VERTIGO: Find, Enjoy and Share Media Trails across Physical and Social Contexts

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Abstract. On the grounds of media sharing in social networks, visualisation mash-ups and early hypertext idea of associative "trails", the opportunity for a new system to explore and enjoy connections among mainly linear media is devised. A novel system called VERTIGO is to be crafted to tackle the current limitations in media consumption across different contexts. On the end-user side, VERTIGO would provide a context-aware, personalised and proactive dashboard with innovative discovery and interaction capabilities; on the enterprise side, media professionals would gain access to a common platform enabling new collaboration models in the value network.

Keywords: Multimedia, Media consumption, Video, Television, Music, Context-awareness, Home, mobile, Geolocation, Social Network, Mashup, Visualisation, Scenarios, Business Model, Value Network.

1 Introduction

The wave of social networks and Web 2.0 services is putting the media industries under an increasing pressure. Long standing models in broadcasting, movies and music sectors are threatened by the overwhelming success of the Internet. Yet there is limited experience of successful endeavours in bringing the best out of the once clearly separated worlds of mass media and personal technologies. Interactive television experiments, for example, have been around for many years, but they have still to deliver on the promise of a big change [1]. Of course, games make for a huge realm, but despite some contaminations they are not to be mixed with mainly linear media. In this respect, novel approaches to create more interactive media experiences are needed as ever before [2]. VERTIGO[1] aims at tackling this challenge by focusing on the opportunity to expand and enrich the users' capabilities in finding, enjoying and sharing media connections or "trails" across the different physical and social contexts. These media trails are now just part of the user personal experience, at individual

[1] "Vertigo" is one of Alfred Hitchcock's most powerful, deep, and stunningly beautiful films (in widescreen 70 mm VistaVision); this classic 1958 noir, that functions on multiple levels simultaneously, has been a recurring case in the very initial project discussions and it is actually included in one of the project original scenarios.

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level or in the close social sphere of her immediate companionship (e.g. when watching a movie with someone); social networks do have sharing features, but they are scattered among many services with limited interoperability and have little or no integration with the linear media consumption setting. The VERTIGO vision is to transform such currently ephemeral "media trails" into a working technology. The system, currently in the early design stage, envisages providing people with a dashboard that would inherit the old-fashioned TV remotes function by reshaping this rigid tool, tied to the living room environment, into a personalised, context-aware, proactive media-rich interface.

First, the "trail" concept in relation to media and social networks is introduced, as grounded in the historic developments of hypertext and illustrated with a mash-up example. Getting closer to market dynamics, a comparative perspective on multimedia consumption across the living room, desktop and mobile context allows highlighting key phenomena at the intersection of the technology and business dimensions. Then, following a scenario-based approach [3] VERTIGO is presented by means of two original stories then followed by some hints to related technology challenges and concluding remarks.

2 Visualising the Trails in Media and Social Networks

One of the most prominent phenomena of Web 2.0 is the concept of a *mashup*, an application that is "generated by combining content, presentation, or application functionality from disparate Web sources" [4]. Whereas in its simplest form a mashup is a combination of a map or some other visual instrument and a set of data, the recent definition by Yu et al. [4] gives a more elaborate context to mashup development. In fact, mashup development can be seen as a form of information visualisation where the underlying objective is to provide visualisation users with expressive views that serve as an amplifier of the cognition of a user and give insight on a certain phenomena represented by the data [5]. Complemented with information visualisation tools such as Prefuse Flare [6] and others [7], mashup technologies and other Web technologies enable the development of highly interactive information visualisations that, according to Kosara, Hauser and Gresh [8] "allows the user to implicitly form mental models of the correlations and relationships in the data, through recognition of patterns, marking or focusing in on those patterns, forming mental hypotheses and testing them, and so on".

From the very beginning, the concept of a trail has been present in hypertext. While describing a fictional device memex, Vannevar Bush was the first to present the idea of hyperlink connecting pieces of information by association (instead of indexing) back in 1945, so in a similar fashion than the human mind operates: "The human mind does not work that way. It operates by association. With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain. It has other characteristics, of course; trails that are not frequently followed are prone to fade, items are not fully permanent, memory is transitory. Yet the speed of action, the intricacy of trails, the detail of mental pictures, is awe-inspiring beyond all else in nature." [9] Indeed, Bush added that "[m]an cannot hope fully to duplicate this mental

process [the intricacy of trails in human mind] artificially, but he certainly ought to be able to learn from it". However, different levels of association (e.g. geo-location, social ties, personal mood, activities) are already made explicit in social networks, even though it is difficult to trace and make use of them in the current scattered multimedia consumption landscape. To reuse McGonigal's [10] excellent metaphor inspired by Lewis Carroll, it would be possible to craft "rabbit holes" through which multimedia consumers are drawn into new multimedia landscapes beyond their imagination to find new, interesting piece of multimedia or a similar-minded fellow consumer [11]. The easy-to-access Web information (Web APIs) and text-based data formats (e.g. Extensible Markup Language) introduces great possibilities to implement such applications.

