODEMUS
ADJUDIC OFFENSE: 00 CODE PETI DISP CODE DATE / /

NEXT REQUEST: INQCASE NEXT KEY:
DC900004 NO MORE DATA

Kako izgleda ovaj radni ekran?



Kako izgleda ovaj radni ekran?

Medical Record Overview

Patient Name: Gold, Lea 

Date of Birth: 10-OCT-75
Sex: F
Race: Q
Insurance: Blue Cross
Policy Number: 67-2323-34

Address: 34 Oak Street Melrose, NY 101010
Telephone Number: 8005551212

School: University of Maryland College Park, MD

1/90
1/91
1/92
1/93
1/94
1/95

▼ Consultations

- ▼ Endocrine Clinic
 - [Dr. Samir Najjar](#)
 - [Dr. Michael Millis](#)
- ▼ Internists
 - [Dr. Horatio Wood](#)
 - [Dr. Alan Leichtner](#)

▼ Conditions

- [Neck Pain](#)
- [Short-Stature](#)
- [Arm Pain](#)
- [Aquired Hypothyroidism](#)
- [Asthma](#)
- [Secondary Amenorrhea](#)
- [Lymphoblastic Leukemia](#)
- [Thyroid Nodule](#)

▼ Misc Documents

- Letters
- Orders

▼ Hospitalizations

- ▼ Children's Memorial Hosp.
 - [Orthopedic Clinic](#)
 - [Endocrinology Clinic](#)
- Boston General Hosp.

▼ Medications

Acetaminophen — 50 mg TID	Acetaminophen — 100 mg TID	Prednisone — 50 mg QID — 75 mg
Doxycycline — 100 mg BID		

Date Span:

2/07/94-Consultation with Dr. Samir Najjar at 15:58

Endocrine Clinic, Children's Memorial Hospital

Diagnosis: Acute Lymphoid Leukemia

Labs

T4	10.7 ug/dL	normal [5.5, 11.0]
TSH	2.80 uU/mL	
FSH	3.5 IU/L	
LH	1.60 IU/L	
E2	68.0 pg/mL	
DS	139 ug/dL	
CA	8.8 MG/DL	normal [8.4, 10.5]
PHOS	4.2 MG/DL	normal [2.7, 4.5]
ALKP	106 U/L	normal [30, 120]

Clinical Measurements

Diastolic BP	60 mmHg
Heart Rate	80 Beats/Min
Height	140 cm

2/07/94-Letter by Dr. Najjar to Dr. Douglas Quinn

Douglas Quinn, MD RE: Lea Gold
Dana-Farber Cancer Institute DOB: 10/10/75
44 Binney Street
Boston, MA 02115

Dear Dr. Quinn:

We had the pleasure of seeing Lea in the Endocrine Program on 2/7/94 for follow up post treatment of all.

History: About a year ago she tripped in school and hit her back on the edge of a metallic table. Since then

3/04/93-Consultation with Dr. Michael Millis at 10:56

Endocrine Clinic, Children's Memorial Hospital

Diagnosis: Oth Acq Limb Deformities

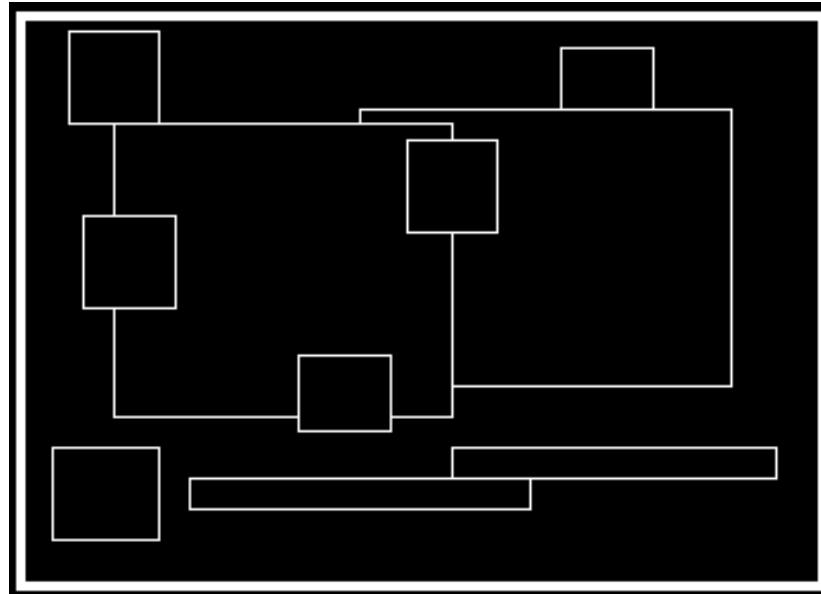
Observations

Skin: Cold extremities, not mottled.
HEENT: Alopecia, esotropia OD, fundi normal
Neck: Thyroid not enlarged.
Heart: Normal.
Chest: Tenderness over most of the upper ribs.
Abdomen: Soft, no masses, no hepatosplenomegaly.
Neurological: DTR 2+ Cranial, nerve II-XII: normal

