

AMuse – An Initial Plan to Associate Museum Visits to Outdoor Cultural Heritage Activities

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ABSTRACT

In this paper, we examine a possible plan to associate museum visits with outdoor cultural heritage activities. The plan consists of looking at museum visit movement styles to predict personality and learning styles, and using holding power to determine user interests. We then describe how this information can be utilized to both suggest possible venues (opportunity development) and provide associated content (opportunity exploitation) at opportune location and times in novel ways.

Author Keywords

Lifelong Cultural Heritage; Mobile Museum Guides; Opportunity Identification; Opportunity Exploitation

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

A number of meta-issues have begun to emerge in the use of technology for cultural heritage. Among these meta-issues is "lifelong cultural heritage"[13]. This entails many different aspects. One aspect is connecting museum visits to other cultural heritage visits. Another trend is the emergence of commercial systems, such as Google Field Trip[<https://www.fieldtripper.com/#>], TourML standard app[22], that provide information on more than one venue. This paper presents significant progress and details on the work described in [23]. In addition we use principles described in [15].

BACKGROUND

Part of the work is based on marketing theory of opportunity identification and exploitation. Opportunity identification is a theme that has been intensively studied for business purposes [3, 6, 8, 9] and can possibly serve to

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inform us in the cultural heritage field with the proper adaptations. For example from Ardicivilli et al. [3] we use: "while elements of opportunities may be "recognized", opportunities are made, not found" and "therefore [prefer] opportunity development rather than opportunity recognition". They define opportunity as the chance to meet a market need (or interest or want) through a creative combination of resources to deliver superior value. In addition the field of opportunity identification as related to cultural heritage has been studied under tourism research [1, 11], however not in the mobile context and not in the context of personalization and connection to prior museum experiences. Verbke and Rekom [11] discuss the concept of the "museumpark" of multiple museums having a positive marketing effect. One could postulate that the indoor-outdoor connection may also have a similar effect. Motivations (24 items) and incentives for cultural heritage are clearly part of the opportunity identification and are listed by [11].

In order to do opportunity identification, we need to understand additional motivations and incentives present in the cultural heritage field. Amy Jones [20] discusses the motivational factors for success in the mobile learning context: We believe that these items are relevant for the mobile cultural heritage experience that we aim to construct, and should be adapted as motivational factors for this experience (See Table 1).

Motivational Factor	Relevancy to Cultural Heritage
Control	Pro-activeness [16]
Ownership	Connection, Identity [7]
Fun	Quality of Experience [18]
Communication	Social Aspects [19]
Learning in context	Free Choice Learning [7]
Continuity between contexts	Coherency [5, 24]

Table 1. Motivational Factors

Visitors have been observed to behave in certain stereotypical movement patterns [25]; patterns such as Butterfly, Grasshopper Ant, and Fish, [21]. We extend this concept of movement patterns to include usage patterns of mobile guides.

The use of personality types to tailor software is not new. We use the SLOAN Big 5 characterization as it is standard and much research has been done using it [10]. We focus on two traits we believe are connected to the museum experience: Inquisitiveness which is a measure of curiosity and Orderliness which measures thoroughness and the need for structure. Introversion and Extroversion could also play a part in group visits, but is not examined in this research. In addition we posit a connection between movement types and "identity" types proposed by John Falk [7]. In addition, preliminary ideas for the connection of movement patterns to personality types have been proposed [2].

SYSTEM DESCRIPTION

The system AMuse (Associating MUSEums) is being developed to bridge a perceived gap between the museum experience and subsequent experiences at cultural heritage sites as part of the effort to develop lifelong cultural heritage [14]. In order to provide a framework for this experience we adopt parts of "opportunity" theory from marketing research.. The system operates in three venues: the museum, pre-visit, close by an external site.

- The system attempts to learn about the user through his movement and use of mobile guide in the museum (**Information Gathering**)
- The system develops opportunities to give personal advice at appropriate times advice where is it worth visiting given the above. This is in-line with marketing theory which suggests that opportunities don't just present themselves but are nurtured. (**Opportunity development**).
- When an immediate opportunity (primarily a location, but can be a date, news item, or person) presents itself, an appropriate associated media asset is presented to the user. (**Opportunity exploitation**).

Information Gathering

The system assumes the use of a mobile guide, which is associated with points of interest (POI). The mobile guide, at each POI, presents a list of relevant media assets. The mobile guide system logs: the POI, which assets are chosen how long they viewed the asset, and in general how long did they stay at the point of interest. The logs are converted into a proposed standard format, consisting of events and activities to be later processed by the system. This data is be augmented by identity and demographic information collected explicitly either at the time of registration or at the end of the visit. We collect two types of information, the first in order to determine general personal characteristics and the second in order to determine specific topic interests. In general we use movement styles, such as ant, grasshopper, butterfly, and fish to predict user characteristics (such as personality). We use time viewing presentations in order to determine user topic interests. In

addition we can use the visitor's choice of media assets to determine user media preferences. At the end of the visit the user is asked to download an application to their smartphone and register thereby connecting their visit information to future opportunities.

