

Multimedia Coding & Communications

Course Outline

- **Multimedia Overview**
- **Component of Multimedia**
- **Lossless Compression Techniques**
- **Lossy Compression Techniques**
- **Elements of Image Compression System and Standards**
- **Video Coding and Compressing Standards**
- **Audio Compression Standards**
- **Multimedia Communication and Retrieval**

- **Multimedia Architecture**

Course Outline

■ Multimedia Overview

- Introduction
- Uses of multimedia
- Multimedia and Hypermedia
- Software Requirements
- Multimedia Authoring
- Automatic Authoring
- Multimedia Presentation and Production
- Editing and Authoring tools.



INTRODUCTION

Multimedia

- Media
 - Plural of Medium
- Multi – Media
 - **Newspaper**: perhaps the *first* mass communication medium, uses text, graphics, and images.
 - **Motion pictures**: conceived of in 1830's in order to observe motion too rapid for perception by the human eye.
 - **Wireless radio transmission**: Guglielmo Marconi, at Pontecchio, Italy, in 1895.
 - **Television**: the new medium for the 20th century, established video as a commonly available medium and has since changed the world of mass communications.

Multimedia

- Multimedia for Multiple People have Multiple, Different, or opposing viewpoints.
 - **For consumer entertainment vendor:** interactive cable TV with hundreds of digital channels available, or a cable TV-like service delivered over a high-speed Internet connection.
 - **For PC vendor:** a PC that has sound capability, a DVD-ROM drive, and perhaps the superiority of multimedia-enabled microprocessors that understand additional multimedia instructions.
 - **For Computer Science (CS) student:** applications that use multiple modalities, including text, images, drawings (graphics), animation, video, sound including speech, and **interactivity**.

Definition: Multimedia

- **Multimedia** is the field concerned with
 - the computer-controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media
 - where every type of information can be represented, stored, transmitted and processed digitally.

Multimedia and Computer Science

- Multimedia and Computer Science:
 - Graphics
 - HCI (Human Computer Interaction)
 - Visualization
 - Computer vision
 - Data compression
 - Graph theory
 - Networking
 - Database systems.

Multimedia

- Image of “LENA” is a picture of an attractive woman
- It is a picture of the **Swedish** model **Lena Söderberg**, shot by photographer **Dwight Hooker**, cropped from the **centerfold** of the November 1972 issue of **Playboy** magazine.
- The Lenna image contains
 - A nice mixture of detail
 - Flat regions
 - Shading
 - Texturethat do a good job of testing various image processing algorithms.
- Lena in 1997 at top right



USE OF MULTIMEDIA

Application of Multimedia

- A **Multimedia Application** is an Application which uses a collection of multiple media sources e.g. text, graphics, images, sound/audio, animation and/or video.

Multi media



multimedia Application

Use of Multimedia

- Multimedia involves multiple modalities of text, audio, images, drawings, animation, and video.
- Examples of how these modalities are put to use:
 1. Video teleconferencing.
 2. Including audio cues for where video-conference participants are located.
 3. Distributed lectures for online education.
 4. Tele-medicine.
 5. Co-operative work environments.

Use of Multimedia

400447

6. **"Augmented" reality:** placing real-appearing computer graphics and video objects into scenes.
7. Searching in large video and image databases for target visual objects.
8. Building searchable features into new video, and enabling very high to very low bit-rate use of new, scalable multimedia products.
9. Making multimedia components *editable*.
10. Building "inverse-Hollywood" applications that can recreate the process by which a video was made.
11. Using voice-recognition to build an interactive environment, say a kitchen-wall web browser.

Multimedia Research

- To the computer science researcher, multimedia application also includes variety of topics:
 - **Multimedia processing and coding:** multimedia content analysis, content-based multimedia retrieval, multimedia security, audio/image/video processing, compression, etc.
 - **Multimedia system support and networking:** network protocols, Internet, operating systems, servers and clients, quality of service (QoS), and databases

Multimedia Research

- To the computer science researcher, multimedia application also includes variety of topics:
 - **Multimedia tools, end-systems and applications:** hypermedia systems, user interfaces, authoring systems.
 - **Multi-modal interaction and integration:** “ubiquity”
 - web-everywhere devices, multimedia education including Computer Supported Collaborative Learning, and design and applications of virtual environments.

Multimedia Project

- Many exciting research projects can be done using multimedia concepts:
 - **Camera-based object tracking technology:** tracking of the control objects provides user control of the process.
 - **3D motion capture:** used for multiple actor capture so that multiple *real* actors in a *virtual* studio can be used to automatically produce realistic *animated* models with natural movement.
ALT+ON
Shank
+ or -
 - **Multiple views:** allowing photo-realistic (video-quality) synthesis of virtual actors from several cameras or from a single camera under differing lighting.
360°
view

Multimedia Project

- Many exciting research projects are currently underway. Here are a few of them:
 - **Specific multimedia applications:** aimed at handicapped persons with low vision capability and the elderly - a rich field of endeavor.
 - **Digital fashion:** aims to develop smart clothing that can communicate with other such enhanced clothing using wireless communication, so as to artificially enhance human interaction in a social setting.

Multimedia Project

- Many exciting research projects are currently underway. Here are a few of them:
 - **Electronic Housecall system:** an initiative for providing interactive health monitoring services to patients in their homes
 - **Augmented Interaction applications:** used to develop interfaces between real and virtual humans for tasks such as augmented storytelling.

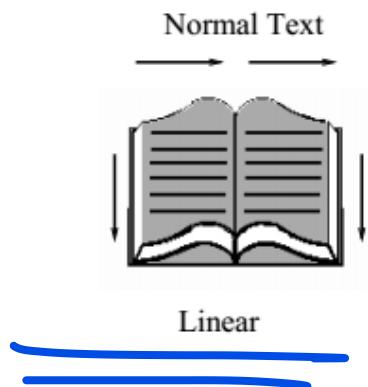
MULTIMEDIA AND HYPERMEDIA

Multi vs Hyper - Media

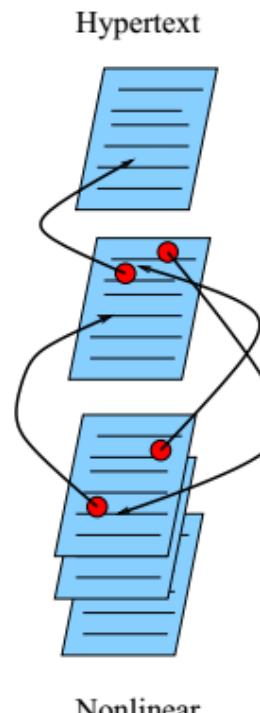
< a href=" " > 4)

A **hypertext** system:

- ❑ to be read nonlinearly,
- ❑ by following links that point to other parts of the document,
- ❑ or to other documents

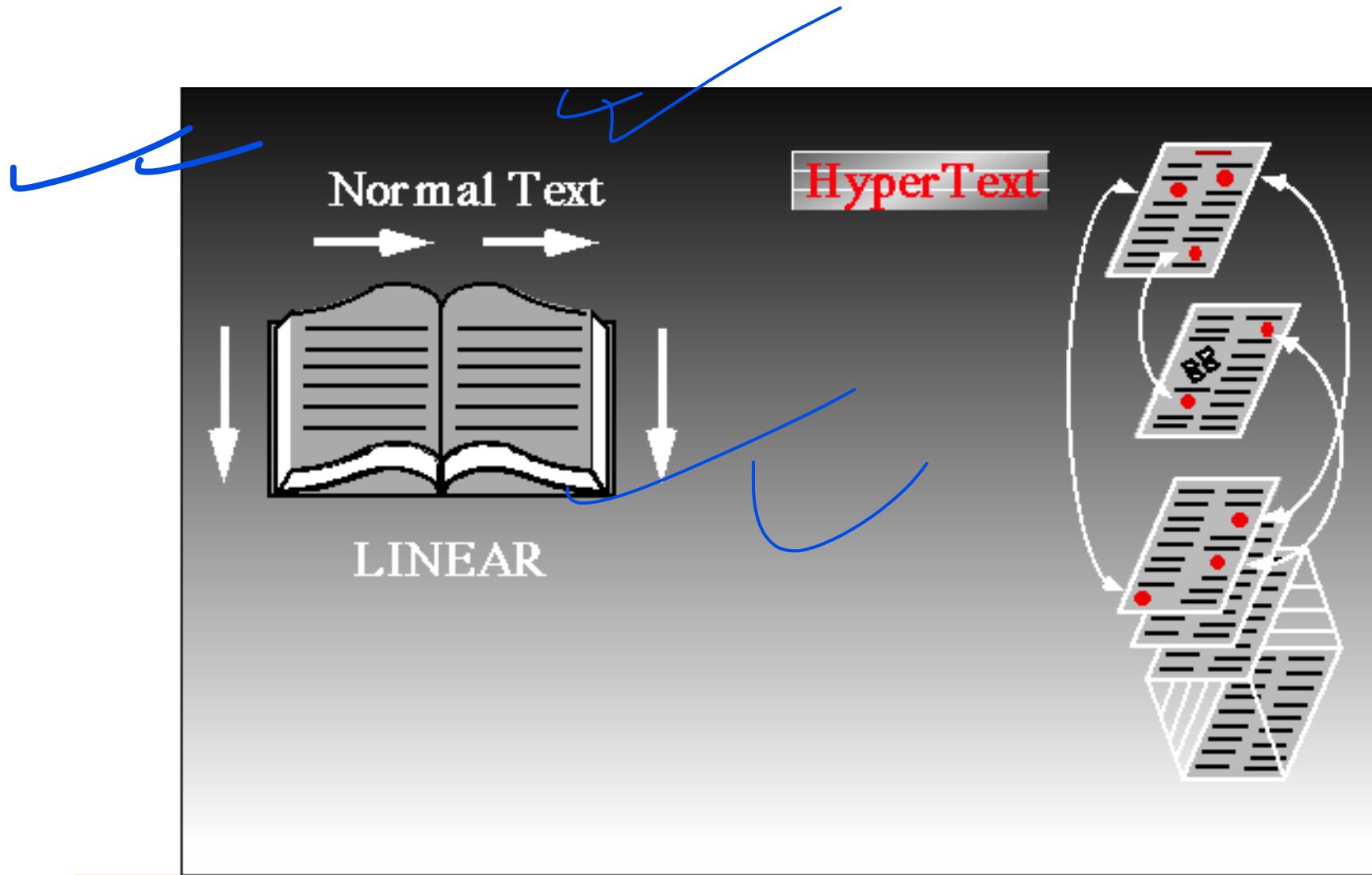


● "Hot spots"



Hypertext is nonlinear

Multi vs Hyper - Media



Multi vs Hyper - Media

- **HyperMedia:** not constrained to be text-based, can include other media, e.g., graphics, images, and especially the continuous media - sound and video.
 - The World Wide Web (WWW) - the best example of a hypermedia application.
- **Multimedia** means that **computer information can be represented through** audio, graphics, images, video, and animation in addition to traditional media.