Clinical Measurements

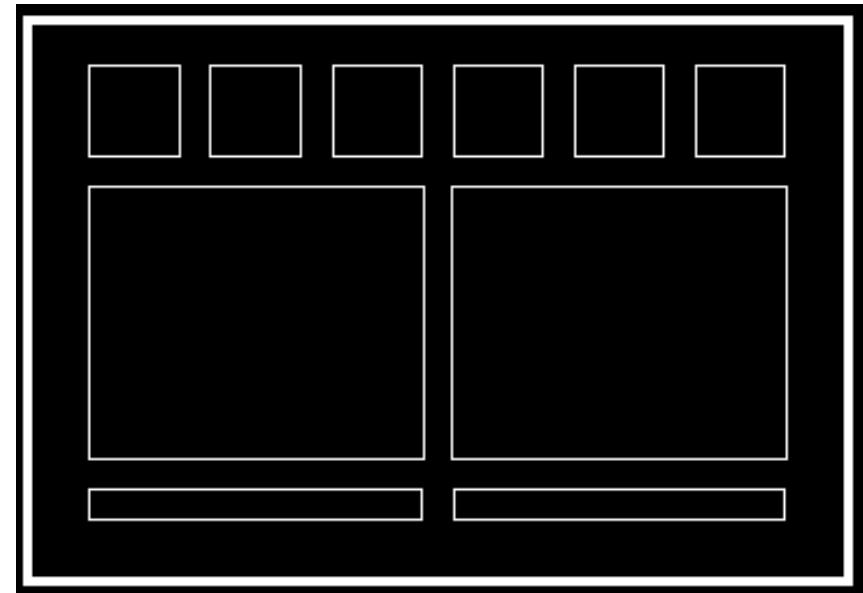
Height	139.4 cm
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Kako treba da izgleda struktura korisničkog interfejsa?

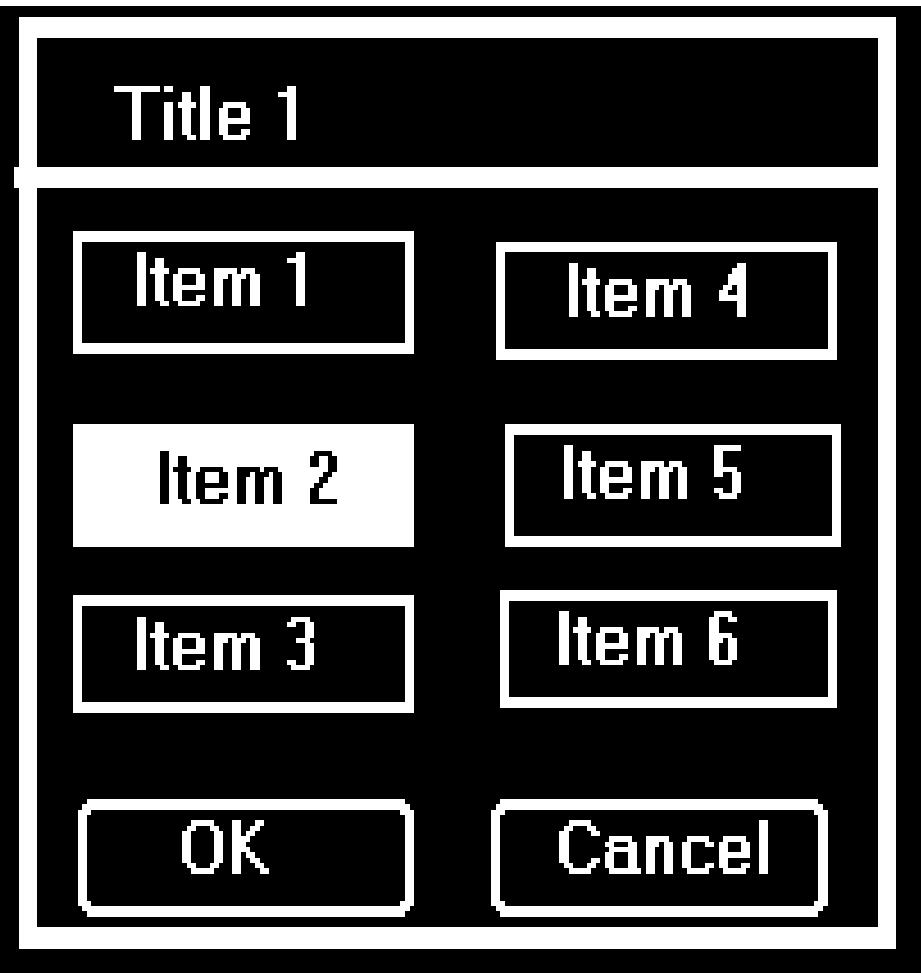
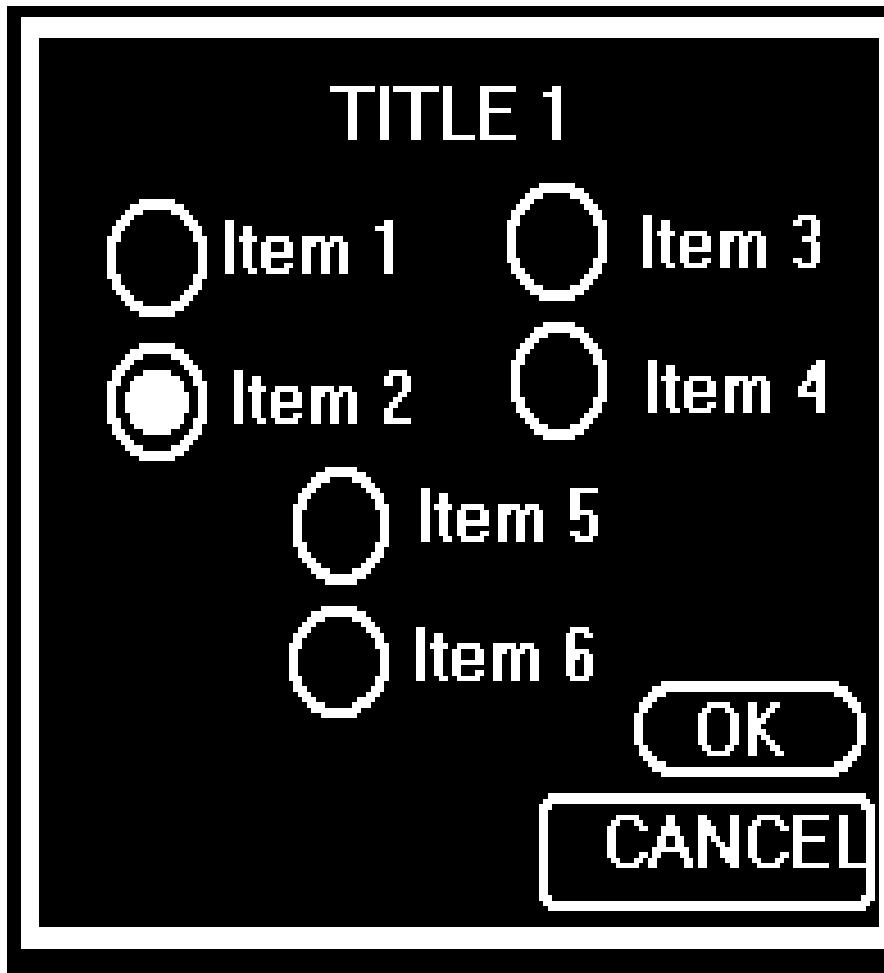


