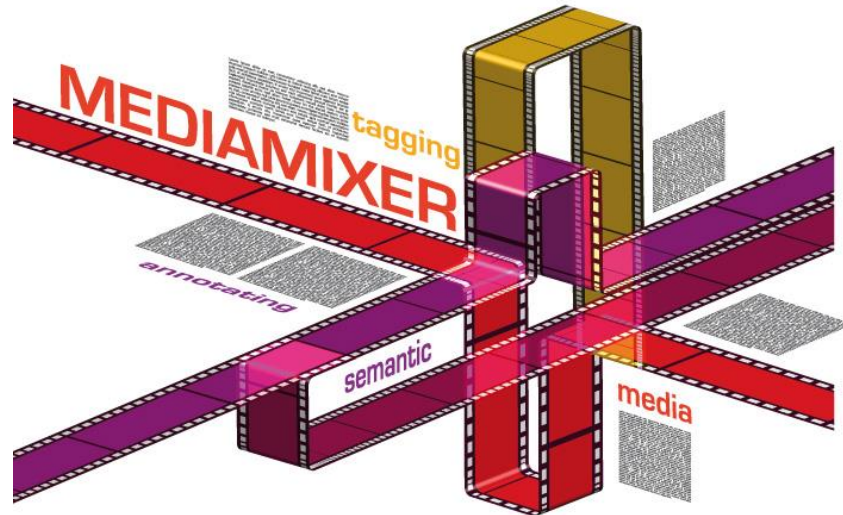# A Media Mixer for online learning

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

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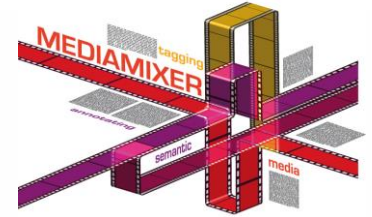*MODUL University*
lyndon.nixon@modul.ac.at

Internet of Education 2013
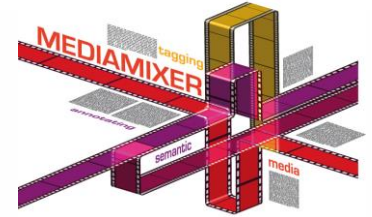*Ljubljana, Slovenia*
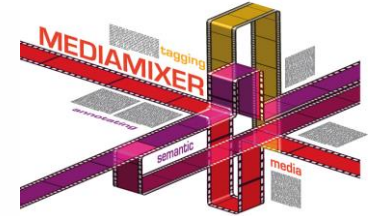*11-November-2013*

Structure of the talk

- Trends 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

Trends in e-learning

Online video is growing

- 78 hours of video is uploaded to YouTube **per minute**

- Online mobile video viewing

Global Bandwidth and Application Growth

Growth in mobile data usage, H2/10

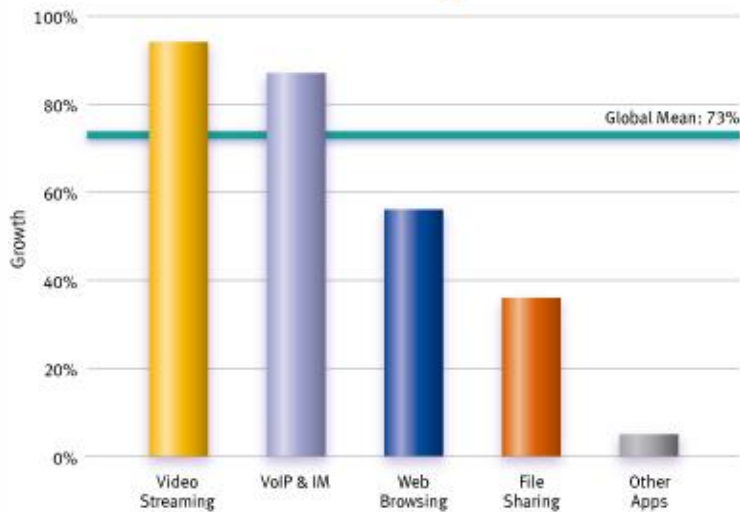© 2011 Allot Communications. All rights reserved.