OR

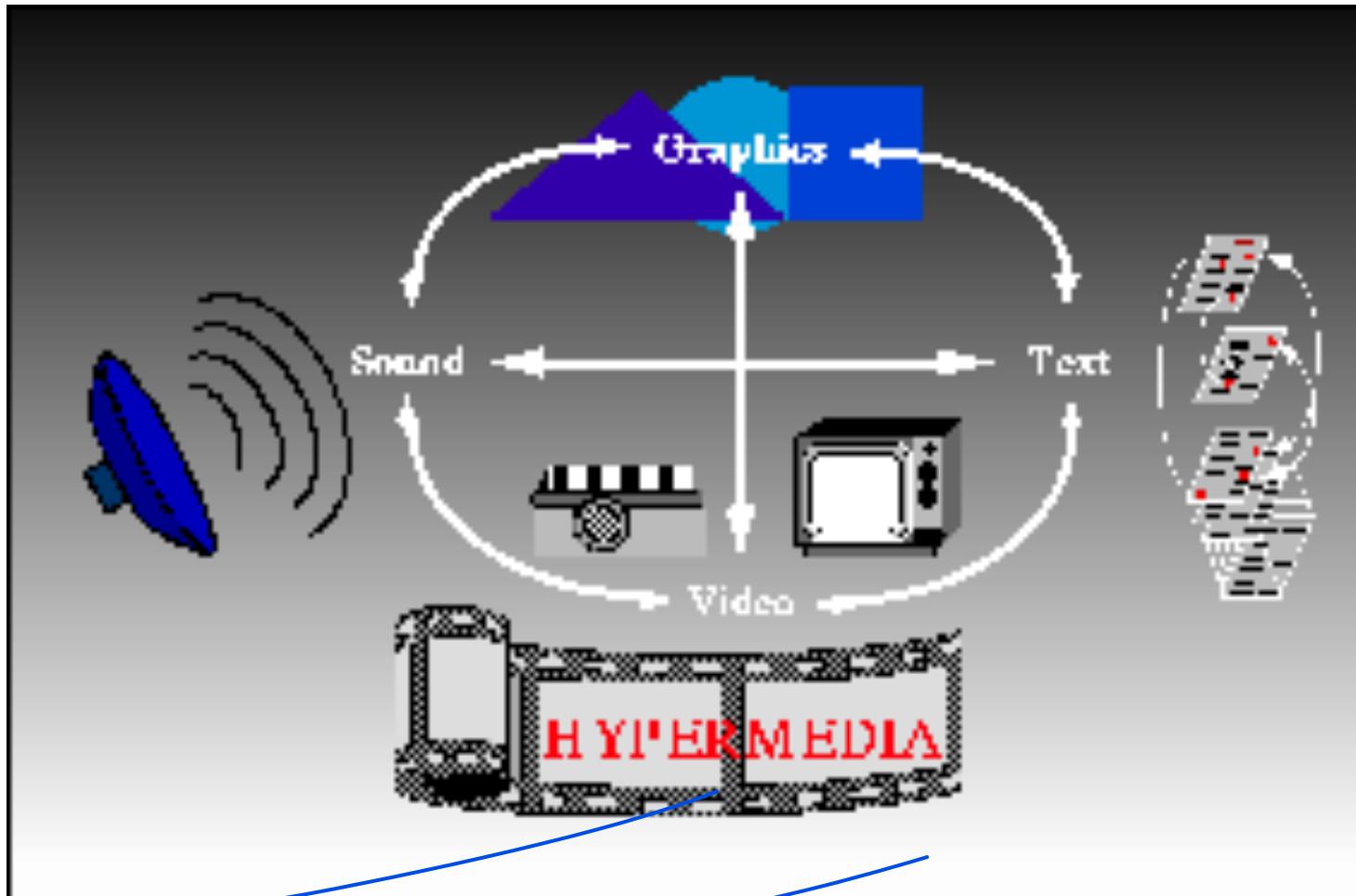
Audio, graphics, images, video, and animation in addition to traditional media **can be represented through computer information.**

Hypermedia

- Hypermedia can be considered as one of the multimedia applications.

World Wide Web

- The W3C has listed the following goals for the WWW:
 - Universal access of web resources (by everyone everywhere).
 - Effectiveness of navigating available information.
 - Responsible use of posted material.



Any Idea??!!

- HTTP
 - HTML
 - XML
- and
- SMIL
- 

HTTP

- HTTP: a protocol that was originally designed for transmitting hypermedia, but can also support the transmission of any file type.
- HTTP is a stateless request/response protocol: no information carried over for the next request.
- The basic request format:
 - Method
 - URI
 - Version
 - Additional-Headers:
 - Message-body
- The URI (Uniform Resource Identifier): an identifier for the resource accessed, e.g. the host name, always preceded by the token “http://”.

HTML

- **HTML**: a language for publishing Hypermedia on the World Wide Web - defined using SGML.

- HTML uses ASCII, it is portable to all different (possibly binary incompatible) computer hardware.
- The current version of HTML is version 5
- The next generation of HTML is XHTML - a reformulation of HTML using XML.
- HTML uses **tags** to describe document elements:

- <token params> - defining a starting point,
- </token> | the ending point of the element.
- Some elements have no ending tags.

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XML

- **XML**: a markup language for the WWW in which there is modularity of data, structure and view so that user or application can be able to define the tags (structure).
- Example of using XML to retrieve stock information from a database according to a user query:
 - First use a global Document Type Definition (**DTD**) that is already defined.
 - The server side script will abide by the DTD rules to generate an XML document according to the query using data from your database.
 - Finally send user the **XML Style Sheet (XSL)** depending on the type of device used to display the information.

XML

- The current XML version is XML 1.0, approved by the W3C in Feb. 1998.
- XML syntax looks like HTML syntax, although it is much more strict:
- All tags are in lower case, and a tag that has only inline data has to terminate itself, i.e., <token params />.
- Uses name spaces so that multiple DTDs declaring different elements but with similar tag names can have their elements distinguished.
- DTDs can be imported from URIs as well.

~~SMIL (Synchronized Multimedia~~

PQR

Integration Language)

- **Purpose of SMIL:** to be able to publish multimedia presentations using a markup language.
- It needs to enable scheduling and synchronization of different multimedia elements, and define their interactivity with the user.
- The W3C established a Working Group in 1997 to come up with specifications for a multimedia synchronization language
- SMIL 3.0 was accepted in 2008.

SMIL

- SMIL 2.0 is specified in XML using a *modularization* approach similar to the one used in XHTML:
 - All SMIL elements are divided into modules
 - sets of XML elements, attributes and values that define one conceptual functionality.
 - In the interest of modularization, not all available modules need to be included for all applications.
 - **Language Profiles:** specifies a particular grouping of modules, and particular modules may have integration requirements that a profile must follow.
 - SMIL 3.0 has a main language profile that includes almost all SMIL modules.

SOFTWARE REQUIREMENTS

Multimedia Tools

■ The categories of software tools briefly examined in multimedia are:

- **Music Sequencing and Notation**
- **Digital Audio**
- **Graphics and Image Editing**
- **Video Editing**
- **Animation**
- **Multimedia Authoring**

1. Music Sequencing and Notation

- **Cakewalk:** now called Pro Audio.
 - Supports General MIDI
 - Provides several editing views (staff, piano roll, event list) and Virtual Piano
 - Can insert WAV files and Windows MCI commands (animation and video) into tracks (MCI is a ubiquitous component of the Windows API.)
- **Cubase:** another sequencing/editing program, with capabilities similar to those of Cakewalk.
 - It includes some digital audio editing tools.
- **Macromedia Soundedit:** mature program for creating audio for multimedia projects and the web that integrates well with other Macromedia products such as Flash and Director.

~~2. Digital Audio~~

- **Digital Audio** tools deal with accessing and editing the actual sampled sounds that make up audio:

- **Macromedia Soundedit** -- Edits a variety of different format audio files, apply a variety of effects
 - **Cool Edit**: a very powerful and popular digital audio toolkit; emulates a professional audio studio – multitrack productions and sound file editing including digital signal processing effects.
 - **Sound Forge**: a sophisticated PC-based program for editing audio WAV files.
 - **Pro Tools**: a high-end integrated audio production and editing environment - MIDI creation and manipulation; powerful audio mixing, recording, and editing software.

3. Graphics and Image Editing

- **Adobe Illustrator:** a powerful publishing tool from Adobe.
Uses vector graphics; graphics can be exported to Web.

- **Adobe Photoshop**

- The standard in a graphics, image processing and manipulation tool.
 - Allows layers of images, graphics, and text that can be separately manipulated for maximum flexibility.
 - **Filter factory** permits creation of sophisticated lighting-effects filters.

- **Macromedia Fireworks:**

- Software for making graphics specifically for the web.

- **Macromedia Freehand:**

- A text and web graphics editing tool that supports many bitmap formats such as GIF, PNG, and JPEG.

- **Adobe Premiere:**

- Provides large number (up to 99) of video and audio tracks, superimpositions and virtual clips
 - Supports various transitions, filters and motions for clips
 - A reasonable desktop video editing tool

4. Video Editing

- **Adobe Premiere**: an intuitive, simple video editing tool for **nonlinear** editing, i.e., putting video clips into any order:
 - Video and audio are arranged in "tracks".
 - Provides a large number of video and audio tracks, superimpositions and virtual clips.
 - A large library of built-in transitions, filters and motions for clips) effective multimedia productions with little effort.
- **Adobe After Effects**: a powerful video editing tool that enables users to add and change existing movies. Can add many effects: lighting, shadows, motion blurring; layers.
- **Final Cut Pro**: a video editing tool by Apple; Macintosh only.

5. Animation

■ ~~Multimedia APIs:~~

- **Java3D**: API used by Java to construct and render 3D graphics, similar to the way in which the Java Media Framework is used for handling media files.
 - Provides a basic set of object primitives (cube, splines, etc.) for building scenes.
 - It is an abstraction layer built on top of OpenGL or DirectX (the user can select which).
- **DirectX** : Windows API that supports video, images, audio and 3-D animation
- **OpenGL**: the highly portable, most popular 3-D API.

5. Animation

■ **Rendering Tools:**

- **3D Studio Max:** rendering tool that includes a number of very high-end professional tools for character animation, game development, and visual effects production.
- **Softimage XSI:** a powerful modeling, animation, and rendering package used for animation and special effects in films and games.
- **Maya:** competing product to Softimage; as well, it is a complete modeling package.
- **RenderMan:** rendering package created by Pixar.

■ **GIF Animation Packages:** a simpler approach to animation, allows very quick development of effective small animations for the web.

6. Multimedia Authoring

- **Macromedia Flash**: allows users to create interactive movies by using the score metaphor, i.e., a timeline arranged in parallel event sequences.
- **Macromedia Director**: uses a movie metaphor to create interactive presentations - very powerful and includes a built-in scripting language, **Lingo**, that allows creation of complex interactive movies.
- **Authorware**: a mature, well-supported authoring product based on the **Iconic/Flow-control** metaphor.
- **Quest**: similar to Authorware in many ways, uses a type of flowcharting metaphor. However, the flowchart nodes can encapsulate information in a more abstract way (called **frames**) than simply subroutine levels.

Project

Multimedia

Project

MULTIMEDIA AUTHORING

Authoring

- Authoring is actually a speeded-up form of programming;
- You don't need to know the intricacies of a programming language, or worse, an API,
- but you do need to understand how programs work.

Mid (P)

Why Authoring System?

- It generally takes about 1/8th the time to develop an interactive multimedia project
- This means 1/8 the cost of programmer time and likely increased re-use of code
- The content creation (graphics, text, video, audio, animation, etc.) is not generally affected by the choice of an authoring system
- Any production time gains here result from accelerated prototyping, not from the choice of an authoring system over a compiled language.

Multimedia authoring

- **Multimedia authoring:** creation of multimedia productions, sometimes called "movies" or "presentations".
 - We take a look at:
 1. **Multimedia Authoring Metaphors**
 2. **Multimedia Production and Presentation**
 3. **Automatic Authoring**

Multimedia authoring

Authoring metaphor

■ A metaphor is a **figure of speech** that directly refers to one thing by mentioning another for **rhetorical effect**.

- A figure of speech is a word or phrase that has a meaning other than the literal meaning.
- **Rhetoric** does not play with the **meaning** of words, rather it is concerned with their **order** and arrangement of order to persuade and influence or to express ideas more powerfully

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and ya

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Authoring metaphor

- The **authoring paradigm**, or **authoring metaphor**, is the methodology by which the authoring system accomplishes its task.
- It may provide clarity or identify hidden similarities between two ideas.