Ovako?

Ili ovako?



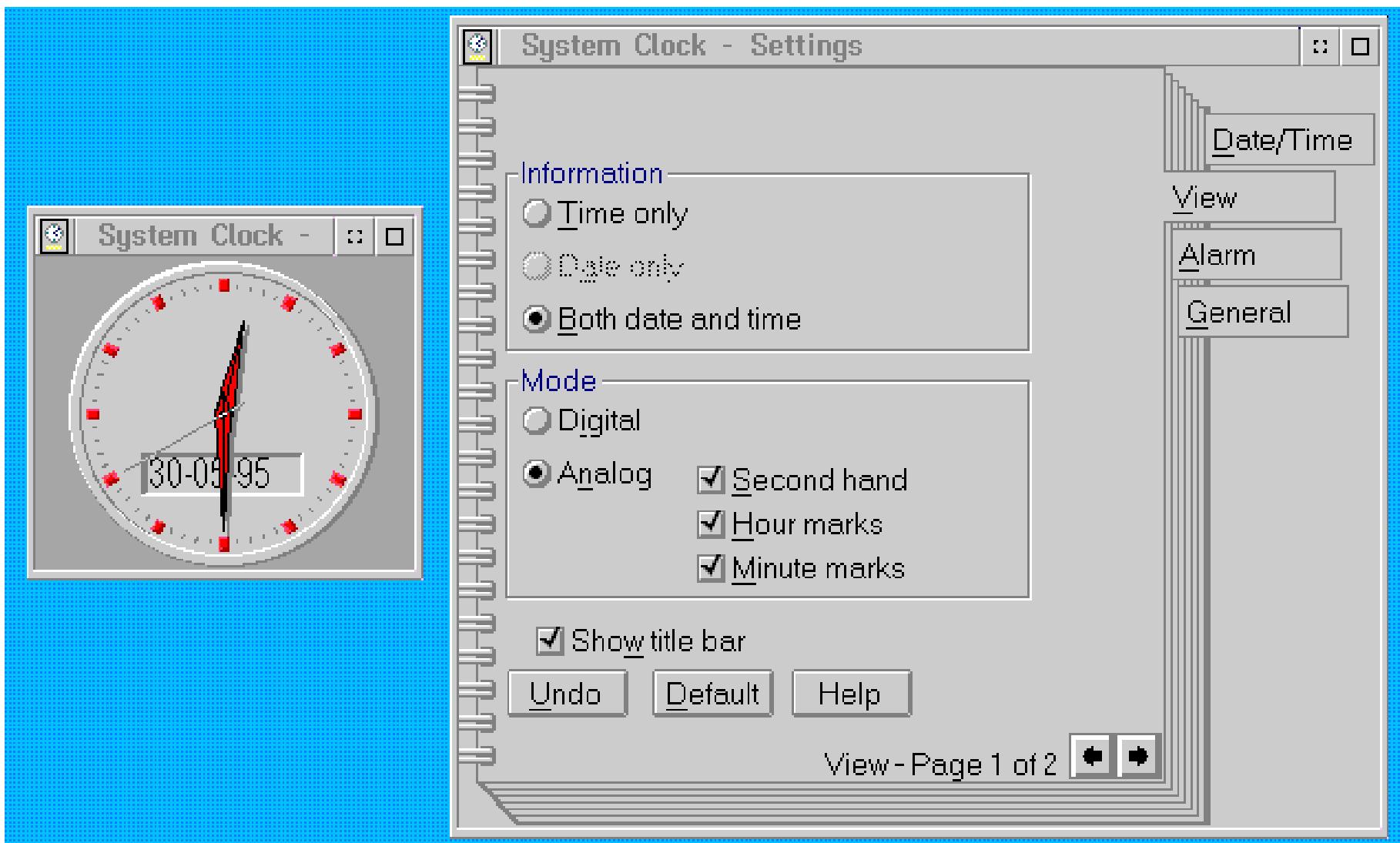
Struktura korisničkog interfejsa?



