Computer Software: What it's really about

In this section you will about software, how it really works and how it relates to computer hardware

---

Unless Told Otherwise The Computer Does Nothing

What do I do?

ZZZ...

Software Are The Instructions For The Computer

- Compress video
- Scan for viruses
- Etc.

James Tam

Similarly If The Computer Makes A Mistake It Was Told To Do It

James Tam

What Does Software Do?
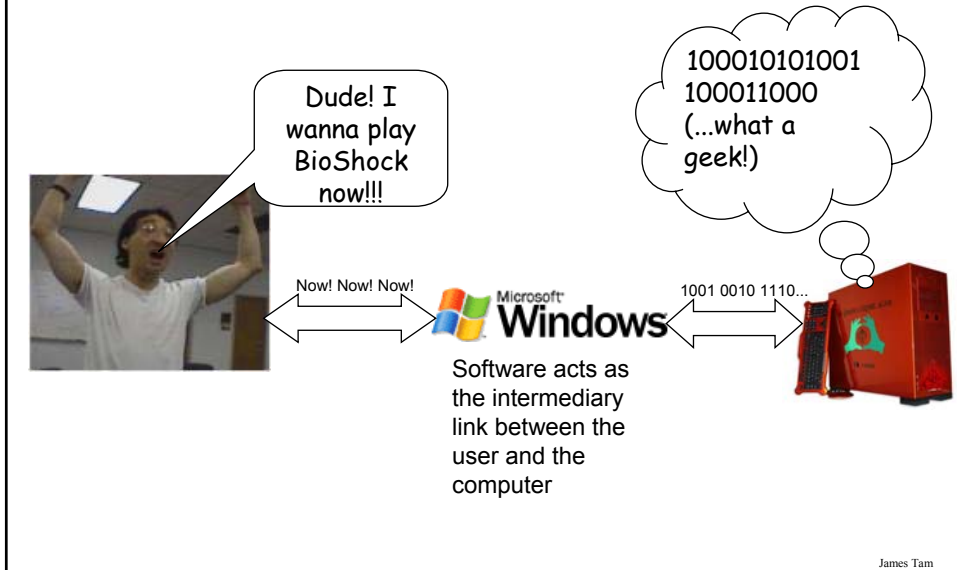
Dude! I wanna play BioShock now!!!

100010101001 100011000 (...what a geek!)

Now! Now! Now!

1001 0010 1110...

Software acts as the intermediary link between the user and the computer

Some Categories Of Software

1. Translators

2. Application software

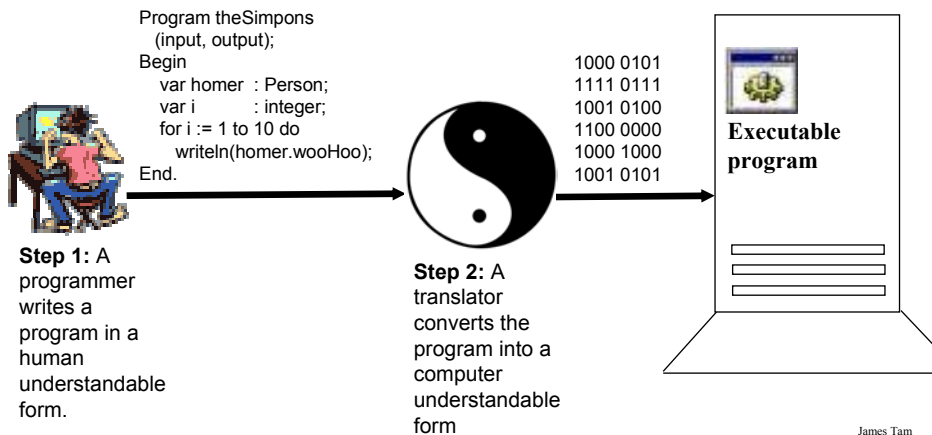3. System software (operating systems)

Some Categories Of Software

1. **Translators**

2. Application software

3. System software (operating systems)

Translators

The (greatly simplified) process of writing a computer program.

```
Program theSimpons
  (input, output);
Begin
  var homer  : Person;
  var i        : integer;
  for i := 1 to 10 do
    writeln(homer.wooHoo);
End.
```

1000 0101
1111 0111
1001 0100
1100 0000
1000 1000
1001 0101

Executable program

Step 1: A programmer writes a program in a human understandable form.

Step 2: A translator converts the program into a computer understandable form

Types Of Translators

Interpreters
- Each time that the program is run translation occurs
- The program is translated on a statement by statement basis and then executed
- Typically used for web-based programs e.g., 'Java script' and many other programs run through web browsers
- **Pro:** can be used when the operating system of the computer on which program will be run is unknown (works for multiple operating systems)
- **Cons:** Slow

