

# Event-centric HyperLinking of Socially Contributed Multimedia Content

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## ABSTRACT

Media hyperlinking consists in linking together media based on their content, uncovering the relation between them. It is becoming an important functionality for providing users with a way to navigate between video entities illustrating various related facets of the original topic and satisfy their information needs. Thanks to such approaches, multimedia search can often be replaced by recommendation. A particular usage of hyperlinking is to provide, through a second screen application, extra information or content about the video watched on a main screen (TV). In this talk, we will focus on event-centric media hyperlinking: the task at hand consists in locating and identifying relevant media items, and displaying them on the second screen. The related material is selected based on underlying events that will be detected through web services: events are seen as structuring elements, defined in terms of date, location, intent and attendance. Two approaches for event-based mining of such additional and related information will be presented. Each of them satisfying a different user information need and addressing different usage scenario; static vs dynamic second screening. In both cases, the event-centric organization of the multimedia material enables to rapidly and effectively visualise what matters about topics of interest.

## Categories and Subject Descriptors

H.3.3 [Information Search and Retrieval]: Retrieval models

## Keywords

Media HyperLinking, Event-based Highlights, Timeline, Search Trends, Web Mining, Video Search, Social Media, Summarization

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## 1. INTRODUCTION

User generated content is available in massive amounts on the Internet and is receiving increased attention due to its many potential applications. One of such applications is the event-centric hyperlinking of multimedia documents. This paper provides a bird eye view of two approaches addressing the problem of retrieving and summarizing events on a given topic, to extract and illustrate events from social media data automatically [4, 2, 3].

Here, we focus on the particular usage of hyperlinking for second screen applications; where a user is watching a multimedia broadcast on a main screen while using a mobile device (the second screen) to visualise related content. The so-called related content enriches the main content along many directions (location, time, action/topic, person of interest, etc.) and can be proposed to the viewer in static form (composed of text and images) or in dynamic form (composed of audio-visual material). In either cases, the information is to be summarized to the viewer.

As the amount of social media shared on the Internet grows increasingly, it becomes possible to explore a topic with a novel viewpoint, one matching the people's opinion. Contrasting with traditional storytelling which provide the personal view of its author/narrator, we propose to focus on public reaction to events. To this end, we proposed two alternative approaches. In the first approach the most "liked" topics are favored and selected to take part in the static summary. In the second approach, events of interest are identified by analysing Google Trends results and visualised on a timeline to provide an overview of what has caught people's attention.

We have proposed innovative solutions to address both types of second screen visualisation; Static and Dynamic. Both approaches, require the media playing on the main screen to be processed and annotated in order to have some information regarding the content of the whole program and/or individual media fragments<sup>1</sup>. In the work presented here, the following analysis is performed on media: shot and scene segmentation on videos, visual concept detection on images and video, automatic speech recognition (ASR) on audio tracks, face detection, etc.. as proposed by the LinkedTV project<sup>2</sup> [7].

Here follows, additional details about both approaches; Static and Dynamic Event Visualisation.

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<sup>1</sup>[www.mediamixer.org](http://www.mediamixer.org)

<sup>2</sup>[www.linkedtv.org](http://www.linkedtv.org)

## 2. STATIC EVENT VISUALISATION

Visualising events in a static manner provides second screen users with a non-intrusive and rather passive access to additional information. Having extracted semantic information from the main media, the topic, location, and time information related to the event of interest is available for each segment of the audio-visual content. This information is used to mine the latest and hottest related events from social news web services. We identify relevant events by harvesting the social news website Digg.com. This has considerable advantages: limited additional processing cost and no storage is needed and the results can be obtained online. Furthermore, thanks to the built-in collective intelligence of such social news web services, the hottest events can easily be identified. Then, for each event, we retrieve both relevant tweets on Twitter and compelling images from Google image search. The resulting documents are assembled and shown within a static vivid interface featuring both event description, tag cloud and photo collage [1].

## 3. DYNAMIC EVENT VISUALISATION

For rich topics, which cover many events, a static view may not offer sufficient details and flexibility for some users who could prefer to engage interactively with the related information. We propose to leverage both social media sharing and search trends as a source of knowledge to identify important events, related to the topic of the main video content (shown on the TV screen), to be displayed on the second screen. Search logs contain a wealth of information. In particular, it is possible to exploit search behavior to discover hot topics as popular queries at a given time reflects important events. Similarly, uploading behavior of media on sharing platforms (i.e. YouTube) reveals people's current interests and activities. To automatically create a visual summary of events related to a topic, videos depicting events are organised along a timeline. Indeed, videos capture information in a rich and effective manner, allowing viewers to quickly grasp the whole semantic content with limited effort. The timeline format enables to represent information on a linear axis, which makes it easier to follow the evolution of an event or to distinguish between different events while providing a global view. Retrieving the search trend for a given topics (using Google Trends<sup>3</sup>) allows to identify related events of interest for users at large, to extract time segments which captured their attention and to formulate a focused search on media sharing platforms (such as YouTube) to collect and display a set of candidate videos associated to each event [5, 6].

## 4. CONCLUSIONS

An original framework for multimedia hyperlinking leveraging on social media data to extract and to depict events has been proposed. It aims to provide interested viewers with related information about the media they are currently watching. The related information is structured with respect to events and visualised either as a static or a dynamic visual summary.

On the static side, a social news web service is employed to extract relevant events and the metadata from selected events is used to query textual and visual content from different online sources (Twitter and Google). In this case the

<sup>3</sup><http://www.google.com/trends/>

results are presented with a attractive visual format combining tag clouds and photo collage.

On the dynamic side, events are presented along a timeline and illustrated with media mined on social media. Interesting events are identified by analyzing the search trends corresponding to a given topic. This ensures that events selected to constitute the timeline have give rise to significant interest (web search) when they occurred.

The proposed event-centric media organisation enables users to rapidly and effectively visualize related multimedia content about topics of interest. Although a second screen application served as example for presenting this work, the approach is directly transferable to more generic scenario such as for presenting search results differently.

## 5. ACKNOWLEDGMENTS

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