An example of a possible application is the (still fictional) Multimedia Trails. Collecting pieces of multimedia as hubs composing a set in interrelated multimedia, say a concert by Mondo Cane performing new versions of the Italian pop music of the 50's and 60s's. The setlist of the concert can be retrieved from Setlist.fm, the live recordings are available e.g. at http://concertlive.co.uk (in addition to unlicensed sources including BitTorrent), attendees of the concert from Last.fm, related videos can be collected from YouTube, images and trivia of the band from Last.fm API et cetera. In the screen capture (Fig. 1) we can see that the keyword-based filtering of videos expose both performances by Mondo Cane as versions by other actors.

Fig. 1. Example mashup of a Mondo Cane concert

Whereas individual interest hubs of multimedia can be visualised with methods of traditional mash-ups, the connections between the hubs or between individual appreciators of the digitalised culture can be represented e.g. as graphs in the tradition of social network analysis and visualisation [12] [13]. An excerpt of a social network is included in Figure 1: two users of Multimedia trails, Luca and Jukka, are connected to each other. Further, Jukka is interested in Mondo Cane that performs modern versions of Italian pop, one of Luca's favourite genres.

3 A Comparative Perspective on Multimedia Consumption across Three Key Contexts

Today, there are still clear boundaries between different multimedia consumption contexts. Each context has seen the growth of distinct ecosystems, very heterogeneous in

terms of business models, openness of markets and role of the user. Yet at the edges they start to overlap and build interfaces between each other. This is quite evident from the following discussion on three generic contexts corresponding to the main segments in the media business: broadcasting, the Internet and mobile telecommunications.

3.1 The Living Room Context

The living room is still dominated by classical mass media, even though various forms of interactive entertainment are making increasing inroads into it. Its traditional strength lies in creating high-quality laid-back entertainment and information experiences, focused on consumption: going beyond this legacy is an open challenge for those willing to innovate the interactive TV experience [14]. There are a number of multimedia solutions on the market targeting the living room, based on streaming access or personal digital libraries. Apart from large TV screens, set-top-boxes, game consoles or PCs in adapted design [15] have already gained a prominent role there. Proprietary platform solutions include the entire range of "media centre" software, e.g. Microsoft Windows Media Centre, the Apple TV and Nero MediaHome. Certain open solutions are available as well, such as the open source Media Portal [16] or Boxee. While those solutions rely on the Internet for content transmission, the rise of IPTV brought closed network end-to-end solutions like Microsoft Media Room, which offer a better quality of service for the sake of choice. Other products ranging from TiVO to the more recent Slingbox and Vudu that are aimed at either adding some interactivity or device-independence to the conventional audiovisual content consumption are also important. Recently, efforts to introduce Web content to TV devices have emerged with TV widgets (e.g. Yahoo! Connected TV). Moreover, Philips, Panasonic, Samsung and other companies are introducing TV devices that support CE-HTML. Apart from the Philips device, the Internet access will be restricted to a closed bouquet of services, where the manufacturer will act as gatekeeper. To generalise, interfaces are stylish and mostly usable, however limited in functionality.

3.2 The Desktop Context

The desktop, situated usually in an office or private room, is the context with the highest productivity potential. It offers the most efficient human machine interface for lean-forward media production and consumption. As an example, personal music collections are today often managed with desktop software. While e.g. Apple iTunes enables the creation of smart playlists composing music on basis of simple rules, the management and consumption of music is still controlled by hand. Music recommendation services such as Pandora.com or Last.fm Radio enable the editing of playlists and sharpen the user profile by evaluating user interactions, such as banning or adding a song. Web-based multimedia services dominate the desktop context and there is a plethora of them. Beauvisage [17], for example, reports that 63% of the time that a panel of French computer users spent on a computer was used to consume Internet services whereas dedicated multimedia applications were used only a 5% percent of the time. Five user profiles were defined on basis of the usage data: Web-oriented (42% of the users), Instant Messaging (IM) (14%), Multimedia (14%), Gaming (11%), and Serious (18%). Interestingly, multimedia consumption was overrepresented in the IM profile as was the