Methodology by which
authoring system accomplish task



1. Multimedia Authoring Metaphors

- Types of multimedia authoring metaphors
 - Scripting Language Metaphor
 - Iconic/Flow-control Metaphor
 - Frames Metaphor
 - Card/Scripting Metaphor
 - Cast/Score/Scripting Metaphor
 - Slide Show Metaphor
 - Hierarchical Metaphor

1. Multimedia Authoring Metaphors

■ Types of multimedia authoring metaphors

□ **Scripting Language Metaphor**

□ **Iconic/Flow-control Metaphor**

□ **Frames Metaphor**

□ **Card/Scripting Metaphor**

□ **Cast/Score/Scripting Metaphor**

□ **Slide Show Metaphor**

□ **Hierarchical Metaphor**

~~Scripting Language Metaphor~~ ↗

- ✓ ~~Closest in form to traditional programming~~
- ~~A powerful, object-oriented scripting language is usually the centerpiece of such a system~~
- ~~Scripting paradigm tends to be longer in development time~~
- ~~But generally more powerful interactivity is possible.~~
- Examples of Multimedia scripting languages:
 - Lingo scripting language of Macromedia Director
 - HyperTalk for HyperCard in Apple's Computer
 - Assymetrix's OpenScript for ToolBook

Scripting Language Metaphor

- It uses special language to enable interactivity (buttons, mouse, etc.), and to allow conditionals, jumps, loops, functions/macros etc.
- E.g., a small Toolbook program is as below:

```
-- load an MPEG file
extFileName of MediaPlayer "theMpegPath" =
    "c:\windows\media\home33.mpg";
-- play
extPlayCount of MediaPlayer "theMpegPath" = 1;
-- put the MediaPlayer in frames mode (not time mode)
extDisplayMode of MediaPlayer "theMpegPath" = 1;
-- if want to start and end at specific frames:
extSelectionStart of MediaPlayer "theMpegPath" = 103;
extSelectionEnd of MediaPlayer "theMpegPath" = 1997;
-- start playback
get extPlay() of MediaPlayer "theMpegPath";
```

Scripting Language Metaphor

- Here is an example lingo script to jump to a frame

```
global gNavSprite  
on exitFrame  
    go the frame  
    play sprite gNavSprite  
end
```

1. Multimedia Authoring Metaphors

■ Types of multimedia authoring metaphors

Scripting Language Metaphor

Iconic/Flow-control Metaphor

Frames Metaphor

Card/Scripting Metaphor

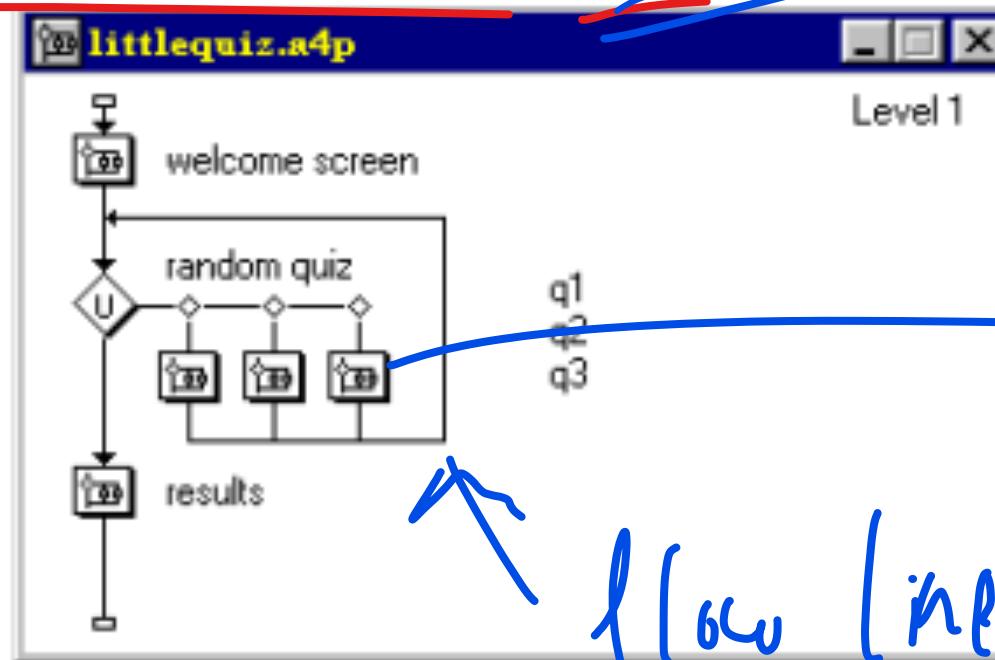
Cast/Score/Scripting Metaphor

Slide Show Metaphor

Hierarchical Metaphor

Iconic/Flow-control Metaphor

- Graphical icons are available in a toolbox, and authoring proceeds by creating a flow chart with icons attached:



Authorware flowchart

Iconic/Flow-control Metaphor

dev last

- It tends to be the speediest (in development time) authoring style.
- The core of the paradigm is the Icon Palette
 - Contains the possible functions/interactions of a program
 - The Flow Line, which shows the actual links between the icons.
- These programs tend to be the slowest runtimes, because each interaction carries with it all of its possible permutations; the higher end packages.

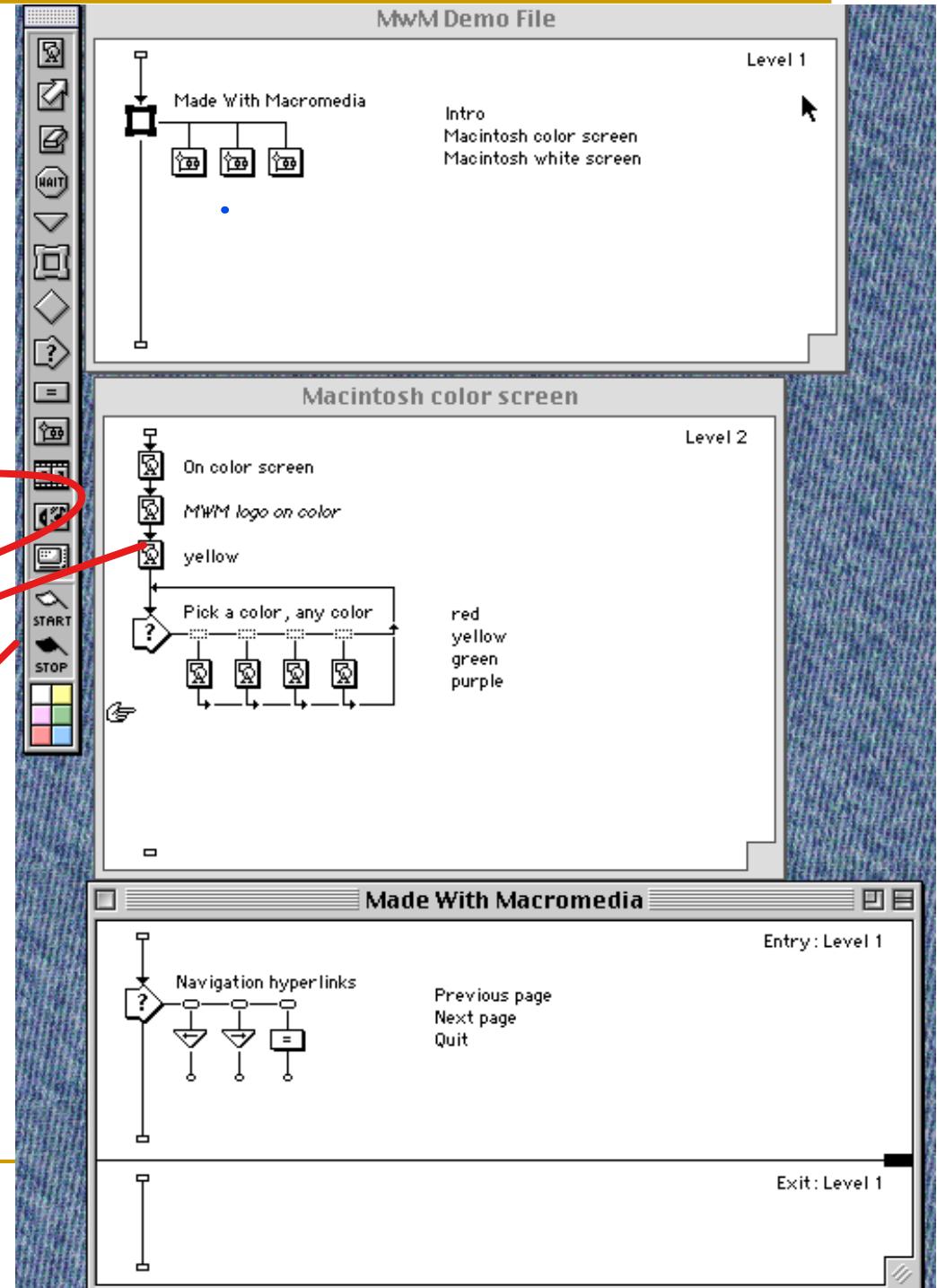
bw

Iconic/Flow-control Metaphor

Example of extremely powerful and suffer least from runtime speed problems are:

- Authorware
- IconAuthor,

Macromedia Authorware Iconic/Flow Control Examples



1. Multimedia Authoring Metaphors

- Types of multimedia authoring metaphors
 - Scripting Language Metaphor
 - Iconic/Flow-control Metaphor
 - **Frames Metaphor**
 - Card/Scripting Metaphor
 - Cast/Score/Scripting Metaphor
 - Slide Show Metaphor
 - Hierarchical Metaphor

Frames Metaphor

- Similar to Iconic/Flow-control Metaphor
- However links between icons are more conceptual, rather than representing the actual flow of the program
- Example of such metaphor are:
 - Quest (whose scripting language is C)
 - Apple Media Kit.

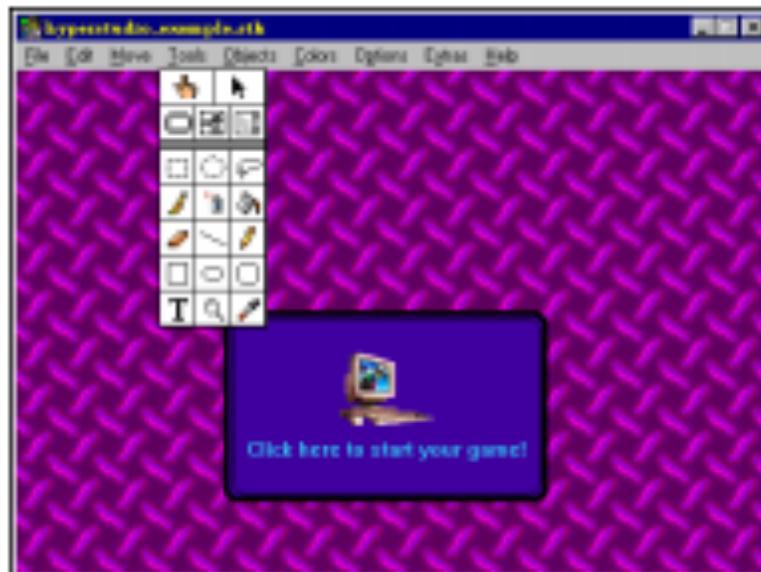


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 - □ **Cast/Score/Scripting Metaphor**
 - **Slide Show Metaphor**
 - **Hierarchical Metaphor**

Card/Scripting Metaphor

- Uses a simple index-card structure – easy route to producing applications that use hypertext or hypermedia; used in schools.
- Many entertainment applications are prototyped in a card/scripting system prior to compiled-language coding.



