



# Multimedia Systems

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Introduction

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# Outline

- Organization
- Introduction to Multimedia
- History of Multimedia
- Media
- Properties of a Multimedia System
- Media and Communication
- Multimedia Advantages

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# Literature

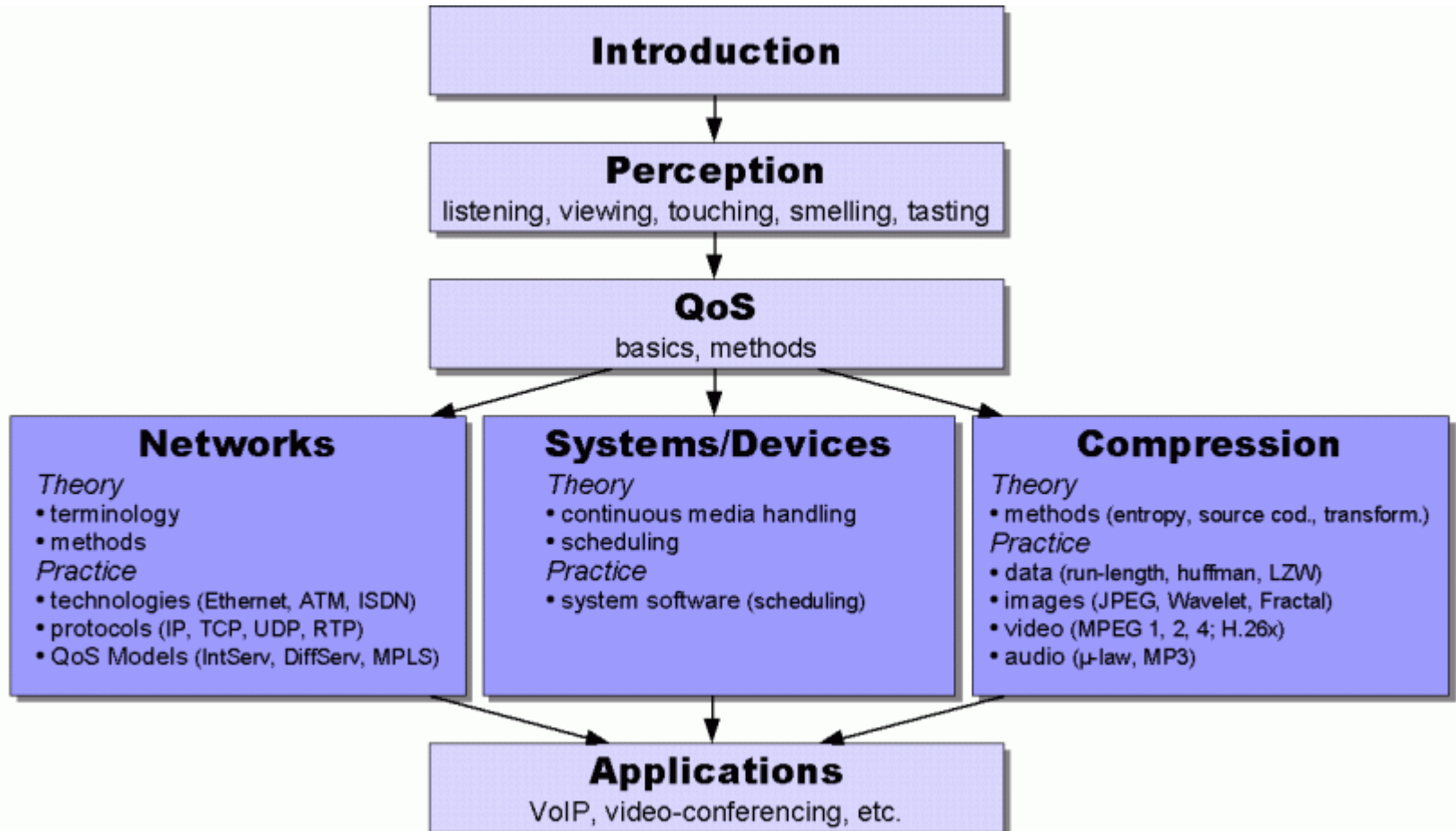
- Ralf Steinmetz  
Multimedia-Technologie. Grundlagen, Komponenten und Systeme.  
3. Auflage, Springer, 2000
- Andreas Holzinger  
Basiswissen Multimedia Band 1: Technik  
Vogel Buchverlag, 2001
- Konrad Froitzheim  
Multimedia Kommunikation  
dpunkt, 1997
- Grenville Armitage  
Quality of Service in IP Networks  
Macmillan Technical Publishing, 2000
- Zheng Wang  
Internet QoS - Architectures and Mechanisms for Quality of Service  
Morgan Kaufmann Publishers, 2001