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
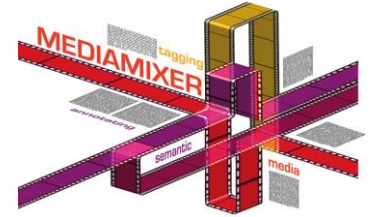- having increased 66-fold from 2009 to 2014

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

Requirements on video-based learning
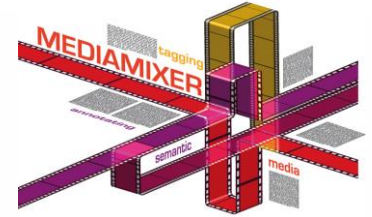
- E-learners need to be able to search and **retrieve** the material they are looking for (based on its subject)

- Consumption trends towards mobile and on-the-go means interest focuses on the **parts** of the material of particular interest
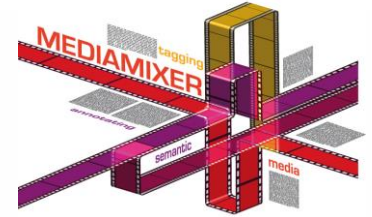
What about sharing & monetarizing content?
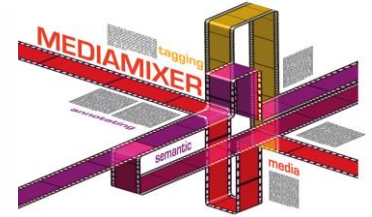
- Huge & growing amounts of valuable AV material but unable to effectively re-distribute or re-sell it.

- 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)
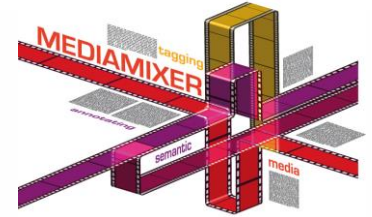
The rise of MOOCs
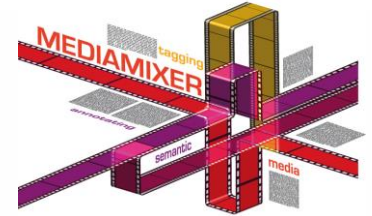
- MOOCs: Massive Open Online Courses
  - 3 million user accounts, over 400 000 students registered within 4 months at edX
  - A learning „offer" may be a **remix** of different content sources
    - Cost saving against recording new material
    - Tailored learning course for each learner
    - Multiple value from a single learning unit
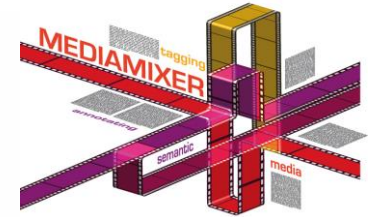
Needed media technology

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!

Media metadata (2)

Google creates neural network, teaches itself to recognize cats

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

💬 22   📘 Like 115   🔴 +1 6   🐦 Tweet 25

TechSpot on: 📘 Like

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."

Greece Tou
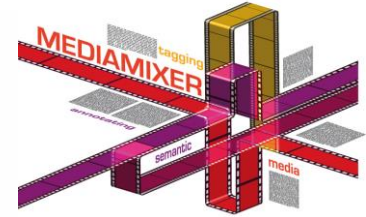
tsc travel **Customize you experience!**

Most Popular

Trending

ITC rule on Appl import

http://www.techspot.com/news/49172-google-creates-neural-network-teaches-itself-to-recognize-cats.html

Media metadata (3)

- 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 (4)
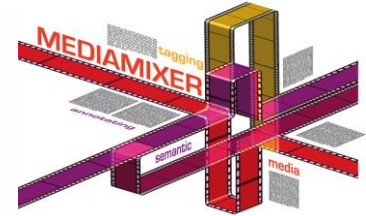
- Effective retrieval needs good query formulation
  - Controlled / known vocabularies
  - System learning, query suggestion or drill-down search
  - Term normalisation / mapping
- „Named entity recognition" (NER) extracts distinct entities out of natural language text
  - Disambiguation & classification
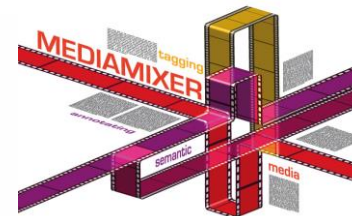 - Trend towards global unique identification