Compilers
- The program is translated all at once and it is the translated version that is run
- This is the approach taken for most commercial software e.g., 'C#' and 'C' are used to produce many kinds of software that's translated into a machine understandable form.
- **Pro:** Fast
- **Con:** The installed version of the program must be translated specifically for each operating system (possibly for each version of operating system)
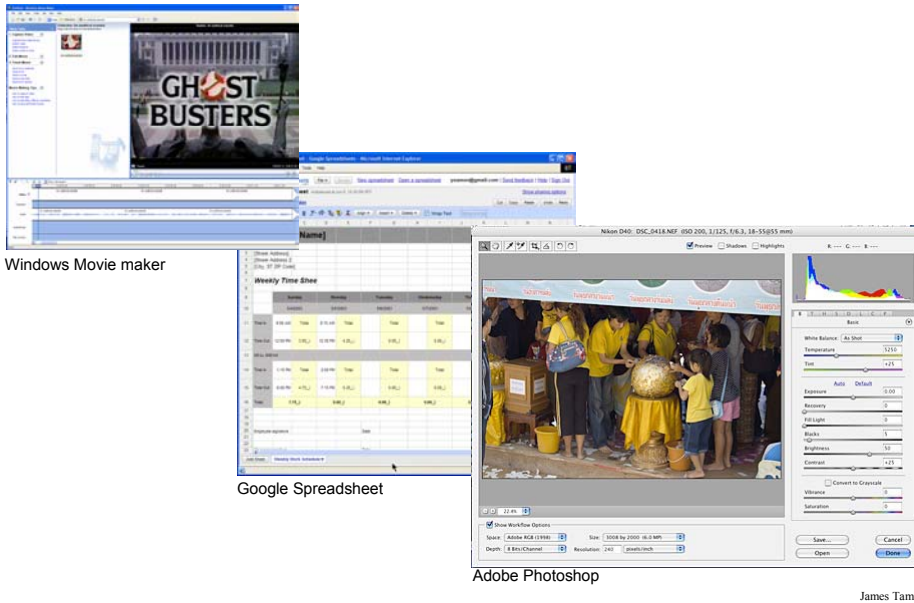

Some Categories Of Software

1. Translators

2. **Application software**

3. System software (operating systems)

Application Software (Applications)

Windows Movie maker

Google Spreadsheet

Adobe Photoshop

Common Categories Of Application Software

Manipulating text

Spreadsheets

Databases

Programs That Manipulate Text

•Text editors

•Word processors
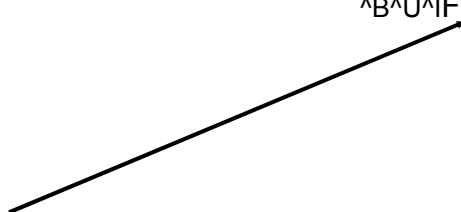
•Desktop publishing programs

•Collaborative writing tools

Text Editors

•Allows text to be edited (add, delete, modify).

•They typically include only the most primitive formatting features (if they are included at all).

•Often used in the writing of computer programs (e.g., Notepad, Emacs, XEmacs) where excessive formatting can produce errors during translation

^B^U^IFor/@/±/~

For i = 1 to 10 do

Word Processors

•Perform the same functions as text editors and more

•Text formatting
  •Font effects e.g., Italic, bold, underline etc.
  •Font colors

•Some multimedia support
  •Images
  •Movies
  •Charts and diagrams

Word Processors (2)

•Additional utilities
  •Spelling checking and thesaurus
  •Document merging
  •Version control
  •Etc.

•WYSIWIG

Desktop Publishers

- Used to produce published documents e.g., magazines, books etc.

- Provide many of the features of word processors (except for the specialized utilities).

- Provide additional powerful support for laying text and graphics.

- Additional support is provided from the importing of images right down to the printing and binding of documents.

- Examples: Adobe InDesign, Adobe PageMaker, QuarkXPress

PDF (Portable Document Format) Documents

- Allow for documents to be shared among different computer types e.g., Windows, Apple, UNIX etc.

- Also it ensures that the appearance of a document will appear the same from computer to computer and printer to printer

Example: Document Is Not Converted To PDF

Original document

Asdkjflaksdjflkasjdf
kljasdklfjaskldfjlasdj
fklasdjflkasjdjdfklasj
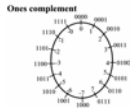
Ones complement

asdijfakldjfaksjdfkla
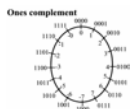jsdklfjasldfjakldjflka
sjdflkajsdklfjasdklfja

Printed on printer 1

Asdkjflaksdjflkasjdf

Ones complement

kljasdklfjaskldfjlasdj
fklasdjflkasjdjdfklasj
asdijfakldjfaksjdfkla
jsdklfjasldfjakldjflka
sjdflkajsdklfjasdklfja

Printed on printer 2

Asdkjflaksdjflkasjdf
kljasdklfjaskldfjlasdj
fklasdjflkasjdjdfklasj
asdijfakldjfaksjdfkla
jsdklfjasldfjakldjflka
sjdflkajsdklfjasdklfja

Ones complement
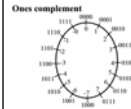
Example: Document Is Converted To A PDF File

PDF document

Asdkjflaksdjflkasjdf
kljasdklfjaskldfjlasdj
fklasdjflkasjdjdfklasj

Ones complement

asdijfakldjfaksjdfkla
jsdklfjasldfjakldjflka
sjdflkajsdklfjasdklfja

Printed on printer 1

Asdkjflaksdjflkasjdf
kljasdklfjaskldfjlasdj
fklasdjflkasjdjdfklasj

Ones complement

asdijfakldjfaksjdfkla
jsdklfjasldfjakldjflka
sjdflkajsdklfjasdklfja

Printed on printer 2

Asdkjflaksdjflkasjdf
kljasdklfjaskldfjlasdj
fklasdjflkasjdjdfklasj

Ones complement

asdijfakldjfaksjdfkla
jsdklfjasldfjakldjflka
sjdflkajsdklfjasdklfja

Techniques For Evaluating And Planning THE Layout And Presentation Of A Document

•The squint test

•CRAP (Contrast, repetition, alignment, proximity)

