Television Linked To The Web

Building the future of television

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www.linkedtv.eu
The LinkedTV vision

• Web and TV exist in parallel
  – 86% of TV viewers surf the Web at the same time (Yahoo!, USA)
  – 88% of USA consumers use mobile as second screen (Business Insider, May 2013)
  – Manual efforts to link TV program to additional content (Shazam, IntoNow)

• LinkedTV: interweaving Web and TV into a single experience

• Mixing lean back and lean forward
  – Want to maintain immersion while removing fourth wall illusion
  – Works only for certain genres and audiences
  – Does second screen help or hinder?
Scenarios and content

**Enriched News**
- Professional news content produced by RBB for general audience
- Local news show *rbb Aktuell*
- People, locations and events can be linked to previous events.

**Antiques Edutainment**
- Program watched predominantly by 50+ers
- AVRO: *Tussen Kunst en Kitsch*
- Presenters, locations and objects provide hooks to related materials.
Edward Joseph Snowden

American former technical contractor for the United States National Security Agency (NSA) and a former employee of the Central Intelligence Agency (CIA) who leaked details of several top-secret U.S. and British government mass surveillance programs to the press.

born: June 21, 1983

On June 14, 2013, U.S. federal prosecutors charged Snowden with espionage and theft of government property.

Wikipedia
How does it work?

Video object and word detection

Paintings by Jan Sluijters

Connection to concepts

Selection of related concepts

Selection of related content

“...schilderij van Jan Sluijters....”

dbpedia.org/resource/Jan_Sluijters

Presentation engine

linkedtv.eu
Concept Detection

- Object detection in video
- Face detection
- Text analysis, keyword extraction
- Multilingual automatic speech recognition
- Combining results from different modality analyses
- Speaker identification
- Object re-detection

- Output in XML using OpenSource tool: EXMARaLDA
  http://www.exmaralda.org/

“...schilderij van Jan Sluijters....”

linkedtv.eu
Concept connections

- Annotations represented in RDF stored in LinkedTV platform
- Use existing vocabularies e.g. schema.org, NERD, LSCOM, DBpedia
- Named Entity Recognition using statistical & knowledge-based approaches
- Enrichment based on textual and visual analyses

connec9on
to
ccepts

dbpedia.org/resource/Jan_Sluyters

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LinkedTV metadata conversion

TV Metadata Generator
Automatic conversion of television content metadata into RDF.

http://linkedtv.eurecom.fr/metadata/

1. Introduction

Here we present the tool "TV Metadata Generator", developed by Eurecom under the scope of the European Proyect LinkedTV FP7. In a nutshell, this application takes a video and its corresponding metadata files, available in different formats, and produces a RDF representation of the whole information. The knowledge graph obtained as result is suitable to be interlinked with other data in the Web, and allow the execution of complex queries that can bring the viewers a new way of enjoy Television.
Concept selection

- Additional information, e.g.
  - biography of artist
  - style of painting

- Related information, e.g.
  - artists from same period
  - paintings in similar style
  - related styles
Content selection

- Selection based on context of scene, e.g. system knows which topics appear next
- User preferences, e.g. closely related information to uninteresting topic is less useful
- We need to understand user information needs (per genre), e.g. don’t miss important news because of personalisation
- Broadcasters don’t want users to drift away from program
Example user information needs for news

• **MORE IN DEPTH SPECIFIC INFORMATION**
  
  *I was wondering just how expensive it is to make all those vaccines, you know? I was just wondering if it is a good idea to even make a lot of it or how hard it is to make.*

• **LOCAL EFFECT OF GLOBAL NEWS – What is the impact in my life?**
  
  *Yes then I would look it up, what is the effect in the Netherlands... (of the bird flu virus)*

• **OVERVIEW OF PAST RELATED EVENTS**
  
  *My search would be something like "South Korea state of war ramp up" (...) I would like to know, what happened two years ago and how they solved it...*
User information needs for news

- Information about how the story ends
- Updates when important changes occur
- More information about the people involved
- Where is that location?
- Consult related publications and documentaries
- Opinions from different experts
- Access related info selected by experts and suggested by broadcasters
Content display

- Many users watch TV news during dinner!
- Use second screen to
  - give user more control
  - retain sense of immersion via TV screen
- Need to resolve issues of pausing when in group situation
- There is no single best solution
How does it work?