Media metadata: trade-off
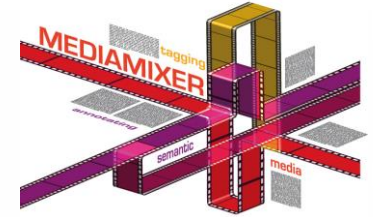
- More metadata – better retrieval / computer supported re-use
  - More manual curation – more cost
  - More automated creation – less accuracy

Pre-annotate
Using automatic
techniques

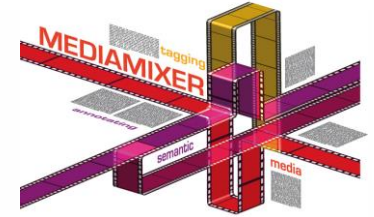Annotate
Human oversight via
intuitive tool
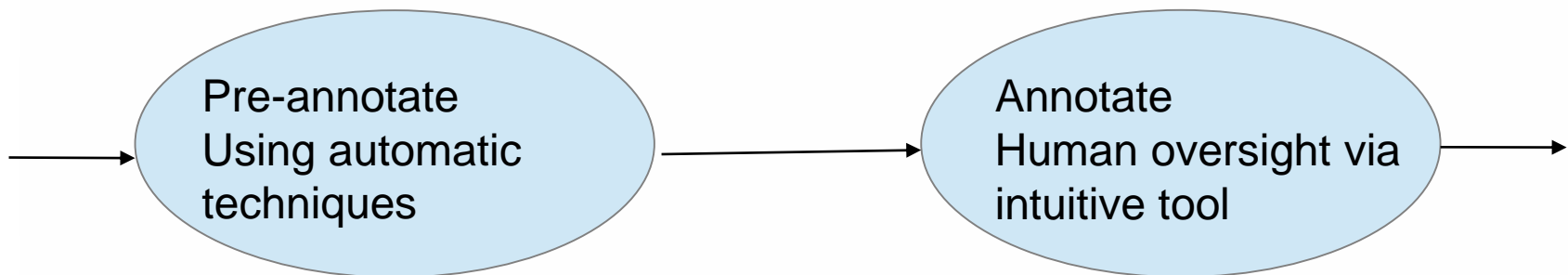
Pre-annotation

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

Pre-annotate
Using automatic
techniques
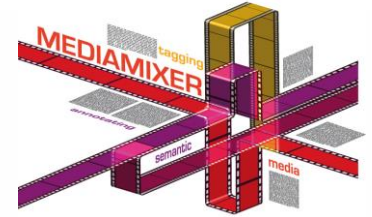
Annotate
Human oversight via
intuitive tool
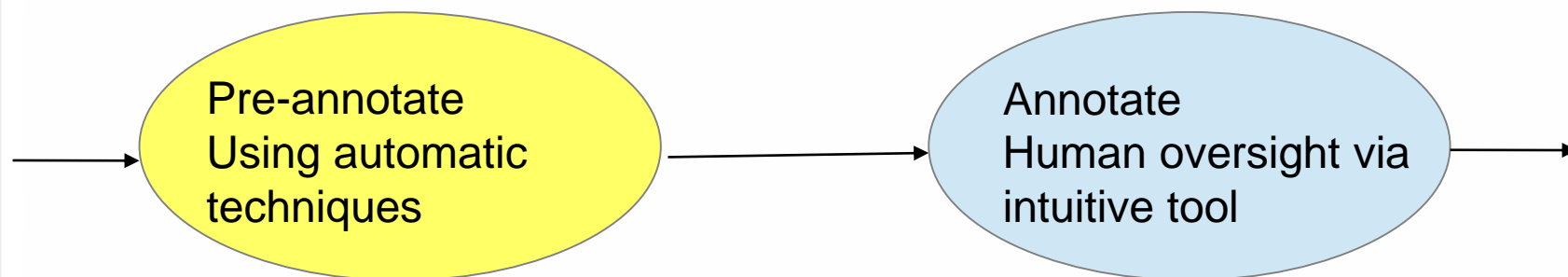
Annotation