The Squint Test

Used to determine what stands out or what elements appear to belong together

CRAP: An Important Tool For Graphical Screen Design & Evaluation

Contrast
- Make different things even more different
- Brings out dominant elements & mute lesser elements

Repetition
- Consistency
- Repeat conventions throughout the document to tie elements together

Alignment
- Visually associate related elements by lining them up

Proximity
- Group related elements
- Separate unrelated elements

Contrasting Contrast

Repetition

Mickey Mouse
- Walt Disney Studios
  Anaheim, California
  58 years old, no children

Employment
- Walt Disney Studios
- Various television studios

Education
- Walt Disney Studios

Favorite Activities
- Driving steamboats
- Roping cattle

Favorite Quote
- Everybody can't be a duck.

From "The Non-Designers Design book by Robin Williams
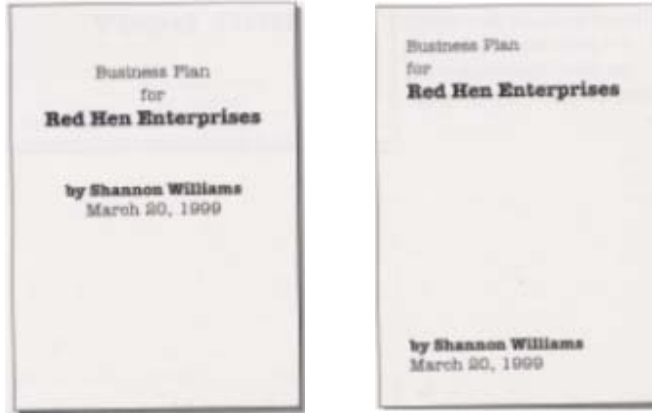

Alignment

Honor Form

Heresy rheumatic starry offer former's dodder, Violate Huskings, an wart hoppings darn honor form.

Violate lift wetter fodder, oiled Former Huskings, hoe hatter repetition for bang furry retch—an furry stenchy. Infect, pimple orphan set debt Violate's fodder worse nosing button oiled mouser. Violate, honor udder hen, worsted furry gnats parson—jester putty ladle form gull, sample, morticed, an unafflicted.

Tarred gull

Wan moaning Former Huskings nudist haze dodder setting honor cheer, during nosing.

"Violate!" sorted dole former, "Watcher setting darn fur? Denture nor yore canned gat retch setting darn during nosing? Germ pup otter debt cheer!"

"Arm tarred, Fodder," resplendent Violate warily.

"Watcher tarred fur?" aster stenchy former, hoe dint half mush symphony further gull.

Feeder pegs

"Are badger dint doe mush woke disk moaning! Ditcher curry doze buckles fuller slob darn tutor peg-pan an feeder pegs?"

"Yap, Fodder. Are fetter pegs."

"Ditcher mail-car caws an swoop otter caw staple?" "Off curse, Fodder. Are mulct oiler caws an swapped otter staple, fetter checkings, an clammed upper larder inner checking-horse toe gadder

Honor Form

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Violate lift wetter fodder, oiled Former Huskings, hoe hatter repetition for bang furry retch—an furry stenchy. Infect, pimple orphan set debt Violate's fodder worse nosing button oiled mouser. Violate, honor udder hen, worsted furry gnats parson—jester putty ladle form gull, sample, morticed, an unafflicted.

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"Ditcher mail-car caws an swoop otter caw staple?" "Off curse, Fodder. Are mulct oiler caws an swapped otter staple, fetter checkings, an clammed upper larder inner checking-horse toe gadder oiler aches, an wen darn tutor vestibule guarding two peck oiler bogs

From "The Non-Designers Design book by Robin Williams

Legibility And Readability: Center Alignment

- Some regard it as unprofessional and advocate against it's use.
- It's described as being unprofessional looking and plain.

Legibility And Readability: Center Alignment

- Overuse of centering can make it harder to determine the structure of onscreen elements.

UNIVERSITY OF CALGARY
DEPARTMENT OF COMPUTER SCIENCE
FACULTY OF SCIENCE
COURSE INFORMATION SHEET
September 10, 2007

1. **Course:** CPSC 203, Introduction to Computers
Lecture/Time/Session: L02, MW 16:00-17:15, Fall 2007
Instructor: James Tam, ICT 707, 210-9455
Office Hours: MW 15:00 - 15:50, T 16:45 - 17:30
(*If I'm not in my office please check in ICT 102*)
E-mail: tamj@cpsc.ucalgary.ca
Website: http://pages.cpsc.ucalgary.ca/~tamj/203

2. **Prerequisites:** None

3. The University policy on grading and related matters is described on pp. 43-45 of the 2007-2008
Calendar. In determining the overall grade in the course, the following weights will be used:

Assignments	40%
Midterm Exam	20%
Final Exam	40%

The course **will** have a Registrar's scheduled final examination.
Special regulations affecting the final grade (e.g. requirement to pass the final examination or to
pass the laboratory to pass the course): Each of the above components will be given a letter
grade using the official University grading system. The final grade will be calculated using
the grade point equivalents weighted by the percentages given above and then reconverted to
a final letter grade using the official University grade point equivalents.