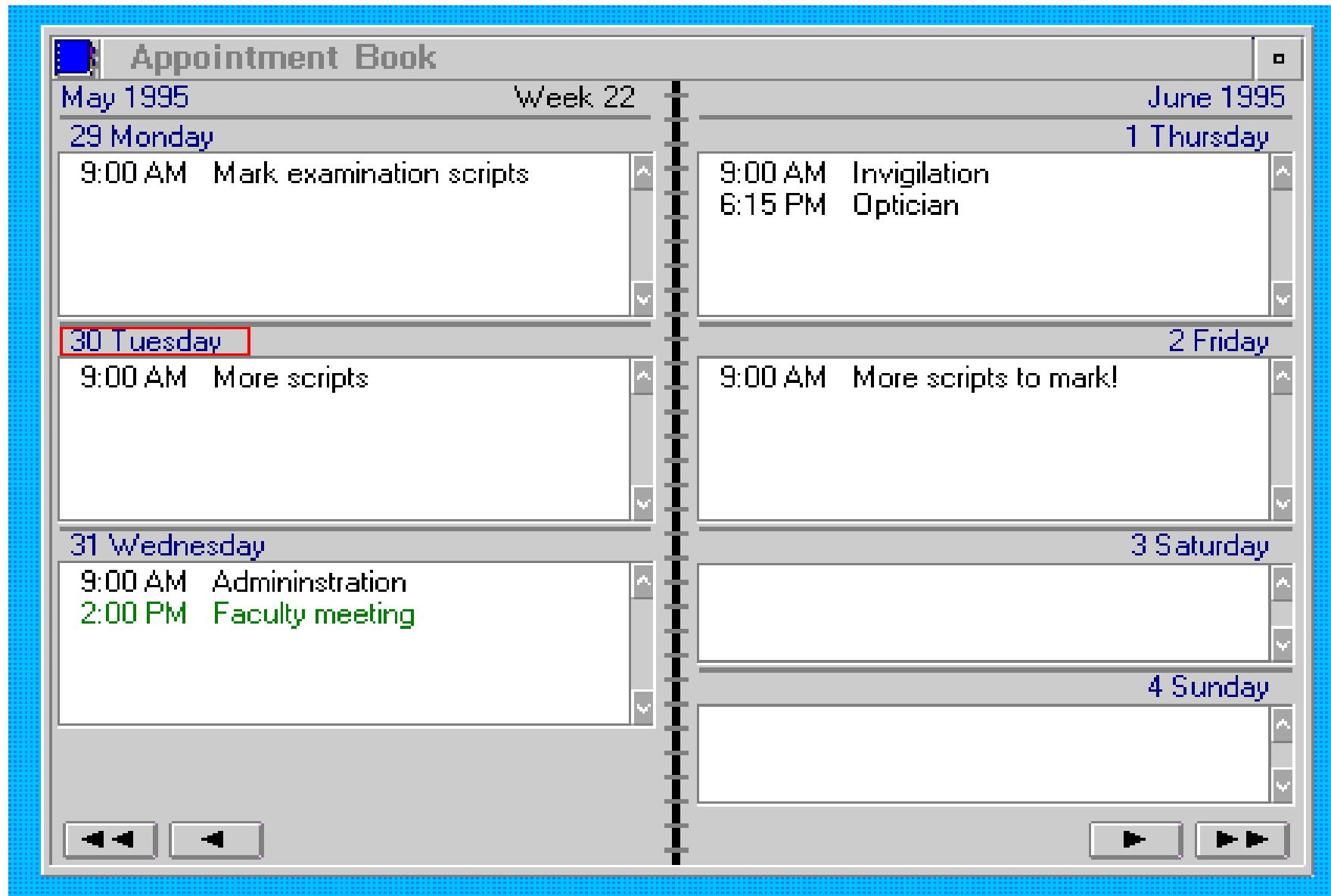
“Dobra” slika sistema - interfejsa

- **Sistem treba da bude “blizak” korisniku:**
 - Prikazuje način kako “razmišlja”
 - Koristi konkretne stvari i ne zahteva mnogo razmišljanja
 - Omogućava dvosmerne informacije
- **Podržava i omogućava lagano učenje**
- **Uklanja tehničke podatke o modelu sistema koje korisnik ne mora da zna**
- **Reflektuje tekući status – promene moraju da se verifikuju**
- **Podrška je uvek aktivna**
- **Smanjuje potrebe za obukom ili treningom**

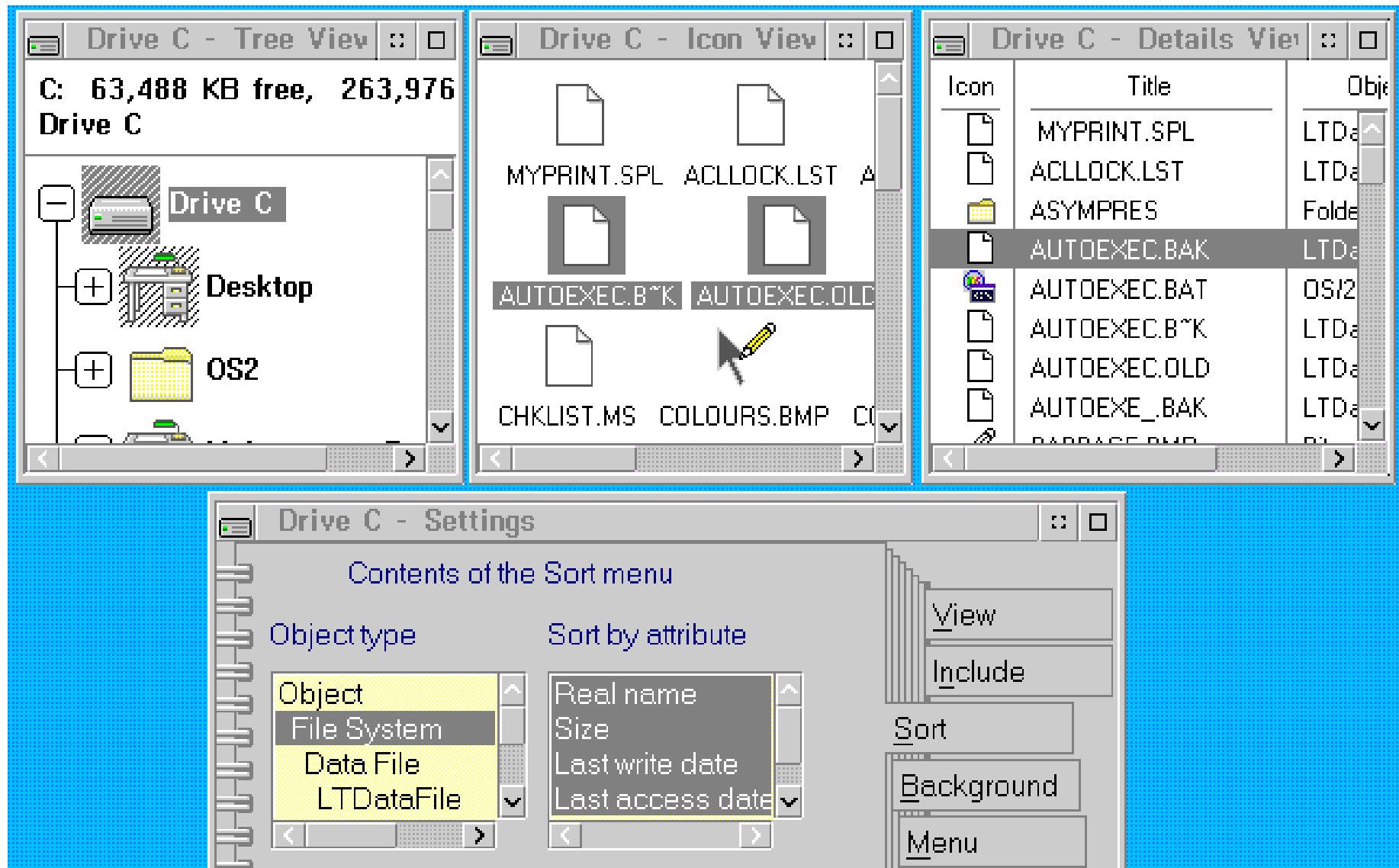
Podešavanje sata !?



