A Media Mixer for online learning

Making learning materials more valuable for their owner and more useful for their consumer

Lyndon Nixon
MODUL University
lyndon.nixon@modul.ac.at

OCWC Global 2014
Ljubljana, Slovenia
24-April-2014
Structure of the talk

• What is MediaMixer?
• Trends on the Web and in e-learning: more creation and consumption of video
• Required multimedia technology
• Media fragment creation, description and re-mixing in a case study: VideoLecturesMashup
• The MediaMixer offer for your content
Introducing....

Making Media more valuable for its owner and more useful for its consumer
MediaMixer is a group of research and industry experts.
MediaMixer is the adoption of years of media R&D innovation
MediaMixer is the promotion of innovative media technology

- Analysis tools
- Annotation tools
- Copyright tools

New Media Applications
- Re-use
- Acquire
- Search

Media Assets

- RDF metadata model
- Media Fragment URI specification

Storage (Media + Metadata)

© 2013 MediaMixer Consortium
http://community.mediamixer.eu
Trends on the Web and in e-learning
Online video is growing

- 78 hours of video is uploaded to YouTube per minute
- Online mobile video viewing

Video streaming accounts for 37% of all mobile traffic

Of all video streaming traffic, YouTube accounts for 45%

A Cisco study on mobile traffic growth expects
- 66% of all traffic by 2014 will be video
- having increased 66-fold from 2009 to 2014
Online education is growing

- Learners & teachers are using the Internet both as a complement and a replacement to traditional learning
  - 60 million downloads of Open University materials at iTunes U in 4 years
  - “classroom flipping”: watch the lecture at home, spend time in class on the exercises
Online video based learning

- Open content: Open CourseWare (20 000 courses)
- Massive lecture capture system: Opencast Matterhorn project (700 universities)
- Online portals specialised in video lectures:
  - Polimedia
  - VideoLectures.NET
    - 25 000 academic videos
What about sharing & monetarizing content?

- Huge & growing amounts of valuable AV material but unable to effectively re-distribute or re-sell it.
- Media owners & platforms would like to continue to benefit from the (online) availability of (older, long tail) content – currently content to make a free distribution (cf. open video) or use ad-supported hosting (eg. YouTube, own platform)
Stock footage

It is growing at more than 20% per annum, fuelled by increased demands for new programming and the huge saving it represents compared with shooting new footage. Interactive technology and the Internet will further contribute to the growth of the market as it makes stock footage cheaper and easier to locate and license.

- http://moneyam.uk-wire.com/cgi-bin/articles/200201020827103514P.html
Media asset re-use

• Getty Images

...While it started out providing expensive images for limited use to a small group of customers, now it also provides cheaper images for broad use to a big group of customers...
Media re-mixing

Harlem Shake
- Originally a free track
- Went viral on YouTube
- >100000 spin off videos with >400mil views (3/13)
- Music owners can „claim“ use of their IP on YouTube videos
- Revenue sharing up to 55% on every ad click in a video

https://www.youtube.com/watch?v=BfuH3JOSfSg

Billboard, 'Harlem Shake' – The Making and Monetarizing of Bauuer's Viral Hit
The rise of MOOCs

- MOOCs: Massive Open Online Courses
  - 3 million user accounts, over 400,000 students registered within 4 months at edX
  - fixed course structures
  - require registration (if free or fee)
  - differing approaches to “open” licensing

Coursera and Udacity are NOT Open Courseware
The re-use of MOOCs?

A learning „offer“ may be a remix of different content sources

• Cost saving against recording new material
• Tailored learning course for each learner
• Multiple value from a single learning unit

Reuse, not production, is key to positive MOOC impact

Mike Caulfield, KEEP LEARNING blog
http://learning.instructure.com/2012/12/reuse-not-production-is-key-to-positive-mooc-impact/
Needed media technology
Issues for media re-use

- How easy is it to find again the digital media we produce and store?
  - Computers are good for search on visual and aural features but is that how others search over media?
  - Text search of media generally looks for matches on text associated to media or in its metadata (title, description)
  - Finding matching scenes or shots in video, or regions in image, requires more detailed descriptions of media (at fragment level)
  - Finding matches may need to overcome linguistic ambiguities, synonyms or multilingualism in a textual search term (semantics)

Well annotated media at fragment level can be easier to retrieve & re-use
Issues for media re-use

- How easy is it to offer annotated media across organisational boundaries for retrieval and re-use, including monetarization and copyright management?
  - MAMS are typically closed, proprietary & monolithic
  - Open publication of annotations requires agreed standards for media description, search query and results format, if each media provider is not to be yet another silo
  - Access to media assets online needs to support payment mechanisms and rights management

Well managed media provision can create new revenue and marketing opportunities
Media metadata

As video collections grow, how to find again a specific video part?