# Organization

- Homepage:
  - [www.icsy.de](http://www.icsy.de) → Studies → Current Lectures → Multimedia Systems
  - [http://www.icsy.de/studium/vorlesung/ws0910\\_MMS/](http://www.icsy.de/studium/vorlesung/ws0910_MMS/)
- Location for following lectures: **32-349**
- Exercises
  - Exercise Course:
    - Every Tuesday from 2.00 pm to 3.00 pm in room 32-349
    - First course: November 10, 2009
  - First exercise sheet: November 9, 2009

# Sitemap



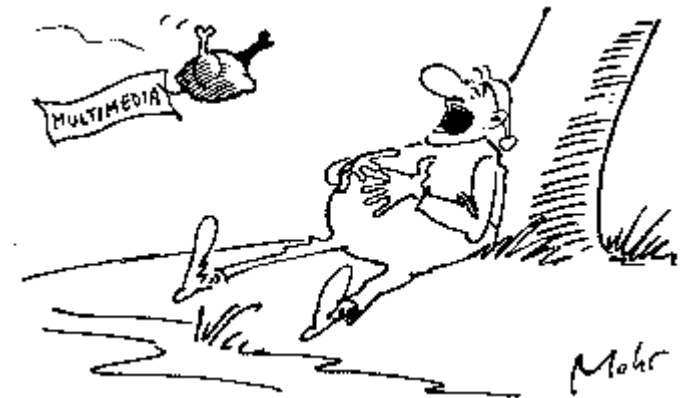
# Introduction to Multimedia (1)

## Opinions:

- "In our multimedia system you can not only edit text, but also include graphics."
- "While you edit your document you can have these five HDTV windows on your screen – oh, look, right now some voice mail came in."

In 1995, "*Multimedia*" was  
*Word of the Year* of the German  
[Gesellschaft für deutsche Sprache GfDS](#)

[Multimedia in Wikipedia](#)



## Introduction to Multimedia (2)

- Multimedia = Multi + media:
  - Multi: Many
  - Medium: "Thing in the middle"; means to distribute and present information
- The term "medium":
  - Medium for perception (Perzeptionsmedium)
  - Medium for representation (Repräsentationsmedium)
  - Medium for presentation (Präsentationsmedium)
  - Medium for storage (Speichermedium)
  - Medium for transmission (Übertragungsmedium)
  - Medium for information exchange (Informationsaustauschmedium)
  - presentation spaces and values (Darstellungsräume und Darstellungswerte)
  - presentation dimensions (Darstellungsdimensionen)



# History of Multimedia (1)

## 1945 Vannevar Bush

- Article in "Atlantic Monthly" about a system called "Memex" (memory extension), link structure between documents.
- Memex a future device for mechanized private file and library. A memex is a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory.
- 1973 at Xerox Palo Alto Research Center (PARC) in California, Alan Kay, a disciple of Vannevar Bush, introduced the graphical user interface (GUI) on the world's first personal computer (Alto) connected to the first local area network (Ethernet).