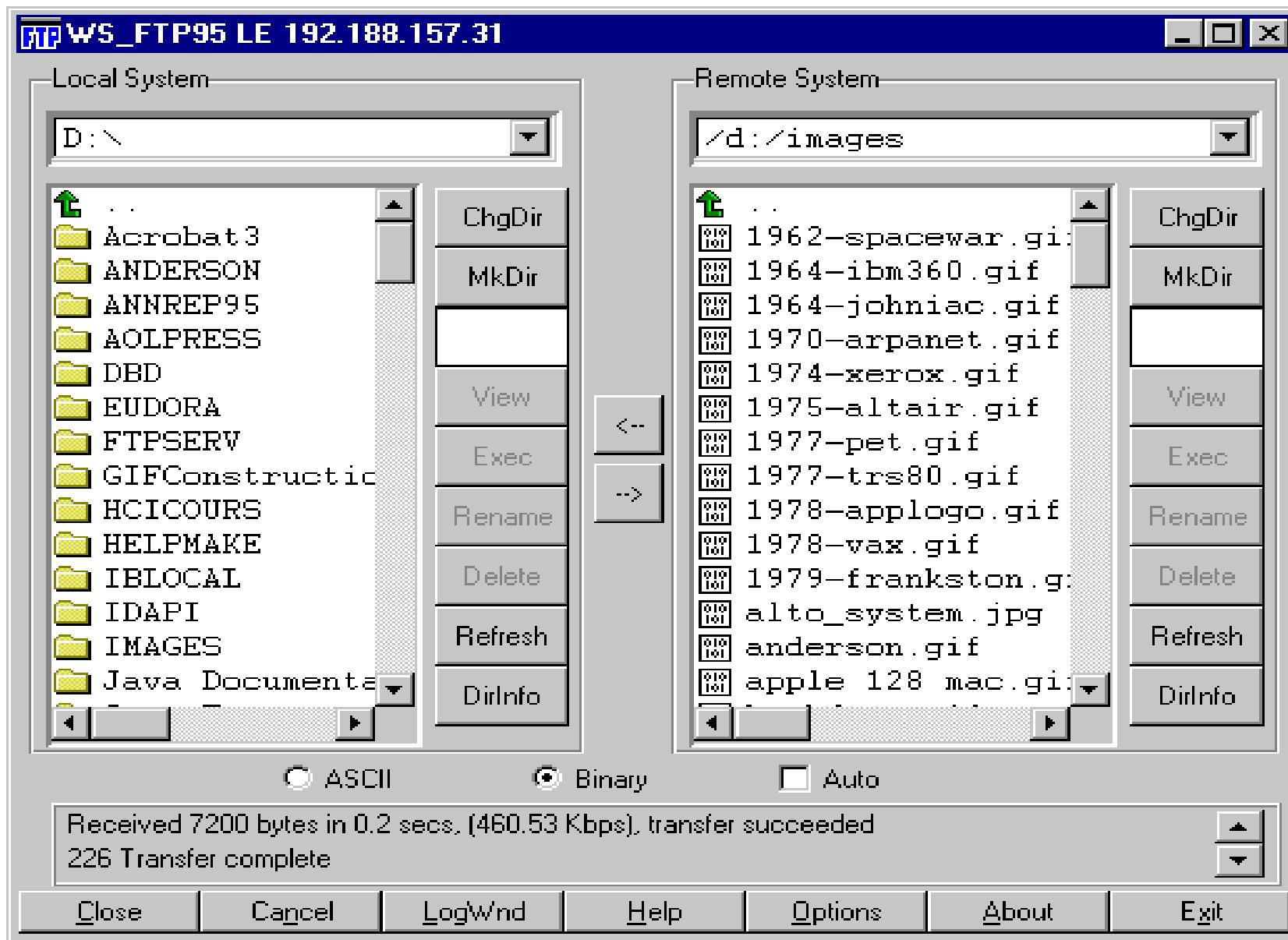
Rokovník!?



Sadržaj diska i njegovo podešavanje!?