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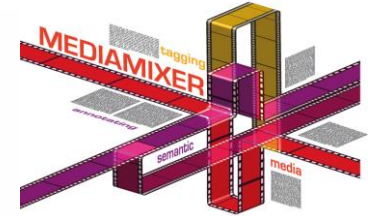 - Entities mapped into a knowledge domain

Pre-annotate
Using automatic
techniques

Annotate
Human oversight via
intuitive tool
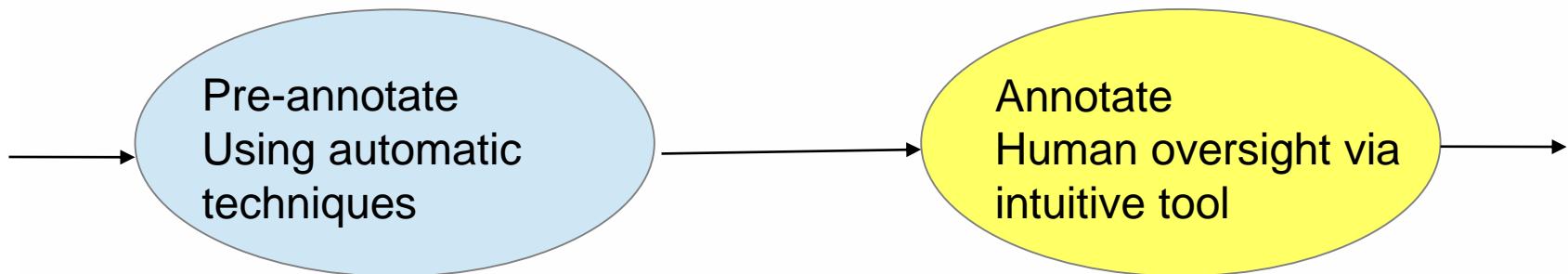
Storage and retrieval

- Metadata store alongside the media repository
  - Query by topic on the metadata store
    - Topic expansion via the knowledge model
  - Result set is a list of relevant video fragments

The MediaMixer hub

AV Content Provider

AV Content Demander

1) AV material analysis and annotation

2) Fragment Definition

3) Rights and Cost Assignment

4) Fragment Upload

5) Clearing (Sell)

Media Mixer Repository
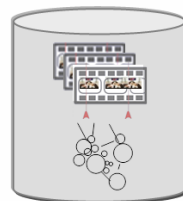
annotated & linked Media Fragments

6) Search. Browsing

7) Rights and Cost Assessment

8) Download

9) Composition of new AV materials

10) Clearing (Buy)

• Video analysis tools
• Video annotation tools
• Video metadata creation and publication
• Digital rights management
• Media search and retrieval
• Media negotiation, purchase and re-use

VideoLecturesMashup
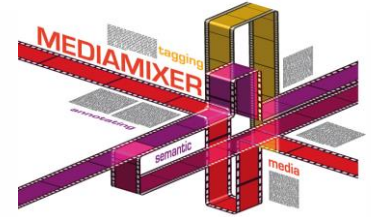
Use case and demonstrator developed in MediaMixer project

With Jozef Stefan Institut, Viidea and the VideoLectures.NET platform

Credits: Tanja Zdolsek and Ana Fabjan (JSI)

MediaMixer use case: VideoLecturesMashup

Extend e-learning video platform VideoLectures to mash up video fragments for learners to quickly browse across distinct collections on the same topic.