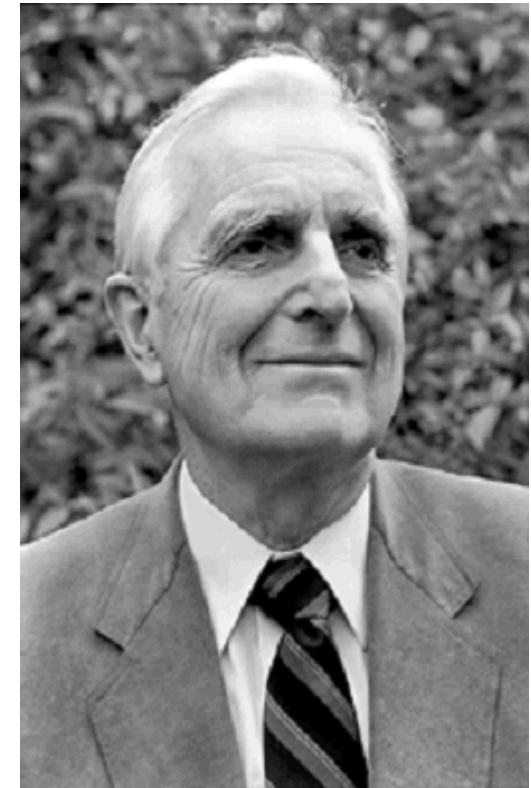


[V. Bush original text](#)

## History of Multimedia (2)

1958 Douglas C. Engelbart

- first began publishing about future high-performance organizations, enabling collaborative technologies and practices for knowledge work, knowledge management, etc.
- 1963 Doug Engelbart invented the computer mouse



[Mousesite: The Demo](#)  
[Mouse inventor wins \\$500K Lemelson prize](#)  
[Fascinating facts](#)

## History of Multimedia (3)

1968 Ted Nelson

- 1968 Einführung des Begriffes "Hypertext"
- 1980 Projekt XANADU (Literary Machines)

Hypertext is the presentation of information as a linked network of nodes which readers are free to navigate in a non-linear fashion. It allows for multiple authors, a blurring of the author and reader functions, extended works with diffuse boundaries, and multiple reading paths.



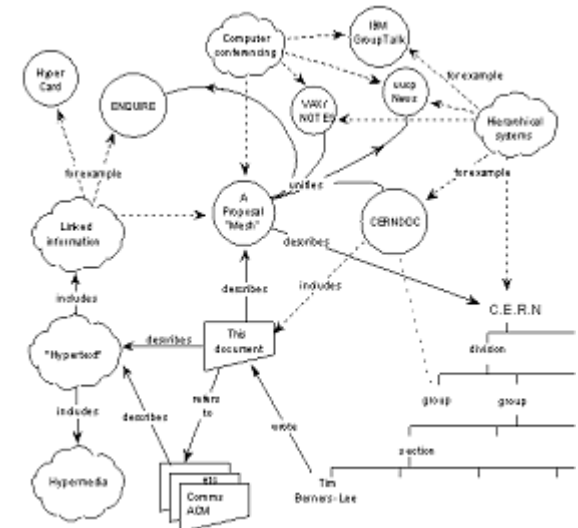
[T. Nelson original text](#)

# History of Multimedia (4)

1989 Tim Berners-Lee

- WWW, a document system for the CERN in Genf
- March 1994
- Marc Andreessen and colleagues leave NCSA to form "Mosaic Communications Corp" (became Netscape).
- May 25-27, 1994
- First International WWW Conference, CERN, Geneva. Heavily oversubscribed (800 apply, 400 allowed in): the "Woodstock of the Web".

- [Tim Berners-Lee original text](#)