Legibility And Readability: Center Alignment

•It can be useful for providing additional contrast
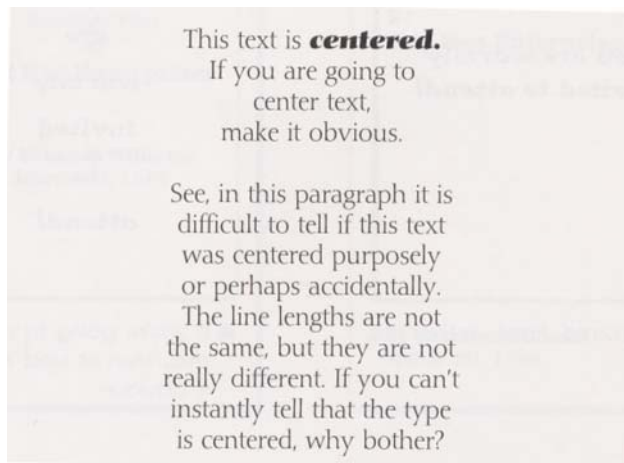 • e.g., titles vs. the body of the text.

•So it should be used sparingly
•It should also be used for a reason rather than as the default

---

Legibility And Readability: Center Alignment

•If you are employing it to provide contrast then at least make it obvious

This text is **centered.**
If you are going to
center text,
make it obvious.

See, in this paragraph it is
difficult to tell if this text
was centered purposely
or perhaps accidentally.
The line lengths are not
the same, but they are not
really different. If you can't
instantly tell that the type
is centered, why bother?

Proximity

Fonts And Font Effects

Proper use of typography
- 1-2 typographical effects (typeface or typography) - 3 max
  - Font types, normal, italics, bold, underline
- 1-3 fonts sizes max

Large
Medium
Small

Large
Medium
Small

Readable

Design components to be *inviting* and attractive

Design components to be inviting and attractive

✓

Unreadable

Design components to be *inviting* and <u>attractive</u>

Design components to be **inviting** and **_attractive_**
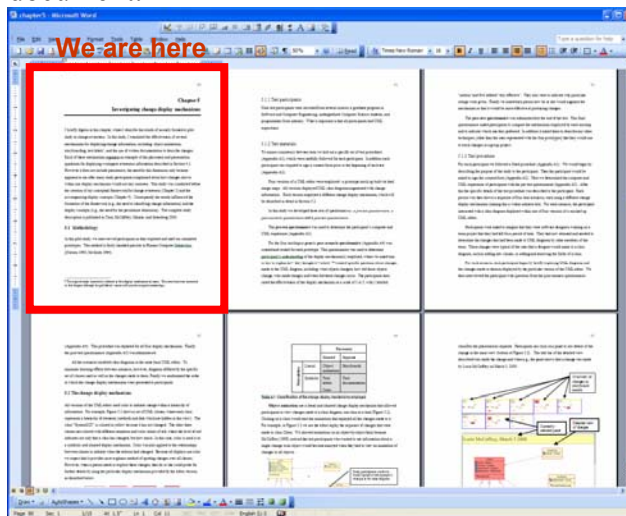
✗

Collaborative Writing Tools

Using existing software with multiple authors is problematic:
- What is everyone else currently working on? (Real-time issues)
- What has everyone else done while I've been away? (Non-real time issue)
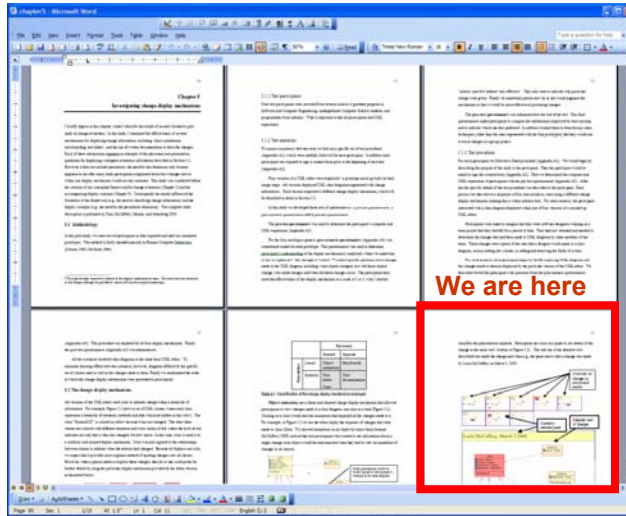
Real-Time Issues: Early Approach

- Everyone has to look at and work on the same part of the same document.

Real-Time Issues: Early Approach

•If someone wants to work elsewhere then everyone has to shift their view.

We are here

Real-Time Issues: Loosened Restrictions Lead To Other Problems

Where is everyone working?

