First VITALAS Dissemination Conference
D8.2.1

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ABSTRACT:

This document contains proceedings of the 1st VITALAS Dissemination Conference, held in Cannes, France, on 11-12 February 2008, jointly with the NoE MUSCLE Final Conference. The conference clustered members of communities in the field of Multimedia Understanding through Semantics, Computation and Machine Learning.

The main objective of this conference was to present achieved results within the VITALAS project

KEYWORD LIST: Dissemination, promotion visibility, conference

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- Joost Geurts, INRIA

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1. Introduction

The MCVC'08 (MUSCLE Conference joint with VITALAS Conference 2008) held in Cannes, France, on 11 & 12 February 2008, clustered members of communities in the field of Multimedia Understanding through Semantics, Computation and Machine Learning.

This scientific conference was co-chaired by Nozha Boujemaa (scientific coordinator of MUSCLE and VITALAS) and Eric Pauwels (CWI)

In addition to the keynote talks, this event included MUSCLE e-Team presentations and showcase demonstrations as well as presentations from other EU-funded projects: VITALAS and PASCAL.

For each VITALAS presentation, a brief description is reported in section3, and slides are set in section 5.

2. Agenda and list of participants

2.1 Agenda

Monday 11 February 2008

09:40 - 10:00 Registration - Welcome coffee

10:00 - 10:15 Introduction - MUSCLE achievements, *Nozha Boujemaa*, INRIA Imedia

10:15 - 11:00 Keynote speaker: Prof. *Andrew Zisserman*, University of Oxford

11:00 - 11:30 Coffee break - Muscle showcase demonstrations

11:30 - 12:00 Shape modelling via higher-order active contours and phase fields - *Ian Jermyn*, INRIA Ariana

12:00 - 12:30 A contrario matching of local features between images, *Yann Gousseau*, ENST

12:30 - 14:00 Lunch

14:00 - 14:30 Recognising Animals, *Allan Hanbury*, TU Vienna-PRIP

14:30 - 15:00 Person detection and recognition, tracking and analysis - *Montse pardas*, UPC

15:00 - 15:30 Action class detection and recognition - *Ivan Laptev*, INRIA Vista

15:30 - 16:00 Coffee break – MUSCLE showcase demonstrations

16:00 - 16:30 On Sequence Kernels for SVM classification of sets of vector - *Khalid Daoudi*, IRIT

16:30 - 17:00 Active machine learning based on kernels on bags and on graphs - *Sylvie Philipp-Foliguet*, ENSEA

17:00 - 17:20 Crossing textual and visual content in different application scenarios - *Gabriela Csurka & Jean-Michel Renders*, Xerox (PASCAL)

17:20 - 17:50 Fully Bayesian Source Separation with Application to the CMB - *Simon Wilson,* TCD

Tuesday 12 February 2008

09:00 - 09:45 Keynote speaker: *Joachim Köhler*, Fraunhofer IAIS, "Audio Content Search"

09:45 - 10:15 Audio-Visual Speech Analysis & Recognition - *Nassos Katsamanis*, NTUA

10:15 - 10:45 Multimodal Interfaces - *Alexandros Potamianos*, TUC

10:45 - 11:15 Coffee break – MUSCLE showcase demonstrations

11:15 - 11:45 Multimodal Processing and Multimedia Understanding: Image Retrieval Using Eye Movements – *Fred Stentiford*, UCL

11:45 - 12:05 Interactive Visualization tool with Graphic Table of Video Contents - *Hervé Goëau*, INA (VITALAS)

12:05 - 12:30 Open Vocabulary Speech Analysis in VITALAS, *Daniel Schneider*, FhG (VITALAS)

12:30 - 14:00 Lunch

14:00 - 14:30 Feature extraction from audio and their application in music organization and transient enhancement in recorded music, *Jakob Frank*, TUWIEN and *Massimo Magrini*, CNR-ISTI

14:30 - 15:00 BilVideo: MPEG-7 Compliant Video Database Management System, *Onur Kucuktunc,* Bilkent University

15:00 - 15:20 Implicit feedback learning in semantic and collaborative information retrieval systems, *Gérard Dupont*, EADS (VITALAS)

15:30 End

2.2 List of participants

Amiaz	Tomer	Tel Aviv University
Bertini	Graziano	ISTI-CNR
Boujemaa	Nozha	INRIA - projet Imédia
Buisson	Olivier	INA
Canterakis	Nikos	Albert-Ludwigs University of Freiburg
Cetin	Ahmet Enis	Bilkent University
Chailloux	Jérôme	GEIE ERCIM
Chetverikov	Dmitry	MTA SZTAKI
Christmas	Bill	University of Surrey
Cord	Matthieu	UPMC
Csurka	Gabriela	Xerox Research Centre Europe
Cunningham	Padraig	UCD
Cvejic	Nedeljko	University of Cambridge
Dahyot	Rozenn	TCD
Daoudi	Khalid	IRIT-UPS
Debili	Fathi	CNRS LLACAN
Di Salvo	Vincenzo	CNR-ISTI
Domijan	Katarina	Trinity College Dublin
Dupont	Gérard	EADS DS
Eklundh	Jan-Olof	CSC KTH
Fazekas	Sándor	SZTAKI
Frank	Jakob	Vienna University of Technology
Fraysse	Aurelia	ENST/ Telecom Paris Tech
Godsill	Simon	university of cambridge (UCAM-DENG)
Goëau	Hervé	Institut National de l'Audiovisuel
Gousseau	Yann	ENST
Gudukbay	Ugur	Bilkent University
Haindl	Michal	Institute of Information Theory and Automation
Hanbury	Allan	Vienna University of Technology
Ho-Hune	Patricia	ERCIM
Jermyn	Ian	INRIA
Joachim	Koehler	Fraunhofer IAIS
Joly	Philippe	IRIT/UPS
Katsamanis	Athanassios	National Technical University of Athens
Katz	Ruthy	Tel-Aviv University, Israel
Kucuktunc	Onur	Bilkent University, Department of Computer Engineering
Laptev	Ivan	INRIA
Lavirotte	Alexandra	ERCIM
Law-To	Julien	INRIA
Levente	Kovács	MTA SZTAKI
Marache	Karen	ERCIM
Marcotegui	Beatriz	ARMINES-CMM
Markovitch	Shaul	Technion
Moellic	Pierre-Alain	CEA LIST
Noelle	Michael	Austrian Research Centers GmbH - ARC
Onaran	Ibrahim	Bilkent University

Pardas	Montse	UPC
Pauwels	Eric	CWI
Pesquet-Popescu	Beatrice	GET-ENST
Philipp-Foliguet	Sylvie	ETIS-ENSEA
Pinquier	Julien	IRIT
Potamianos	Alexandros	Technical University of Crete
Ronchaud	Remi	ERCIM
Salerno	Emanuele	ISTI-CNR
Salvetti	Ovidio	ISTI-CNR
Schneider	Daniel	Fraunhofer IAIS
Sebe	Nicu	Univ. of Amsterdam
Siltanen	Sanni	VTT
Sperlhofer	John	ec3
Stentiford	Fred	UCL
Szirányi	Tamás	MTA SZTAKI
Tavakoli Targhi	Alireza	KTH (Royal Institute of Technology)
Toreyin	B.Ugur	Bilkent University
Wilson	Simon	Trinity College Dublin
Zisserman	Andrew	University of Oxford

3. VITALAS presentations

This section gives the abstracts from the presentations provided by the presenters. The slides are annexed at the end of this document.

Interactive visualization tool with graphic table of video contents

Hervé Goëau
INA

In this paper, we present an interactive visualization, called Table Of Video Contents (TOVC), for browsing structured TV programs such as news, magazines or sports. In these telecasts, getting a good segmentation can be very time-consuming, especially in an annotating context. Our visualization, connected with a classical media player, offers a very handy video browser. This system allows a global overview by showing the temporal structure and by giving some semantic information. The drawn structure enables a non linear video access by suggesting relevant key frames. The TOVC is created from a graphic framework designed for computing similarities on visual contents, and displaying the associated proximities in a 2D map with graph representation. TOVC is one of its first applications and shows interesting capabilities.

Open Vocabulary Speech Analysis in VITALAS

Daniel Schneider
FhG IAIS

Automatic indexing of TV and radio speech data requires robust components for both speech recognition and spoken document retrieval. Due to the high topic variability and the resulting large vocabularies, classic word-based approaches have to cope with a high number of out-of-vocabulary words. This talk presents a phonetic approach to open vocabulary indexing based on syllable decoding and retrieval. Current experimental results are presented, followed by a demonstration of the Fraunhofer IAIS AudioMining system for spoken term detection.

Implicit feedback learning in semantic and collaborative information retrieval systems