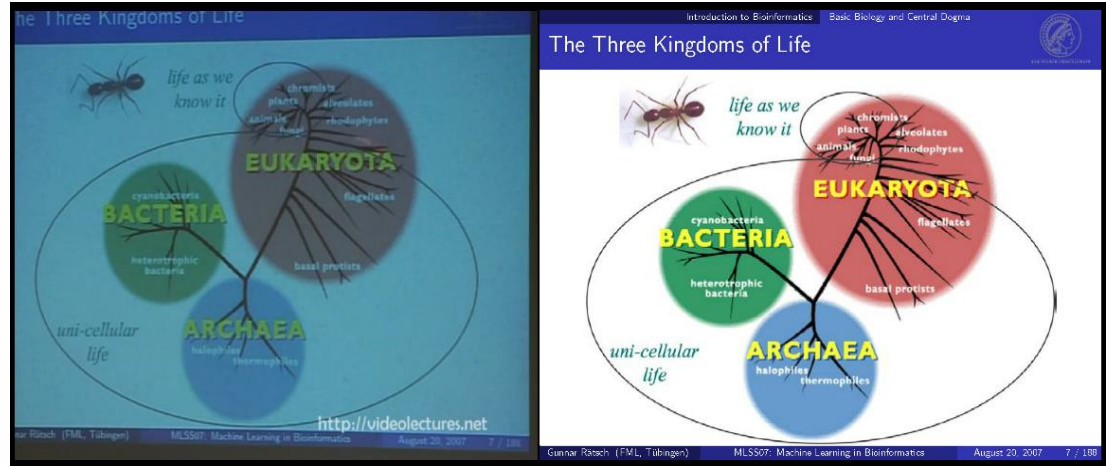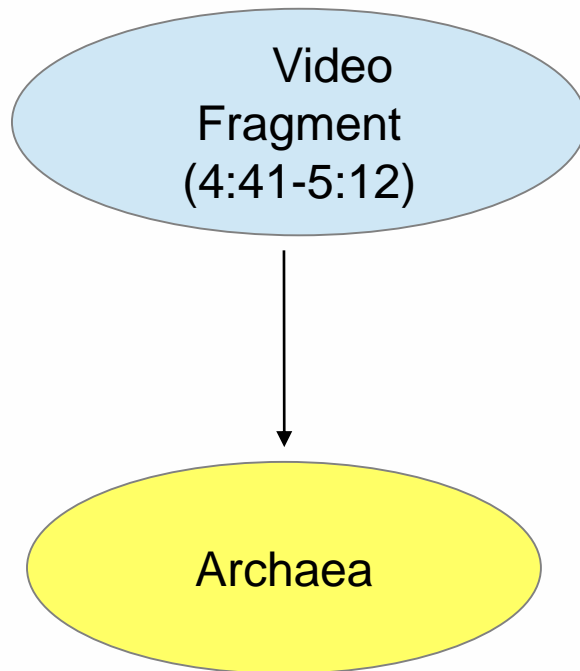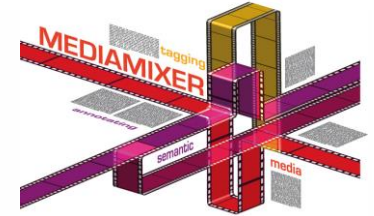# MediaMixer use case: Video fragment creation
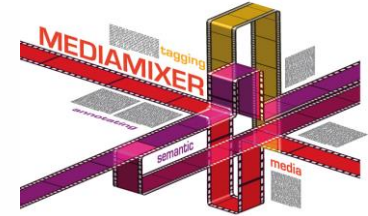
Slide timeline

00:00 Machine Learning in Bioinformatics
00:55 Overview
02:23 Part I: Introduction to Bioinformatics
02:41 What is Bioinformatics? - Page 1
03:28 What is Bioinformatics? - Page 2
04:23 The Subject of Bioinformatics
04:41 The Three Kingdoms of Life
05:12 Basic Unit of Life: the Cell
05:46 Biology of the Cell
06:38 Short History of Genetics

… there are three Kingdoms of Life, Bacteria, Archaea and Eukaryota...

