

LinkedTV News: A dual mode second screen companion for web-enriched news broadcasts

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INTRODUCTION

The European project LinkedTV aims to integrate television content with Web content through the use of automated techniques such as named entity extraction and semantic linking. In order to obtain knowledge about applying this technology to news programs we conducted a user study. In the study [1] we identified users' current habits and requirements in terms of information needs and user experience for consuming the news.

We found that, content-wise, TV newscasts and online news are considered as complementary and users often consult both types of sources. Participants of the user study indicated they want support for two main information seeking tasks: looking up factual information about the actors and concepts in the news and further exploring the topic of the news item. We identified 5 specific dimensions for the exploration: *i*) as it was portrayed by different sources *ii*) through the opinion of different authors *iii*) through in-depth articles *iv*) through a timeline of past related events and *v*) from the point of view of common people situated where the event takes place.

Participants indicated that they perceive viewing newscasts as a social experience and reading online sources as a solitary one. Furthermore, their behavior is lean back (passive) when watching TV and lean forward (active) when consuming news online. Most participants indicated that they enjoy their lean back approach to newscasts and would like an unobtrusive solution to accessing additional information.

Based on this, we developed a second screen companion for newscasts (linkedtv.project.cwi.nl/news). In order to meet the user experience requirements, we designed the

application to work in two modes: passive (lean back) and active (lean forward). To retrieve the content that supports the information seeking tasks, we implemented solutions for entity extraction and semantic linking in the news domain.

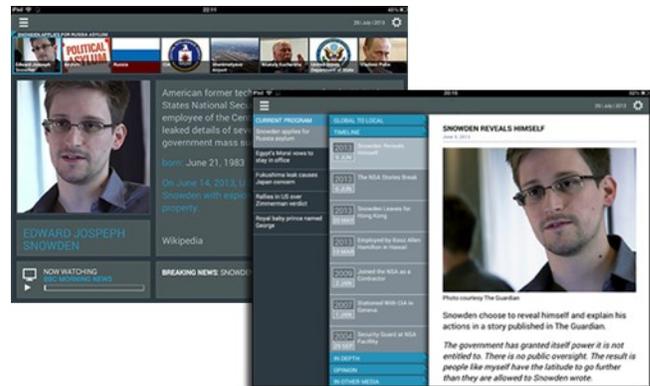


Figure 1 - Screenshots of LinkedTV News companion application: passive mode (left) and active mode (right). Edward Snowden's photograph: Laura Poitras / Praxis Films

In the passive mode, the application operates as a second screen that is synced with the TV program (Figure 1). This mode provides the user access to factual information by presenting timed slides composed by short texts and images about named entities (persons, organizations and locations) mentioned in the news. As this mode requires no interaction, it intends to unobtrusively complement the lean back and potentially shared TV viewing experience.

In addition, the passive mode provides functionality to bookmark news. This one click interaction forms the bridge to the active mode of the application. In the active mode (Figure 1, right), the user can explore a specific news item from different angles. It gives access to articles from the Web that are related to the bookmarked news item according to the 5 identified dimensions for exploration.

USE CASE SCENARIO

Alonso and Becka watch the newscast while eating dinner. They place their tablet running the companion app and synced with the TV in front of them. The first news is about former CIA employee Edward Snowden, famous for

disclosing classified documents. He is requesting political asylum in Russia. Alonso is acquainted with the story, but not with this new development. As they watch the program, the tablet shows slides with summarized information about relevant concepts. They focus on the TV, but turn to the tablet whenever they want details about what they are watching. Becka chooses to read the slide about Sheremetyevo airport. Snowden is trapped in its transit zone and she wants to know what it is like. An unfamiliar face calls Alonso's attention. The nametag says he is Anatoly Kucherena, Snowden's lawyer. With a glance at the app, Alonso discovers that he is also the leader of a politically active NGO.

The next item is about what many are calling a *coup d'etat* in Egypt against Mohammed Morsi. Morsi was democratically elected, and although Alonso may not agree with his political views, he is not sure what to think about the *coup*. He would like to read opinions about this, specially the ones of people living in Cairo, but he is still eating, so he bookmarks the news for later. The following news is interesting for Becka, it speaks about a leakage in the Fukushima nuclear power plant. Becka asks Alonso to bookmark this news too.

While the TV plays entertainment news, Alonso sets the application to active mode and selects the Egyptian *coup* from his bookmarked news. He browses the twitter feed and chooses to see tweets from Cairo. There he finds out how divided the opinions of Egyptians are. He still can't make up his mind. He clicks the "in other media" tab and a list of headings featuring the Egypt *coup* in different newspapers and TV channels is displayed. He consults The New York Times and also Al Jazeera. He likes to compare these sources that present views from two distant parts of the world.

Becka postpones reading about Fukushima until the next day. During the train ride back home, she browses her bookmarked news. Apparently, TEPCO, the company who owns the nuclear plant, delayed informing about the radioactive water leakage, and some workers' health may be affected. How come the plant is still causing problems? Why haven't they shut it down completely? In the "timeline" tab, she finds a chronological view of how the plant got to its actual state. It seems that actions have been taken, but maybe not the correct ones. She still can't figure out how dangerous this new leakage is. She thinks that maybe author pieces by journalists and environmentalist bloggers will deal with the matter in a more straightforward way. She selects the "opinions" tab of the application and finds a selection of opinionated articles that help her make up her mind.

ENTITY EXTRACTION AND SEMANTIC LINKING

We created a first approach to automatically select the content for the application.¹

For the passive mode, we extract entities from the transcripts that correspond to the news items. As we experienced that

not all relevant entities are contained in the video transcripts, we continue with an expansion step [2]. We use a selection of entities to construct a query that we submit to Google. From the top articles returned by Google, we again extract the entities. The combined set of entities from the first and second step form the candidate set. For the news about Edward Snowden mentioned in the scenario, we manually selected the entities: Edward Snowden, CIA, Anatoly Kucherena, Russia, Department of State, Vladimir Putin, NSA. All these entities occur in the automatically selected candidate set. Currently, we are experimenting with different methods to rank the candidates. In addition, we implemented an editor tool to select the entities from the candidate set and curate the information for display.

The content for the active mode is obtained by querying a Google Custom Search Engine² configured to search within documents from a curated list of news providers. For each section in the active mode we construct a query to express the specific information need as mentioned in the after-program segment of the scenario. To retrieve articles from various news sources we use the most frequent entities extracted from the transcripts. For opinion articles we use the same query, but limited to the subdomains of the news sources containing opinionated articles. To retrieve more in depth articles we use the main entity and add "in depth" to the query. For the documents in the timeline we construct a query out of the main entity and wrap it inside the pattern "The" + entity + "case". The tweets are retrieved through the Twitter API using the main entities as the query and the user selected location as a filter.

EVALUATION AND FUTURE WORK

Through a task-based study, we validated the design concept of the application and its ability to fulfill the user requirements found in our initial study [1]. Users were enthusiastic about the integration of online sources with the newscast. The application was described as easy to use, useful and time saving, obtaining a SUS (System Usability Scale) score of 68%. We are currently preparing user evaluations regarding the automatic content selection.

ACKNOWLEDGMENTS

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¹ In the user test we used manually selected content.

² www.google.com/cse