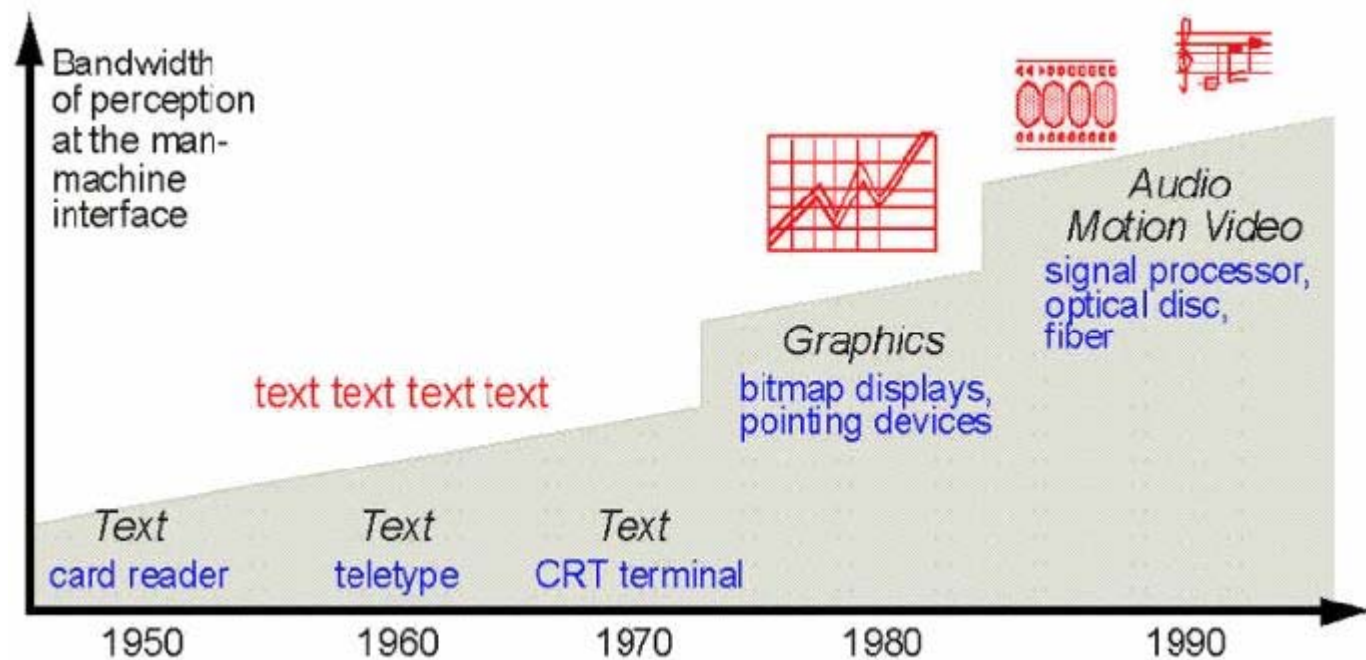


# Media (1)

- Media are means of communication:
  - Between computers and their users
  - Between humans using computers as communication tools
  - Between humans and the environment
- Media in computing:
  - Text:
    - 1950's: punchcard readers
    - 1960's: teletypes
    - 1970's: CRT terminals
  - Graphics:
    - 1980's: bitmap displays, pointing devices
  - Audio and video:
    - 1990's: digital signal processors, optical disks, fiber

## Media (2)

Media affect human computer interaction:



- Listening is easier than reading
- Showing is easier than describing
- Speaking is faster than writing

# Why Media are Important

- Media determine:
  - For what purpose computers are used
  - How computers are used
  - Who can use computers
- Example: Visualization / Graphics
  - New applications:
    - Geometric modeling, computer-aided design, ...
    - Information visualization
  - New interfaces:
    - Windows, icons, desktop

- Conclusion:

*Multimedia systems affect our view of computing in general, not just specific application areas.*



# Media Present Information

- **Presentation dimensions:**
  - Value dimension (dimension 1)
  - Spacial dimension:
    - Computer screens: 2 visual dimensions
    - Holographic projectors: 3 visual dimensions
    - Stereo sound: 1 acoustic dimension
  - Temporal dimension



# Time-Dependence of Media

- Time-independent / discrete media:
  - Text
  - Graphics
  - A single position coordinate
- Time-dependent / continuous media:
  - Audio
  - Video
  - A sequence of position coordinates (description of movement)
- Note:  
"Continuous" refers to the user's impression of the data, not necessarily to its internal representation.