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.
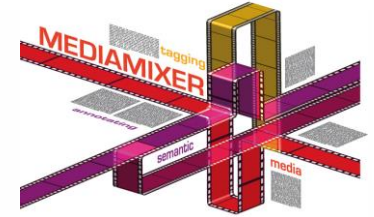
MediaMixer use case:
Video fragment annotation

Video
Fragment
(4:41-5:12)

Archaea

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

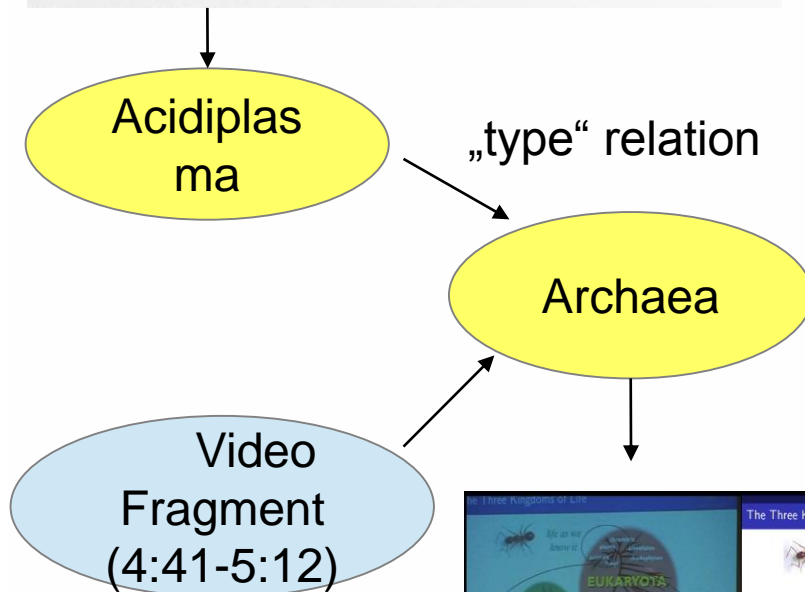Topics are connected to a global knowledge model (DBPedia).

MediaMixer use case: Video fragment management
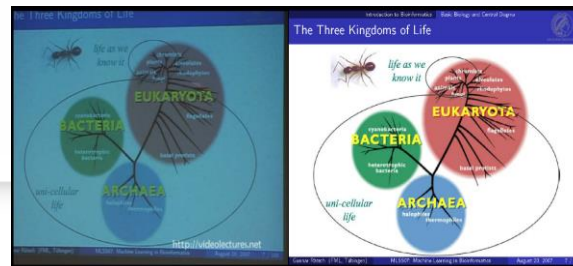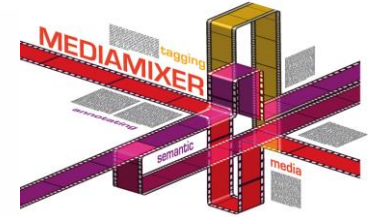

Annotations are managed in a separate metadata store.

The store provides a semantic query endpoint returning lists of video fragments matching a query topic (including semantically related topics)

Acidiplasma

Acidiplasma

„type" relation

Archaea

Video Fragment (4:41-5:12)

MediaMixer use case: Video fragment playback

- 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.
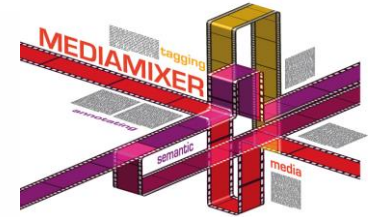- 21:31 - of your life.

- 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 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)

Demo @ mediamixer.videolectures.net

The MediaMixer offer

MediaMixer community portal

COMMUNITY PORTAL

Home | About Media Mixing | Materials | Demonstrators | Use cases | Events | Forum | Contact

You are here: Home

Welcome to the MediaMixer community portal !

Making Media more valuable for its owner and more useful for its consumer

http://community.mediamixer.eu

Free sign-up

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

Updated with latest materials on all Media Mixer topics:

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

MediaMixer Webinars

MediaMixer Webinars 2013

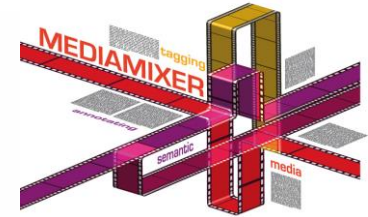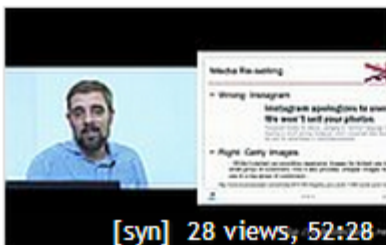From September 2013 to February 2014 MediaMixer will offer
streamed live at http://mediamixer.eu/live, and here you will a
viewers may post their questions to the speaker via Twitter o
TitanPad!

