Integration of Broadcast Digital Video and Personalized Online Media

- Hyperlinked Interactive Video -

Norbert Gerfelder, Matthias Finke, Luc Neumann
Computer Graphics Center (ZGDV), Germany
Introduction - Status

- Digital TV is in use (e.g., DVB in Europe)
- World Wide Web is in real use
  - It is a business in various application domains (Internet & mobile)
- “Fusion” and integration take place
  - Video usage on the Internet (streaming media)
  - TV sets with integrated Web browser
  - Delivery channels are used for various media and applications (xDSL, Cable Modem)
- ... for the user
  - Digital TV = more channels
  - Multimedia and Hypermedia on the World Wide Web is accepted and used
- ... but
  - open questions ....
Introduction - Open Questions

- **Which added value services can be offered in the future?**
  - Which role can video play on the Internet?
  - Which new services can be offered on the TV-set?

- **In which way can video and online media be integrated?**
  - Is interactive video a solution?

- **How to author content for different applications and devices?**
  - How to create interactive video?
  - In which way can the content be customized and re-used?
    - How to customize interactive video for different devices?
    - How to personalize interactive video for different users or user groups?
Outline

- Video-based Interactive Services (Classification)
- Hyperlinked Interactive Video
  - Requirements and System Architecture
- The MOVieGoer System
  - Video-Object Definition
  - User Interaction and Data Flow
  - Personalization and Media Adaptation
- Applications of Hyperlinked Interactive Video
- Conclusion
Video based Interactive Services (#1)

- **What is “Interaction”?**
  - ... perform an action
  - ... start a request
  - ... act with data/media
  - ⇒ ... get involved!

- **Classification**
  - Simple interaction
  - Multimedia interaction
  - Local interaction
  - Global interaction
Video based Interactive Services (#2)

- **Simple interaction**
  - VCR functionality
  - Video buttons (e.g., videotext URLs in Germany)

- **Multimedia interaction**
  - Interact inside a media (e.g., hyperlinks in HTML)
  - Integrational use of different media (e.g., get video out of text)

- **What is missing?**
  - Interact inside video
  - Get additional information out of video
  ⇒ Video as a starting point for interaction
Video based Interactive Services (#3)

- **Local interaction**
  - all processing is performed on the end device
    - VCR functionality, CD-ROM, Videotext
  - all data has to be available on the end device (bandwidth, storage)
  - all functionality has to be available on the end device (thick client)
  - no return channel is needed

- **Global interaction**
  - processing can be performed on the server side
    - World Wide Web, E-Commerce applications
  - data can be transmitted on demand (actuality, less storage)
  - functionality can be available on server side (thin client)
  - return channel is needed
Hyperlinked Interactive Video (#1)

- **Goal:**
  Enabling of video-based hypermedia applications in the broadcast and online domain

- **Concept:**
  - Video consists of "objects"
  - Linking of "objects" and additional information
  - Additional information can vary over time
  - Combined presentation of video and hypertext information
Hyperlinked Interactive Video (#2)

Requirements

- Enabling multimedia interaction
- Usage for local and global interaction
- Support of different application domains
  - (Delivery channels, end devices, ...)
- Extension of the hypertext metaphor for other media
- Linking of video and online information
- Interaction with video objects
- Support and usage of existing formats
  - no additional video format!
- Usage of standard protocols (e.g. HTTP)
The MOVieGoer System (#1)

- **Goals**
  - Active participation of the user by offering new functionality
  - Interaction with objects inside the video
  - Video hyperlinks
    - Linking of additional information with video objects
    - more than one video object or additional information in one frame
  - Personalization
    - Support of device and user profiling

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The MOVieGoer System (#2)

- Architecture
- Usage of standard protocols
- Data separation between
  - video data
  - selectable object definition
  - linking data
  - additional data
- Module separation between
  - player components
  - content handler
  - process handler
  - data storage
The MOVieGoer System - Authoring

- Segmentation of video data
- Definition of sensitive regions
  - Manual
  - (Semi)automatic
- Annotation
  - Linking of objects with additional information, e.g., using URLs
  - Definition of keyframes
  - Marking (recognition) and object tracking
The MOVieGoer System - Segmentation

original frame

recognized objects, e.g., players

key frame method
The MOVieGoer System - Interaction Handling

- Parameters
  - x,y coordinates
  - frame number
  - content number
  - (user ID)
  - (device ID)
The MOVieGoer System - Personalization
The MOVieGoer System - Summary

- MOVieGoer is a first step towards Interactive Video
  - Allows real interaction with video objects, not only frames or scenes
  - Hypertext metaphor was extended for other media - real hypermedia
  - Flexible in regard to
    - kind of media
    - formats
    - delivery channels
  - Can be used in single-, multi-, and broadcast environments
    - supports local and global interaction
  - Allows content re-use
  - Supports personalization in regard to user and device
  - Can be used together with DVB-MHP
Application (#1)

Scenario
Sport Event
Application (#2)

Scenario
E-Commerce

MOVieGoer

FashionShow 99

You can rotate the model!
Blazer by Giovanni Dovane
Spring Collection 99
Price: 250$
Order it Online - here!
Application (#3)

Scenario
Distance Learning
Conclusion

- Technology allows
  - the development of interactive services
  - the combination of Internet and digital video
  - new classes of services

- User demands
  - more than traditional TV or Video on Demand
  - combination of various information channels
  - the use of different services on various appliances

- Therefore, user centered development has to be the goal
  - real multimedia services have to be developed, e.g., MOVieGoer
  - ease of use has to be reached - Ubiquitous computing
  - remove the borders between WWW and broadcasting

⇒ Internet Interactive Broadcasting
The Future - Internet Interactive Broadcasting

Usage

Appliances

Channels

Content Services
Internet Interactive Broadcasting - Activities

- W3C “Broadcasting Interest Group”
  - Established by the Word Wide Web Consortium (W3C) (6/98)

- Group works on
  - New URL-scheme for TV channels / New URL for content in TV services
  - Broadcast-specific data on the Web (SI/PSI-like metadata)
  - Broadcast HTML (TV-related profile of CSS, HTML, etc.)
  - Authoring guidelines
  - Default style sheet for TV
  - Metadata description / transport
  - Interaction mechanisms for streaming media, linking of media
  - Controlling streaming media
  - Filtering/transforming data for specific devices / device profiles
Conclusion - (Open) Standardization Issues

ISO / IEC

- **MPEG 1 / 2**
  - Video, Audio, Synchronization; Media Delivery
- **MPEG 4**
  - Video, Audio, 2D/3D Graphics, Animation, Text, Hyperstructures
- **HTML, HTTP**
  - Text, Graphics, Hyperstructures
- **XML, SMIL, HTTPng**
  - Video, Audio, Multimedia Synchronization, Media Delivery

W3C

- **???**

- Both are addressing the same areas
- No need for differentiation
- Cross border development is recommended
Conclusion - Open Research Issues

- For Hyperlinked Interactive Video:
  - Visualization of selectable objects
- Object segmentation, recognition and tracking
  - Sensor fusion is needed (application specific vs. general) (Bove et. al. 1998)
- New Interaction Devices
  - Remote control (⇒ EMBASSI)
Thank you for your attention!

Norbert Gerfelder
norbert.gerfelder@acm.org
www.zgdv.de/miv