- Video object and word detection
- Paintings by Jan Sluijters
- Connection to concepts
- Selection of related concepts
- Selection of related content
- Presentation engine

“...schilderij van Jan Sluijters....”
dbpedia.org/resource/Jan_Sluyters
A clearly defined and modularized **platform** architecture, deployment decisions made, initial REST API

An interactive **video player** based on Web specifications (HTML5) realising intuitive interaction & enrichment layers
Online demos

Demo categories

- Scenarios
- Core Media
- Annotation Tool
- Linked Media
- Personalisation

Scenarios

Linked Cultural Heritage TV

Description

This scenario developed by the Netherlands Institute for Sound and Vision is focused on cultural heritage. It uses material from the program Tussen Kunst & Kilsch (similar to the BBC’s Antiques Roadshow) courtesy of Dutch public broadcaster AVRO. In the show, people take art objects with them to be assessed by an expert. The objects brought in provide the possibility to add relevant information on questions like Who, When, What, Where and Subject, all related to art history and cultural heritage. This first demo has been showcased at several conferences in 2012.

Homepage
Designing a 2\textsuperscript{nd} screen news companion

- Description of context analysis evaluations
- Results and requirements
- Design proposal
- Demo
- Evaluation of the hi-fi prototype
- Discussion and conclusion
- Future work
Why the news?

- standard format
- fragmented pace
- no suspension of disbelief
- informative nature
- richness and variety of media formats
The adoption of second screen systems is facilitated by their resemblance to current behavior patterns.

80% of 3000 respondents are mobile multitasking while watching TV.

98 million mobile TV multitaskers.
Goals for news prototype

• to obtain knowledge about users information needs and an indication of the reception that this technology could have among them;

• to extract initial design guidelines for future work within LinkedTV and in the field of second screen interfaces for web-enriched television newscasts;

• to create a high-fidelity prototype to facilitate communicating a future vision of hyperlinked broadcast news.
User Centred Design Cycle

Plan
Research
Requirements
Design
Evaluate
Release
Context Research

- Second screen and multitasking user habits
- Habits and social context regarding news broadcasts
- Habits when searching for additional information (frequency, tools, processes)
- Opinions, suggestions and desires regarding the application and functionalities
- Define target user group
FOCUS GROUP
Setting = living room environment (experiment room)

Participants
- 11 (6F, 5M)
- Mean age: 43, S.D.: 11.5
- 1 undergrad. 4 university grad. 1 postgrad. 3 HBO, 1 VWO, 1 HAVO
- Diverse digital literacy
- Regular newscast viewers

Method
- Demographics + habits Q.
- View news videos, make questions, choose device
- Brainstorm
- Talk about the future of TV

INTERVIEWS
Setting = office at respondent's workplace

Participants
- 8 (3F, 5M)
- Mean age: 33, S.D.: 5
- Highly educated (University graduates and postgraduates)
- Very digitally skilled
- Regular newscast viewers

Method
- Demographics Q.
- Open semi-structured interviews lasting from 24 to 45 min.
- Functionality ranking
Results and implications for requirements
Habits and implications for requirements

1. **Choice of Device**

![Graph showing choice of device]

- **Shared**
- **Personal**

2. **Location and time**

![Graph showing location and time]

- **Living Room**
- **Dining Table**
- **Bedroom**
- **Bar**
- **Café**
- **Desk**

- **TIME OF THE DAY**
  - **Breakfast**
  - **Lunch**
  - **Dinner**
  - **20:00-22:00**

3. **Social context**

- 6/11 watch the news with others.
- 5/6 interact while they watch.

4. **Multitasking**

- 4/11 participants eat or drink while watching the news.
- 6/8 second screen multitask (email reading and Internet browsing)
User Needs

**Information needs**
- Give *in depth information* about the news on TV
- Give an overview of *past-related news*
- Illustrate multiple *opinions* about the news
- Allow users to consult news in *diverse sources*
- Alert users about important changes in news
- Give information about *context, people and organizations* mentioned in the news
- Allow to access *opinions of locals*

**Desired functionalities**
- Personalization: *easy configurable user-controlled*
- Video *control* capabilities
- *Bookmarking* for later viewing
- *Sharing* information
LinkedTV News (concept)

What is LinkedTV News
• *LinkedTV News* is a second screen application for tablets
  – Acts as a companion to viewers when watching the news broadcasts.
  – Its main goal is to enrich television newscasts by integrating them with other media
  – Combines watching TV newscasts and consulting online newspapers and videos.