use of mobile phone communication [17]. Most remarkable recent developments in Web-based multimedia services include the trend to open service APIs to third parties and to create unified APIs, such as the OpenSocial API. This allows for creative service mash-ups, reinforcing the position of the World Wide Web as prime innovation source for media services. Songkick, for example, collects their tour information from MySpace, Last.fm and other sources. Big players such as Facebook are developing a platform strategy by integrating third party services. In Facebook alone, one is able to manage her musical interests with the Facebook default profiles and several applications including Music iLike, Living Social: Albums, and YouTube Video Box. But even though they all rely on the Facebook platform, their recommendation data is build up from scratch and they do not share it with other services. While standards like APML [18] will hopefully lead to better interoperability, the free flow of profile information is eventually dependent on business-level decisions made by the service providers. The state-of-the-art in video-centred Web applications offers another perspective. Major efforts are concentrated on the streaming quality and the social aspects are considered less. Services as Zattoo or Livestation concentrate almost only on the aggregation of channels on a dedicated video player; Hulu.com offers content from a group of TV broadcasters; the BBC iPlayer includes also a content download feature. Some other applications, instead, let users produce videos, mix, tag, and share them to communicate with other users. The most famous case is obviously YouTube and its many interesting features including video recommender, geographical video positions and the recent collaborative annotations tool. Overall, these services are pushing ahead a television consumption model in which the online desktop brings in more interactivity, even though they somewhat diminish the traditional social aspects of TV communal watching [19].

3.3 The Mobile Context

The mobile context traditional strength lies in communication and contextual services [20] [21]. Mobile media consumption has been moving from mass-market download offers to streaming services most suitable for high-end 3G and Wi-Fi enabled smart phones (see e.g. YouTube on the Apple iPhone). In parallel, broadcasters have been promoting 3G and DVB-H TV channels, apparently with limited success, at least in Europe. Moreover, users are provided also with alternative media aggregators such as Joost and Babelgum. Modern mobile devices can figure out their geo-location, but this is generally not used for current media applications. At the moment, multimedia management is still done with a desktop where smart playlists, multimedia stores and multimedia-ripping tools can be used to connect to different sources. Of course, mobile music is another area of huge interest. As Apple has brought a virtual iPod on their iPhone, other vendors are trying to catch up in this space; Nokia, for example, is pushing the offer of music packages with selected phones, integrated with subscription offers. Conventional broadcasting radio is also commonly available on mobile phones, with standard antennas or via streaming, with the addition of interactive extensions. Beside music listening, some more original features are emerging e.g. with the Last.fm applications for the iPhone and Google Android; they allows users to tap into some of the Last.fm social networking aspects of music consumption. Other recent socially-aware mobile applications include the recent iTunes DJ feature, where

people in e.g. a party can use the iPhone Remote application to vote and choose upcoming songs in the party playlist.

3.4 Device-Service Convergence and Platform Strategies

Drawing from the previous comparison, two general trends can be identified: the convergence of both devices and service provision on the one hand, and the raising of distinctive platform strategies on the other. Handheld devices, television sets and computers are constantly adding or combining features that were previously reserved for specific devices. As a consequence, the lines between the core functionalities of devices blur: any of them can meet some multimedia consumption (and creation) user' needs. This evolution goes hand in hand with the convergence of service provision as actors move in into new areas to explore new business models. The convergence of service provision is closely linked to platform strategies. This concept refers to actors in a value network vying for dominance by attempting to attract third-party services, content and end-users to their platform. This form of two- or sometimes multi-sided markets can take different forms and in the review above shows many diverging examples of organisations implementing this strategy.

4 VERTIGO Scenarios

4.1 Trails as Memory Helpers

Ann is a very sociable person and well educated in using online services (although she is not a techie). Outside working hours you will find her sitting at some fashion bar drinking an exotic cocktail with a friend, or posting on Facebook, or answering questions on LinkedIn. At the same time she really loves a quiet evening at home enjoying one of her favourite movies, just by herself, or with a few selected friends sharing similar interests.

Today
Ann really loves movies and anything that is in any way movie related, from music soundtracks to actor biographies and the like. She has a collection of them on DVDs, either bought or recorded from the TV or downloaded over the Internet. The funny thing is that when you open the case of one of her DVDs, there are a bunch of notes and half glued Post-ITs that fall out. These are things like: "This movie is a remake, I should find out what the original was and who was playing in it. Lisa would know. ASK!!!", or "There was a kind of controversial book about the film director. GET IT and READ IT", or "The scene of the girl walking alone on the Champs Elysées, really moving. Julia would have loved it. Next time invite her and enjoy together", or "This movie does not seem that funny anymore, probably last time I watched it, I was in a better company". It is always something personal: a reminder to check the sound track or call that friend who knows everything about that actor.

Tomorrow
Ann is even fonder of movies but she is now able to personalise every media experience in an online inter-linked stream of memory flashbacks and plans for the future.