# Media Present Information

- **Media transport information appealing to human senses:**
  - Presentation space:
    - Sense of vision (paper or computer displays)
    - Sense of hearing (stereophonic sound)
    - Sense of touch/tactile (pressure gloves)
    - Sense of balance (pneumatic simulators)
    - Sense of smell, taste,...
  - Presentation values:
    - Characters
    - Pressure waves
    - Electromagnetic waves
- **Value classes:**
  - Self-contained values
    - Temperature, taste, smell
  - Agreed-upon values (symbols):
    - Text, spoken language, gestures

# Properties of a Multimedia System

- **Flexibility:**
  - Provide mechanisms to handle all kinds of media, in particular, discrete and continuous media
  - A VCR and a desktop publishing system for text and graphics are not multimedia systems.
  - An editor with voice annotation is a multimedia system.
- **Integration:**
  - Independent media storage
  - Computer-controlled media combination

- **Definition:**

**A multimedia system is characterized by the integrated computer-controlled handling of independent discrete and continuous media.**

# Essential Elements of Multimedia

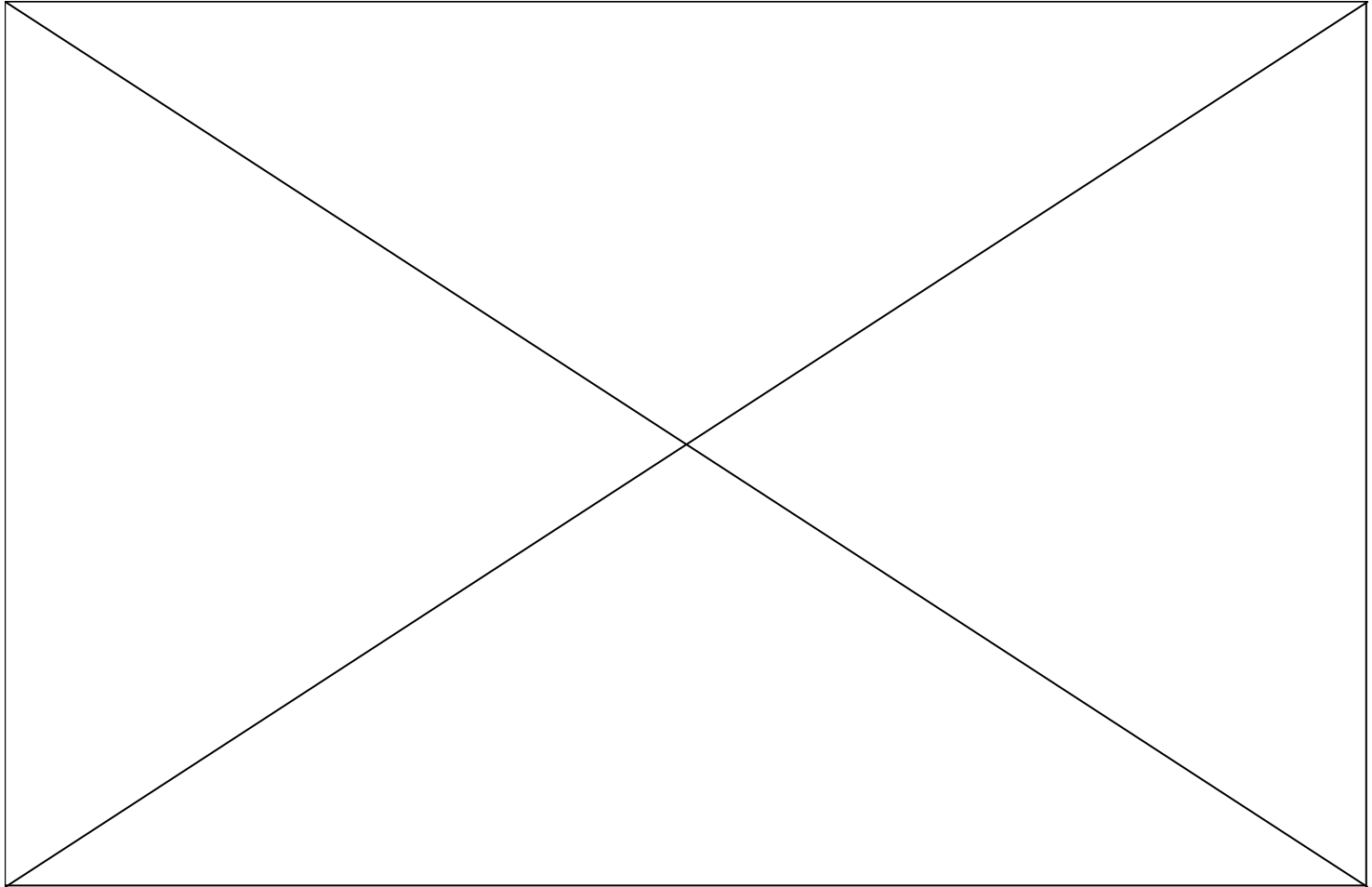
## Essential Elements

- Immersion
- Interdisciplinarity
- Hypermedia
- Interactivity
- Narrativity





# Interaction Example



# A New Definition of Multimedia



## Simulation of Human Communication

Simulation is the representation or replica of specific aspects of a real world system, in particular of its behaviour in time. The simulation allows us examination or manipulation, which's realization would be too dangerous, too expensive or even impossible in reality.

[Mind and Machine](#)

# Multimedia Advantages: Expressiveness

- **Man-machine communication:**
  - From computer-oriented interfaces to human-oriented interfaces
  - From a human perspective, interfaces are still insufficient:
    - Speaking is faster than writing.
    - Listening is easier than reading.
    - Showing is better than describing.
- **Information spectrum:**
  - Any idea requires a certain amount of information to express it
  - Each medium has limitations on the information it can convey
  - When information is transported through inappropriate media, parts of it may get lost
- **Extended bandwidth of perception:**
  - More complete media spectrum with audio and video
  - More familiar "look-and-feel" of man-machine interfaces