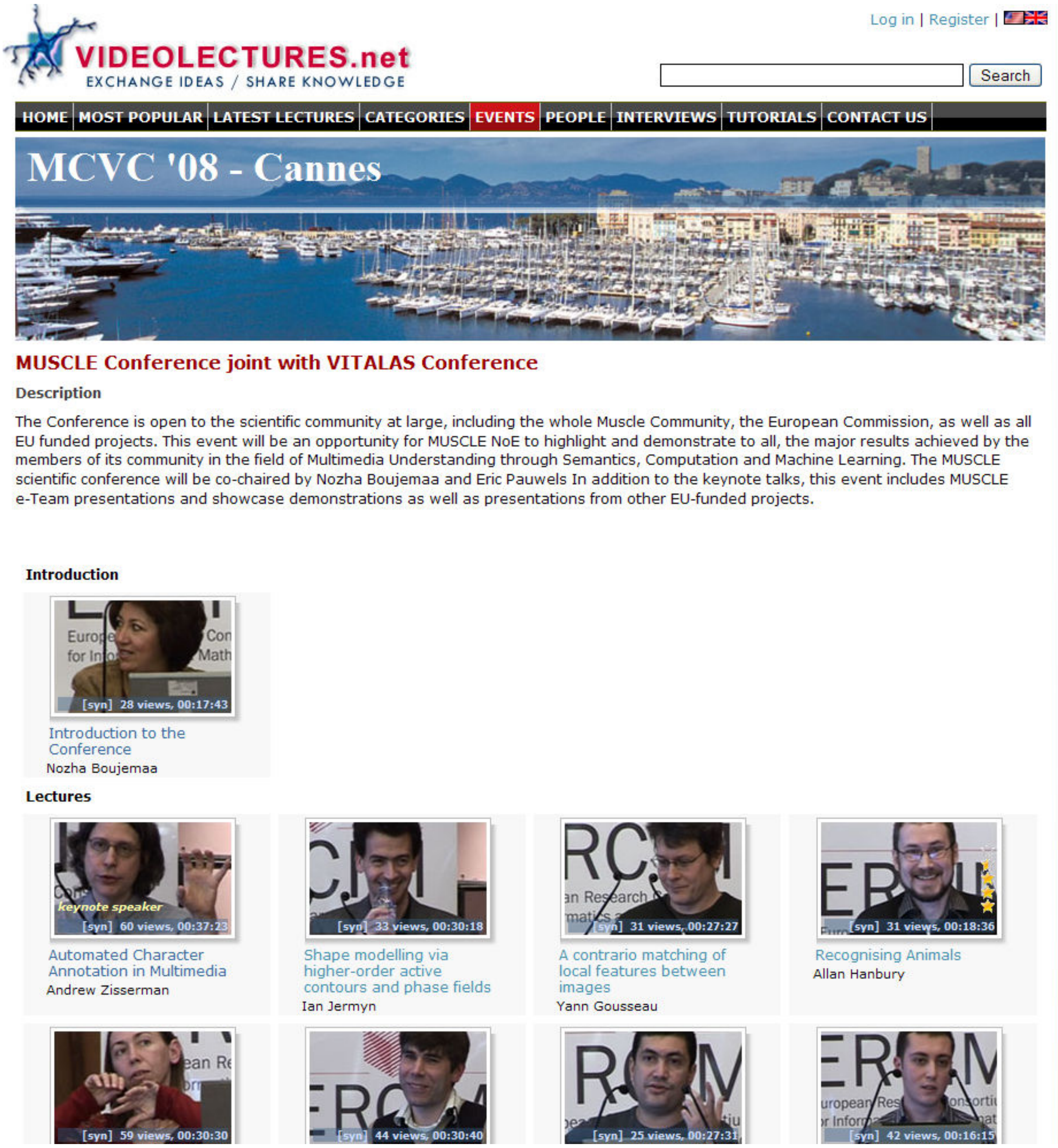
Gérard Dupont
EADS

Information retrieval is a very wide domain which can involve various types of activities and tasks. Many complex factors are participating in a search for information and many systems have been experimented. Nowadays a general consensus has been established around a keyword/document matching process which appears to be efficient on large scale and have enough reliability to satisfy a significant part of the users. Btu this claim has to be limited and for some subjects, search is still a difficult task. Many reasons can be proposed to explain this phenomenon, but the most salient ones are the difficulty for users to express their needs while searching for information and the limitation of shared knowledge between users and information retrieval systems, meaning that both users and machines don't really understand the information and knowledge space used as references by the other.
This presentation try to provide an overview of one way to resolve those gaps: using feedback learning. The aim is to make the system learning on user behaviour in order to better define its current needs. Machine learning algorithms applied on signal coming from user while performing a search can lead to the understanding of what is really relevant to the users and then can be exploited to help him during its tasks.
The work, engaged through the VITALAS1 project, is presented: study of users search logs and definition of a feedback learning framework. Then research on implicit relevance feedback and query optimisation is presented as a first attempt to exploit the feedback learning framework. Finally an overview of the next steps within those studies is presented and especially their impact on the VITALAS project.

4. Dissemination impact

This Conference was open to the scientific community in the field of Multimedia Understanding through Semantics, Computation and Machine Learning.

In order to relay the event, the conference announcement was posted on the VITALAS project website and on the website of CHORUS, the European Coordination Action. After the event, video recordings of the presentations (recorded by videolectures.net) were made available through the project website.


Log in | Register |
VIDEOLECTURES.net
EXCHANGE IDEAS / SHARE KNOWLEDGE
Search
HOME
MOST POPULAR
LATEST LECTURES
CATEGORIES
EVENTS
PEOPLE
INTERVIEWS
TUTORIALS
CONTACT US
MCVC '08 - Cannes
MUSCLE Conference joint with VITALAS Conference
Description
The Conference is open to the scientific community at large, including the whole Muscle Community, the European Commission, as well as all EU funded projects. This event will be an opportunity for MUSCLE NoE to highlight and demonstrate to all, the major results achieved by the members of its community in the field of Multimedia Understanding through Semantics, Computation and Machine Learning. The MUSCLE scientific conference will be co-chaired by Nozha Boujemaa and Eric Pauwels In addition to the keynote talks, this event includes MUSCLE e-Team presentations and showcase demonstrations as well as presentations from other EU-funded projects.
Introduction
[syn] 28 views, 00:17:43
Introduction to the Conference
Nozha Boujemaa
Lectures
keynote speaker
[syn] 60 views, 00:37:23
Automated Character Annotation in Multimedia
Andrew Zisserman
[syn] 33 views, 00:30:18
Shape modelling via higher-order active contours and phase fields
Ian Jermyn
[syn] 31 views, 00:27:27
A contrario matching of local features between images
Yann Gousseau
[syn] 31 views, 00:18:36
Recognising Animals
Allan Hanbury
[syn] 59 views, 00:30:30
[syn] 44 views, 00:30:40
[syn] 25 views, 00:27:31
[syn] 42 views, 00:16:15

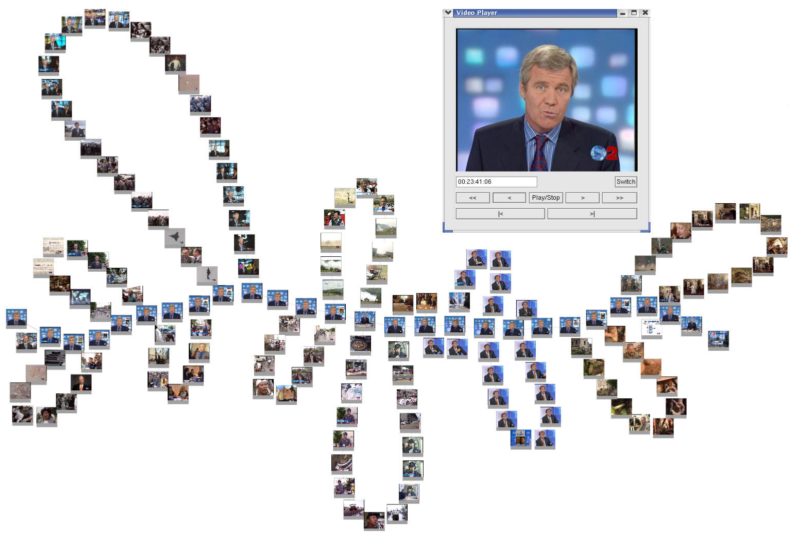
ERCIM took the opportunity of this 1st conference to improve the VITALAS poster, assigning a communication agency. The result is of a great quality and the 60x80cm posters have been distributed to each partner for dissemination at a local level.

5. Conclusion

International researchers from different scientific disciplines participated in the VITALAS Conference and engaged interesting and fruitful discussions with VITALAS project partners. Based on positive feedback from the participants and the number of visitors who viewed the video presentations after the event, we may consider the VITALAS conference a success. The next VITALAS Conference is planned for February 2009.

6. Annex: Presentations

INTERACTIVE VISUALIZATION TOOL WITH GRAPHIC TABLE OF VIDEO CONTENTS



Hervé Goëau

INTERACTIVE VISUALIZATION TOOL WITH GRAPHIC TABLE OF VIDEO CONTENTS

1. Context
2. Solutions in the state of the art
3. Framework and method
4. Results
5. Evaluation
6. Future works

Context and objectives

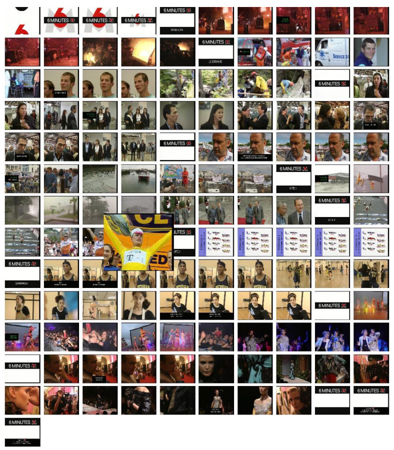
- ***51*** *channels daily collected (**100** in 2010)*
- ***Constant*** *staff of **80** archivists (DL)*
- *News telecast : a strategic issue*
    - *very time consuming*
    - *one daily program for each main channel*
    - *finest level of annotation*

→*accelerate the access to the content by giving a quick overview*

Video summarization and browsing interfaces

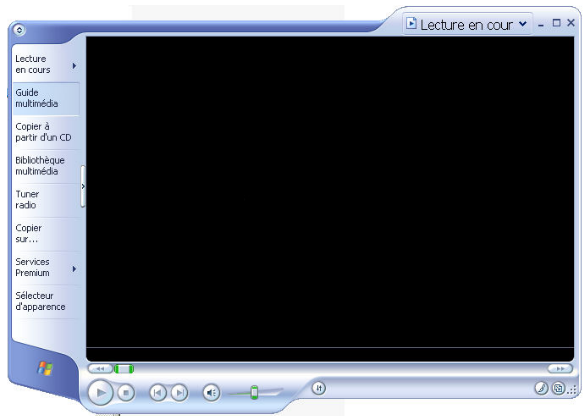
Basic

Time line or grid



Too compact

video slider



Lack of scalability

Video summarization and browsing interfaces

Merging

one shot, no global motion

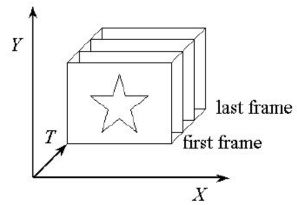
Video summarization and browsing interfaces

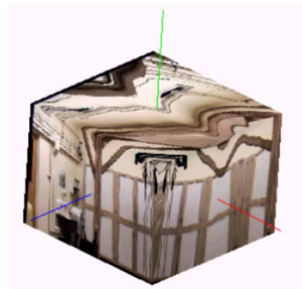
Stiching - dynamic

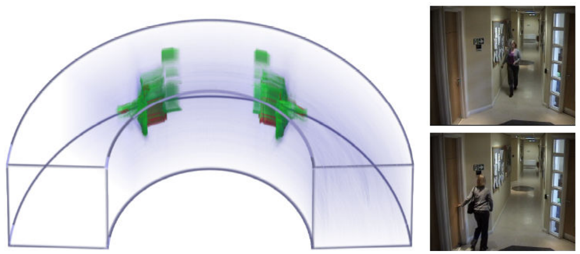
page setting

Video summarization and browsing interfaces

3D representation







Readability ?

Video summarization and browsing interfaces

Keyframes tiling

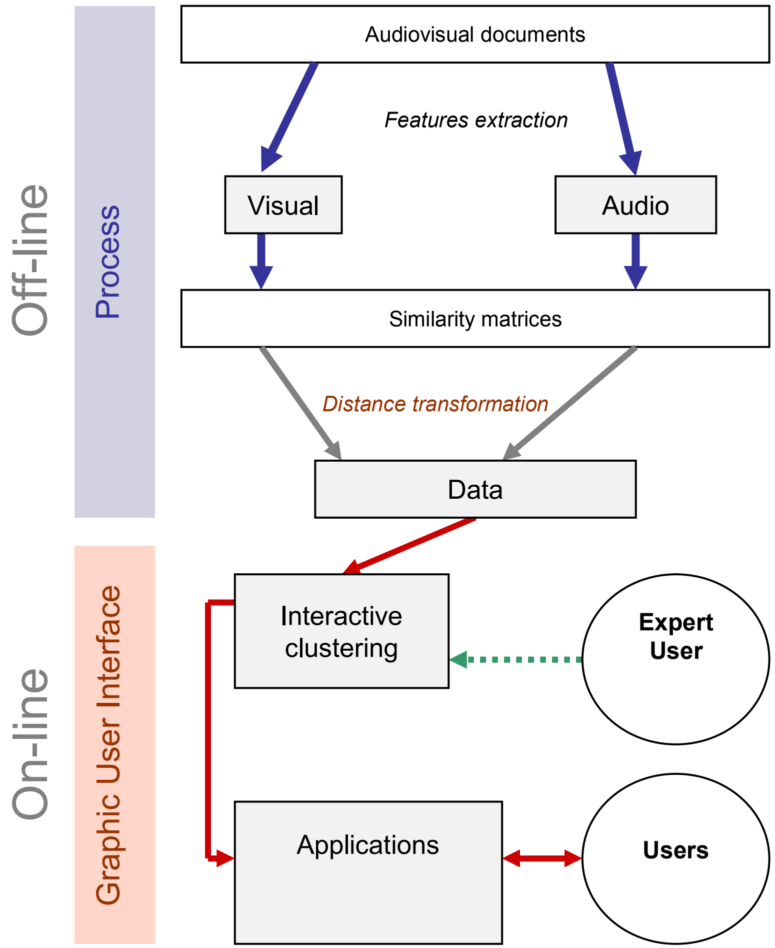
Semantic analysis of content ?

