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Nack, F.; Jones, S.

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Nomadic Information in Social Environments

Frank Nack and Simon Jones
HCS, University of Amsterdam
{nack,sjones}@sciencedotuvadotnl

Abstract

This paper investigates the uses of multimedia information in environments, where information does not merely represent static aspects of a concept or event but actively adapts to the experiential space of a user and thus shapes the creative means of social interaction in highly mobile societies.

1. Introduction

Over decades people in western societies have experienced the world and their private lives as static with respect to their spatial and social coordinates. In the view of globalised and virtualised societies this felt security vanishes resulting in behaviour that falls back into strategies long assumed buried in the past: nomadism.

Nomads are usually understood as communities of people that move from one place to another, rather than settling down in one location. One of the later stages of nomadism, called nomadic pastoralism, was a result of the Neolithic Revolution, during which humans began domesticating animals and plants for food and started forming cities. Here nomadism had existed in symbiosis with already settled cultures trading animal products (meat, hides, wool, cheeses and other animal products) for manufactured items not produced by the nomadic herders.

The concept of nomadic pastoralism celebrates its resurrection in industrialised nations in various forms, i.e. In management practices, social organization, or the composition of information. An example of nomadism in social organisation is the growing movement of RV lifestyle (RV = recreational vehicle), where people are interested in travelling and camping rather than living in one location. The movement is divided in various subcultures, such as workampers¹[1], grey nomads², or technomads [2].

Technomads are also a good example for nomadism in management practices. Technomads make use of work arrangements in which they enjoy limited flexibility in working location and hours, such as e-commuting, e-work, telework, or telecommuting [3]. The main aspect is that the daily commute to a central place of work is replaced by telecommunication links. Many work from home, while others utilize mobile telecommunications technology to work from coffee shops or myriad other locations. This is called telework, referring to substituting telecommunications for any form of work-related travel, thereby eliminating the distance restrictions of telecommuting [3].

With the swift developments in mobile phone technology, which turned the mobile phone into a pervasive, low-cost personal item, this trend toward nomadic information exchange has meanwhile also reached the private sphere. According to figures from Eurostat [4], the EC's in-house statistical office, there are in 2007 95 mobile phones for every 100 Europeans. The figures reveal a divide between old and new Europe in commitment to fixed phones. While older members of the EU, such as the UK (13%) and Germany (11%), tended to have fewer mobile-only homes compared to newcomers such as the Czech Republic which has 42%, though it seems that this trend is changing too.

In addition, there are 169 million web users in Europe who see the web as the prime information source and accessible regardless of their current location. In particular the younger population up to 30 years of age has fully integrated the web into their lifestyle. One particular result of this integration is that these users expect, much more than their counterparts, that they have an influence on the information source, clearly advocated by sites such as Wikipedia³, Youtube⁴,

1 These are people that work at the campgrounds/rv parks they stay at for site and perks.

2 Retired travelers who usually travel north in winter in their RVs to catch the warmer weather and return south for spring and summer.

3 http://en.wikipedia.org/wiki/Main_Page

4 <http://uk.youtube.com/>

Rever⁵, Metacafe⁶, Flickr⁷, MySpace⁸, Facebook⁹, Stickam¹⁰ and the like. The phenomenon of these sites resembles clearly the developments of the neolithic revolution – the societies formed by the sites try at a certain point to domesticate the social interaction and codes, i.e. by enforcing editorial decisions, imposing stricter rules on the use and reuse of material, e.g. by applying copyright laws, or by introducing new economic strategies, such as user-centric advertisement. The inhabitants, who trade their creativity, based on which these social environments live, with the freedom to create and influence their space, will only rest as long as the fertility of the brand is sustainable. The second generation of Web users—most likely their successors, too—are flighty and loyal mainly to the information they create, consume and distribute, regardless the environment they work in. Like a caravan they will push along once the fun part vanishes to try finding a site that suits them better.

The two core aspects of nomadism, namely mobility and individualism, strongly influence the view on information for the future. Information needs to be understood in a holistic manner that allows humans firstly to freely chose locations and still be able to socialise with established groups and second to efficiently communicate by accessing information relevant for the current spatial, temporal and social context. It seems that the concept of information as a statically stored item that waits to be used needs to be replaced by a fluid and experienced-based concept of information that allows it not only to individually serve but also to follow the user on its paths.