Categories

Top » Computer Science » Software and Tools
Top » Computer Science » Semantic Web

[syn] 28 views, 52:28

What is MediaMixing? – making
media more valuable for its owner
and more useful for its consumer
Lyndon Nixon

[syn] 21 views, 47:12
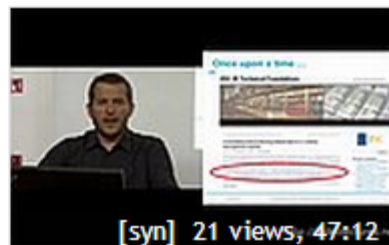
Describing Media Assets – media
fragment specification and
description
Raphaël Troncy

LIVE Webinars at
http://mediamixer.eu/live
cover all technology areas and use
cases
RECORDINGS on VideoLectures.NET
Next live talk this Thursday 14.11. at
1100 CET

November 1100 **Fragmenting your Media Assets meaningfully –**
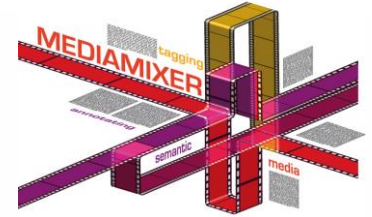14th, 2013 CET **media analysis for fragment detection and**
extractionIn this webinar we will discuss a set of
video processing techniques for media fragment
creation and annotation. These include techniques for
the temporal segmentation of the video into shots and
scenes, the re-detection of appearances of specific
objects throughout the video, and the detection of
concepts that describe the temporal video fragments.
Such techniques are the first step towards converting
the raw video material into meaningful media
fragments.

Vasileios Mezaris (CERTH)

MediaMixer Winter School

1st Winter School on Multimedia Processing and Applications

### Dublin, Ireland, January 6-8, 2014

Co-located with MMM 2014

We are pleased to announce the 1st edition of the WinterSchool on Multimedia Processing and Applications.

The winter school aims at offering participants from all over the world – both PhD/MSc students and young researchers – training on the latest technological developments in the area of multimedia processing (media analysis, media annotation, media rights management) and of emerging multimedia applications (in the Sensor Web, audiovisual archives, TV broadcasting, digital preservation and e-learning domains).

Learn about and get hands-on experience with the media technology.
http://winterschool.mediamixer.eu

Thank you for your attention!

Contact us:

Membership - http://community.mediamixer.eu
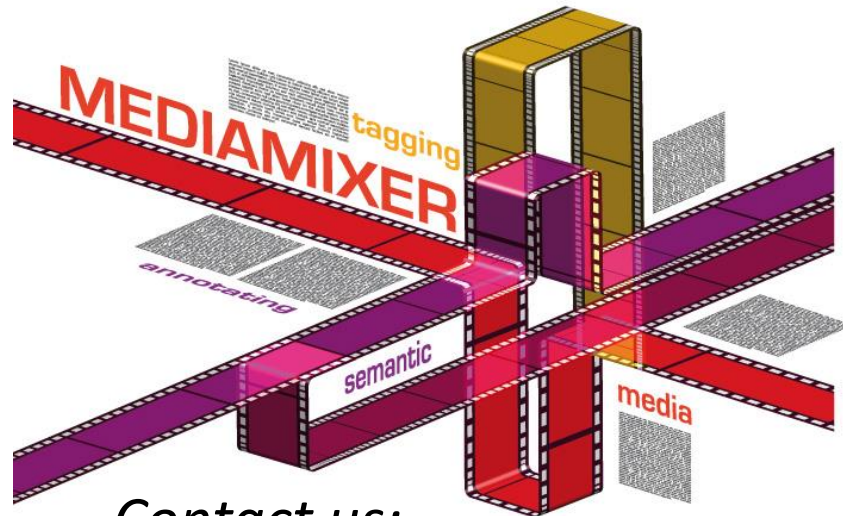
Collaboration - email lyndon.nixon@modul.ac.at

Say hello @project_mmixer