- Computers can only automatically extract low level media features while humans tend to query with high level “concepts” or “events”
  - Query by Example (QBE)
  - Content based Media Retrieval
  - Computer Vision

“Semantic gap” an ongoing research issue!
Google creates neural network, teaches itself to recognize cats

By Rick Burgess
On June 27, 2012, 4:30 PM

Google engineers claim they’ve designed a computer network capable of analyzing, categorizing and ultimately teaching itself to recognize the content of images. The “neural network” was fed 10 million images from YouTube video thumbnails and -- without being told how -- created its own concept of what a cat is.

In fact, programmers found that the system had created a fuzzy, dream-like image of a cat’s face from scratch (pictured to the right) as at least one generic reference used for identifying felines.

"We never told it during the training, 'This is a cat,' " said Dr. Dean, who originally helped Google design the software that lets it easily break programs into many tasks that can be computed simultaneously. "It basically invented the concept of a cat. We probably have other ones that are side views of cats."

Media metadata (3)

Shots subset retrieved for Lecturer_and_board

For loop
For each element in the list
    if condition:
        action
else:
    Perform default action

This frame shows a lecturer standing in front of a chalkboard with...
Media metadata (3)
Media metadata (4)

- Textual metadata has long been a key factor in media collections
  - Dublin Core has summarized the main fields for indexing and retrieval; different industries have developed richer metadata models
  - Manual entry by collection experts, varying terminology and interpretation
  - Increasing automated production of metadata from all available input sources (e.g. ASR, OCR, subtitling, transcripts, associated text)
Media metadata (5)

- „Named entity recognition“ (NER) extracts distinct entities out of natural language text
  - Disambiguation & classification
  - Trend towards global unique identification
Media metadata: trade-off

• More metadata – better retrieval / computer supported re-use
  – More manual curation – more cost
  – More automated creation – less accuracy
Pre-annotation

- Determine the fragments of the video material and their topics
  - Segmentation based on 'natural markers'
  - Concept detection in video
  - Topic identification from extracted text
Annotation

• Model the video description in a structured and semantic way
  – Structured metadata format
  – Media fragment identification
  – Entities mapped into a knowledge domain

Pre-annotate
Using automatic techniques

Annotate
Human oversight via intuitive tool
Storage and retrieval

- Metadata store alongside the media repository
  - Query by topic
- Effective retrieval needs good query formulation
  - Controlled / known vocabularies, normalize or map free text to vocabulary terms
  - System learning, query suggestion or drill-down search (iteratively improve)
Storage and retrieval

- Result set is a list of relevant video fragments
  - Follow metadata to the URL of the video
  - Playback can be ordered & grouped
  (http://www.mediamixer.eu/jukebox/)

Video Lecture Jukebox

You're watching video number 2 of 4: 'http://www.ccc.modul.ac.at/mediamixer/videolectures/mitworld_chomsky_terror/video_01/qviumizbtqgqvn0n6q6frop5y.mp4#t=3084.18,3089.51'
An example with video lectures
MediaMixer use case: Video fragment creation

Fragments were created based on the slide synchronisation timeline.

Transcripts (auto-generated by speech-to-text technology where necessary) were parsed and split across fragments.

... there are three Kingdoms of Life, Bacteria, Archaea and Eukaryota...
MediaMixer use case: Video fragment annotation

Fragments were then annotated by extracting topics from their textual metadata (slide OCR or speaker transcription).

Topics are connected to a global knowledge model (DBPedia).
Annotations are managed in a separate metadata store. The store provides a semantic query endpoint returning lists of video fragments matching a query topic (including semantically related topics).
MediaMixer use case:
Video fragment playback

The front end uses HTML5 or Flash. Both codebases are extended to support video fragment playout.

Individual playback can be modified to linear or non-linear channels (for e.g. a TV or mobile video experience)

- 5:35 - that chemistry has no relevance whatsoever to the life
- 8:35 - solid foundation for studying any kind of life science.
- 15:49 - chemistry every day and will for the rest my life.
- 16:06 - for the rest of your life.
- 21:31 - of your life.
- 8:59 - That’s an enormous skill in not only computing, but in life.
- 10:35 - Because life is way too short to do anything that’s
- 15:42 - have as few as, say, two a year, it dominates their life.
- 41:07 - program in your whole life.
- 4:41 - The Three Kingdoms of Life
- 5:12 - Basic Unit of Life: the Cell
The MediaMixer offer to you
MediaMixer community portal

Free sign-up for email when new materials are available

Intro to all technology at community.mediamixer.eu/technology

Updated with latest materials on all Media Mixer topics:

Technology use cases
Demonstrators
**Tutorials, cf. Core Technology Set**
Presentations
Software
Specifications

http://community.mediamixer.eu
MediaMixer Webinars

ALL Webinars are at http://mediamixer.eu/live

They cover all technology areas and use cases (broadcasting, e-learning)
Thank you for your attention!

Contact us:

Membership - [http://community.mediamixer.eu](http://community.mediamixer.eu)

Collaboration - email [lyndon.nixon@modul.ac.at](mailto:lyndon.nixon@modul.ac.at)

Say hello @project_mmixer