Event-based Media Processing and Analysis: A Survey of the Literature

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Christos Tzelepis[a,b], Zhigang Ma[c], Vasileios Mezaris[a], Bogdan Ionescu[d], Ioannis Kompatsiaris[a], Giulia Boato[e], Nicu Sebe[e], Shuicheng Yan[f]

[a]*Information Technologies Institute (ITI), CERTH, Thermi, 57001, Thessaloniki, Greece*
[b]*Queen Mary, University of London, Mile End Campus, UK, E14NS*
[c]*School of Computer Science, Carnegie Mellon University, USA*
[d]*LAPI, University "Politehnica" Bucharest, 061071 Romania*
[e]*University of Trento, Italy*
[f]*Department of ECE, National University of Singapore, Singapore*

Abstract

Research on event-based processing and analysis of media is receiving an increasing attention from the scientific community due to its relevance for an abundance of applications, from consumer video management and video surveillance to lifelogging and social media. Events have the ability to semantically encode relationships of different informational modalities, such as visual-audio-text, time, involved agents and objects, with the spatio-temporal component of events being a key feature for contextual analysis. This unveils an enormous potential for exploiting new information sources and opening new research directions. In this paper, we survey the existing literature in this field. We extensively review the employed conceptualization of the notion of event in multimedia, the techniques for event representation and modeling, the feature representation and event inference approaches for the problems of event detection in audio, visual, and textual content. Furthermore, we review some key event-based multimedia applications, and various benchmarking activities that provide solid frameworks for measuring the performance of different event processing and analysis systems. We provide an in-depth discussion of the insights obtained from reviewing the literature and identify future directions and challenges.

Keywords: Event-based media processing and analysis, event conceptualization, event representation and modeling, multimedia event detection, event-based applications and benchmarking, survey of the literature

1. Introduction

In these times, people tend to collect dozens of photos and video clips every day using their smartphones, tablets, cameras, and such information is exchanged ceaselessly in a number of different ways (e.g., via social networks). The growing number of various types of sensors for capturing environmental conditions, in the moment of content creation, has led to multimedia content enriched with context-awareness that allows capturing experiences and events of interest from a very rich personal perspective. This unveils a growing demand, but also an enormous potential for event-centred data analysis. The core idea consists in using events as primary means for understanding, organizing and indexing content (e.g., audio, videos, news, social streams). Events have the distinctive ability to semantically encode relationships that come from different informational modalities. These modalities can include, but are not limited to: time, space, involved agents and objects, with the spatio-temporal component of events being a key feature for contextual analysis. A plethora of techniques have recently been presented to leverage contextual information for event-based analysis, covering audio-, visual-, and textual-based approaches.

Event-based media processing and analysis is currently a hot topic being used in a broad range of scientific and consumer domains, a sample of which include: (a) multimedia organization and consumer

Email addresses: tzelepis@iti.gr (Christos Tzelepis), kevinma@cs.cmu.edu (Zhigang Ma), bmezaris@iti.gr (Vasileios Mezaris), bionescu@alpha.imag.pub.ro (Bogdan Ionescu), ikom@iti.gr (Ioannis Kompatsiaris), boato@disi.unitn.it (Giulia Boato), sebe@disi.unitn.it (Nicu Sebe), eleyans@nus.edu.sg (Shuicheng Yan)