In this paper we describe our vision of information environments, where information does not merely represent static aspects of a concept or event but actively adapts to the experiential space of a user and thus shapes the creative means of social interaction in highly individualised and mobile societies.

2. Scenario for Nomadic information

In this section we describe a scenarios to exemplify what we mean with nomadic information. It is placed in the realm of entertainment and cultural heritage, namely in a museum space, which is part of a larger city-based environment. With this scenario we aim to show that the form of fluid information we wish to

establish emphasise the interconnection of work and leisure, production and consumption in a mobile society.

2.1 Museum – mausoleum of information

The primary aim of museums is to collect, preserve, and support the study of historical, artistic, or scientific artefacts. A collection exhibition is the result of that work, but the exhibition should also garner income to guarantee the museum's continuation. Generally the biggest challenge of exhibits has to do with limited space, resulting in mere fractions of a collection that can be presented at any one time. Consequently, museums tend to display the more popular artefacts. For most institutions, the dilemma is that today's visitors no longer desire the traditional canon that supplies them with similar material in comparable presentation formats.

On the contrary, the audience wishes to be confronted with connection, context, and uncommon perspectives. In addition, audiences are experience-hungry and desires to see knowledge being communicated in a compelling and enjoyable manner, accessible on an individual level, which includes the connection to experiences already made at other exhibitions. In short, people expect to experience an event as a continuous, flexible, and networked exchange of ideas. Nothing should obstruct this experience, turning it into an ambient experience that integrate as much of the personal technology and equipment, rather than gadgets provided by the institution currently visited.

2.2 Museum – home of ideas and interaction

Taking the above shortcomings of current museums and basic user requirements into consideration a different museum experience needs to be provided.

Peter, an Italian urban architect with some experiences in film set design, is going to attend a conference in Amsterdam. As usual before leaving he updates his mobile phone with his latest travel and interest profile. Having arrived in Amsterdam his phone informs him about the currently happening cultural events, already clustered according to his city experiences of former travels. The interactive exhibition of Dutch silent film in the Filmmuseum catches his interest and so he marks this event among others. Once he arrived at his hotel room, he sits down and accesses on his private travel site the generated visit plan for the next days, adjusted to his work agenda. As opening hours are longer today and all preparations for tomorrow are done, he decides that a

5 <http://revver.com/>

6 <http://www.metacafe.com/>

7 <http://www.flickr.com/>

8 <http://www.myspace.com/>

9 <http://www.facebook.com/>

10 <http://www.stickam.com/>

visit of the Filmmuseum would nicely fit now and he changes the agenda accordingly. He also sees that friends and colleagues, also part of the same travel community¹¹, either have similar plans or have still free slots where he has planned events. He quickly sends some invitations and then leaves for the city centre.

On his way to the Filmmuseum, the mobile phone points his attention to potential interesting sights and events – introducing them with more detail if he shows interest. On his map he can also see the location of these places, allowing him to establish an idea about the layout of the city with respect to his interests.

Once he arrives at the Filmmuseum, the mobile phone changes the interaction from the city story servers to the story engines of this institution. For Peter this change is not noticeable.

Inside the museum Peter can explore freely. The first screen he passes provides him with information to facilitate him getting into the subject of the current exhibition. He also learns something about the available physical objects of the exhibition. He is additionally informed that the larger screens respond to the overall audience in their closer proximity, whereas smaller screens are merely used to serve individual information needs.

The presentation Peter follows is based on the story structure he used during his last visit at the Tate Modern in London, emphasising overall structural elements of the genre to be investigated and then quickly dive into detailed explanations. The Filmmuseum's story engine has taken that information from the travel and interest profile stored on his mobile phone. The presentation also tries to highlight relations between the current topic, namely Dutch silent film, to other interests of Peter, such as film genres like documentaries, fiction films or expressionistic films or set design and literature, preferably to material available in the museum's digital archive.