Two Cards in a Hypermedia Stack

1. Multimedia Authoring Metaphors

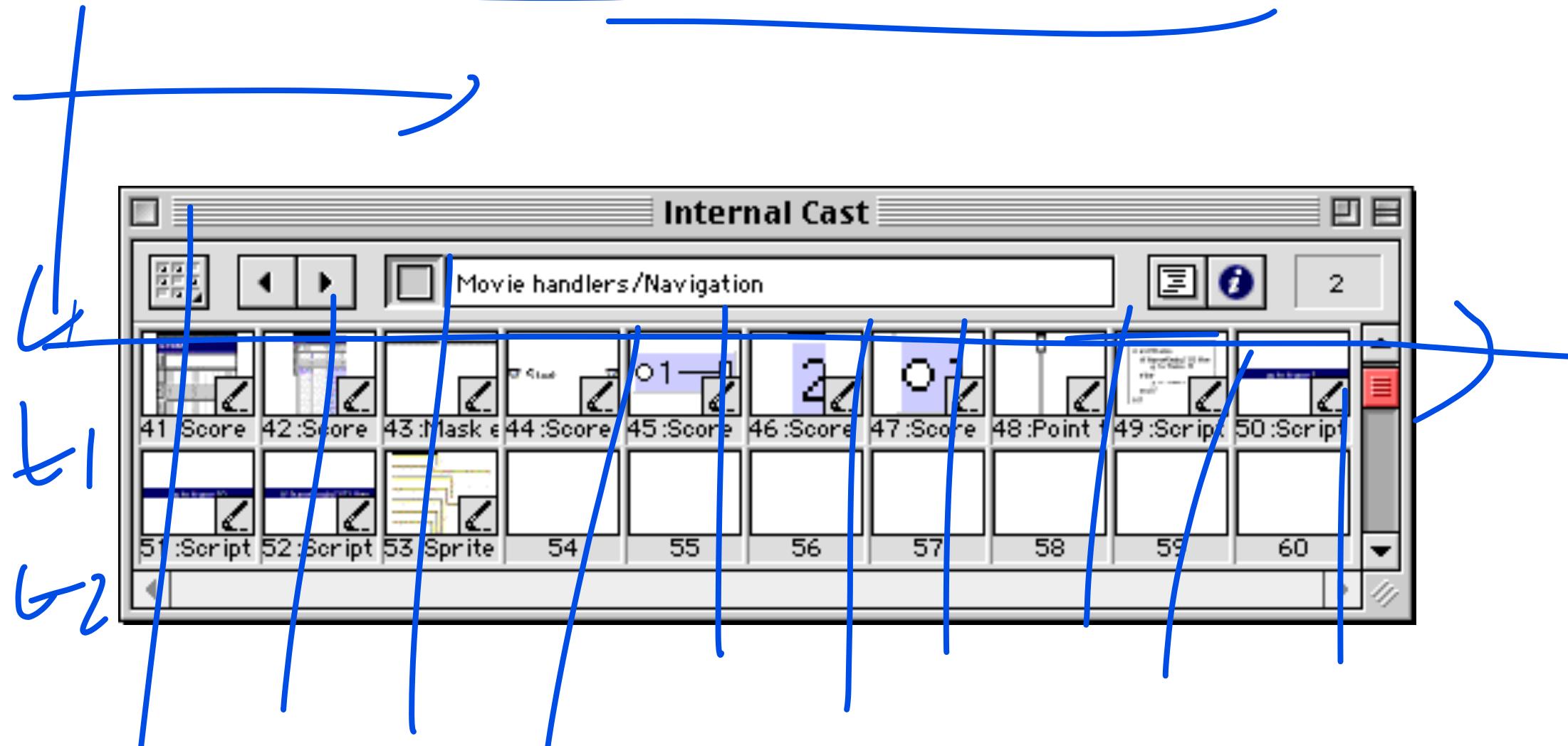
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 - **Hierarchical Metaphor**

~~Cast/Score/Scripting Metaphor~~

- Uses a music score as its primary authoring metaphor
- The synchronous elements are shown in various horizontal **tracks** with simultaneity shown via the vertical columns.
- Multimedia elements are drawn from a **cast** of characters, and **scripts** are basically event-procedures or procedures that are triggered by timer events.
- Director, by Macromedia, is the chief example of this metaphor.
 - Director uses the **Lingo** scripting language, an object-oriented event-driven language.

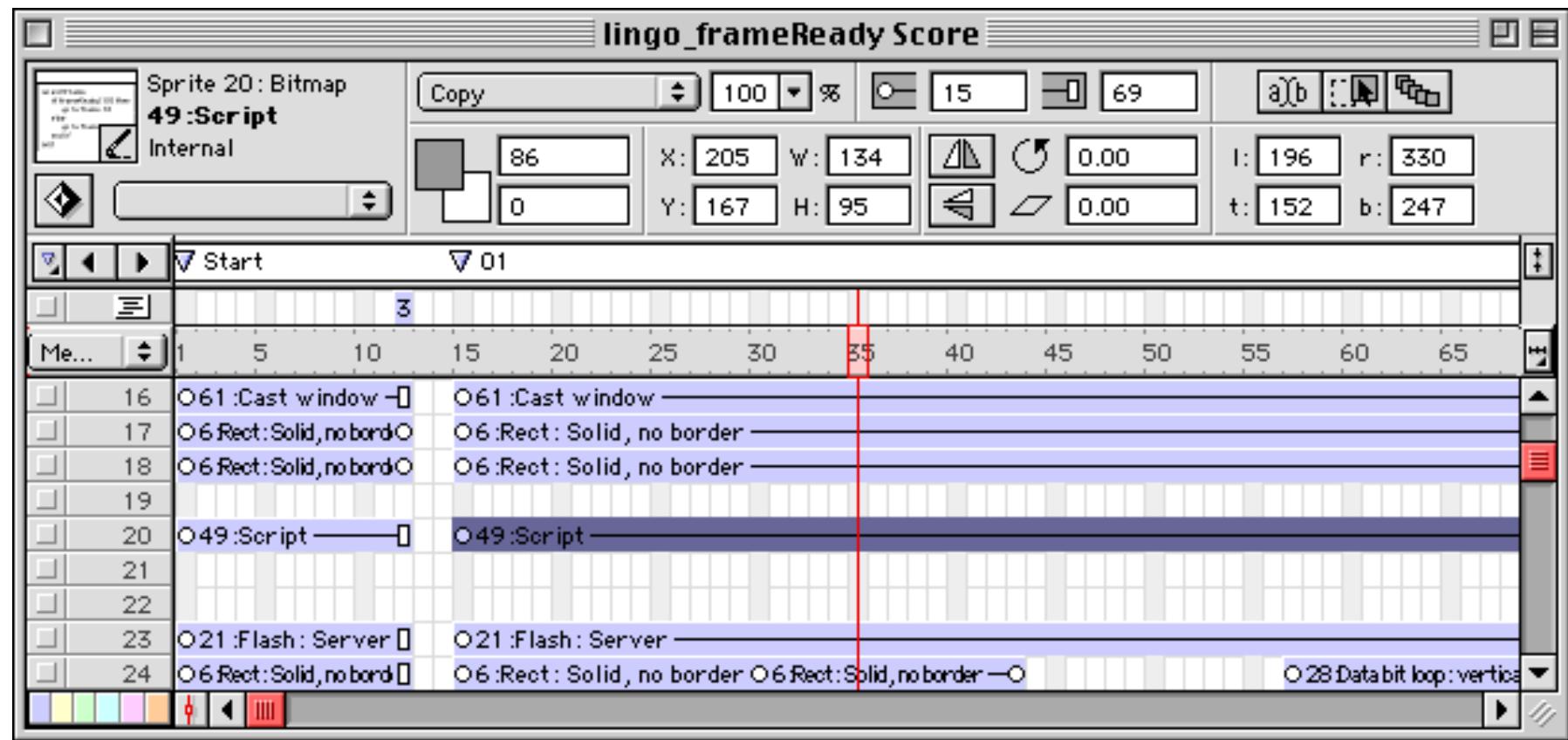
Cast/Score/Scripting Metaphor

■ Macromedia Director Cast Window



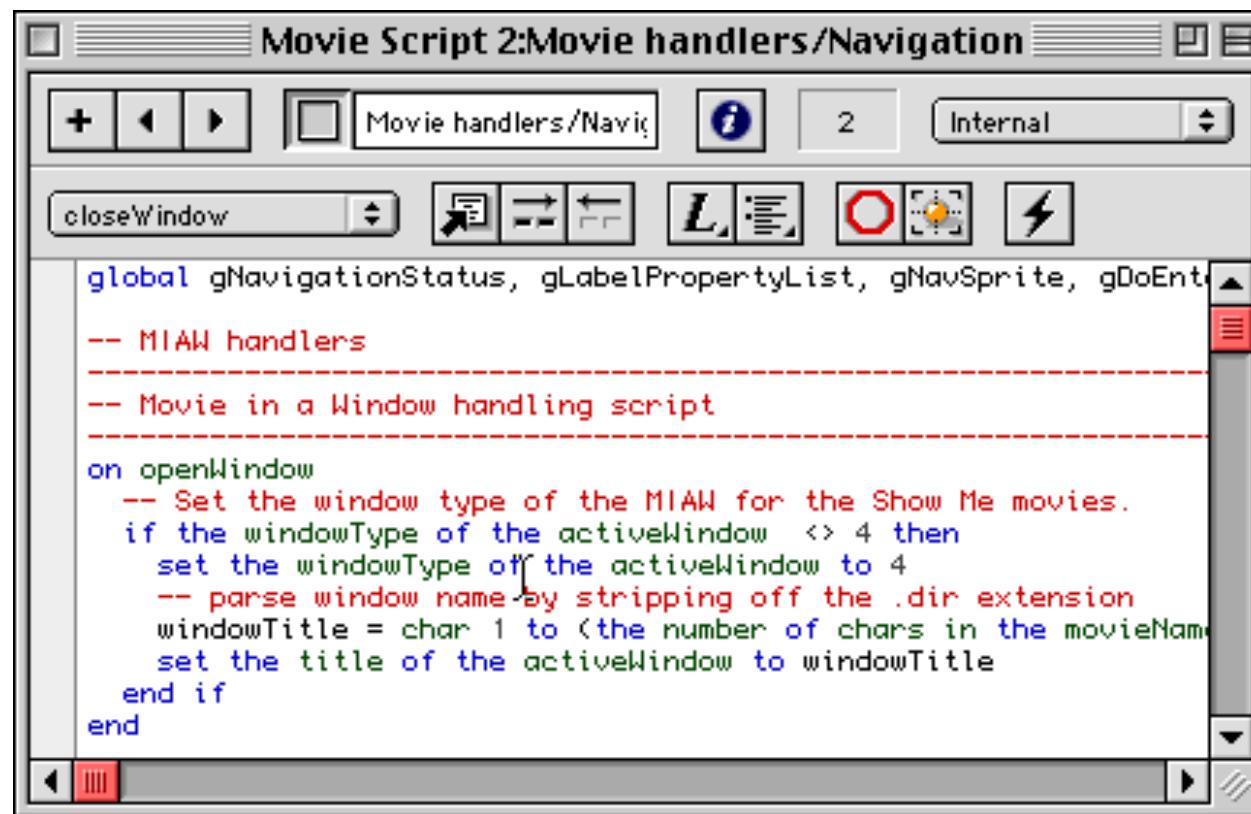
Cast/Score/Scripting Metaphor

■ Macromedia Director Score Window



Cast/Score/Scripting Metaphor

Macromedia Director Script Window



1. Multimedia Authoring Metaphors

■ Types of multimedia authoring metaphors

Scripting Language Metaphor

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Frames Metaphor

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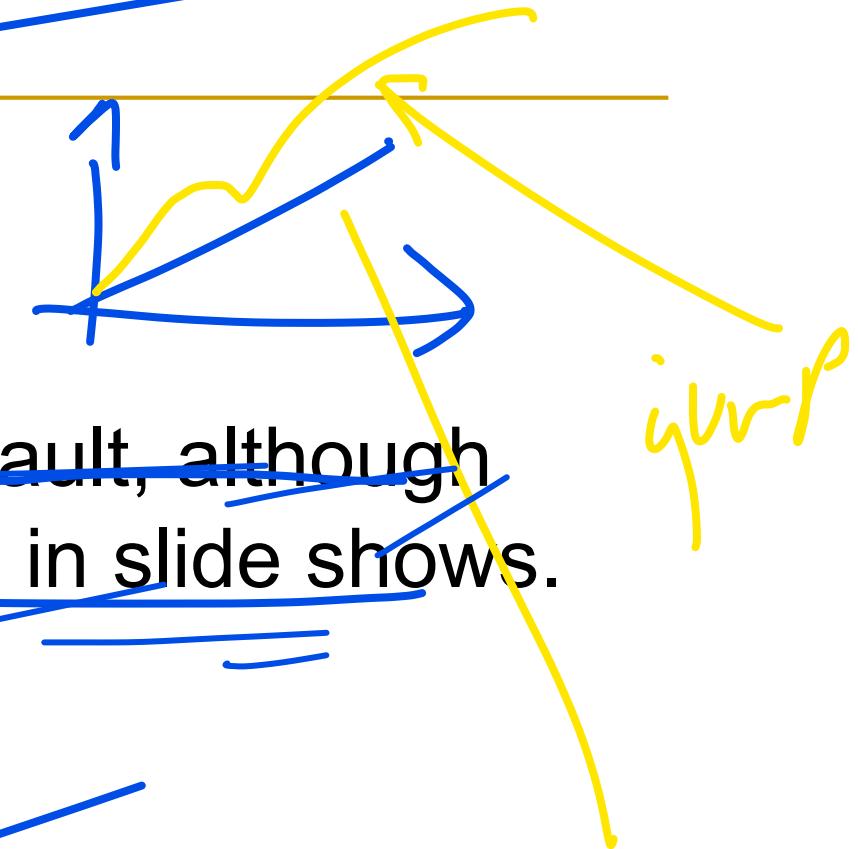
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Slide Show Metaphor