Andy's focus

Carl's focus

Saul's focus (local user)

Non-Real Time Issue: What's Everyone Been Up To While I've Away?
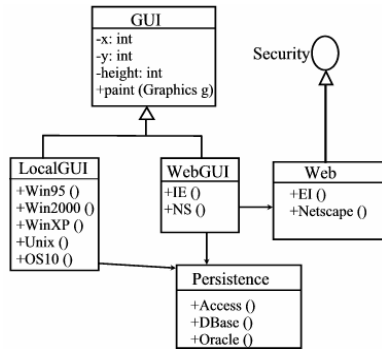
Before
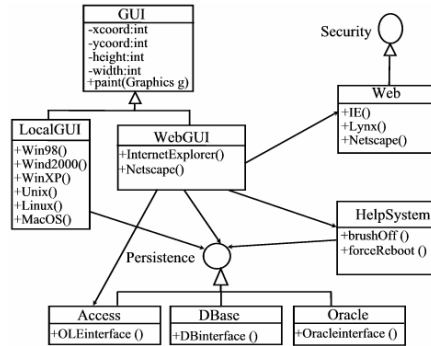
After

Some Approaches For Communicating What's Occurred In The Past

Body of document

Wear indicator for a portion of the document

Area of document currently visible (in gray)

Scrollbar

Wear Indicators Hill W., Holan J., Wroblewski D. and McCandless T (1991) Edit Wear and Read Wear.

tamj:
This are some comments used to indicate how the documentation system works.

Some unmodified text[t1]
New text Original text
Some more unmodified text
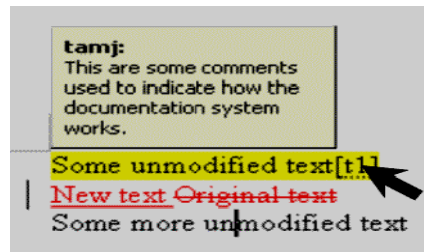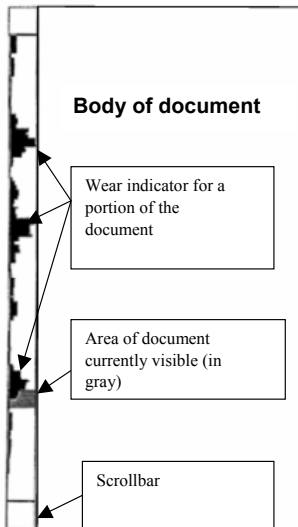
Annotations: Microsoft Word

Managing Information

•E.g., A personal budget

Spreadsheets

Early versions began as an electronic equivalent to the paper version.

VISICALC Dan Bricklin & Bob Frankston

Spreadsheets Allow For Powerful 'What If Analysis

- Because results are calculated dynamically, the effect of different scenarios can be simulated.
  - e.g., Grades
    - What would be my term grade if I got a 'B-' on the final exam?
    - What would be my term grade if I got a 'B' on the final exam?
    - What would be my term grade if I got a 'A-' on the final exam?

Databases

- Are used to store and retrieve information

- Why bother?
- E.g., tracking client information

MILES EDWARD O'BRIAN
DS9 Corp
Electrical engineering
2007 purchases: $10,0000,000
2006 purchases: $1,750,000

JAMIE SMYTHE
Cooperative services
Gasoline refining
2006 purchases: $5,000,0000
2005 purchases: $5,000,0000
2004 purchases: $5,000,0000
2003 purchases: $5,000,0000
2002 purchases: $5,000,0000

SCOTT BRUCE
Bryce Consulting
Investment analysis
2007 purchases: $500,000
2006 purchases: $1,500,000
2005 purchases: $2,500,000
2004 purchases: $500,000

Etc.

- If the list is short then a simple text file may suffice

- As the list grows organizing and updating the information becomes more challenging.

- Also searching the list according to specific criteria may become difficult
  - e.g., Show all clients whose purchases in 2007 were between one and five million dollars
  - e.g., Show all clients that made a year purchase exceeding 10 million dollars.

Some Categories Of Software

1. Translators

2. Application software

3. **System software (operating systems)**

Software

- What you know: Software acts as an intermediary between people and computers.

```
        People
          ⇕
        Software
          ⇕
        Hardware
```
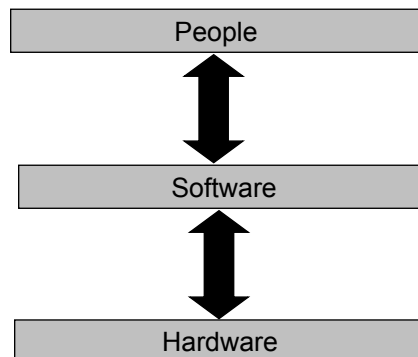
Operating Systems

What you will learn: Operating systems may act as an intermediary between people and computers, or between other software and the computer.

People

| Application software | | Translators |

Operating System

Hardware
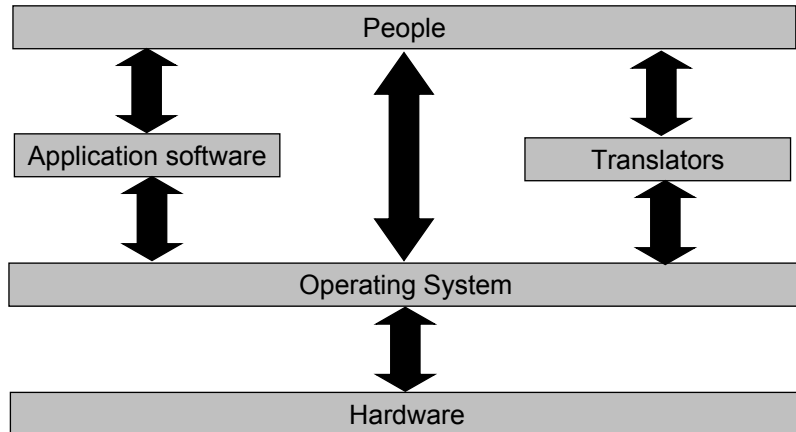
What Does The Operating System Do?