Our solution

- *Table Of Video Contents (**TOVC**)*
- ***Highlights the video structure***

→ *non linear access*
→ *fast access*
→ *location in the content*

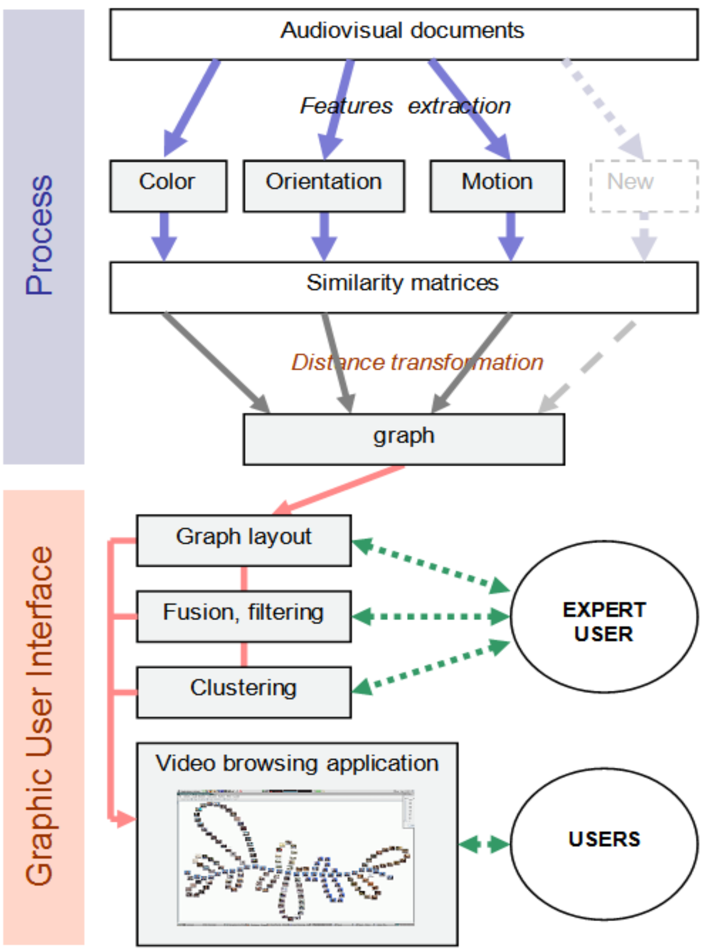
Generic Framework



- **Media analysis**:
  -similarity measures computation

- **User oriented experimental framework**:
  – video browsing with TOVC
  – semi-supervised or unsupervised photo annotation
  – navigation, proximity exploration

Current implementation of TOVC



- Media analysis:

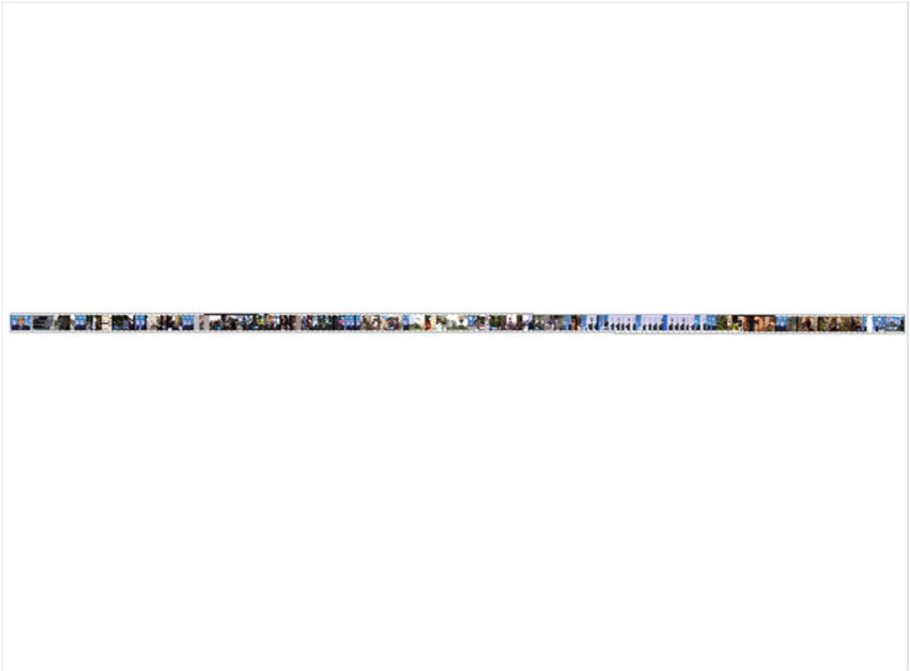
- visual descriptors extraction
- similarity measures computation

- MultiDimensional Scaling (MDS)

- Graph representation
  - numerous drawing algorithms

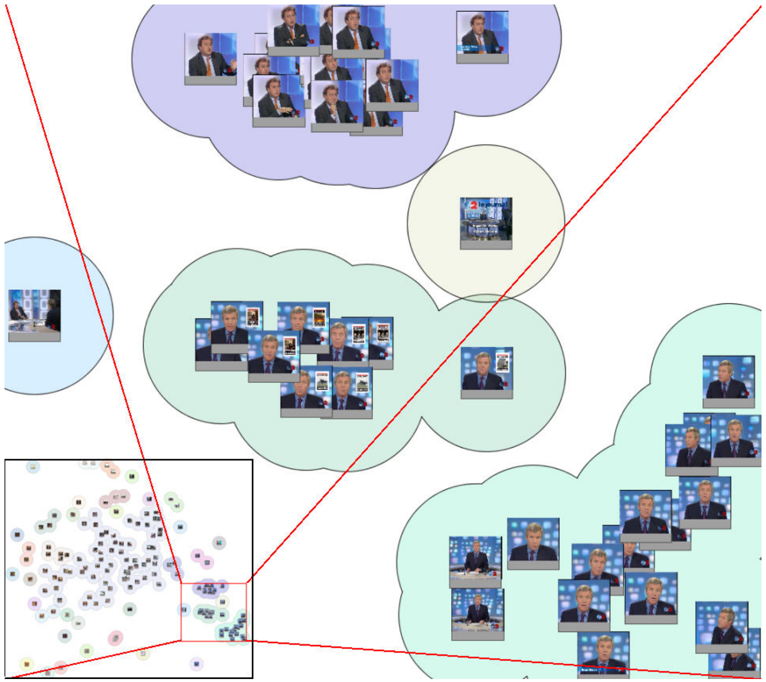
An example

An example



1. No key frame detection (constant frequency extraction)
2. Feature combination
3. Instantaneous feedback by using MDS

An example

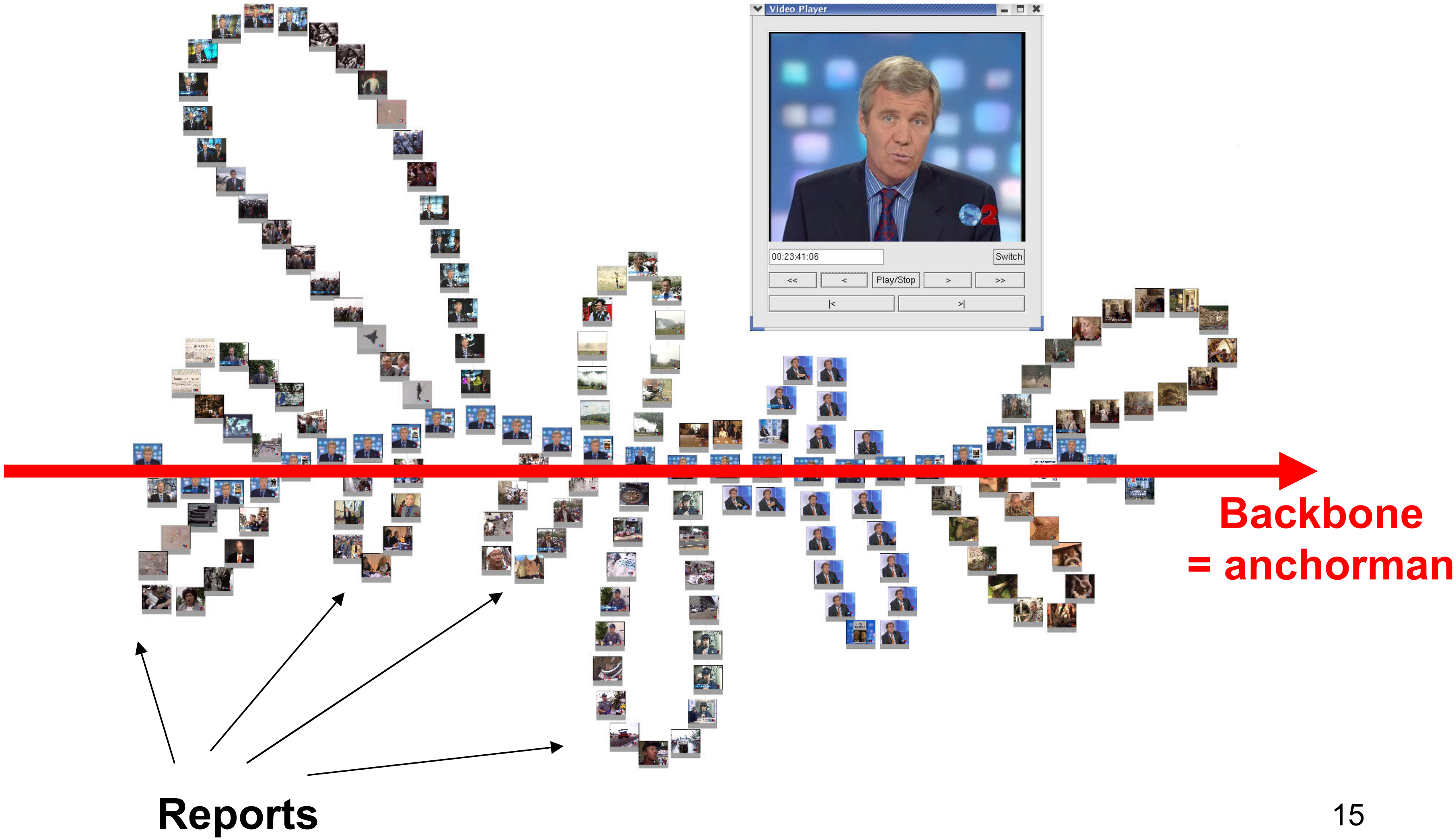


4. Cluster detection

5. “Backbone” selection

6. Structure filtering and drawing

An example


Video Player
00:23:41:06
Switch
<<
<
Play/Stop
>
>>
|<
>|
Backbone
= anchorman
Reports