What is the target user
– Users between 25 and 45 years of age
– Highly-educated
– Who like to be up to date about the international news
– Watch news broadcasts regularly
– Own a tablet computer or share it with someone in their household.

Interaction
• Synchronous and Asynchronous interaction with the television
  – Interacting with the application while watching TV
  – Bookmarking news and postponing their in depth exploration

Engagement modes
• Two engagement modes represented by two main screens:
  – Lean back
  – Lean forward.
**Engagement Modes**

**Lean Back**
- Presents condensed information related to the objects, places, persons, and events in the news
  - Slides (a paragraph of text illustrated by an image).
  - This mode is automatic and requires no user interaction

**Lean Forward**
- Enables in-depth exploration of each news headline in the categories
  - different sources;
  - opinions of different authors;
  - in-depth articles;
  - timeline;
  - point of view of geo-localized tweets
The Hi-Fi Prototype

FUGITIVE EDWARD SNOWDEN TRAPPED IN RUSSIA - PUTIN

BBC | July 15, 2013

The US authorities have in effect trapped fugitive intelligence leaker Edward Snowden in Russia, President Vladimir Putin has said.

But Mr Putin said Mr Snowden would leave if he was able to.
DEMO TIME
Evaluation of the design proposal
**PROTOTYPE EVALUATION**

**Setting**
- Living room environment (experiment room)

**Participants**
- 8 (3F, 5M)
- Mean age: 33, S.D.: 5
- Highly educated (University graduates and postgraduates)
- Very digitally skilled.
- Regular newscast viewers

**Method**
- Demographics + habits Q.
- Task-based study
- ASQ (after scenario questionnaires)
- SUS (System Usability Score)
- USE (Usefulness + satisfaction)
- Interviews
### Evaluation of Lean Back

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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Average</th>
<th>StdDev</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>4.8</td>
<td>0.8</td>
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<tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>4.8</td>
<td>1.0</td>
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<tr>
<td>Distracting</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>3.0</td>
<td>1.0</td>
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<td>Cumbersome</td>
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<td>Excessive Info</td>
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<td></td>
<td></td>
<td></td>
<td>3.6</td>
<td>1.0</td>
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<tr>
<td>Fast Pace</td>
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<td></td>
<td></td>
<td>2.9</td>
<td>0.8</td>
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### Multitasking with Lean Forward

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<td></td>
<td></td>
<td></td>
<td></td>
<td>4.0</td>
<td>1.3</td>
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16 questions were formulated, and participants found answers for 10 of them, giving 62% of answers found without the need to consult the Internet.
**Interviews**

P8 I like it, it’s useful. It's so much better to have this tool than not to have this tool. The best is the easiness, it’s easy to use; it gives you easy access to different kinds of information with just one click.

Most valued sections were:

- The timeline
- The headline as it was presented in different media sources.
- The possibility of bookmarking the news in order to postpone the more cognitively demanding tasks.

Accessing geo-localized information through tweets was, unexpectedly, the functionality that participants liked the least.
Suggestions for improvement

• Make TV area permanently visible
• Make difference between “save” and “bookmark” clear
• Add “skip chapter” to VCR controls
• Use thumbnails for navigating
• Add “related articles” browsing route
• Rename “global to local” section
• Add “search” field
• Reduce distractions from spontaneous screen changes
What next?

• Analyse link types included in prototype.
• Relate these to links in linked data sources.
• Investigate success of automatic generation.
SUS (System Usability Scale)

Average SUS 83 with a standard deviation of 10.

This gives a 92% percentile, letter A above average (average is 68%)
Questionnaire for User Interface Satisfaction

<table>
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<tr>
<th>USEFULNESS</th>
<th>SATISFACTION</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>It helps me to find information more efficiently.</td>
</tr>
<tr>
<td>2</td>
<td>It is useful.</td>
</tr>
<tr>
<td>3</td>
<td>It makes the things I want to accomplish easier to get done.</td>
</tr>
<tr>
<td>4</td>
<td>It saves me time when I use it.</td>
</tr>
<tr>
<td>5</td>
<td>It meets my needs.</td>
</tr>
<tr>
<td>6</td>
<td>It does everything I would expect it to do.</td>
</tr>
</tbody>
</table>

The resulting score was 5.6 with a standard deviation of .7. This would correspond to a percentile of 80%.

The resulting score was 5.5 with a standard deviation of .5. This would correspond to a percentile of 78%.