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Curiosity driven search: When is relevance irrelevant?

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ABSTRACT

Classical information search behaviour models based on work-task scenarios fail to explain common leisure search scenarios motivated by a hedonistic need rather than a defined information need. This paper presents work into such unstructured search driven by curiosity. In order to explore this hedonistic catalyst, a social media search application was designed in which the search experience is triggered by the user's spatio-temporal context during their exploration rather than query-response based information retrieval. We report a study with real users and a simulated casual-leisure search task where results indicated that relevance is not relevant for some searches.

Keywords

Curiosity, Casual-Leisure, Social Media, Context, Search Experience

1. INTRODUCTION

For many years digital search has been understood just as a findability problem and has been related to the search box paradigm due to its origins in library systems. Classical Information Search Behaviour (ISB) models had focused their attention on the destination (the results or the goal) of the search with metrics such as precision or recall instead of the search journey [12] (e.g engagement, flow, telepresence, etc).

Social media services have shown that ISB models based on work-task scenarios do not explain common information leisure search behaviours[5]. For example, an individual who searches their social media universe for hours after a long day at work may do so out of curiosity, to relax or for other hedonistic¹ motivation, rather than because of a clear in-

¹The word hedonistic is used relating to pleasure and is not

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formation need. Therefore, models such as Elsweller et al's [5] have shown the importance of re-thinking information searching behaviour theory for casual-leisure search.

Query-response information retrieval (IR) systems have been used quite successfully in work-based scenarios, although many have highlighted the importance of moving beyond this paradigm when the work-task is exploratory or involves learning [17]. But if a casual search-leisure user has an undefined information need or a hedonistic motivation, why should the search experience be based on an interaction model that assumes the existence of this information need and the user's capacity to communicate it? [14, 15].

This paper explores casual-leisure behaviour in social media by eliciting curiosity driven search sessions. Instead of following the query-response paradigm for the casual leisure searcher, we propose the design of a search experience triggered by the user's context. Instead of focusing on the interaction design in the communication of the information need, the intention is to model and produce an environment around the hedonistic need or a set of "transient information needs to keep the session going" [5] by allowing the users to communicate their own context or "desired context". For example, a user searches on Twitter to find out what is happening in London when what he really wants is to relax while he is on the bus going home.

The goal of the paper is to propose a design to improve the search experience for a casual searcher. The paper contains two main novel contributions. Firstly, it describes a simulated "casual-leisure" search scenario such as "wasting or killing time" or "exploring for the experience" in the laboratory using the user's context to elicit curiosity from social media content. Secondly, it was found that for some participants relevance was not relevant (e.g. users find irrelevant information but are happy with their search experience) in an initial comparison between a user's context triggered search and a classical query-response based search experience from questionnaires and recorded search sessions.

2. RELATED WORK

Information Search Behaviour. Although search is commonly understood as just a findability problem and restricted to a query-response paradigm, research in Human Computer Interaction (HCI) and IR has highlighted the need intended to be derogatory.

to address exploratory search work-task scenarios [17, 12].

From Taylor’s [14] “visceral needs” to “compromised need” ISB researchers have acknowledged the vital role of the user in the searching process. They understand all ISB as a consequence of an information need that demands to be satisfied. However, social media (e.g Facebook, Twitter, Instagram, etc), mobile devices and other pervasive technologies have made information accessible to people in leisure scenarios and revealed ISB motivated by hedonistic need rather than informational. Elswiler and Wilson [5, 18] have demonstrated how classical ISB focused on work-tasks scenarios fall short in explaining common casual-leisure search behaviours because they were created in library and information science. Their findings suggest that IR systems for leisure search scenarios should be designed to address hedonistic search intentions. This work builds on their model and seeks to study leisure search behaviours in action motivated by a leisure need (e.g curiosity, fun, relax, etc).

Curiosity. Human emotions and behaviour is strongly affected by curiosity. In a recent model, Kashdan et al. [9] highlight exploration and absorption (e.g losing track of time) as important factors to assess curiosity. Using the absorption concept, they highlight overlapping characteristics between curiosity and “flow theory” [3], the idea of an “optimal level of experience” in which a person is fully immersed by perceiving the correct balance between the challenge and the skills to face it.

According to Berlyne [1], curiosity is triggered by novelty, complexity, uncertainty and conflict. These interrelated variables have been used to create different kinds of stimulus (services and products) such as video games, fashion magazines, etc. Recently, interactive system designers of public spaces have developed a curiosity model around these principles to design playful interactive systems [16]. Instead of focusing on the content, they analysed how the interaction by itself could affect the user’s curiosity. Inspired by their findings, it can be deduced that curiosity could be based not just on the content (e.g topically relevant results), but also in the way the search experience is designed. This research aims to find out if a curiosity driven search experience could encourage people to explore and display casual-leisure information behaviour.