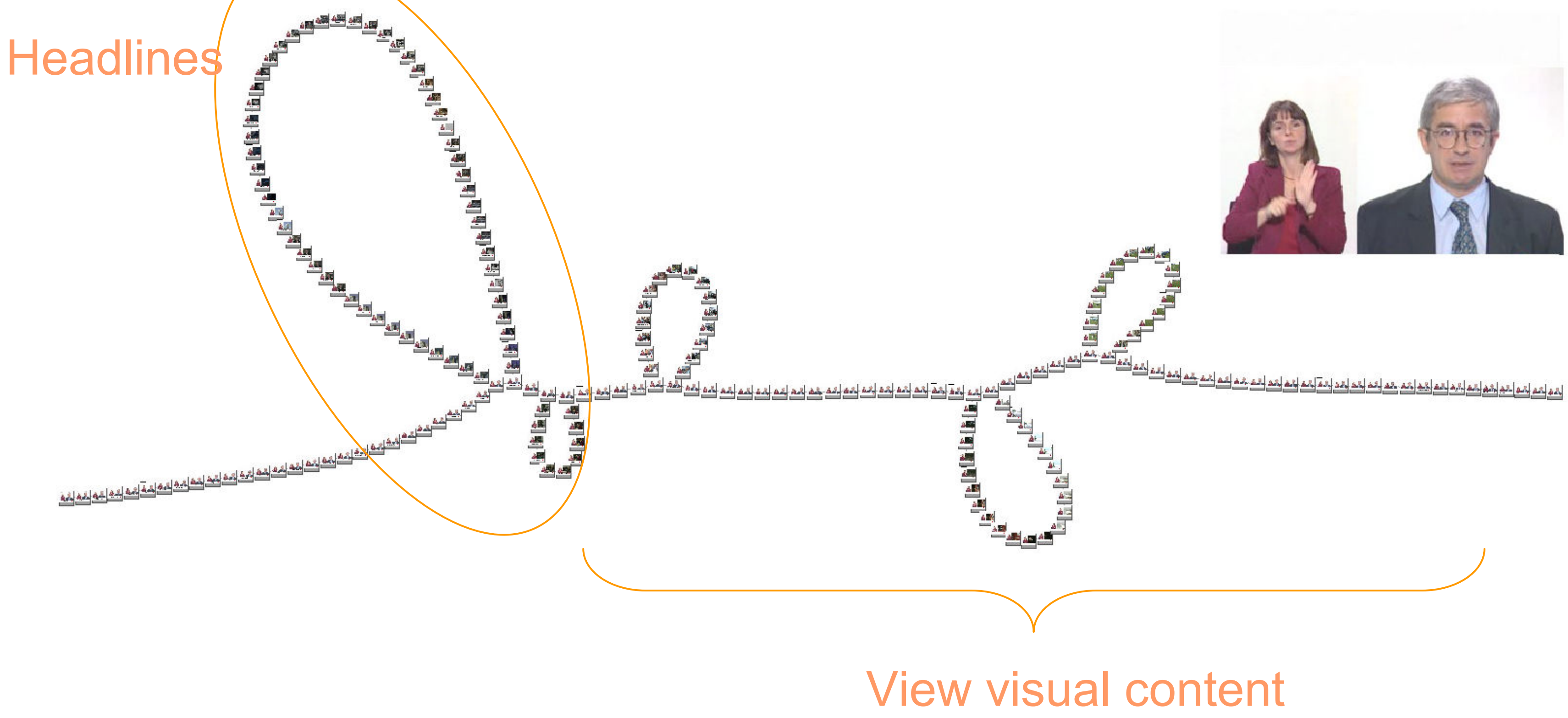
An example

An example

An example

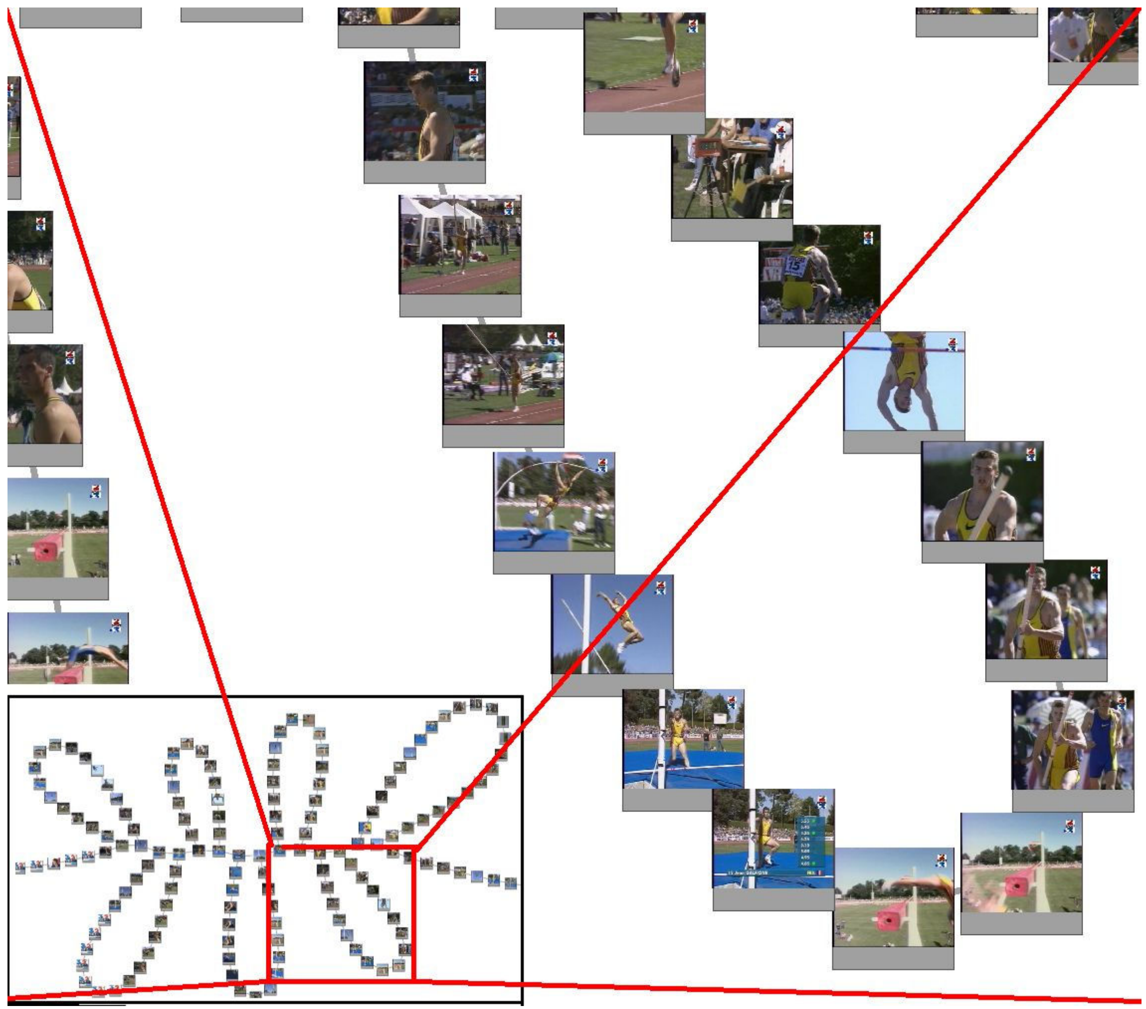
Some Results in Various Programs

deaf and hard hearing or news in brief



TOVC in sport program

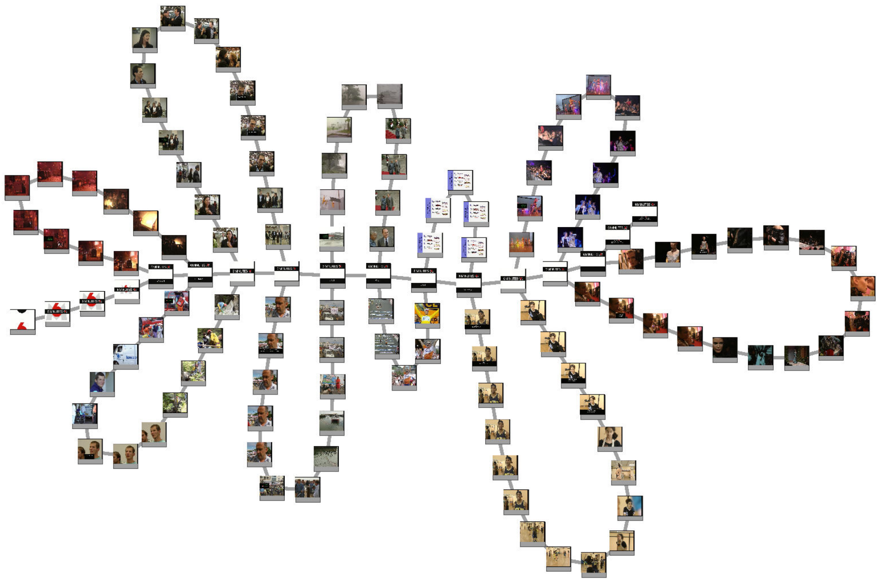
One loop
=
one event



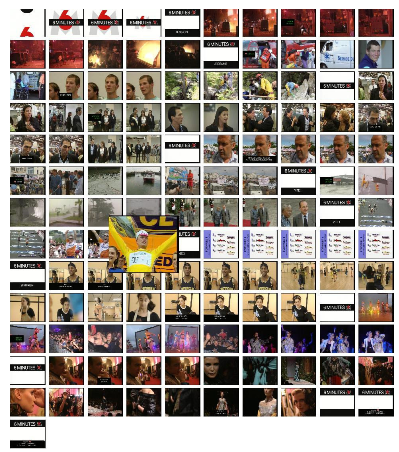
Evaluation / usability test

How to evaluate a user interface ?

- 12 users
- TOVC versus basic grid visualization
- 2 news programs
- Timed search tasks
- Interview



VS



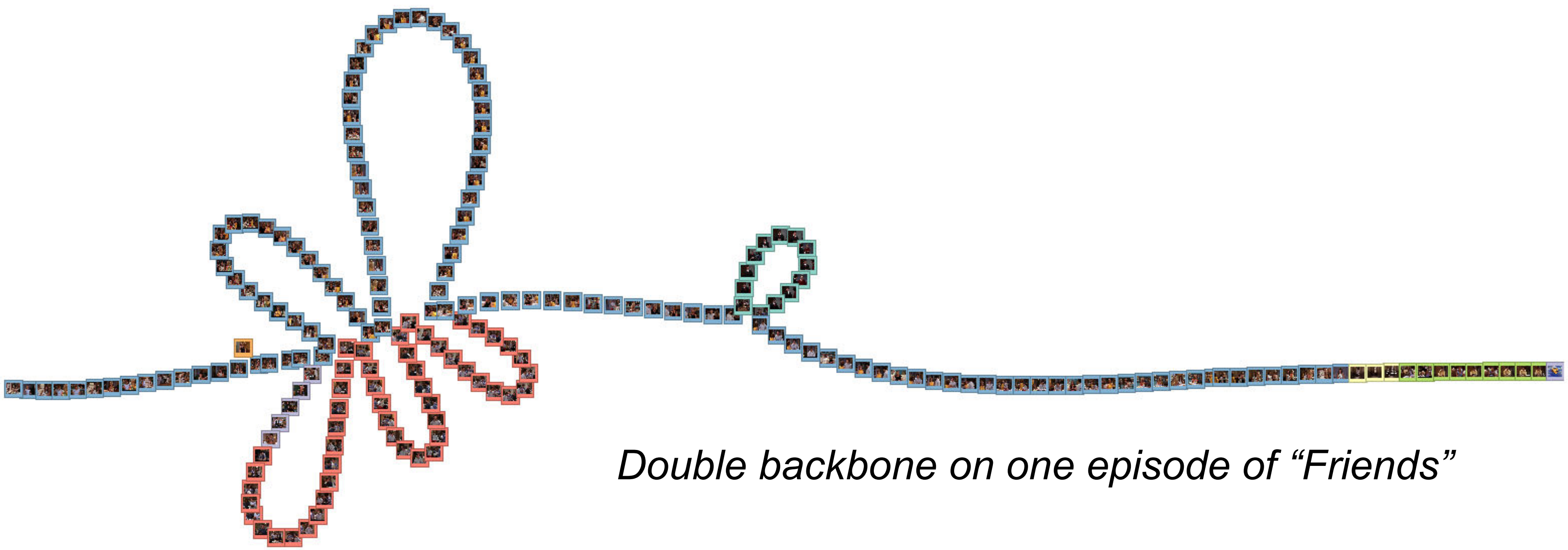
Evaluation Results

- Search task :
  - 50% are faster with TOVC
  - 25% indifferent
  - 25% are more efficient with the grid view
  - 20% time average on search task