Hierarchical Metaphor

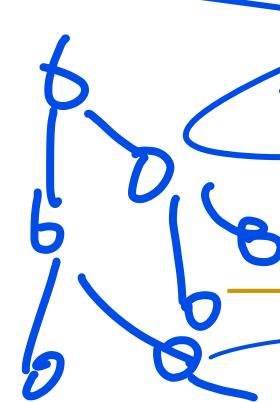
~~Slide Show Metaphor~~

- A linear presentation by default, although tools exist to perform jumps in slide shows.



~~Hierarchical Metaphor~~

- User-controllable elements are organized into a tree structure – often used in menu-driven applications.



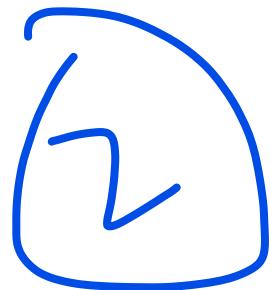
Multimedia Programming vs Multimedia Authoring

A visual
↓
both -
why

- Authoring involves the assembly and bringing together of Multimedia with possibly high level graphical interface design and some high level scripting.
- Programming involves low level assembly and construction and control of Multimedia and involves real languages like C and Java.
- Example of Multimedia Programming
 - Study Java programming in Quicktime
 - Quicktime may also be programmed in C.
 - The Java Media Framework

Multimedia Programming vs Multimedia Authoring

- Authoring involves the assembly and bringing together of Multimedia with possibly high level graphical interface design and some high level scripting.
- Programming Involves low level assembly and construction and control of Multimedia and involves real languages like C and Java.
- Example of Multimedia Programming
 - Study Java programming in Quicktime
 - Quicktime may also be programmed in C
 - The Java Media Framework



MULTIMEDIA PRODUCTION AND PRESENTATION

Multimedia Presentation

- It involves:

- Graphics Styles
- Sprite Animation
- Video Transitions
- Slide Transitions

Multimedia Presentation

■ **Graphics Styles**

■ Sprite Animation

■ Video Transitions

■ Slide Transitions



Graphics Styles

- Human visual dynamics impact how presentations must be constructed.

~~1. Color principles and guidelines:~~

1. Some color schemes and art styles are best combined with a certain theme or style.
2. A general hint is to *not use too many colors*, as this can be distracting.

Graphics Styles

- Human visual dynamics impact how presentations must be constructed.

1. Fonts:

1. For effective visual communication in a presentation, it is best to use large fonts (i.e., 18 to 36 points),
2. And no more than 6 to 8 lines per screen (*fewer than on this screen!*).

Graphics Styles

3.

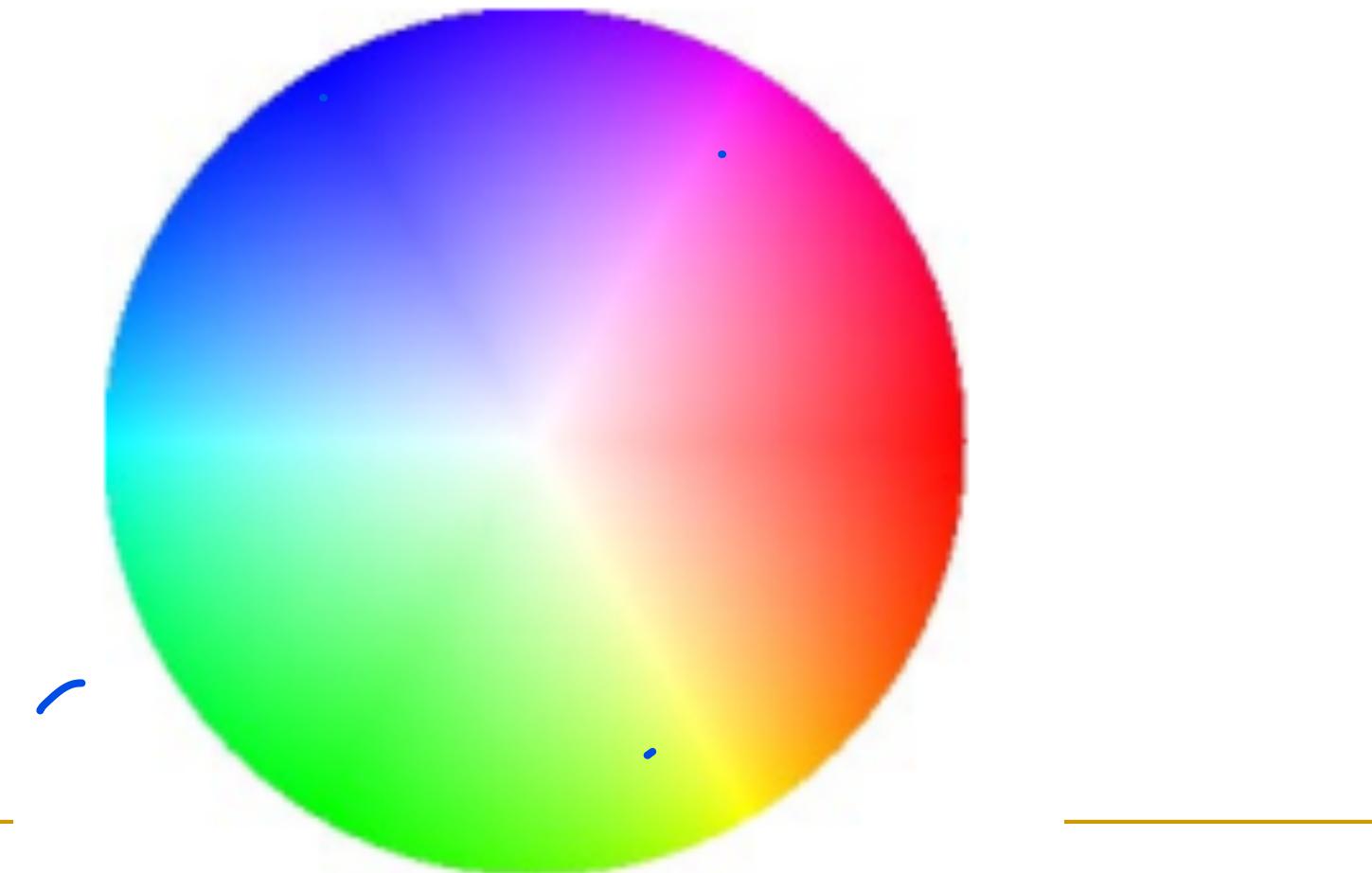
A color contrast program:

- If the text color is some triplet (R, G, B)
- A legible color for the background is that color subtracted from the maximum (here assuming $\max=1$):

$$(R; G; B) \Rightarrow (1 - R; 1 - G; 1 - B)$$

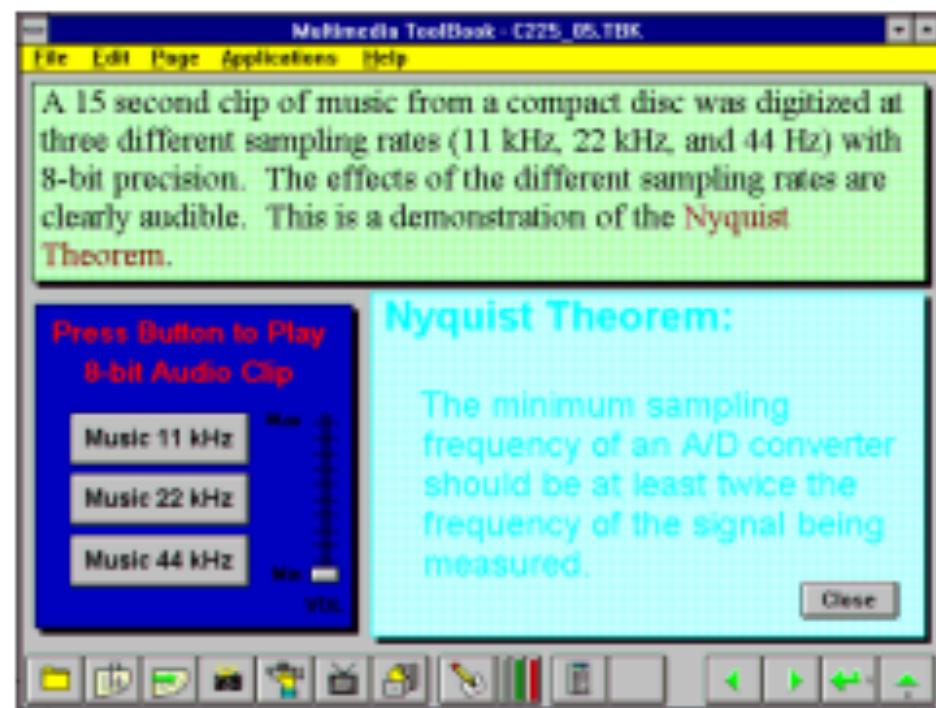
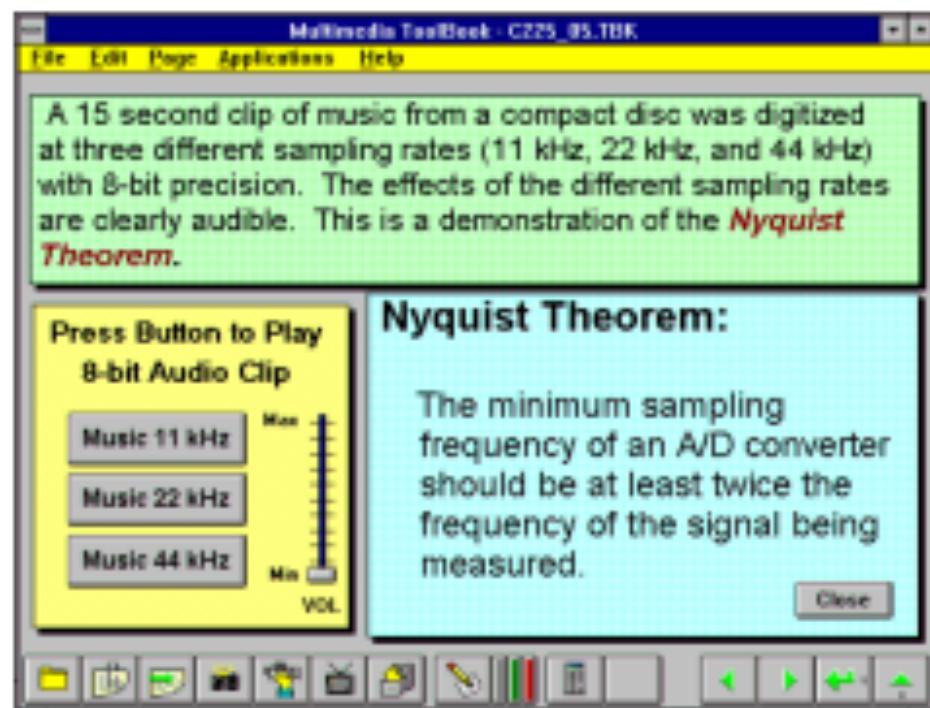
- Some color combinations are more pleasing than others:
 - e.g., a pink background and forest green foreground
 - Or a green background and mauve foreground.
- Next figure shows a comparison of two screen projections:

─ A “color wheel”, with opposite colors equal to $(1-R, 1-G, 1-B)$:



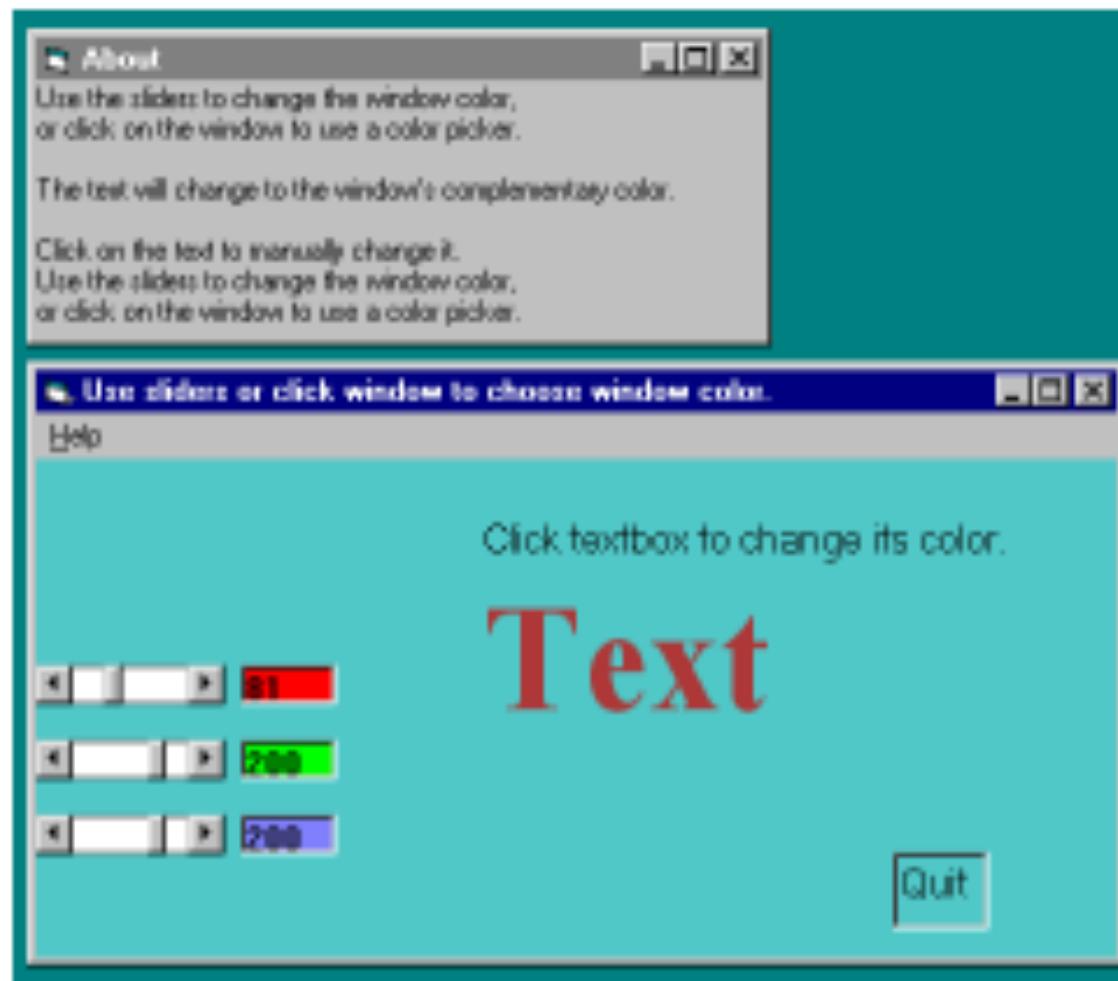
Graphics Styles - Colors and fonts

[from Ron Vetter]



Graphics Styles - Program to investigate colors and readability.

- Figure shows a small VB program (textcolor.exe) in operation:

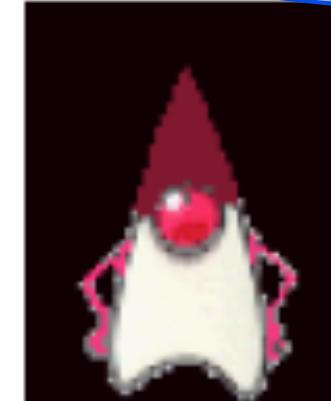


Multimedia Presentation

- Graphics Styles
- **Sprite Animation**
- Video Transitions
- Slide Transitions

Sprite Animation

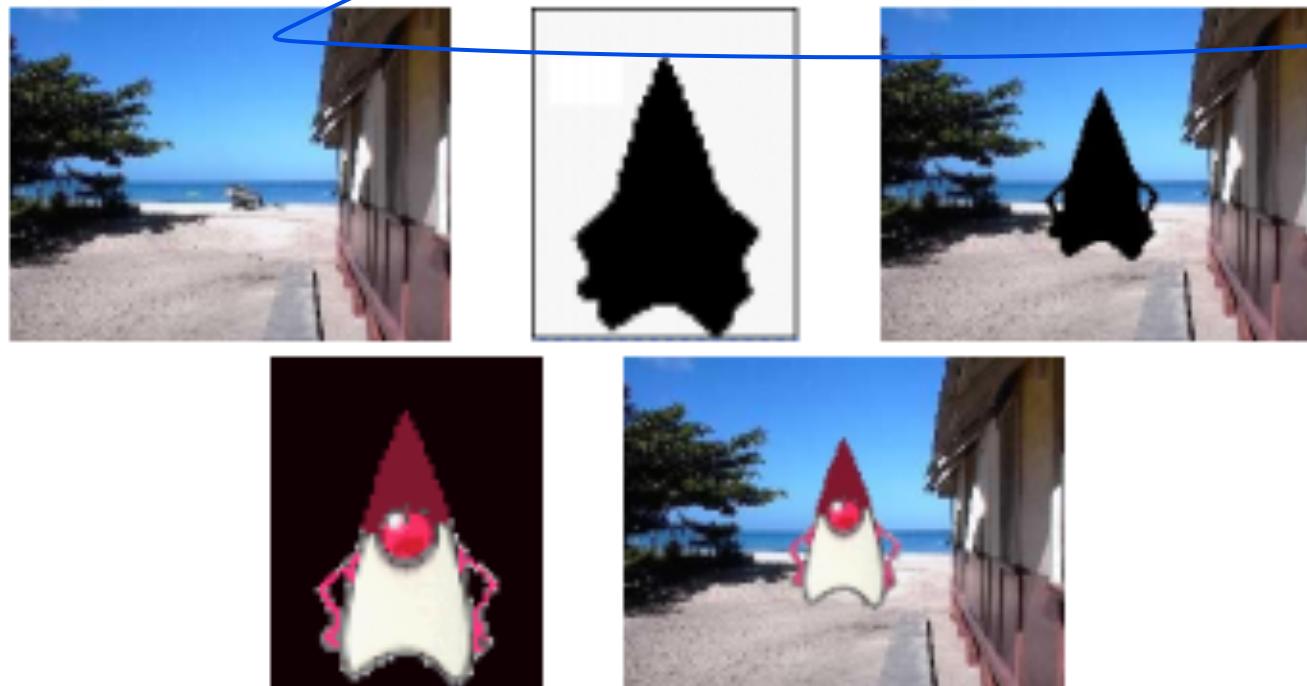
- **The basic idea:** Suppose we have an animation figure, as in the below Figure (a).
- Now create a 1-bit mask M , as in Figure (b), black on white, and accompanying sprite S , as in Figure (c)



Sprite creation: (a) Original, (b) mask image M , and (c) sprite S
("Duke" figure courtesy of Sun Microsystems.)

Sprite Animation

- We can overlay the sprite on a colored background B , as in below Figure (a) by first ANDing B and M , and then ORing the result with S , with final result as in Figure (e)



Sprite animation: (a): Background B . (b): Mask M . (c): B AND M . (d): Sprite S .
(e): B AND M OR S

Example of Sprite Animation Video

- <https://www.youtube.com/watch?v=4Kn8wyc7UnY>

Multimedia Presentation

- Graphics Styles
- Sprite Animation
- **Video Transitions**
- Slide Transitions

Video Transitions

- **Video transitions:** to signal “scene changes”
- Many different types of transitions:
 1. **Cut**
 2. **Fade –In or Fade-Out**
 3. **Wipe**
 4. **Dissolve**
 1. **Type I: Cross dissolve**
 2. **Type II: Dither dissolve**

~~Video Transitions - Cut~~

- ~~1. An abrupt change of image contents formed by abutting two video frames consecutively.~~
- ~~2. This is the simplest and most frequently used video transition.~~



~~W~~ Fade-In/Fade-Out

- A fade is when the scene gradually turns to a single color — usually black or white — or when a scene gradually appears on screen.
- Fade-ins occur at the beginning of a film or scene, while fade-outs are at the end.
- Fading to black is used to move from a dramatic or emotional scene into another scene, or to the credits at the end of a film.
- Fading to white, on the other hand, can be used to create a sense of ambiguity or a sense of hope

Video Transitions

- **Wipe**: a replacement of the pixels in a region of the viewport with those from another video.
- Wipes can be
 - left-to-right
 - right-to-left
 - Vertical
 - Horizontal
 - Like an iris opening, swept out like the hands of a clock, etc.



Video Transitions

- **Dissolve:** replaces every pixel with a mixture over time of the two videos
- Gradually replacing the first by the second
- Most dissolves can be classified as two types:
 - Type I: Cross dissolve
 - Type II: Dither dissolve

Video Transitions

- **Dissolve:** replaces every pixel with a mixture over time of the two videos
- Gradually replacing the first by the second
- Most dissolves can be classified as two types:
 - **Type I: Cross dissolve**
 - **Type II: Dither dissolve**

~~Video Transitions - Cross dissolve~~

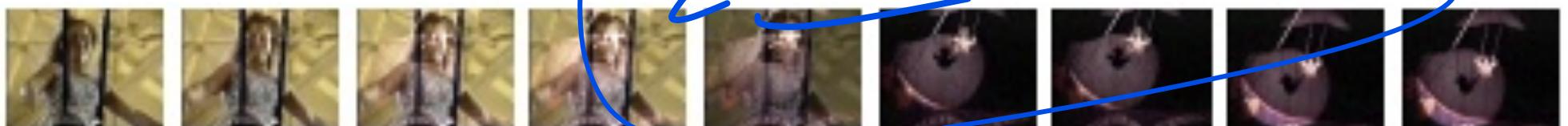
- Every pixel is affected gradually.
- It can be defined by: $D = (1 - \alpha(t)) \cdot A + \alpha(t) \cdot B$

where **A** and **B** are the color 3-vectors for video A and video B.

- Here, $\alpha(t)$ is a transition function, which is often linear:

$$\alpha(t) = k \cdot t;$$

$$\text{with } k \cdot t_{\max} \equiv 1$$



Video Transitions

- **Dissolve:** replaces every pixel with a mixture over time of the two videos
- Gradually replacing the first by the second
- Most dissolves can be classified as two types:
 - Type I: Cross dissolve
 - Type II: Dither dissolve

~~Video Transitions - Dither dissolve~~

- Determined by $\alpha(t)$,
- Increasingly more and more pixels in video A will abruptly (instead of gradually as in Type I) change to video B.