Peter strolls through the museum and the story of the exhibition will follow him, depending on his speed of walking. The larger screens he mainly sees higher level information, which is arranged to present the story in a way that suits the majority of the audience. In cases he likes to receive quite specialised information he can ask that it is sent to his mobile device (either as text, sound) or he visits one of the smaller and rather isolated screens.

At any time he can use the mobile phone to set highlights which facilitate him to record a path through the story space. Highlights are merely time markers which the system uses to identify the topic currently under investigation. Depending on the button pressed

Peter can also emphasise the value of the mark (from very important to needs to be reminded). Based on this interaction the museum's story engine helps him to explore the current exhibition space but can also facilitate him to change the presentation all together and investigate other topics. For example, observing the development of the set design in Dutch silent film the story engine can establish side lines to other non Dutch films in the archive from the same period, resulting in a transition from 'De brug' a film by Joris Ivens from 1928 to Walter Ruttmann film "Berlin, Symphony of a Great City."

During the presentation Peter is presented with the description of a set design on which he also worked in a 3D project that re-established the development of this film's sets. He can enter this information into the storyline, here in form of a simple link to the web page of this project (he can later add more information if he wishes). For that he uses a simple editing suite provided by the museum, that facilitates the creation of information in any media type, where the new item is automatically included so that the story engine can immediately reuse it.

Peter also marks this part of his story path, again using the editing tool, so that he can later send a little info to his friend who also worked with him on this project.

While meandering through the exhibition space he is necessarily confronted with other material watched by other visitors, who by chance have long left the exhibition story space and diverted into other topic. He can join any other story path if that fits his interest better by marking the story point of the other users as his own current story point. The resulting path will, however, most likely change very soon direction, as the personal interests of the two users are different. As Peter is quite talkative, he started chatting to the other person, who also seemed approachable, and for a few minutes they had an interesting exchange of ideas about the work of Antonioni.

At some stage Peter wants a bit of rest and thus approaches the cafe. While having tea and a giant almond rounds, he revisits the marked event of the set design he wanted to inform his friend about. Using the editing device on the phone he can combine the location of the story path, the key paragraph of text and the part of the video clip relevant to that section, add a message from himself and mark that the system should add the link of the page it is going to generate for Peter at the end of his visit. This page will not only provide a graphical description of his way through the museum including the material he has visited but additionally life views from the site and links to the virtual space of the museum relevant to the investigated topics. The

11 Such as Dopplr: <http://www.dopplr.com/>

particular point on the path the message is about is highlighted as shared experience.

Having sent the mail he looks at one of the screens and gets inspired by a visual summary of topics explored by current visitors and he plans to return to the original exhibition at a particular topic. He also realises that the museum offers a service to connect people with similar profile and paths to allow for shared experiences of the museum space if the involved mobile devices have established a general agreement on communication. Peter opens the indicated message, quickly scans the interest profile, age and sex of the listed persons and then makes a decision to contact a woman slightly younger his age. He is informed, however, that the other person is not interested in being contacted and so he tries the guy in German expressionistic film. Shortly after his phone rings and they arrange to meet.

Both Peter and Marc spend around half an hour together discussing Murnau's "Sunrise", which is available in the Filmmuseum's digital library. They use one of the small screens to scroll through the film for making their points and sometimes add their opinions in form of spoken comments to it. Personal information as their name is provided to the story system through their phone. Both also use one of the cameras available to produce life video scans which they both send home to their partners.

When Marc has to leave they agree that personal details, such as address and phone number should be placed on the private part of the personal page generated at the end of their visit and they instruct the system through their phones accordingly.

Peter has another half an hour and so he decides to have a look at his visit page at one of the terminals in the lobby. He sets a couple of access rights and has a look at the list of items suggested to him being available in the museum shop. Nothing appeals to him and so he departs for dinner. He looks at the city map on his mobile phone and decides for a French restaurant close to his hotel. Having returned to his hotel, he again visits the by now further enhanced museums page. He has now the option to revisit any point of his tour, offering the material he actually perceived plus additional links to related sources of the museum or other institutions on the web, or to enter the virtual Filmmuseum. This virtual museum uses material that could not be presented due to spatial or temporal constraints. Second, the virtual Filmmuseum offers a system of connotations among the artefacts to be exhibited, which are translated into a spatial structure of rooms, corridors, and places of different size, shape, remoteness, or proximity. What Peter really could explore here is a semantic structure by navigating virtual spaces with the topics contained in

the rooms. The semantic structures facilitate a visualization that forces him to move about the space to find out facts. Naturally, the virtual media architecture must not be 3D only because the physical space proposes this analogy¹². The important step is to understand that the virtual and the physical space represent two sides of the same coin—the domain semantics. That, however, he leaves for another day after he had a quick look.