# Multimedia Advantages: Reachability

- **Network evolution:**
  - Still today: Disjoint telephone, data, and TV distribution networks
    - Advantage: Pervasiveness
    - Disadvantage: Each for one medium only
  - Today: Integrated Services Digital Networks (ISDNs)
    - Advantage: Already voice and data
    - Disadvantage: Limited to voice and data
  - Today: Access network Digital Subscriber Line (DSL)
    - Advantage: Arbitrary digital data
    - Disadvantage: Still insufficient bandwidth for some media
  - Tomorrow: Integrated Broadband Communication Networks (IBCNs)
- **Chicken-and-egg problem:**
  - Consumers will not connect to the network before good services are available
  - Providers do not offer services as long as there is no market



# Multimedia Advantages: Individuality

- **Interaction:**
  - TV uses broadcast (couch-potato mode):
    - Users can select program, but nothing else
    - Prevents applications outside a mass market
  - Computer at the receiving side can influence:
    - When to watch
    - What to watch
  - Advantages:
    - Adjustable degree of interaction
    - Single-consumer applications
- **Personalization:**
  - Computer can filter and select information
  - "Personalized newspaper"

# Multimedia Advantages: Processing

- **Computer processing functions can be used to:**
  - Select information
  - Modify information
  - Interpret information
- **Media transformation:**
  - Generate movie from textual description
  - Play music from a score
- **Media understanding:**
  - Audio commands
  - Video analysis



# Questions

1. Persons and their contributions to the history of multimedia
2. Presentation dimensions
3. General type of media
4. Presentation space and value classes
5. A technical and a content based definition of multimedia
6. Essential elements of multimedia
7. What does simulation mean?

# Links

- [Multimedia Glossary](#)
- As We May Think - this paper by Dr. Bush calls for a new relationship between thinking man and the sum of our knowledge.  
<http://www.theatlantic.com/doc/194507/bush>
- IEEE Multimedia - features the latest practical information on research and applications in multimedia hardware and software.  
<http://www.computer.org/multimedia/>
- PROJECT XANADU Founded 1960 The Original Hypertext Project  
<http://xanadu.com/>  
[http://en.wikipedia.org/wiki/Project\\_Xanadu](http://en.wikipedia.org/wiki/Project_Xanadu)
- A Little History of the World Wide Web  
<http://www.w3.org/History.html>