- Interview :
- localization in the video content
- remember an already seen frame

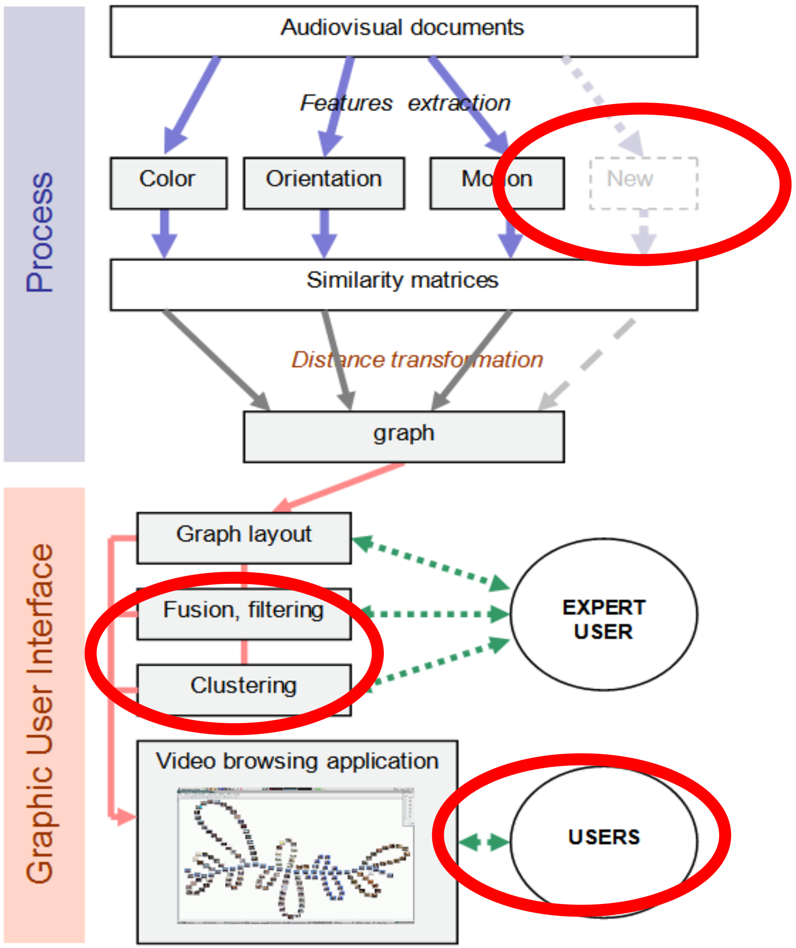
Future works

- Experiment on **less structured video** like fictions, series, documentaries



Double backbone on one episode of "Friends"

Future works



- Audio description
- **Fusion formalism**
- **Learning process** (for news)
- **evaluation process**

Open Vocabulary Speech Analysis in Vitalas

Daniel Schneider

Speech Group, Fraunhofer IAIS

Fraunhofer Institut
Intelligente Analyse- und
Informationssysteme

Outline

- Vitalas Scenario: Broadcast News Audio Indexing
- Structural Audio Analysis
- Open Vocabulary Speech Recognition
- Demo: AudioMining

Challenge in Vitalas: Large Scale Broadcast News Indexing

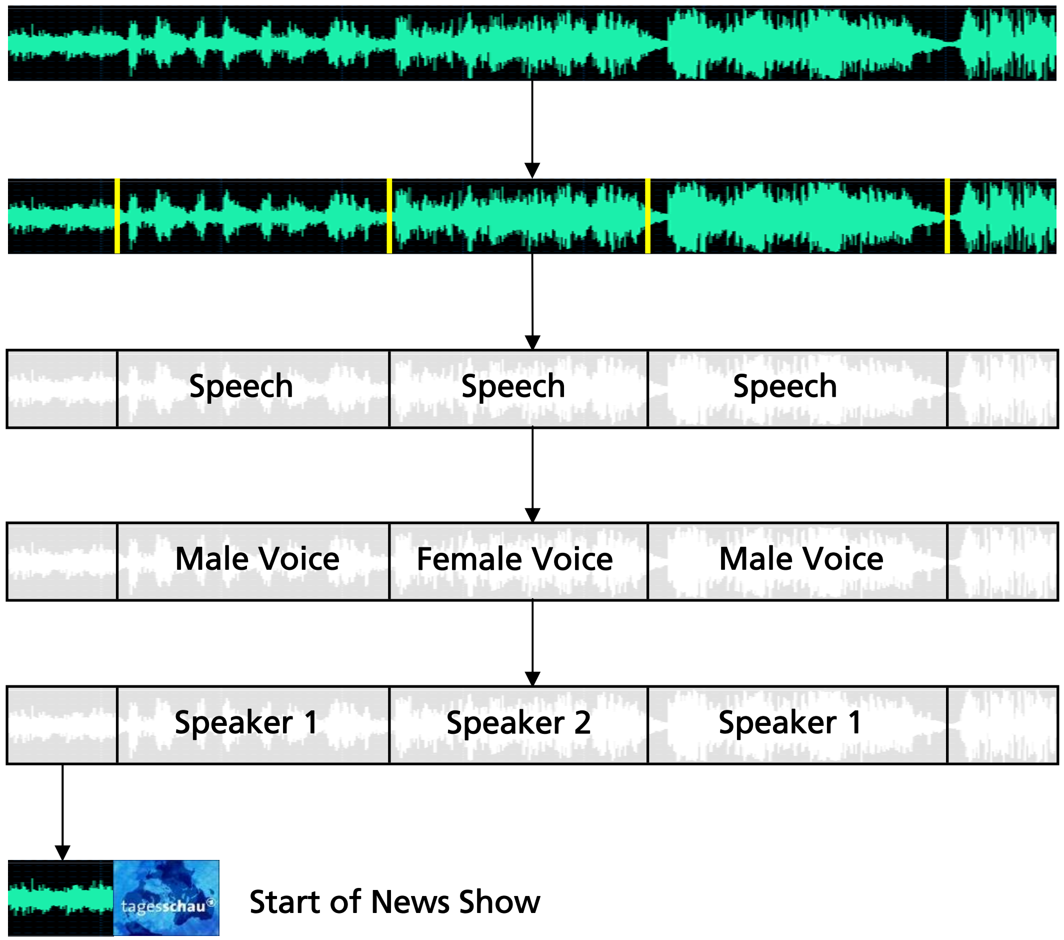
- Huge amount of data (> 10.000 hours)

- Heterogeneous material
  - From various sources of unknown type
  - High topic variability
  - Huge vocabulary
  - Multilingual data

- Requires efficient and robust algorithms for…
  - Information extraction
  - Information retrieval

Structural Audio Analysis in Vitalas

- Unstructured Audio Data
- Homogeneous Segmentation
- Speech Detection
- Gender Detection
- Speaker Clustering
- Programme Identification via Jingle



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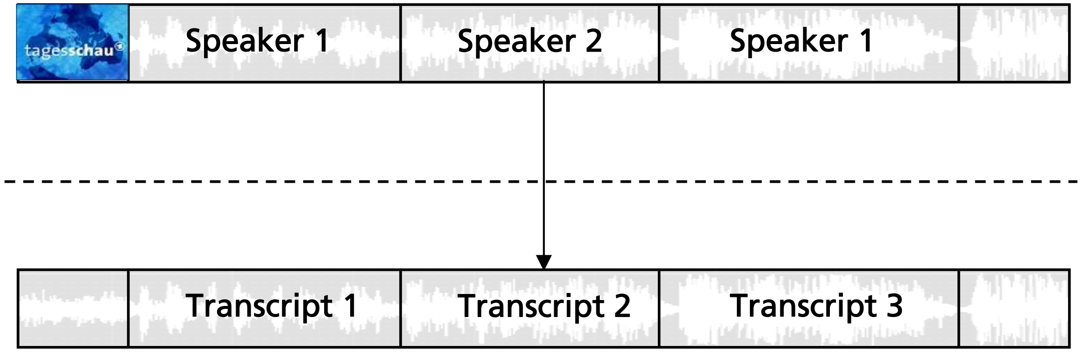
Speech Recognition

- Structual Analysis
- Speech Recognition

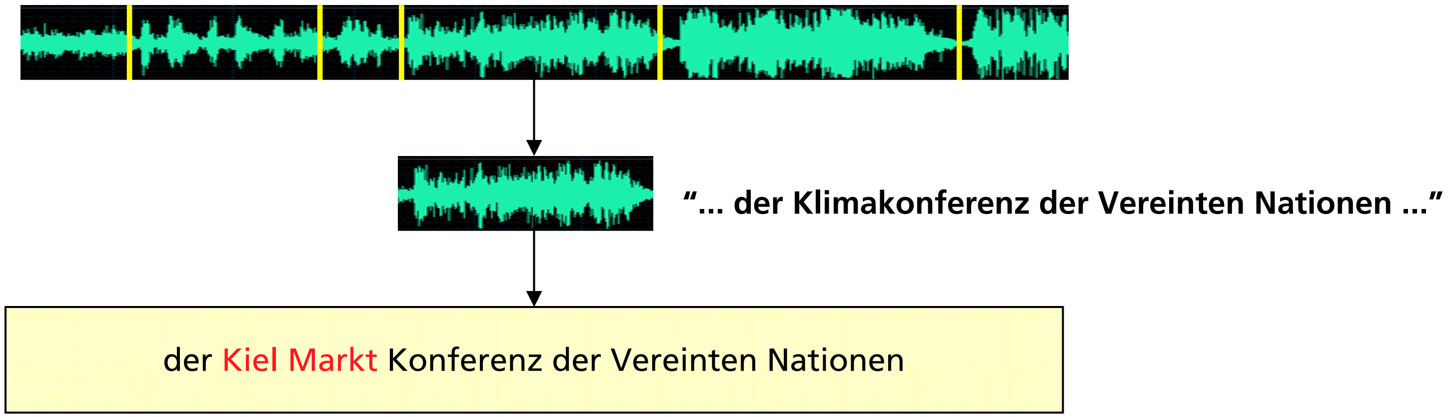


- Transcripts can be used for…
  - Search in entire archive (“Audio-Google”)
  - Media observation (Alert if keyword occurs)
  - Input for text mining (e.g. Topic Detection)

Speech Recognition Challenges

- Out-of-Vocabulary problems with classic word based ASR of broadcast data
  - New and popular words (e.g. Gammelfleischskandal - „rotten meat scandal“)
  - Proper names (companies, cities, people)

- Compound words in German (climate conference – Klimakonferenz)
- Huge Lexica required – large effort



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Informationssysteme

Phonetic Approach to Open Vocabulary Indexing

- Idea:
  - Search on phonetic subword level instead of word level
  - Search for a sequence of sounds instead of words