Video Transitions - Dissolve

- Fade-in and fade-out are special types of Type I dissolve

Where video A or B is black (or white).

- Wipes are special forms of Type II dissolve

- Where changing pixels follow a particular geometric pattern.

- Build-your-own-transition: Suppose we wish to build a special type of wipe which slides one video out while another video slides in to replace it: a *slide* (or *push*).

Example of Different Types of Video Transition

- <https://biteable.com/blog/tips/video-transitions-effects-examples/>

Multimedia Presentation

- Graphics Styles
- Sprite Animation
- Video Transitions
- **Slide Transitions**

Slide Transitions

- Build-your-own-transition: Suppose we wish to build a special type of wipe which slides one video out while another video slides in to replace it: a *slide* (or *push*).
- Unlike a wipe, we want each video frame not be held in place, but instead move progressively farther into (out of) the viewport.

~~Slide Transitions~~

- Suppose we wish to slide VideoL in from the left, and push out VideoR.
- Below figure shows this process:

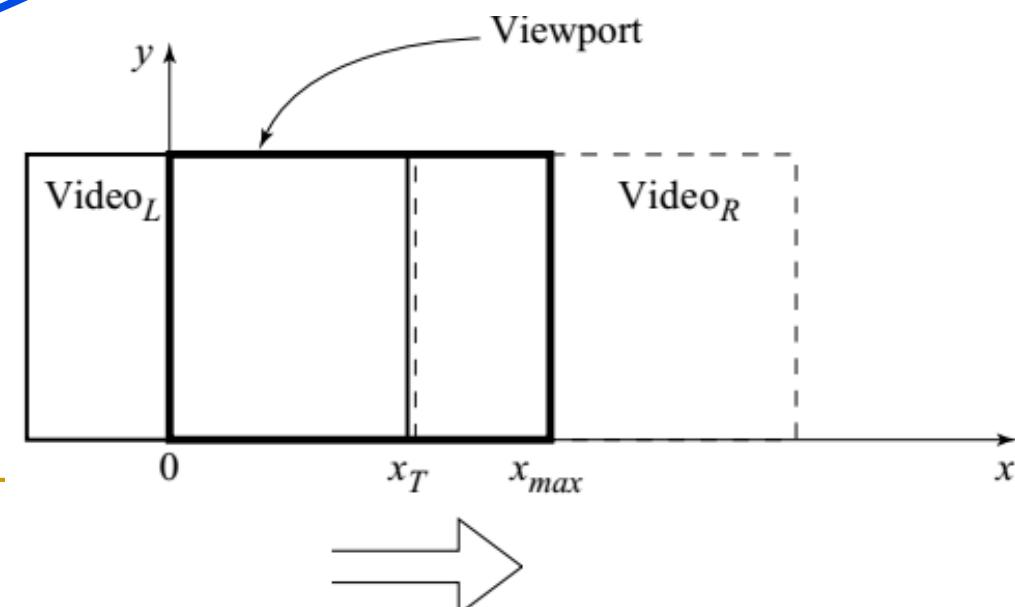


(a): VideoL. (b): VideoR. (c): VideoL sliding into place and pushing out VideoR

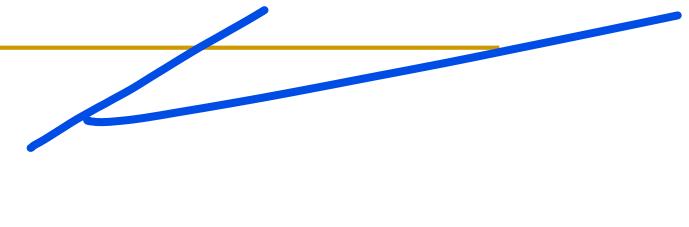
~~Slide Transition~~

- As time goes by, the horizontal location x_T for the transition boundary moves across the viewport from $x_T = 0$ at $t = 0$ to $x_T = x_{max}$ at $t = t_{max}$.
- Therefore, for a transition that is linear in time, $x_T = (t / t_{max}) x_{max}$.
- So for any time t , the situation is as shown in Figure (a).
- Let's assume that dependence on y is implicit since we use the same y as in the source video. Then for the red channel (and similarly for the green and blue), $R = R(x; t)$

Figure (a): Geometry of Video L pushing out Video R .



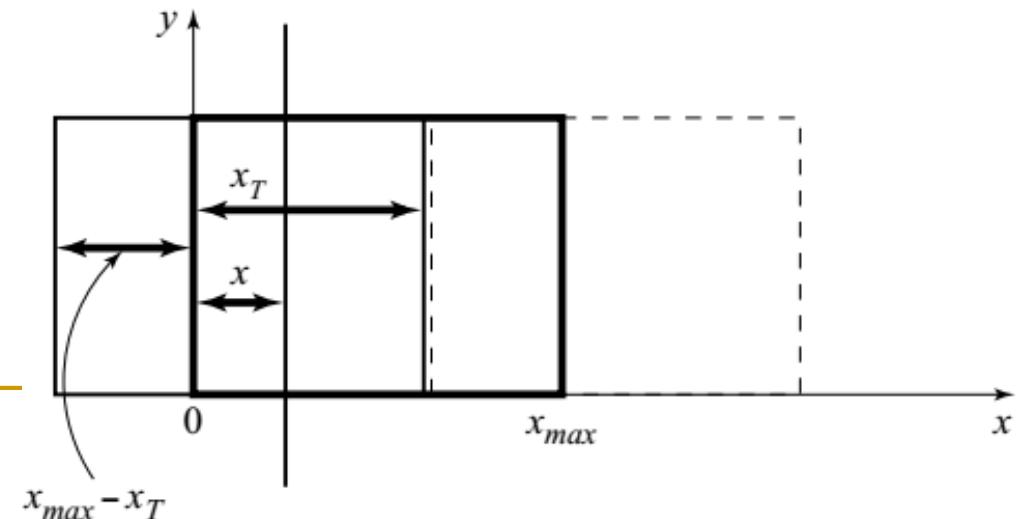
~~Slide Transition~~



- Suppose that we have determined that pixels should come from Video L .
- Then the x -position x_L in the *unmoving* video should be $x_L = x + (x_{max} - x_T)$, where x is the position we are trying to fill in the viewport, x_T is the position in the viewport that the transition boundary has reached, and x_{max} is the maximum pixel position for any frame.

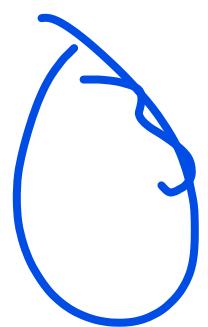


Figure (b): Calculating position in Video L from where pixels are copied to the viewport



~~Some Technical Design Issues~~

- **Computer Platform:** Much software is ostensibly "portable" but cross-platform software relies on run-time modules which may not work well across systems.
- **Video format and resolution:** The most popular video formats - NTSC, PAL, and SECAM - are not compatible, so a conversion is required before a video can be played on a player supporting a different format.
- **Memory and Disk Space Requirement:** At least 128 MB of RAM and 20 GB of hard-disk space should be available for acceptable performance and storage for multimedia programs.



AUTOMATIC AUTHORING

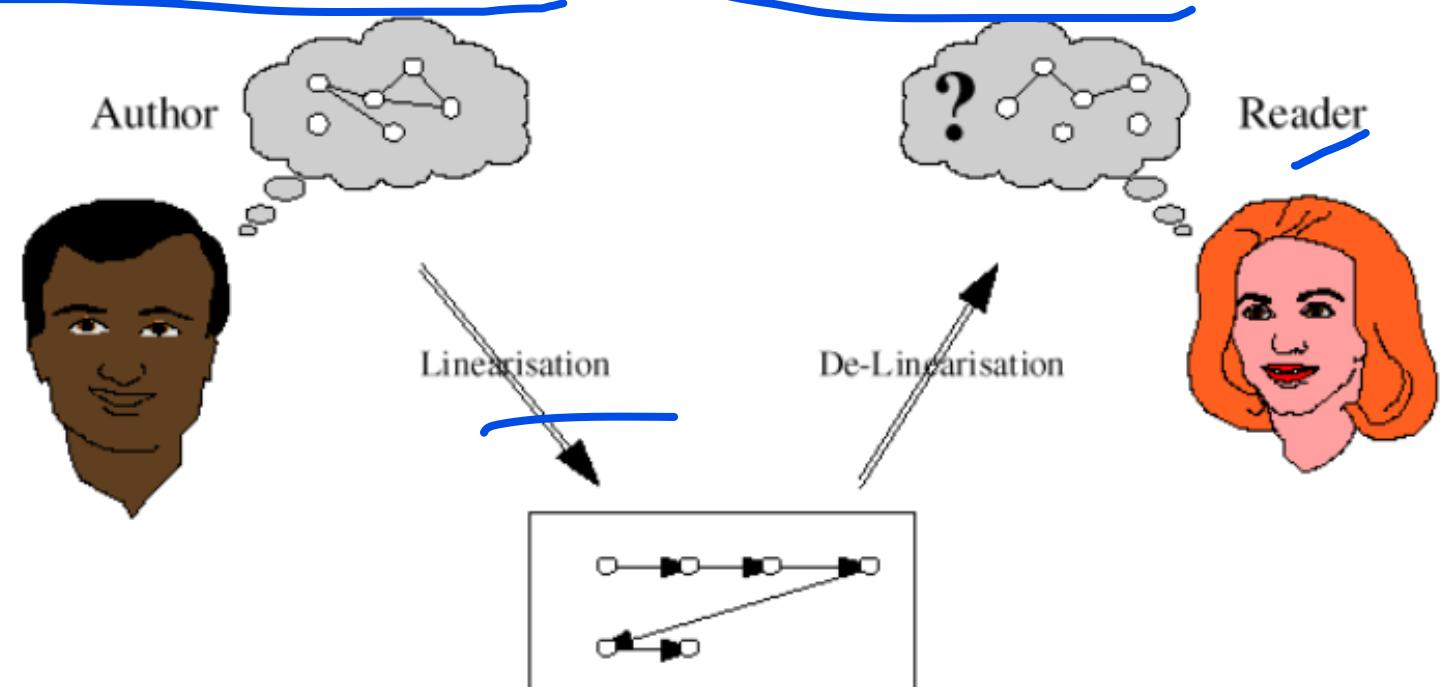
Automatic Authoring

- **Hypermedia documents:** Generally, three steps:
 - **Capture of media:** From text or using an audio digitizer or video frame-grabber; is highly developed and well automated.
 - **Authoring:** How best to structure the data in order to support multiple views of the available data, rather than a single, static view.
 - **Publication:** i.e. Presentation, is the objective of the multimedia tools we have been considering.

Automatic Authoring

■ Externalization versus linearization:

- Below figure (a) shows the essential problem involved in communicating ideas without using a hypermedia mechanism.