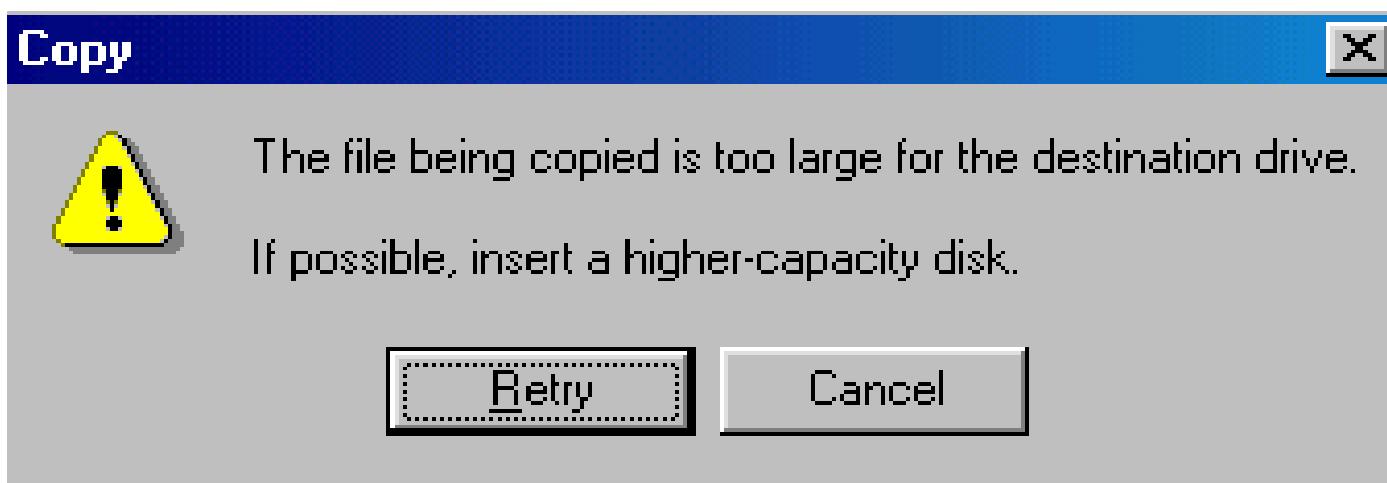
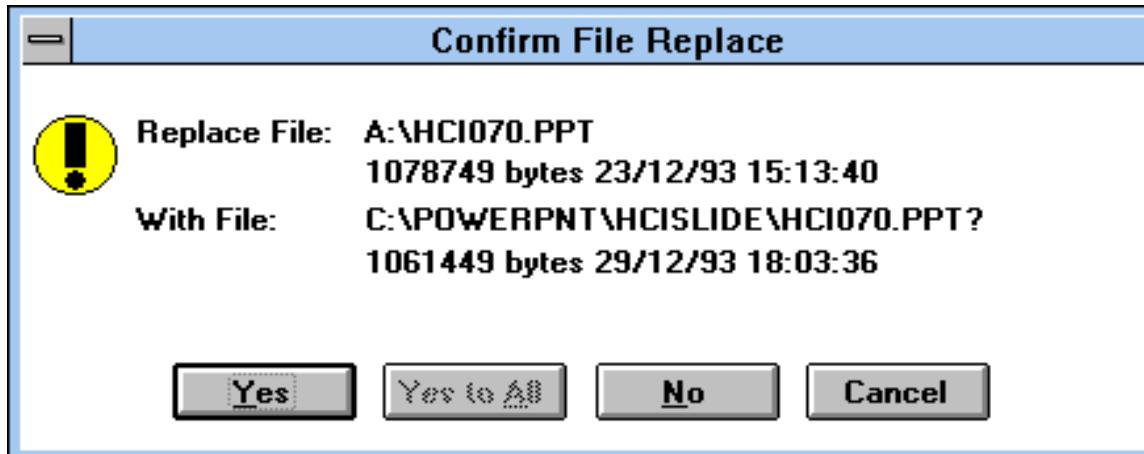
Sadržaj particije diska!?



Šta je sa porukama o greškama?

- Kako bi se korisnik osećao kada bi naišao na ovakav komentar prilikom korišćenja računara?
 - Fatal compiler error!! [Sledi jezivi zvuk SIRENE!!!!]
 - You did something bad. Restart your computer.
 - You pressed the wrong button, stupid!
 - Syntax error. Error number 435760.
 - Out of RAM. Try again.

Poruke koja traži odgovor od korisnika i on odgovor daje aktiviranjem odgovarajućeg tastera



Forme – primer 1

 **Netscape - [Microsoft FrontPage Beta 2 EULA]** [] [] []

File Edit View Go Bookmarks Options Directory Window Help

Registration Form

Prefix First Name M.I. Last Name

Email* (Re

Don't send me email based on this information.

Country

What is your connection/modem speed?

Which statement best describes your role regarding PC software?

Company Name

[] [] [] [] [] []

 Start  C:\WINDO...  Netscape ...  Paint Shop Pro  FTP WS_FTP95 ... 2:57 PM

Forme – primer 2

Congregation

Title	Christian Name	Initials	Surname	Listing No.	Household No:	Year joined:
Mr	Bugs	B	Bunny	1	33	
Address	The Hole			District No.		
	Near Hollywood, CA			3	PwO: 51	Contributor: <input checked="" type="checkbox"/>
Phone No.	Sex	Marital Status	DOB	Covenanted: <input type="checkbox"/> Anon: <input type="checkbox"/>		
0232	M	Single		Communicant: <input checked="" type="checkbox"/> Voter: <input checked="" type="checkbox"/>		
Session: <input checked="" type="checkbox"/>	Married	Senior citizen: <input checked="" type="checkbox"/>	Tuesday circle: <input type="checkbox"/>			
Committee: <input type="checkbox"/>	Widowed	Core list: <input type="checkbox"/>	OPH/Nursing Home: <input type="checkbox"/>			
Visitor (Focus): <input type="checkbox"/>	Separated	Divorced	Date Widowed: <input type="checkbox"/>			
Sunday school: <input type="checkbox"/>	G B: <input type="checkbox"/>	Choir: <input checked="" type="checkbox"/>	P W A: <input type="checkbox"/>			
C E: <input type="checkbox"/>	Scouts: <input type="checkbox"/>	Worship group: <input type="checkbox"/>	A C E: <input checked="" type="checkbox"/>			
B B: <input type="checkbox"/>	Youth group: <input type="checkbox"/>	Music group: <input type="checkbox"/>	House group: <input type="checkbox"/>			
Tennis: <input type="checkbox"/>	Bowls: <input checked="" type="checkbox"/>	Badminton: <input type="checkbox"/>	Prebyterian Herald: <input type="checkbox"/>			
Christian Irishman: <input type="checkbox"/>	Annual report: <input checked="" type="checkbox"/>					