Phonetic Approach to Open Vocabulary Indexing

1. Generate transcription on subword level (phone or syllable)

…?u:.?En.kli:.ma:.kO.fe:.rEnts…

…?aN.ge:.la:.mE6.k@l…

---

2. Break down search term into subword units

Klimakonferenz → kli:.ma:.kOn.fe:.rEnts

---

3. Fuzzy Phonetic Search

…?u:.?En.kli:.ma:.kO.fe:.rEnts…
Klimakonferenz

…?aN.ge:.la:.mE6.k@l…

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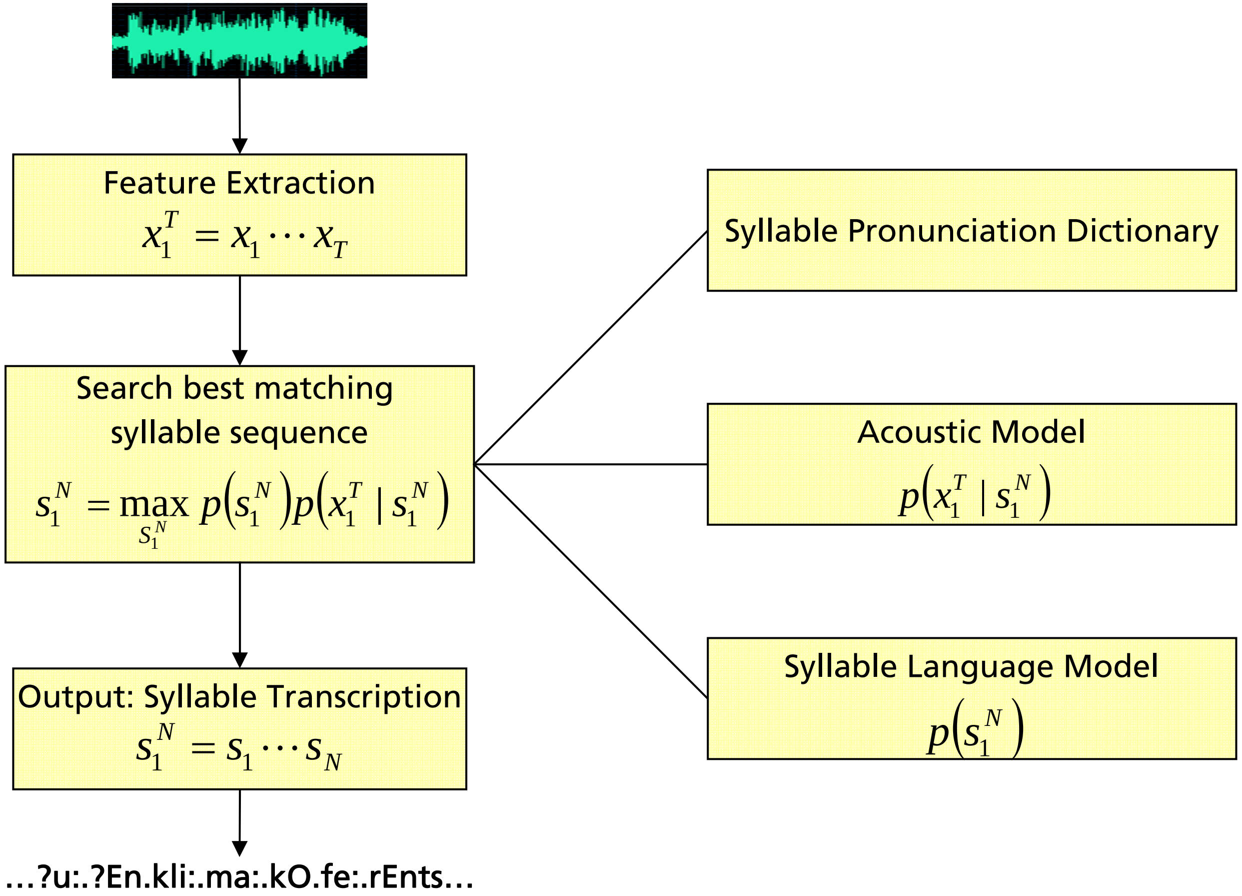
Phonetic Approach (1): Generate Subword Transcription



- Cross-Word Triphone Hidden Markov Models
- Bi- / Trigram Models

Phonetic Approach (2): Fuzzy Syllable Search

- Break down search term: Klimakonferenz → kli:.ma:.kOn.fe:.rEnts
- Goal: Retrieval of documents containing similar syllable sequences
- Fuzzy search based on Levenshtein Distance between
  - Single syllables
  - Syllable sequences

Examples distances between single syllables:

d_e:_s_	d_e:_s_	zero
d_e:_s_	k_O_n_	high
d_e:_s_	d_i:_s_	low
d_e:_s_	d_I_s_	medium

Examples distances between syllable sequence:

k_l_i:_ m_a:_	k_l_i:_ m_a:_	zero
k_l_i:_ m_a:_	k_l_i:_ n_a:_	low
k_l_i:_ m_a:_	k_l_i:_ n_6_	high

- Solution based on Dynamic Programming (c.f. Speech Decoding)

Properties of Phonetic Subword Approach

- The set of subword units is finite and (rather) small
  - Complete vocabulary coverage (no OOV)
  - 10.000 syllables compared to 300.000+ words
  - Compact ASR search space

- Implicit decomposition of compounded words
  - *kli:.ma:.kOn.fe:.rEnts* gives 100% hit for the search terms
    Klima, Konferenz, Klima Konferenz, Klimakonfernez

- Implicit stemming capabilities of fuzzy search
  - Skandal – skan.da:l
    Skandals – skan.da:ls (less important to learn genitive explicitly)

Experiments: Fraunhofer AudioMining Corpus

- High Quality Studio Data
  - Accurate sentence level transcriptions
  - (Almost) no background noise
  - Only one speaker per segment
- 14 hours of carefully annotated training data
- 3 hours of evaluation data (disjoint from training set)
- Main Challenges
  - Speaking rate (interview vs. read speech)
  - Spontaneous Speech in interview situation

Data: German News Shows

Comparable to VITALAS

data sets from IRT and INA

- Broadcast News
- Broadcast Conversation

Experiments: Model Setup

- Acoustic Models
  - Maximum Likelihood Reestimation
  - Phonetic Clustering of triphones
  - 7300 triphone HMMs with up to 16 Gaussian mixture components
- Language Models trained on 2000-2006 newswire data with CMU SLM toolkit
  - 80 million running words
  - Text transformed to syllables
  - Corpus Topics: Politics, Economy, Culture, Sports
- Pronunciation Lexicon: 10000 most frequent syllables from LM training

Current Results - Speech Recognition

- Task: Syllable Transcription of 3 hours of Broadcast Data (Radio Shows)

Syllable Error Rate	ASR Realtime Factor
34.3	1.5

- High error rates (test set includes several BC shows)
- Example for frequent substitution error:
  - Reference: U_n_t_   (and)
  - Recognized: U_n_   (an‘)
- Errors partly covered by fuzzy retrieval

Current Results – Fuzzy Phonetic Retrieval

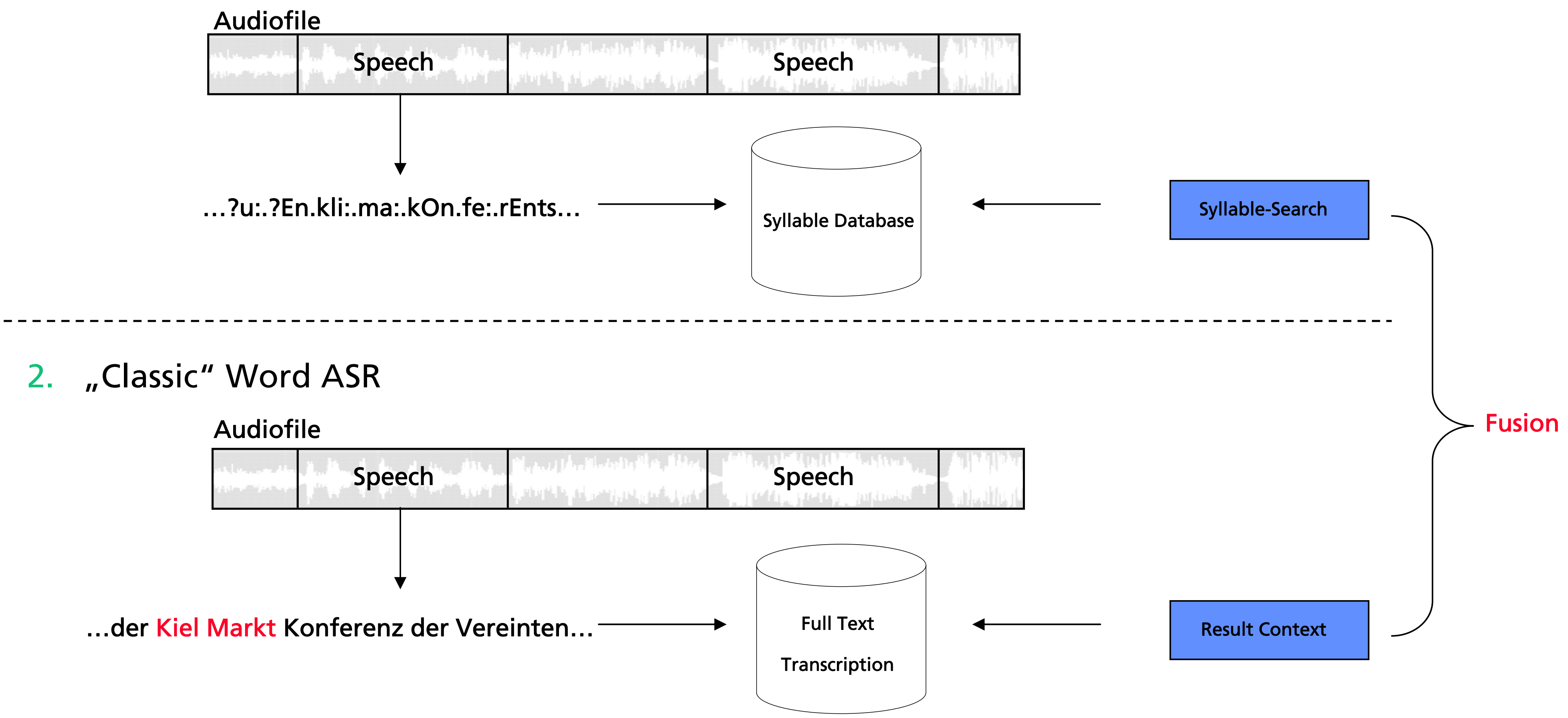
- Task: Detect 213 keywords and keyphrases in recognition results
- Confidence thresholds of the fuzzy search can be chosen depending on the application

Confidence Threshold	Precision	Recall	Remark
0.70	0.66	0.65	Equal Error
0.85	0.91	0.53	Tuned for Precision

- Some errors due to…
  - Search term is substring of actual spoken compound word (Klima – Klimakonferenz)
  - Short search terms consisting of highly frequent syllables (Mutter – mU.t6)

Additional Word Context for Enhanced Display of Results

1. Vocabulary Independent Syllable Recognition



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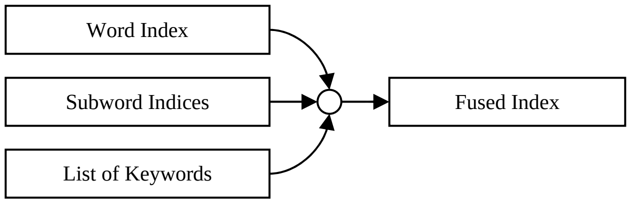
Demo: AudioMining

Next Steps

- Evaluate the syllable approach on other languages
  - Vitalas End-Users: IRT (German) and INA (French)

- Improve Recognition Accuracy
  - Use information extracted by structural analysis
  - Speaker / domain / progamme adaptivity

- Improve Information Retrieval Accuracy
  - Fusion of word, syllable and phoneme recognition results
  - Exploit ASR output graph instead of 1-Best



- Consider Scalability
  - Current search approach not applicable for 10k hours archive
  - Evaluate efficient implementations and alternatives

Thank you!

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Implicit feedback learning in semantic and collaborative information retrieval systems

by Gérard Dupont[1, 2]

written under the direction of

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Summary

- Introduction
- Enhanced IRS with feedback learning
- Feedback learning in VITALAS
- Focus on learning using behavior measure as feedback
- Conclusion and future work

Introduction

Information retrieval ?