Communication using
hyperlinks [from David
Lowe]

(a)

Externalization

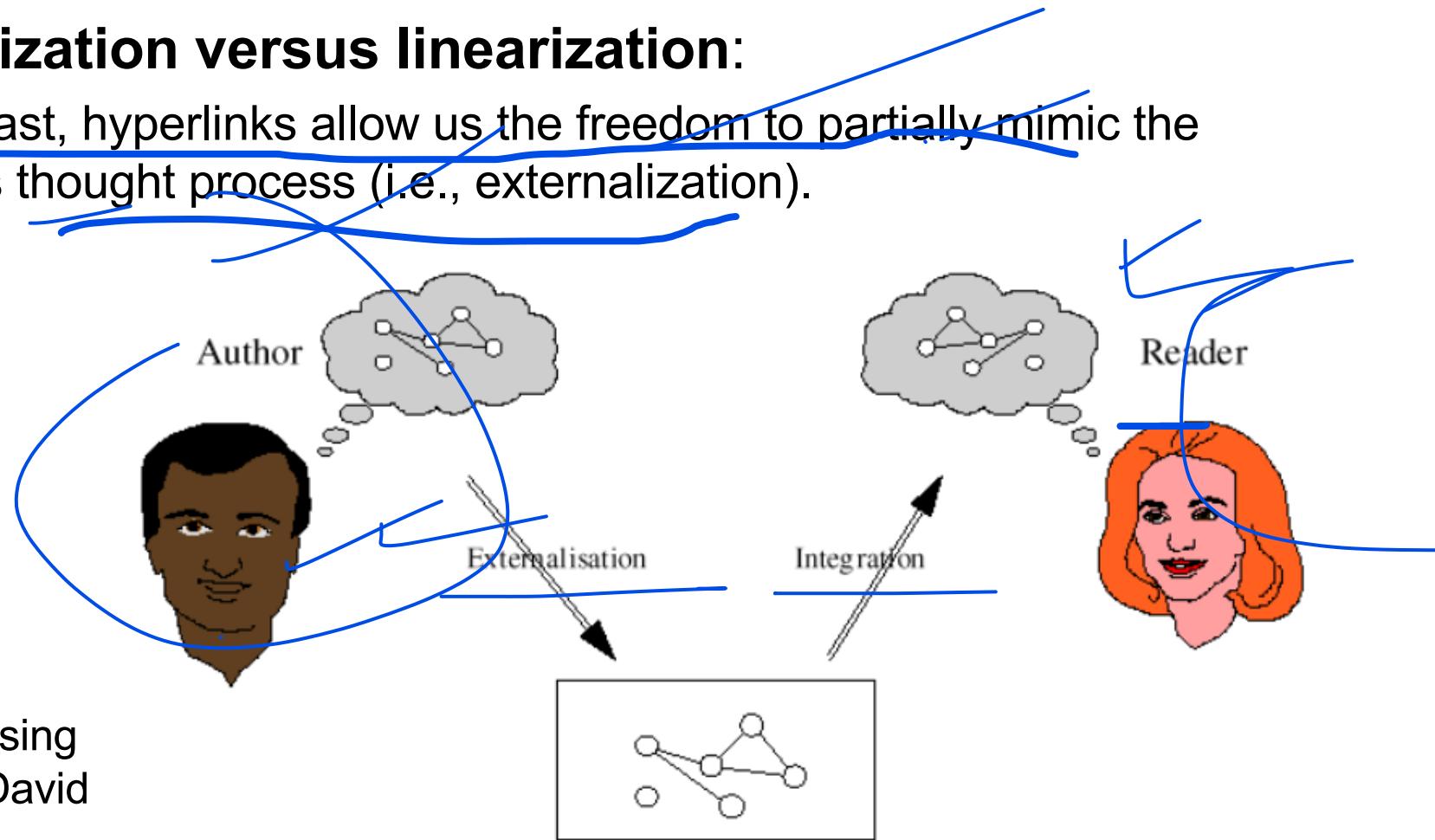
■ Externalization (or externalisation) is an unconscious defense mechanism by which an individual "projects" his or her own internal characteristics onto the outside world, particularly onto other people.

Automatic Authoring

4/1

■ Externalization versus linearization:

- In contrast, hyperlinks allow us the freedom to partially mimic the author's thought process (i.e., externalization).

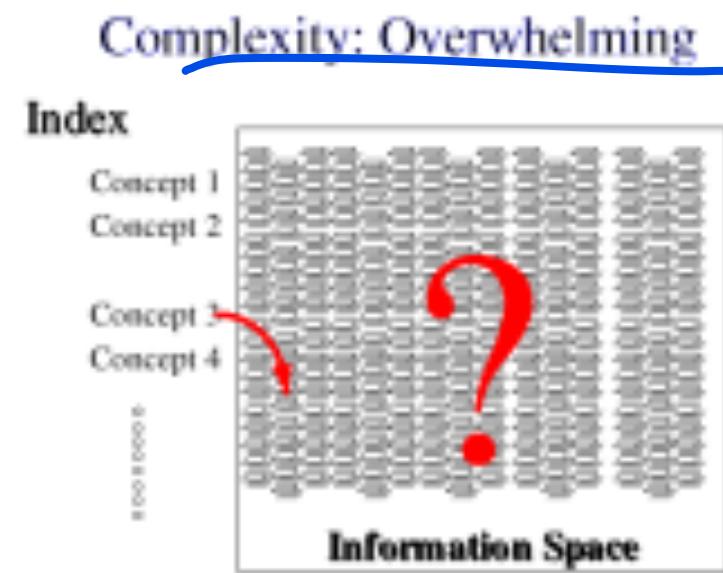
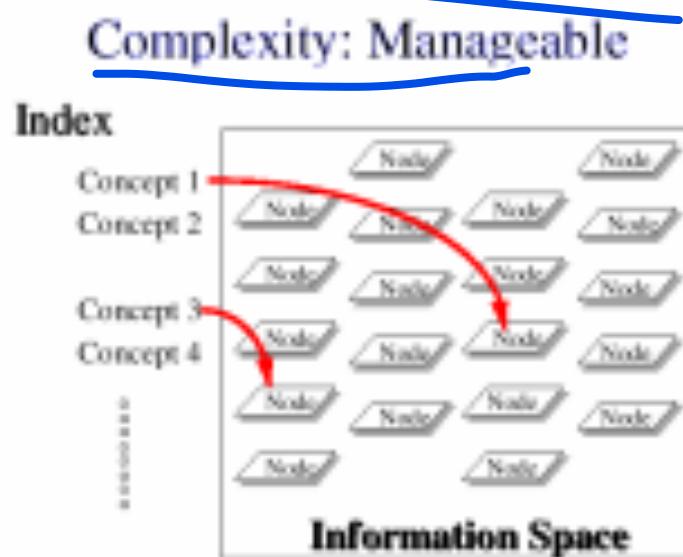


Communication using
hyperlinks [from David
Lowe]

(b)

Automatic Authoring

- Using, e.g., Microsoft Word, creates a hypertext version of a document by following the layout already set up in chapters, headings, and so on.
- But problems arise when we actually need to automatically extract semantic content and find links and anchors (even considering just text and not images etc.) below figure displays the problem.



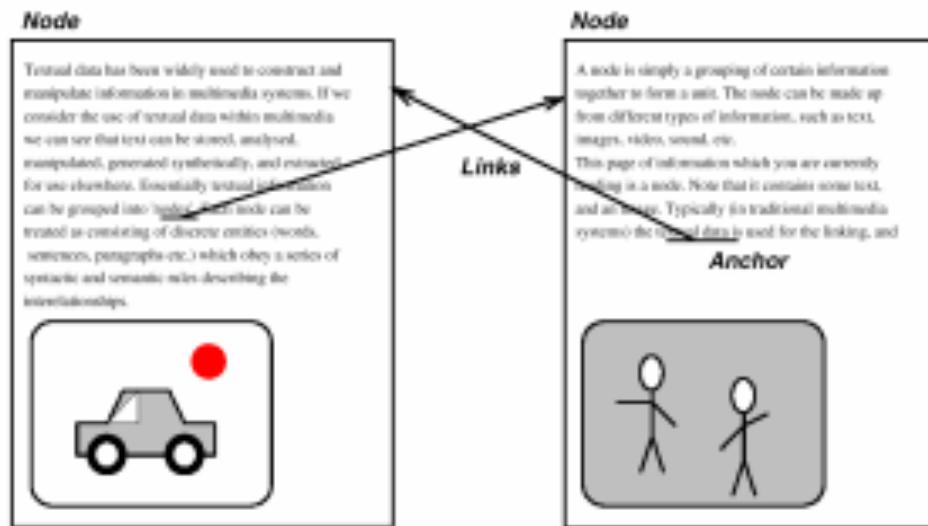
Complex information space [from David Lowe].

Automatic Authoring

- Once a dataset becomes large we should employ database methods.
- The issues become focused on scalability (to a large dataset), maintainability, addition of material, and reusability.

Automatic Authoring - Semi-automatic migration of hypertext

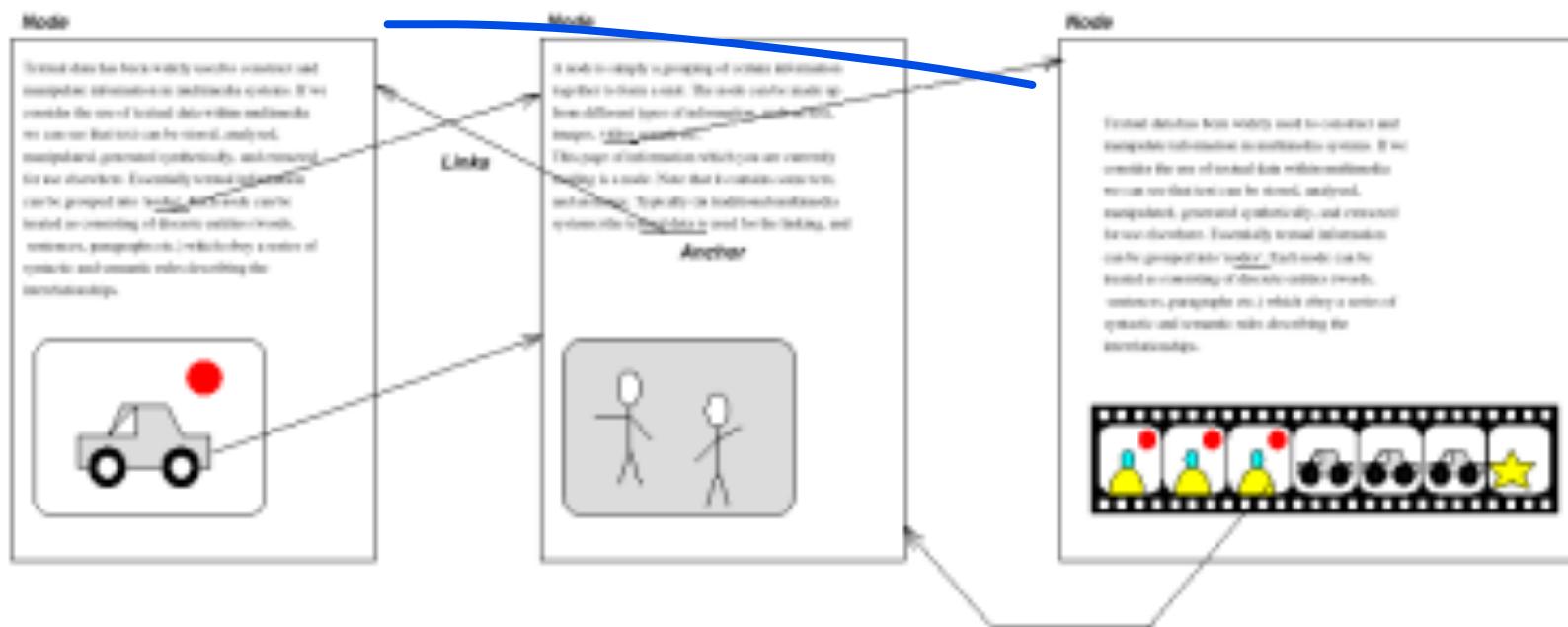
- The structure of hyperlinks for text information is simple:
- “nodes” represent semantic information and these are anchors for links to other pages.



Nodes and anchors in hypertext [from David Lowe]

Automatic Authoring - Hyperimages

- We need an automated method to help us produce true hypermedia:



Structure of hypermedia [from David Lowe]

Automatic Authoring - Hyperimages

- Can manually delineate syntactic image elements by masking image areas. Below figure shows a “hyperimage”, with image areas identified and automatically linked to other parts of a document:



Hyperimage [from David Lowe]

USEFUL EDITING AND AUTHORING TOOLS

Useful Editing and Authoring Tools

- One needs real vehicles for showing understanding principles of and creating multimedia.
- And straight programming in C++ or Java or any high end programming language is not always the best way of showing your knowledge and creativity.
- Some popular authoring tools include the following:
 - **Adobe Premiere 6**
 - **Macromedia Director 8 and MX**
 - **Flash 5 and MX**
 - **Dreamweaver MX**