3. Challenges

Peter's day had been an exercise in meeting predetermined and predictable needs. However a predicate of the nomadic mindset is the desirability of being exposed to new concepts. The most valuable of such concepts challenge Peter's assumptions and perspectives and ultimately alters his understanding of information and thereby his own internal model of the world. In this sense, challenge is indeed the challenge we face for such information systems. Current systems utilise similitude as selector of new experience. 'If you liked that then you'll like this'. However the more profound and hence lasting experiences are the unexpected ones that are at once accessible and confrontational. It is easy to be either, but being both is a demanding challenge. So far we have little capability in marshalling such experience for users. Simply choosing things at random or those some significant distance apart in feature space is unlikely to be successful. If Peter is a committed vegetarian he is unlikely to appreciate a visit to a meat market, no matter how agreeable the architecture.

Traditional approaches to the exposure of new and challenging experiences occur either as part of a guided educational program with an accepted authority or through detailed individual study via a tutor or mentor. The nuanced-driven nature of these approaches overwhelms our current ability to characterise or understand a user in e- or m-space. However unless and until we can achieve this level of modelling and understand more generally the principles and practices of successfully challenging a users interests, our ability to tailor experiences to user will simply tell them more and more about less and less. This does not bode well for the extensive or sustained acceptance of such systems and represents in our view an urgent and largely unexplored research challenge.

The above scenarios describe an ambitious adaptive indoors information system. However, as pointed out in the introduction of the scenario, it is not restricted to a merely restricted to a on various levels controlled

12 The virtual is inspired by work of Fuchs and Eckerman [5]

space, such as a museum, but would also work in a larger context, such as a city, or even in an abstract space, like a language system, which we explore differently while we learn it.

The basis for the approach described in the scenario to work is to root technological developments in the understanding that information interest is based on sensory experiences that is shaped and filtered by emotional and cultural memories. Exploring a museum, a city or a virtual knowledge space is an infinitely personal experience that exists as a memory that constantly changes as we experience it over and over again. The sensory experience can be determined by many different factors: navigation, speed, focus. In addition we perform actions that as component of our strategy to achieve the goal: random exploration of the physical space or the intellectual space (e.g. never move and explore in front of one screen), follow the shortest paths to reach artefacts, or look for different intellectual invitations. How we proceed depends on our experiences of similar places. If a system has access to some of these components it can to some extent predict our interest and thus serve our information need.

In this section we highlight a number of technological challenges which also cover research carried out at the HCS lab as well as at the Centre for Content, Culture and Technology (CCCT) at the University of Amsterdam and Hogeschool van Amsterdam. We will, however not analyse the environment in its entirety, as this would go beyond the scope of this article. We merely focus on the aspects of user and media representation, as this is the focus of our research.

3.1 Context

The access of information depends on the personal, spatial and temporal context in which a user is situated. As people frequently switch between contexts it is necessary that pervasive information adapts to the user.

Distributed here means that we see information provided on localised isles that are combined by personal and temporal markers of individuals to either a personal or community trace. An important aspect here is id¹³ as it allows the user to trace aspects of appearance and connection over time and space. The aim is to allow placing information where it was created but at the same time to carry some of it with you or retrieve it whenever needed.

13 An initiative as the OpenID Foundation (<http://openid.net/>) might be helpful. It needs to be stated clearly that the authors strongly believe that the individual user should always have complete control over the use of this id.

Localising information is only one aspect of context. More important is to embed the information into a conceptual, processual and emotional framework. The resulting restriction of context description is the key problem here, as quick decision making processes are needed to serve the information need adequately. This is not only a representation challenge, as we will see a bit later, but also a challenge for the underlying network structure.