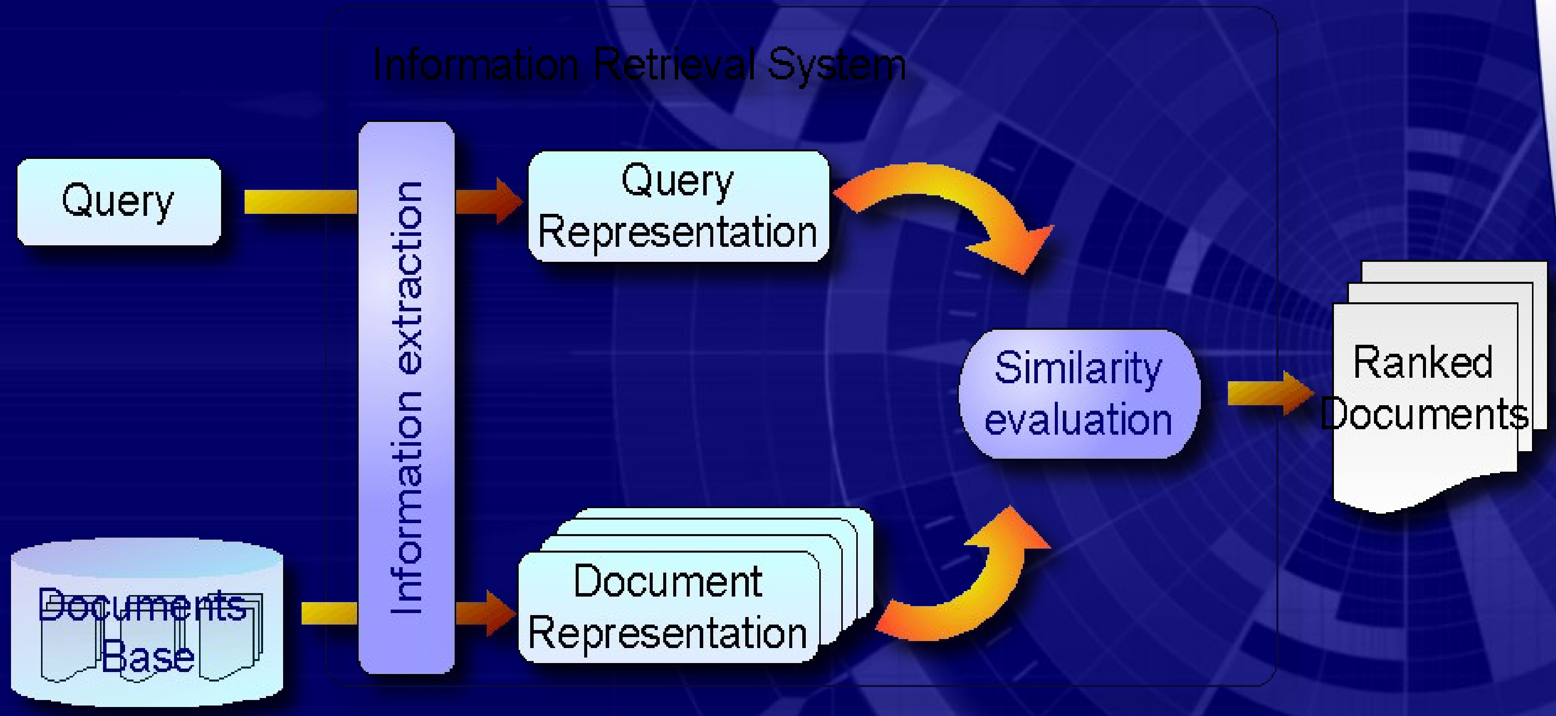
"Information retrieval (IR) is finding material (usually documents) of an unstructured nature (usually text) that satisfy an information need from within large collections (usually stored on computers)"

An introduction to information retrieval - Manning , 2007.

Variables :

- Document and collection of documents : library, database, Intranet, Internet...
- Unstructured information without precise meaning
- Information needs expressed by users

Simple view of IRS



Aim : Matching query with documents (or part of documents)

– Information model to represent document and needs

– Similarity evaluation theory to produce ranked list of documents

Information model

– Vector model dedicated to text document retrieval

Document term vectors

$$\vec{D}_i = \begin{pmatrix} word_1 - 0{,}24 \\ word_2 - 0{,}4 \\ word_3 - 0{,}1 \\ \ldots \\ word_N - 0{,}1 \end{pmatrix}$$

Query term vectors

$$\vec{Q} = \begin{pmatrix} word_1 - 0 \\ word_2 - 1 \\ word_3 - 0 \\ \ldots \\ word_N - 1 \end{pmatrix}$$

Example of similarity formula (normalized cosinus)

$$score(\vec{D}_i, \vec{Q}) = \frac{\langle \vec{D}_i, \vec{Q} \rangle}{\|\vec{D}_i\| . \|\vec{Q}\|} = \frac{\sum_{k=1}^{N} d_{i,k} \times q_k}{\sqrt{\sum_{k=1}^{N} d_{i,k}^2} \times \sqrt{\sum_{k=1}^{N} q_k^2}}$$

– Generalized probabilistic model

$$P(D|L) = \prod_i P(A_i = a_i | L)$$

- Term vector extended to description through attributes/values
- Relevance as probability
- Possibility to handle multimedia features as attributes

Limits of current IRS

Strong assumptions :

- Dimensions of the vector model or attributes in the probabilistic model are independent
- User information needs is fully described by its query

Not verified in most of the cases :

- Linguistic study tells us that terms are not independent in texts (synonymous, antonymous,...) neither are features extracted in CBIR
- User can not define precisely their needs since they are trying to complete their knowledge

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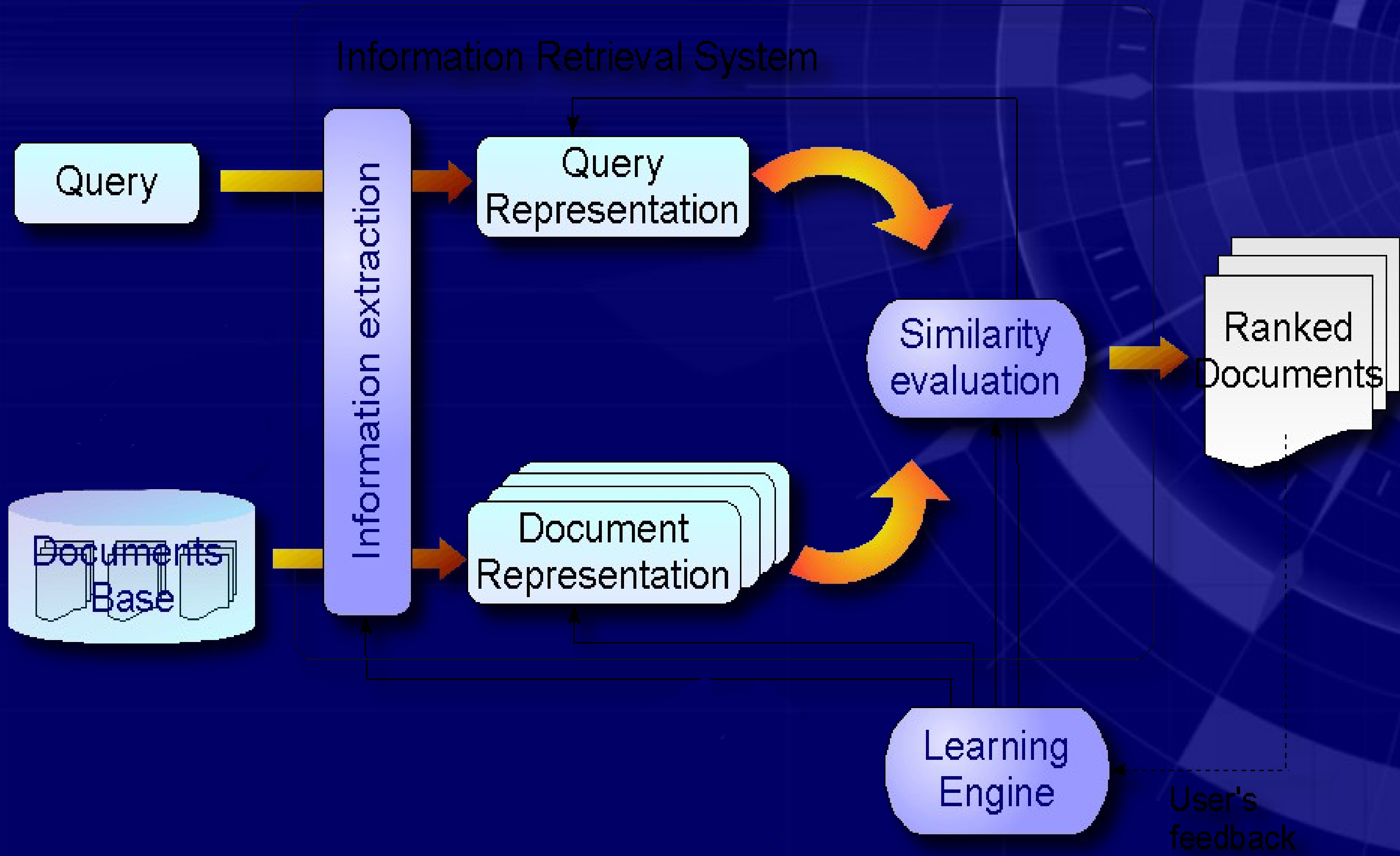
Enhanced IRS with feedback learning

Feedback learning

By giving feedback about the presented documents, users tell more about their needs to the system



Search becomes (again) an iterative process.

The IRS can enhance itself at multiple levels :

- information representation
- similarity evaluation

Feedback learning strategies

Many possibilities explored :

- Query rewriting (short term)
- Search context modelling (mid term)
- User model learning (long term)

Proven efficiency of explicit relevance feedback learning concept :

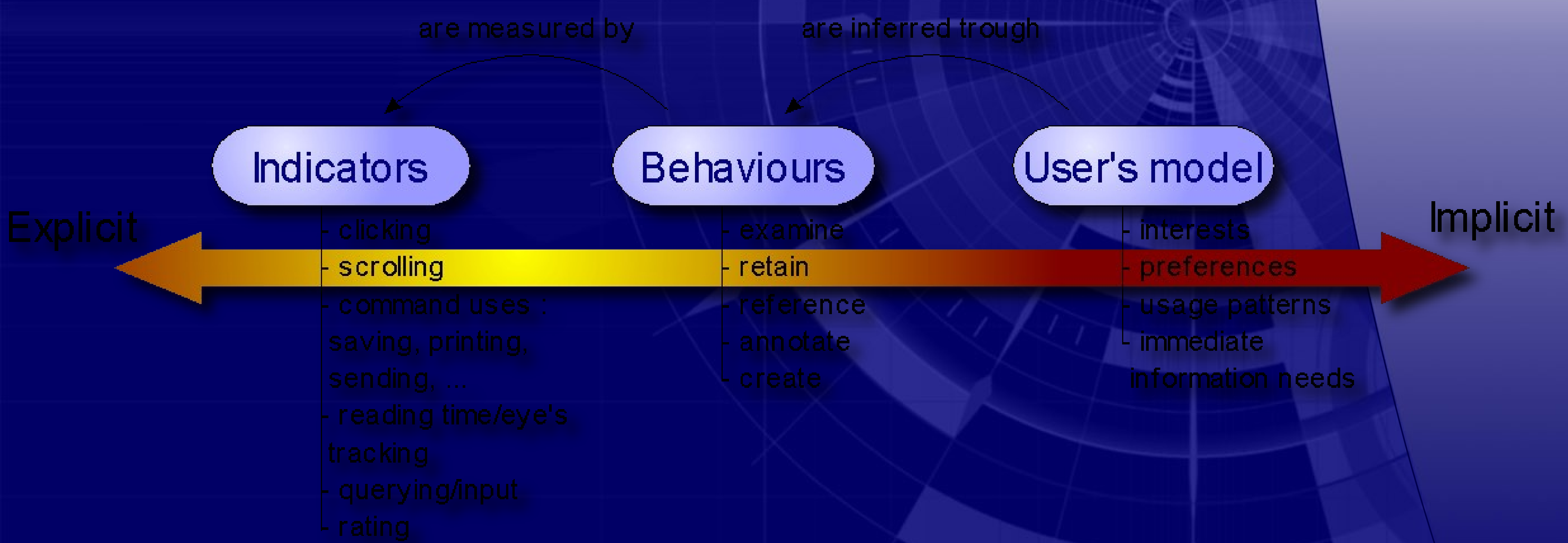
ex : “Rocchio” Algorithm established in the 70's

Explicit vs Implicit feedback

- Experimental (and operational) studies have shown that users are reluctant to provide explicit feedback on documents
- Use of implicit (behavioral) indicators to fill the gap
  - ex : reading time, scroll behavior, click trough data, ...
- Implicit data are known :
  - to raise privacy issues (but solutions exist)
  - to be noisy (or biased, but issues are raised on explicit bias too)
  - to be easy to gather in large amount

Explicit vs Implicit feedback

Hybrid approches combines explicit and implicit data.