1. Communicate with peripherals

2. Manage processor time

3. Manage memory

4. Provide security

5. Manage the storage devices

Communicating With Peripherals

The operating system communicates with peripherals (e.g., input and output devices) through driver software.

People

| Application software | | Translators |

Operating System

| Driver software |

Hardware
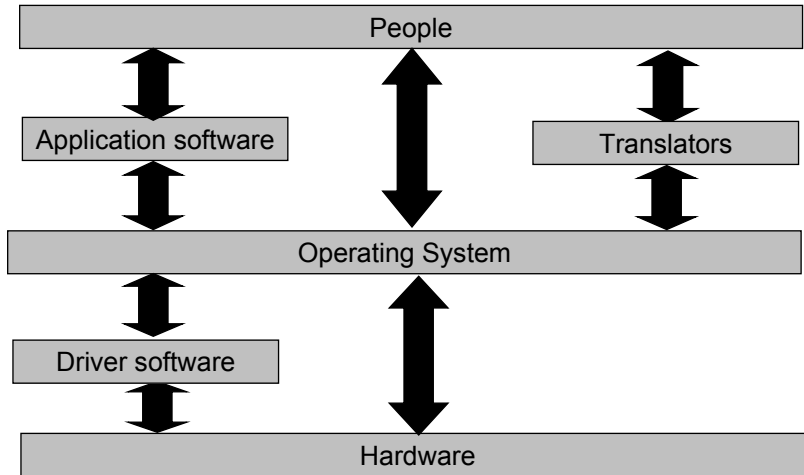
An Example Of How Peripherals Work: A Mouse

RAM

Mouse driver
Keyboard driver
Operating system
MS-Word
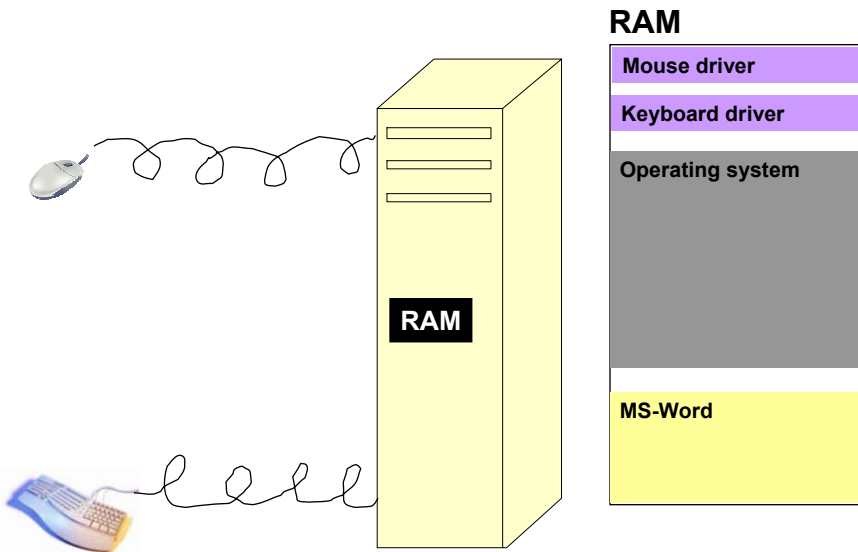
RAM

Managing Processor Time

A = B + C

Managing Memory

RAM

A = B + C
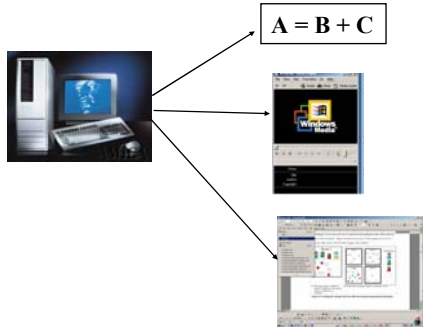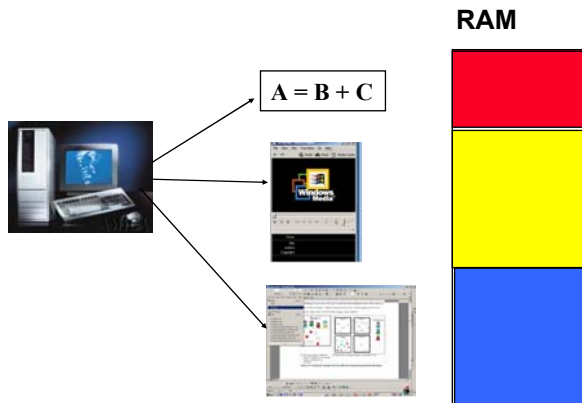
Managing Memory: Virtual Memory

• Essentially memory appears limitless because of virtual memory

• It treats storage space on the hard drive as if it were an extension of RAM.