She has a different way of keeping all of this together. Ann's media dashboard interaction features drive her to expand beyond simple playing: she can post a comment, store it for future memory, share it with friends or possibly let it be public for everyone; get the answer to her questions from Lisa or Julia and also order that controversial book from a partner online bookstore. When she decides to watch again a movie, her history of watching that movie can be retrieved and the new experience will be added. All of this experience is visualised as a media living "add-on", a starting point for further experiences. When she decides she wants to watch a new "noir", she can get opinions from the "noir-lovers 24/24 7/7" group in the movies' social network and make a selection based on this advise. She can see and visualise the "not-to-miss" movie of the week – on the basis of trusted opinions – and plan to watch it on TV. She can also check if her friends are watching the same program, or invite some of them to do so and share the experience.

Fig. 2. On the left, Ann is overwhelmed with stick notes as memory helpers; on the right, Markus is struck by the connections or "trails" between the Golden Gate and the Vertigo movie

4.2 Linking Places and Media

Markus is a long time independent traveller, quite a heavy music listener (having been himself active in playing with a college group) and avid reader of books and magazines. Now in his late forties, he just feels a bit frustrated by the complexity of pursuing his interests online, not being in the habit of moving from one service or social network to another, building profiles, installing and updating new software and the like. He is a bit more confident with cell phones though: he likes to fiddle around with them and has enough money to buy the good ones, even if he is not so much into the technical details.

Today

Markus is on vacation in the US, wandering around the Golden Gate Bridge in San Francisco. A wave of memories wells up in him: a key scene from a Hitchcock-classic, VERTIGO, was shot at this particular location and, of course, he forgot to include the soundtrack in his iPod playlist when he left the hotel in the morning (actually, he only has a CD-version of the soundtrack in his CD shelf). It occurs to him that that the bridge has starred in quite a few movies. He tries to figure out where to look for some more information now that he is has a brand new smart phone, with data access even in the US thanks to that roaming option he has subscribed before leaving. The difficulty is where to look for the information. Wikipedia entries are

difficult to read on the small screen; moreover, it should only be possible to listen to that track. This way, he would be sure to remember the movie!

Tomorrow

A few years later Markus is back on the West Coast. As he is on location, the map on his smart phone entices him with icons pointing to multimedia "trails" found in this location. A dynamically composed playlist appears in his player including the main theme of VERTIGO as well as versions of other Hitchcock themes by Laika & the Cosmonauts, a long time favourite of Markus, and by Los Angeles Philharmonic conducted by Esa-Pekka Salonen, a fellow Finn. Also images and movie scenes appear in the playlist. He shuffles it until he notes one piece that reminds him of that famous movie he was pondering about the other day: the bridge is also featuring in the opening scene of The Maltese Falcon! He is able to post an extract to the media social network he is finally able to master, with an impromptu comment. What a better place to comment on a movie than its real stage! Media outdoors can be even more fun than at home – but certainly he is going to enjoy the full movie on his HDTV set when he returns home (perhaps with some more comments from friends).

5 Towards the VERTIGO Contextual Media Dashboard

The scenarios presented above flesh out the VERTIGO vision from the end-user point of view; at the same time, they try to convey the idea of how to translate multimedia "trails" into working mechanisms.

From this latter technology perspective, VERTIGO is an extensible context-aware media delivery, exploration and management platform featuring a rich-media end-user control dashboard. The system taps the power of social networks and ubiquitous computing to change the ways in which media such as movies, video, music and all types of TV content are delivered, explored, managed, and enjoyed. To make this real, a number of challenges have to be faced in the areas of multi-context content and media service provision, social network-aware media consumption and sharing, personalisation and recommendation systems, adaptive, context-sensitive visualisations for media consumption, among others.

It is also worth to recall that the early ideas presented in this paper are the result of an initial common effort in which have taken part players from different industry sides, including a public broadcaster, a leading mobile operator, a major player in consumer electronics and set-top box manufacturing, in cooperation with research and innovation specialists. True openness and full interoperability with Web-based services was unanimously sought for, well beyond the addition of feeds or other limited layers of interactive content, as shown by the already available market offers. Current limitations are not only the result of established proprietary approaches, but in some cases they also stem from the conflict between competing platform strategies, be they based in the Internet or IT domains, or in the traditional broadcasting and media sectors. Yet there is an increasing awareness that the flexible and personalised interactions made popular by the Internet have to expand to the media and all across the various contexts in which media are consumed, shared and extended. In order to make this, users and professionals have to be provided with new interfaces, new services

and new expressive means. The discovery and enjoyment of "media trails" appears as a promising path, both from the user' interest and the relevance in technology and business terms. In this respect, VERTIGO strives to be an experiment in which a new media value network might take shape.

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