Record: 51

Forme – primer 3

Asgard TicketBase

File Edit Record Modules Help

Patrons Performers Contacts All

Household: [Text Box]

Select individual: [Select Box]
Title: First Name: Initials:
Last Name: Quick Sale
Position: Salutation:

Select address: [Select Box]
Address 1: [Text Box]
(Town): [Text Box]
City/County: [Text Box]
Postcode: [Text Box]
Country: [Text Box]

Select Telephone/Fax: [Select Box]
Area Code: Tel No: Ext: [Text Box]

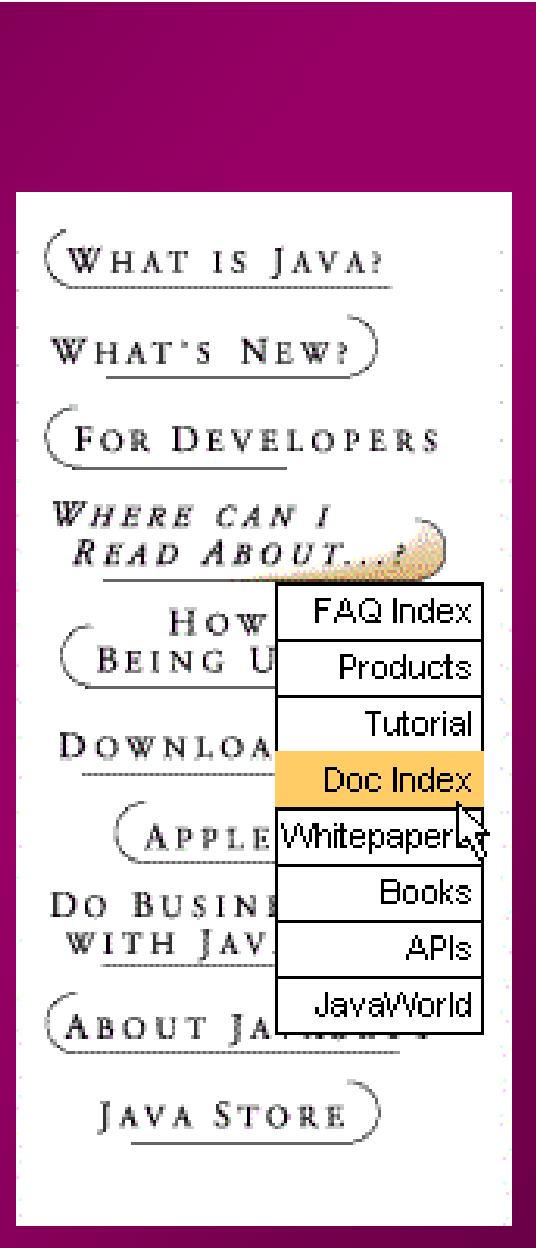
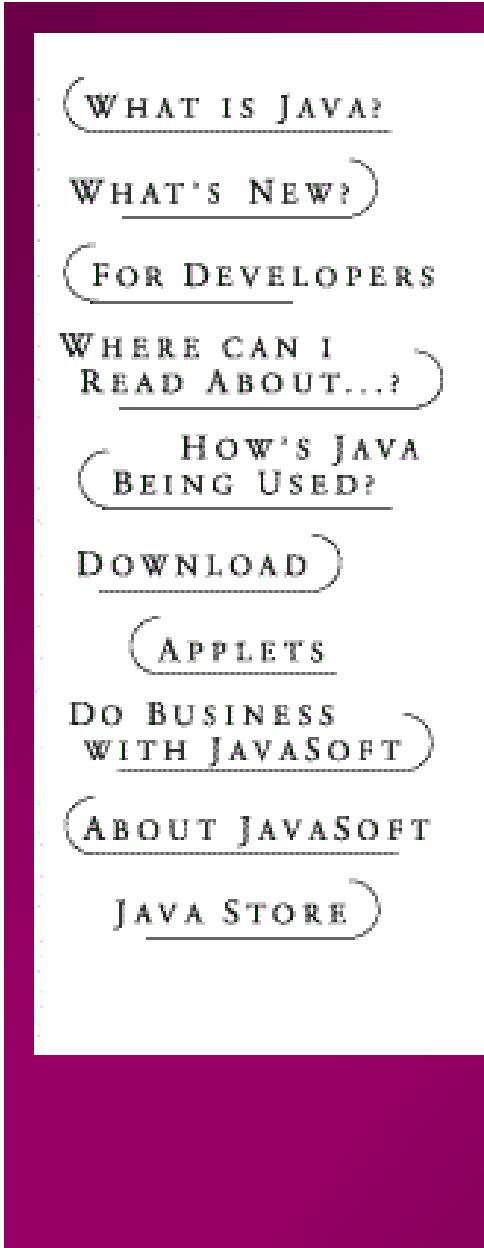
Cordial Mailing list? Selected? Unique ID: -1

Field 1 [Select Box] Field 5 [Select Box] Field 11 [Select Box]
Field 2 [Select Box] Field 6 [Select Box] 00/00/00 [Text Box]
Field 3 [Select Box] Field 7 [Select Box] Field 9 [Text Box]
Field 4 [Select Box] Field 8 [Select Box] Field 10 [Text Box]