Feedback learning and search in context in VITALAS

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Analysis of search logs

Search in context and relevance feedback : starting with search log data study in collaboration with CWI.

Research issues are :

- Do users of professional images IRS have the same behavior as classic users from state-of-the-art studies ?
- Are they advanced searchers ?
- Can we detect specific behavior pattern ?

Aim is to select the right approach.

First experiments

Experiments (conducted by CWI) with "implicit collaboration" using past search sessions :

- query suggestion
- term suggestion
- results suggestion

Experiments (conducted by EADS) on using implicit feedback data to infer document interests/relevance :

- interaction events tracking in web based GUI
- framework to learn search context in WebLab platform
- optimization framework for query/term suggestion

Focus on learning using behavior measurements as feedback

Search context with feedback

Explicit and implicit feedback have advantages and drawbacks. It is better to combine feedback through a common framework.

Measurements of current user behavior to extract interests :

- Time spent on reading a document
- Selection of terms in abstract
- Click on a link after reading its description
- Explicit rating of items

Matrix X of measurements per documents/parts of documents

X(i,j) = measure of behavior j on element i

$$X = \begin{pmatrix} m_{1,1} & m_{1,2} & m_{1,3} & m_{1,4} \\ m_{2,1} & m_{2,2} & m_{2,3} & m_{2,4} \\ m_{3,1} & m_{3,2} & m_{3,4} & m_{3,4} \end{pmatrix}$$

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Search context with implicit feedback

- Using past search history to learn relevance pattern in behavior measurements

Rel= matrix of behavior patterns on relevant documents

$$Rel=\begin{pmatrix} r_{1,1} & r_{1,2} & r_{1,3} & r_{1,4} \\ r_{2,1} & r_{2,2} & r_{2,3} & r_{2,4} \\ r_{3,1} & r_{3,2} & r_{3,4} & r_{3,4} \end{pmatrix}$$

Irr = matrix of behavior patterns on irrelevant documents

$$Irr=\begin{pmatrix} s_{1,1} & s_{1,2} & s_{1,3} & s_{1,4} \\ s_{2,1} & s_{2,2} & s_{2,3} & s_{2,4} \\ s_{3,1} & s_{3,2} & s_{3,4} & s_{3,4} \end{pmatrix}$$

- Classic supervised learning problem which enables the computation of current search context.

  ex: a weighted vector of terms reflecting current interests.

Searching in context

Using the search context to enhance user experience while in a search session :

- Query expansion and/or suggestion to help users to define their needs
- Changing the similarity and ranking algorithm to personalize the behavior of the system to the user and its current needs
- Adapting the presentation of results
- Providing tools to interact/explore the corpus (to provide more accurate data for implicit relevance feedback)

Searching in context : a multi objective optimisation probl

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Query expansion and/or suggestion as a multi objective optimization problem : finding the "best query" regarding multiple criteria and constraints

$$\vec{f}(\vec{x}) = \{ f_1(\vec{x}), \ldots, f_i(\vec{x}), \ldots, f_n(\vec{x}) \}$$

$$\text{with} \quad \vec{g}(\vec{x}) \geq 0 \Leftrightarrow \{ g_1(\vec{x}) \geq 0, \ldots, g_i(\vec{x}) \geq 0, \ldots, g_m(\vec{x} \geq 0) \}$$

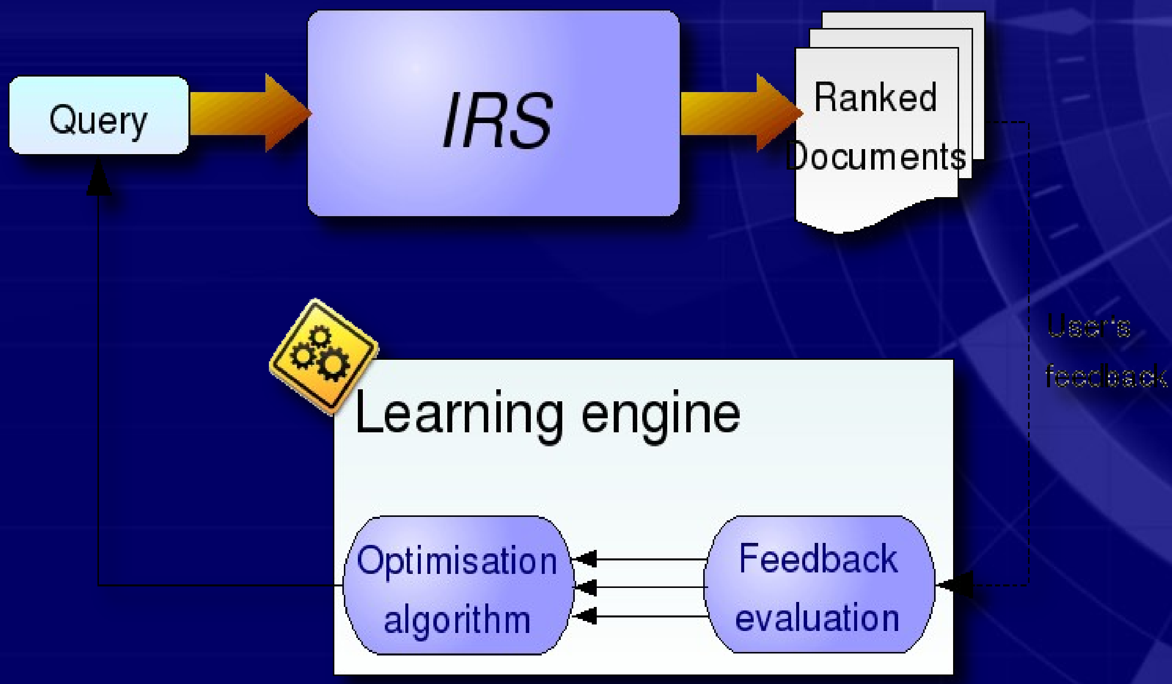
Criteria examples : Precision, Recall, Diversity, Novelty

$$P = \frac{N_{relevant\,results}}{N_{results}} \qquad R = \frac{N_{relevant\,results}}{N_{relevant\,doc}}$$

Adapted and personalized for each user or community of users

Evolutionary algorithm for query expansion/suggestion

Evolutionary algorithms to optimize the first user query :



1. Given a query of N terms
2. Rank document
3. Evaluate criteria through user's feedback
4. Optimise the query vector to maximize the criteria

Evolutionary algorithm for query expansion/suggestion

Difficulties :

- High dimensionality of term space

  reduced through the use of search context learned from feedback

- Combinaison advanced query operator

  use of genetic programming to compute advanced queries

Multiple level of impact :

- Query suggestion (with or without complex syntax)
- Term suggestion to disambiguate with context
- Implicit rewriting with “push” of new documents

Evolutionary algorithm for query expansion/suggestion

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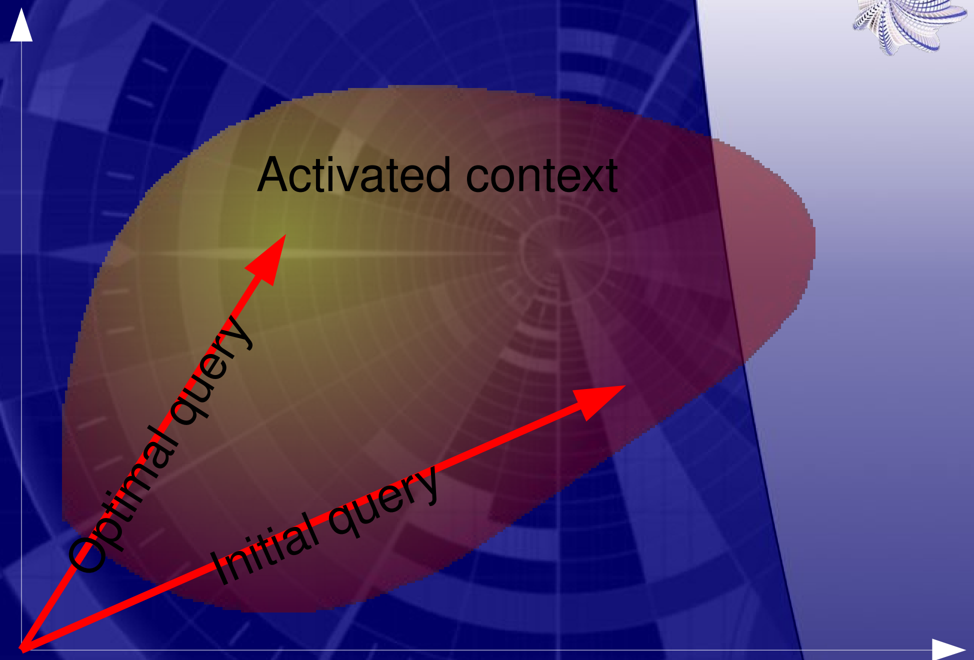
User query vector in the whole vocabulary of N terms

$$\vec{Q} = \begin{pmatrix} word_1 - 0 \\ word_2 - 1 \\ word_3 - 0 \\ \dots \\ word_N - 1 \end{pmatrix}$$

Search context which "activate" some parts of the vocabulary

$$\vec{C} = \begin{pmatrix} word_1 - 0{,}0 \\ word_2 - 0{,}89 \\ word_3 - 0{,}5 \\ \dots \\ word_N - 0{,}01 \end{pmatrix}$$



Geometrical representation of search space, initial user query and search context used to limit the searched area

Expanding context using semantic and collaboration

Use of semantic knowledge bases to expand the context : changing the information model to concept space

- Classification/clustering problem in a graph or a hierarchy of semantic concepts
- Use of Word Sense Disambiguation (WSD) techniques

Knowledge representation comes out users past searches : use of collaborative search experiences and/or external bases (ontologies, wikipedia...)

Conclusion and future work

Future research paths

- Finalisation of Logs analysis
- Exploration of feedback learning approaches
  - Implicit relevance learning with already existent data : Experimentation of state-of-the-art approaches in IR based on statistics and of pattern recognition approaches
  - Query expansion with evolutionary algorithms to optimise query weights with operators
  - Extension of collaboration to enlarge user search context by using user model similarity matching and developing new paradigm of collaboration
- Evaluation of proposed approaches
- Integration within WebLab platform (VITALAS V2 ?)

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About the author

- Research engineer at EADS DS
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- Involved in VITALAS (EC project 2007/2009)
  - EADS DS as software architect
  - Personal involvement in "search in context"
- Research interests :

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Enhanced IRS