Computing Personal Charecteristics

In order to characterize the user we make use of his general movement activities. We use the following statistics:

- NumberOfPOIsVisted (NPV) – This is the number of positions where a person stayed more than 9 seconds as detected and logged by the mobile guide's positioning system. Nine seconds is a number we have used for previous analysis and has provided good results
- POIsWherePresentationsSeen (PPS) – This is the number of positions where the visitor viewed at least one media asset connected to that position as computed from the logs of the mobile guide.
- NumberOfPresentationSeen (NPS) – This is the total number of media assets the visitor viewed as computed from the logs of the mobile guide.

Type	Formula
Fish	$(NPV - PPS \geq PPS) \parallel ((PPS/NPV \leq T_1) \& (NPS/PPS < T_3))$
Ant	$(PPS/NPV > T_1) \& (NPS/PPS > T_2)$
Butterfly	$(PPS/NPV > T_1) \& (NPS/PPS < T_2)$
Grasshopper	$(PPS/NPV < T_1) \& (NPS/PPS > T_3)$

Table 2. Classification of users based on movement

The thresholds $T_1=0.5$, $T_2=0.5$, $T_3=0.3$ were obtained by experimental trial and error until a good clustering was obtained on visitor data at the Hecht Museum (n=400).

If we take the meaning of the formulas what we are positing is that a fish sees very little presentations but wanders around. An ant visits a large number of POIs and sees a large number of media assets at each spot they visit; while a butterfly also sees a large number of POIs, they sees less media assets. A grasshopper visits few POIs but sees relatively many media assets.

Computing Visitor Interest Preferences

Using standard methodology each POI has associated with it a number of tags taken from a specific ontology (possibly with weights). In addition each media asset has associated with it a number of tags taken from a specific ontology

(again possibly with weights). Using the logs of the guide we determine time spent (either at the POI or with a media asset). These durations are normalized and added to the user model.

Other Information Garnered

If the guide has a variety of media types to choose from, then the system can ascertain which media format the user prefers by looking at the museum mobile guide logs to determine what are their preferred media format (audio, video, pictures) and add this information to the user model.

Additionally we can explicitly ask on which day of the week the user plans their weekend leisure activities. We may also ask their preferred communication channel (e-mail, SMS, smartphone notification, voice message)

If the visitor takes pictures, using the guide, or provides access to his tagged photos, these may also be used by the system. If the user grants access to their social network, then this information may also be used to provide content.

Making Inferences from Movement Styles

As discussed above we make inferences from the movement styles to two of the Big Five personality traits, inquisitiveness (I) & non-inquisitive (N), and orderliness (O) & disorderly (U), which are also referred to as temperament. An additional inference can also be made to the Falk type. We also list their percentage in the population [21]

Movement pattern	Curiosity	Attention Span	Big 5	Falk type	%
Grasshopper	Low	High	NO	Professional Hobbyist	41
Fish	Low	Low	NU	Recharger	33
Ant	High	High	IO	Explorer	10
Butterfly	High	Low	IU	Experience Seeker	16

Table 3 Movement to Personality

Opportunity Development

Using the information gathered above, the system prepares itself to develop opportunities that can be later exploited. As in marketing advertisements there is an emphasis on the subtle approach and gentle persuasion.

We attempt to accomplish this by using the user's interests to search a database for possible venues to visit[4, 12, 17]. Initially we try only to make the user **aware** of possible sites given his communication preference. After this initial message we filter these possibilities using contextual

factors such as location, time, and weather, rank them, present them to the user and try to **motivate** the user to commit to visiting one of the sites (for example, adding the visit to his calendar or using a planning application for the intended site). Again not as a specific recommendation but using the site information embedded in more subtle message

Personality types can affect the frequency of communication, marketing strategy (direct, indirect, door in the face vs. foot in the door) and length of message. For example an ant's message may contain many recommendations of places to visit; while a grasshopper may have a focused list of only 1 or 2 items.

In addition each communication can begin or end with one of the following incentive messages. Incentives are: be given food for thought, not stand still in life, quality of life, enrich your life, learn something, watch works of art, visit a museum and seeing something new. The incentives chosen are matched to the personality types.

Opportunity Exploitation

Depending on location, (primarily but also significant dates and the availability of news items), when they are near a site they gets a notification that there is information connecting them to a previous museum visit. The presentations consist of an introduction (given once), a reminder of how this is connected to the museum. At the end they will get a summary message. Frequency and amount of notification, content depends on interests and personality characteristics. The content is focused less on providing content concerning the current site (which may be provided by a local mobile guide) but rather on content which connects the user to previous cultural heritage experiences. This material can be information, visual or text which has a connection to the present opportunity. In addition we try to take advantage of social information such as picture of friends or family at the site. There is an importance of coherency and duplication avoidance, that we try to maintain when providing information.

EVALUATION AND DISCUSSION

As the system is in its initial stages at present and only ad-hoc evaluation is available. The need for such a system was evaluated with a questionnaire and showed positive results. In addition the definition of the thresholds and formulas where tested on real visitor data to see if it provided adequate clustering. Of course other formulas for the movement types can be used, but these formulas seem to be a reasonable start.

CONCLUSIONS

Some of the innovative aspects of the system include: Use of observed user behavior in museum to build up model; System responsible for managing long-term process (awareness, motivation, commitment); Use of social information for cultural heritage content (not just

reflection); Taking into account the users context (device (bandwidth, display size, audio capabilities), time of day,

weather, when delivering content and recommendations)

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