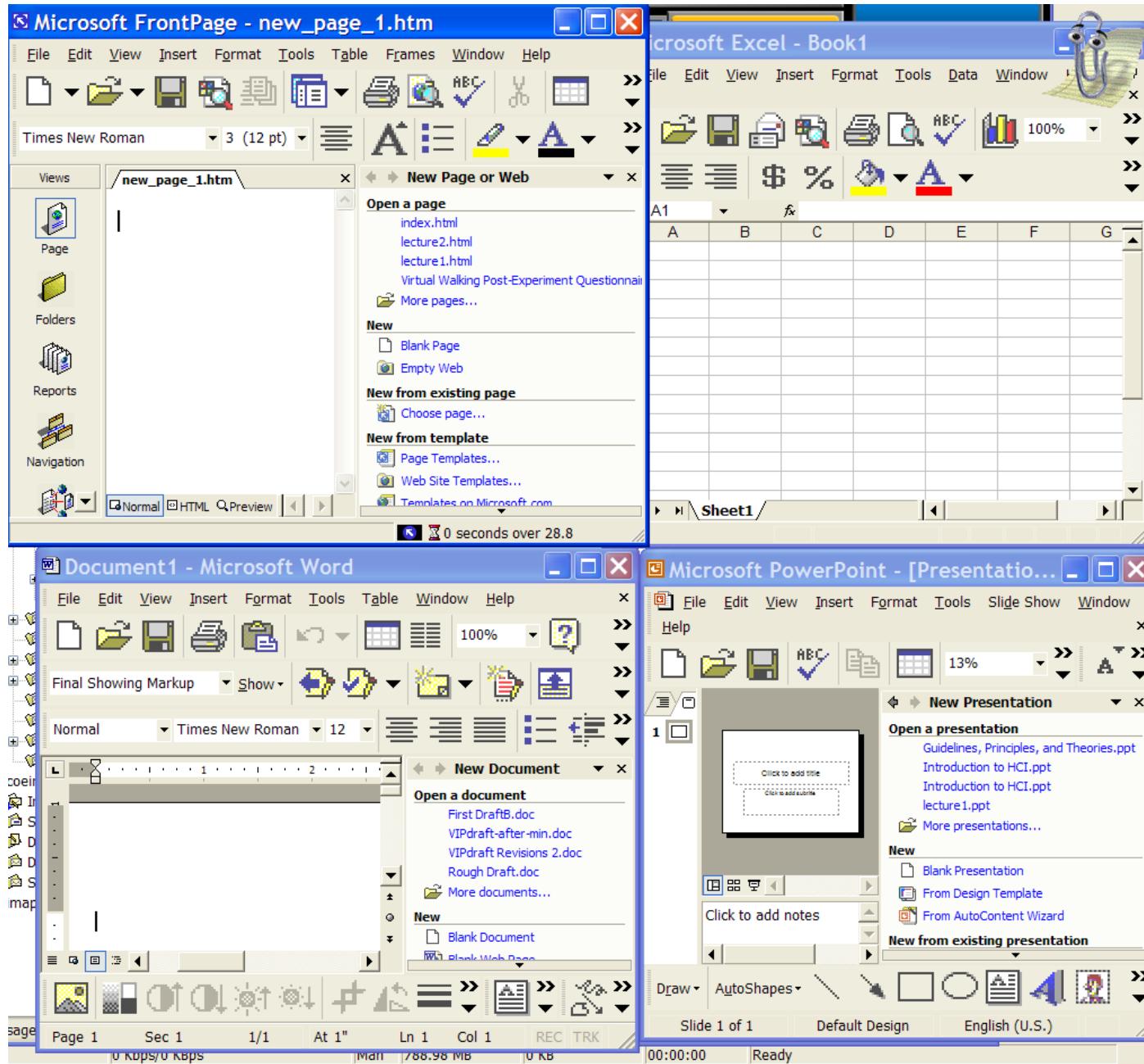
Classifications Notes Tickets Bookings Reminders

Ready SOS 01/01/00 - SV - 01/01/00

Nestandardni meniji



Microsoft aplikacije



GUI Istorija

- 1973 Pioneered at the Xerox Palo Alto Research Center.
 - First to pull together all the elements of the modern GUI.
- 1981 First commercial marketing as the Xerox STAR.
 - Widely introduced pointing, selection, and mouse.
- 1983 Apple introduces the Lisa.
 - Features pull-down menus and menu bars.
- 1984 Apple introduces the Macintosh.
 - Macintosh is the first successful mass-marketed system.
- 1985 Microsoft Windows 1.0 released.
Commodore introduces the Amiga 1000.
- 1987X Window System becomes widely available.
IBM's System Application Architecture released.
 - Including Common User Access (CUA).
 - IBM's Presentation Manager released.
 - Intended as graphics operating system replacement for DOS.
 - Apple introduces the Macintosh II.
 - The first color Macintosh.

GUI Istorija

- 1988 NeXT's NeXTStep released.
 - First to simulate three-dimensional screen.
- 1989 UNIX-based GUIs released.
 - Open Look by AT&T and Sun Microsystems.
 - Innovative appearance to avoid legal challenges.
 - Motif, for the Open Software Foundation by DEC and Hewlett-Packard.
 - Appearance and behavior based on Presentation Manager.
- Microsoft Windows 3.0 released.
- 1992 OS/2 Workplace Shell released.
Microsoft Windows 3.1 released.
- 1993 Microsoft Windows NT released.
- 1995 Microsoft Windows 95 released.
- 1996 IBM releases OS/2 Warp 4.
Microsoft introduces NT 4.0.
- 1997 Apple releases the Mac OS 8.
- 1998 Microsoft introduces Windows 98.
- 1999 Apple releases Mac OS X Server.
 - A UNIX-based OS.
- 2000 Microsoft Windows 2000 released.
Microsoft Windows ME released
- 2001 Microsoft Windows XP released