Allowing the access of information for the creation, modification, search and sharing by retrieving and deliver it in real time we might need a different network that is rather content and service centric than IP oriented, where the key and main focus is the user and the services demanded more than the location of the service. The aim is to be able to switch between server and client capabilities as needed. First pushes in this direction are provided by JoikuSoft¹⁴, who provide "JoikuSpot", which allows making available the UMTS- or HSDPA internet connections of the mobile phone via W-lan to other machines.

Joiku needs to be understood as a pointing finger not the destination as at heart it is enabling an extra broadband connection for laptops. However, the longer term issues indicated by Joiku is the ability to form ad-hoc networks of handsets connected via mobile broadband or wifi to share resources (e.g. locale or sensor information) and content (a 2008 Nokia N95 is capable of holding as many as 10 full-length movies and many hundreds of YouTube style clips). Such systems are highly likely to be used for nomadic communities as they reflect community dynamics and offer both opportunities (my handset, my location, my context) and constraints (no central authority, incomplete or partial contextual comprehension).

Understanding context in the light of localisation, interaction and temporal constraints means that they form the basis for the detection of interest. The above scenario suggests an approach that mainly exploits the user's actions and the location in which they are performed. Each of those can be collected via various sensors. Technologies, such as accelerometers for movement or touch-sensitive screens for the identification of gesture can be applied [6]. Research has to determine, though, which is the most efficient way to turn which sort of gathered data into recommendations for a suitable information provision. This influences the development of information representation.

3.2 Information authoring and exploitation

The information offered to users needs to be authored and our scenario showed that there are in

14 <http://www.joiku.com/>

general two ways: information created by experts and user generated content. The scenario showed that the line between the two is not clearly drawn.

With respect to content created by experts there are two important aspects that need to be addressed. First of all an authoring environment needs to be created that supports the overall general production flow and within the communication between the various involved contributors. Second, the content needs to be created so that, depending on the changing information needs, access mechanisms and expectations of the potential user, adequate material can be automatically generated.

Developing an authoring environment, that for example can support the design and realisation of a complex exhibition, we need tools that support the association of semantic annotations with media assets to allow already during production creative stimuli for the creators. Designers and domain experts must be able to use their creativity in familiar work processes as well as their human processing to extract the significant syntactic, semantic, and semiotic aspects of the media's content during production or any time after. Over time the collected authoring data will allow automated support in form of suggestions for user patterns (e.g. quick, medium or long time access, potential user groups, etc.), investigation of cross-domain relations and working pattern of the author and suggests alternatives to stimulate different views in the author (creative support). The result is semi-automatically generated machine-readable descriptions based on a formal language. Both the raw data and the associated metadata form the basis for persuasive content but they are also an aid during the production phase of an exhibition as they guarantee that no potentially interesting information during the authoring process gets lost. In addition they provide the ground for checking the accessibility of the content. Examples for first attempts into that direction are [7] and the NM2 story authoring tool for interactive media¹⁵.

The aim is again to fragment the fundamental processes of media production [8] to support their easy placement in the overall context of production and consequently consumption.

Given the unpredictable nature of the relationship between visitor and presentation in a dynamic environment, it's infeasible to create all relevant media documents for a virtual space in advance. We need automated processes for generating visually pleasing media documents. The tools for designing and maintaining such processes are in their infancy.

Their development depends on our better understanding of objective measurements for media

units (such as colour, shape, or texture), representing prototypical style elements and how they can be combined with high-level conceptual descriptions supporting contextual and representational requirements.

More importantly is, however, to establish a connection between the material and the context of the user who wishes to work with the information. As outlined in the scenario, it is our hypothesis that distributed reactive information environments use a restricted context representation. In particular the actions with context defined processes, such as accessing, creating, consuming, annotating, allow for linking data to user interest. Strategies to achieve this type of adaptive interaction can be adopted from case-based reasoning (CBR) [9], in particular those strategies that trace the history of actions [10].

Having the content as well as context representation in place it is then possible to provide the user with tools that allow him for a particular context to add information without forcing him to deeply understand the internal representation for this context. Using the tracing mechanism as described above in combination with the editing tools the actual inclusion into the local context repository is shield from the user.