Security On A Single-User, Non-Networked Computer

The focus will be on physical security

Security On A Multi-User, Non-Networked Computer

•Separate and secure the work of different people who are working on a computer.

Mary's A2

Bill's A2

George's A2
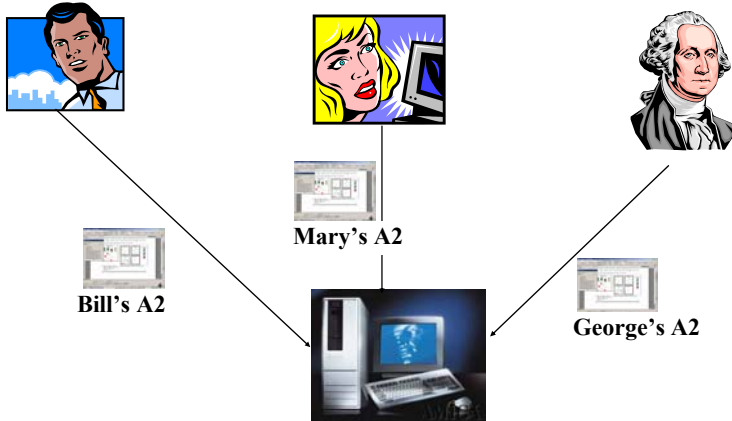
Different Users Can Have Different Levels Of Access

Limited user account
•Can create new documents, view and modify documents belonging to the account
•Can make changes to their own account e.g., password

Administrator account
•Can install programs
•Can add, delete and modify user accounts
•Can make system wide changes

Security On Networked Computers

•While there are many security issues, one issue is directly related to memory management.

•Programs that are external to the computer (including the Internet) typically have limited access permissions.

Managing Storage

The operating system determines where and how to store information in the storage devices

Clicks 'save'

Save document in E:/work (hard drive)

Determine specific location on drive
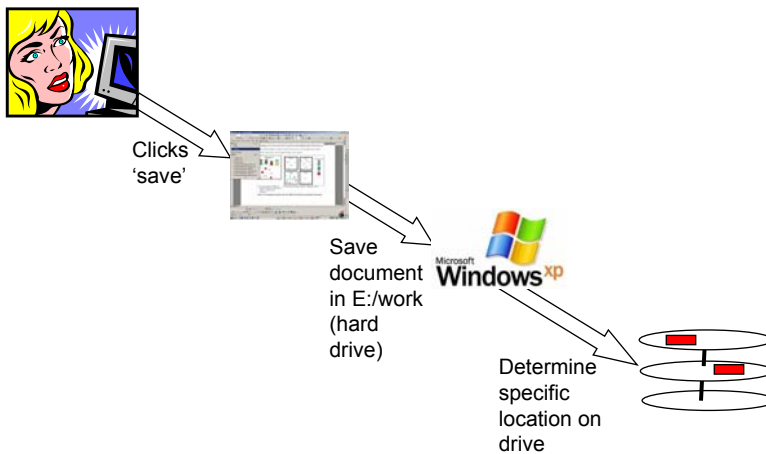
Managing Information

- To speed up the retrieval of information from storage, information is 'indexed'.

- The increase in speed may lead to some unexpected security issues.

A2.doc (platter 1, sector 15)
A2.doc (platter 2, sector 512)
A2.doc (platter 3, sector 1023)
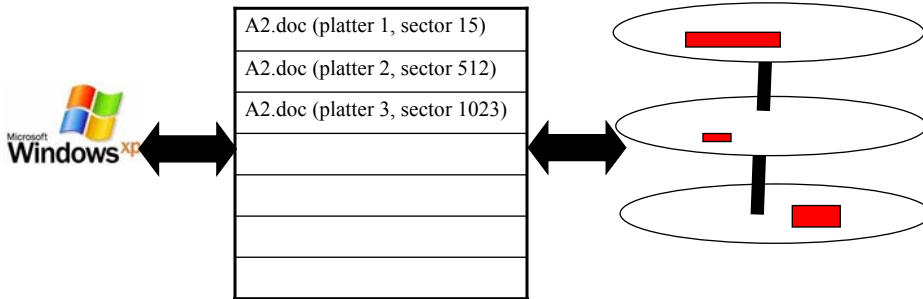
James Tam