The challenge for research lies here in the provision of efficient authoring tools that work on mobile devices [11]. They have to be powerful enough to allow the user access and authoring as described in the scenario but are adapted to the particular restrictions mobile devices provide. This means that the PC view on user authoring interfaces needs to be left for exploring new types of authoring paradigms.

The critical question still remains, how does an adaptive information system that is aware of a user, boosts the interest and creative exploitation of information space if it not necessarily knows much about them.

3.3 User model

The available methods within personalised hypermedia systems [12] quickly reach their limits if applied in highly distributed and adaptive environments. The usual approach is divided in two parts: the server side, which generates the user models from a database containing the interactions of the user with the system and the personal data/preferences that each user has given to the system. The server uses this model in combination with a hypermedia database in a personalisation engine to identify user needs, decide on the types of adaptation to be performed and communicate the resulting presentation to an adaptive interface. This approach considers the user model as a

15 <http://www.ist-nm2.org/>

set of information structures that contain Kobsa's six basic components [13]:

1. representation of assumptions about the knowledge, goals, plans preferences, tasks and/or abilities of the user;
2. representation of relevant common characteristics of a user pertaining to specific user subgroups;
3. classification of a user in one or more of these subgroups;
4. recording user behaviour;
5. distillation of assumptions about the user from the interaction history;
6. generalization of the interaction histories of many users into stereotypes.

This approach is too all-encompassing for the nomadic environment described earlier. As mentioned above, it is our hypothesis that the contextualisation of the information presentation can be tailored to match the unique and specific needs of an individual or a community without providing the 6 components.

We assume that a small amount of basic descriptions of task and genre preferences is sufficient to establish information access and exchange. The critical question is what is the bare minimum and what is going to happen if this minimum turns out to be not enough. Our assumption is that the mobile device can always access any of the machines on which the user maintains his profile, but more research in this direction needs to be performed.

Besides the fragmentation of the 'central user model' (see the downloading of the travel and interest profile in the scenario) we also see the need of short and long-term memory representations that allow further clustering of information provision. For example, how do we supply information to groups, based on existing user preferences, if the group changes its consistency frequently? An example for that are the larger screens described in the scenario. This problem becomes even more challenging if we assume that the screens are situated in an open space, like a square in the city. Here questions like distances between group members, their position to the presentation source and the available individual profile information are relevant. As we aim for a freely shareable profile the merge is critical. We hope to contribute with our research to ongoing work on profiling and the exchange of profiles between different social networks¹⁶.

For the long-term representation of an individual user profile it is important to understand the change of the profile based on the experiences currently made in

relation to trends already established in the past. The interplay of these factors with the representation of information already collected in the past is relevant to be able to truly serve the user.

The relevant and truly new aspect is to develop technology that can establish a distributed user profile, which a users can maintain and which ultimately allow them to pick those elements they would need on their nomadic explorations, where picking needs to be instantly possible in greatly changing contexts. The question is: how much of this decision-making are users willing to shift to the machine to establish fluid information provision. The aspect of access rights and trust are essential and need further investigation.

3.4 Real environments

The essential factor to test all the above ideas is to provide real systems. So far they do not exist. At HCS and CCCT we start working to establish such mobile environments within the city of Amsterdam as a test bed. The aim is to provide solutions that allow a seamless meandering between closed and controlabel environments, such as a museum, and open and chaotic environments, like a city area. The projects are designed for multidisciplinary research groups to address HCI as well as representation challenges. Particular emphasis is put on the application in the city, using the city as the lab. The biggest effort will be the integration of various and differing technologies. We hope to overcome this with an open source approach¹⁷ that should allow the users to adapt the environments even better to their needs.

4. Conclusion

In this article we outlined our idea of nomadic information and its implication on the development of tools for content authoring, access and presentation. The outlined approach establishes the basis for the recording of experiences as interconnected and interactive threads. Accounts of a user's different experiences will be connected to each other, but so will be the accounts of similar experiences of different users. A continuously woven narrative will emerge that provides a more natural way for recounting past experiences and establishing social interaction in a dynamic and mobile environment.

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¹⁶ The potential collaboration between Nokia and Facebook is an indicator that this direction of research will become even more relevant.

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