The User Interface

It's the method of interacting with the software

Computer user

Graphical user interface

Command line

Gesture
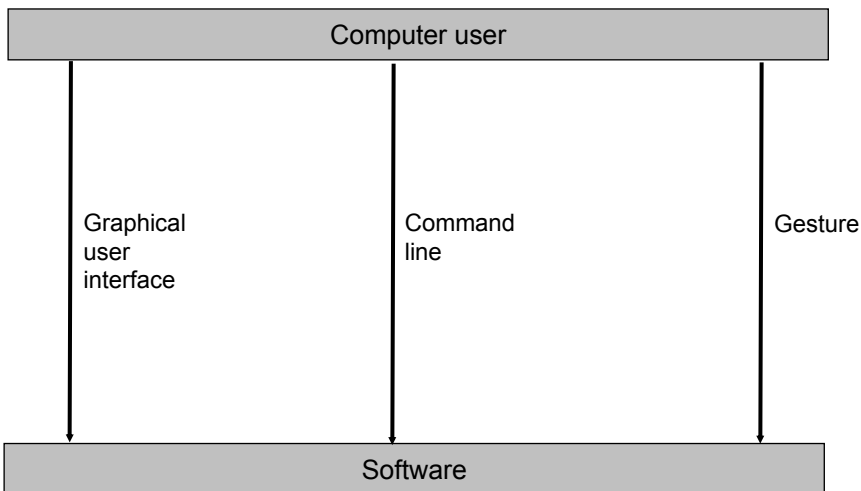
Software

James Tam

Command Line Interfaces

•Employs character-based interaction with software

```
[csc powerPoint 22 ]> ls
computers.ppt*  logic.ppt*  modules.ppt*      number_representations.ppt*
decisions.ppt*  loops.ppt*  non_decimal.ppt*  programming_intro.ppt*
[csc powerPoint 23 ]>
```

•MS-DOS (Microsoft Disk Operating System)
–Under the current version of Windows it's called "Command Shell"
–It was adopted by IBM for it's first personal computer in 1981
–MS-DOS quickly dominated the market
–MS-DOS trivia (just for fun ☺):
  – "I don't think it's that significant." **-** Tandy president John Roach
  – Microsoft bought the rights to QDOS (which MS-DOS was based on) for $50,000
  – "DOS will be with us forever. We've learned how passionate people are about DOS." - Microsoft vice president Brad Silverberg

---

Command Line Interfaces

•UNIX
•Developed by Bell labs for a multi-user environment
•Somewhat similar to but more powerful than MS-DOS
•Because it's not proprietary to one company there are many different versions many of which are free to use

Graphical User Interfaces

•Interaction with the software occurs via a WIMP (Windows, Icons, Menus, Pointing) interface

•The first graphically based operating system was developed by Xerox for the Xerox Star and was based on the metaphor of an office worker's desktop
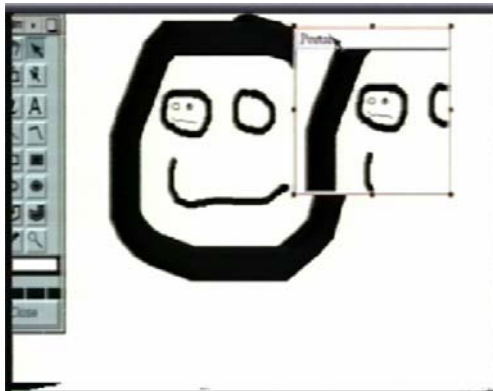

The Interfaces Of Tomorrow?

"I hate computers. Telepathy would be better" – John Perry Barlow cofounder of the Electronic Frontier Foundation.

1. ZUI's e.g., Pad++

Pad++ from: www.cs.umd.edu/hcil
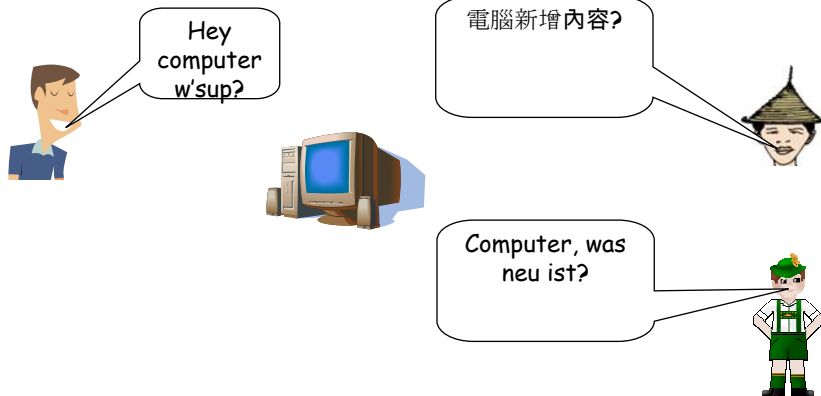
Interfaces Of Tomorrow? (2)

2. The Task Gallery

The Task Gallery, Microsoft Research

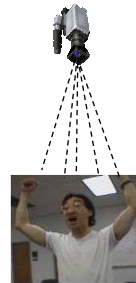# The Interfaces Of Tomorrow? (3)

3. Natural language systems

Interfaces Of Tomorrow? (4)

4. Gesture-based systems
   - Science fiction and beyond

From "Minority report", Dreamworks

You Should Now Know

- What is software

- What is the purpose of software

- What are translators, how do they work and what are the types of translators used

- What is meant by the term application software

- What is the difference between a text editor and a word processor

- What is a PDF document and what are the benefits of using this format

- Techniques for designing and evaluating the layout of a document
  - The squint test
  - CRAP

You Should Now Know (2)

•How collaborative writing tools can communicate real time and non-time information about the work of others

•How spreadsheets were developed and how they can be used in 'what-if' analysis

•What is the purpose of using a data base

•What are the main tasks of an operating system

•How do device drivers and peripheral devices work

•What is virtual memory, what is the cost and benefit of employing it

•How does an operating system provide security for a computer

You Should Now Know (3)

•How does an operating system store and manage the information on a computer

•What is a user interface

•What is a command line interface and what are/were some commonly used examples

•What is a graphical user interface and how they originated

•Some new approaches for interacting with the computer in the future