Contextual Search. Context is a powerful variable to understand and modify human behaviour. A comprehensive definition for context in computer science is provided by Dey [4] as “any information that can be used to characterise the situation of an entity”.

Moreover, this definition of context seems too abstract. Therefore, literature on context frameworks was reviewed and adopted one due to its extensiveness and logical division of the context. It consists of: Task, Spatio-temporal, Personal, Social, and Environment categories [6, 7].

In order to improve the search results, researchers in IR have used context to understand and predict search intent [6]. However, most of them have used the context concept within the IR system, but not when designing the search experience. We used the above mentioned framework to model the search experience.

Recently there has been a lot of interest in using contextual features around a social media content (e.g location and time). For example, Who.ly [8] is a web application that connects people with their hyper-local communities using event detection algorithms over Twitter data. Their search

experience is not driven by contextual features following a similar layout of typical curated news media agregators.

3. METHODOLOGY

In order to study casual-leisure search behaviour, the evaluation and experiment followed a user-centred approach both in the laboratory and naturalistic scenarios [10].

User Study Setup. A simulated task scenario was presented with a loosely-defined information need in order to generate an information environment for participants and gather their judgments [2]. The participants were asked to explore “what things are happening in their city or other parts of world” while they wait for their friends in the simulated scenario. Twitter was chosen because previous researchers have highlighted microblogging as an important scenario in casual leisure search behaviour [5, 18].

The participants were given user engagement questionnaires to evaluate the search experience[11]. Regarding the interaction data, the length of the search session during the simulated task was recorded.

Some parts of the user study were conducted in a controlled usability laboratory, but most were done on-line e.g. announcements via social media and email using Survey-Gizmo². Thus allowing a more naturalistic study setting without an observer.

At the beginning of the study, the participants filled in a pre-questionnaire. Then they were invited to take part in the simulated scenario using Ambicities or Twitter. The applications were randomly assigned to each participant similar to Hu et al. [8]. During the simulated leisure search session, there was no minimum or maximum time for the task. The simulated search sessions lasted an average of 12.06 minutes. After the session, they were presented with a post-questionnaire where they evaluated the search experience.

Participants. There were 28 participants, 5 in the laboratory and 23 who joined the on-line study. The sample comprised 19 males and 9 females. Most reported daily use of social media information and familiarity with popular social networks sites. The participants answered that when they choose a leisure activity 96% use Internet and 77% follow Word of Mouth.

Designing Ambicities. In order to increase the “casual search behaviour” specially for the study, it was assumed that the search experience should be “session focused rather than result focused” [5]. It was necessary to make the search journey itself more important than the destination during the interactive user experience and elicit curiosity around the user’s context. Therefore Ambicities³ web application was built around the “transient information need” [5]: what is happening around a location according to Twitter?. The application uses Web Sockets, and Geo-location. There were two views: Map and List as shown in Figure 1.

The aim of the system was to engage people during the search session, invite them to explore for a longer period and to experience ‘flow’ [3] rather than an IR-system which goal is to retrieve topically relevant documents as quickly as possible. Previous research found a strong relationship between context and the users’ motivation in casual leisure scenarios [5]. Spatio-temporal context features like Now, Recent, Near Me, Near a particular Location (e.g clicking a location but-

²<http://www.surveygizmo.com>

³<http://www.ambicities.com/main/>

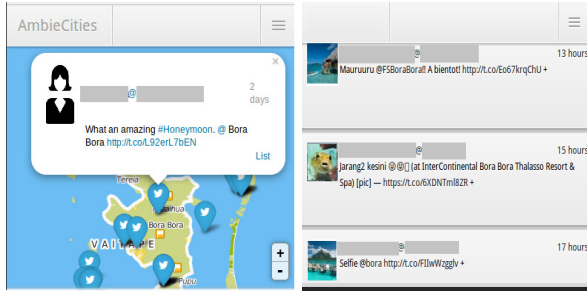


Figure 1: Ambiecities Mobile Map and List View

ton, dragging the map to a particular location or typing the name of a particular location) were used and enabled users to choose their “desired context” or “current context”. The content was not controlled because the aim was to investigate the importance of the experience and how contextual factors could be matched with the user’s hedonistic need.

4. RESULTS

Participants using Ambiecities spent more time on average exploring than those using Twitter even when they felt the content was not relevant, because they were driven by curiosity. Consider a participant Caroline⁴. She was trying to discover “fun” things using Ambiecities, but it seemed nothing was happening where she was looking. Most of the tweets were about “people just talking” she mentioned. She kept looking and searching for more tweets even in other locations for almost 12 minutes. After using Ambiecities, she said: “I felt like I was clicking on tweets because I could not help it, not because I thought I would find something interesting. I click because I was feeling nosy. After 20 clicks I realized I did not care about them but I still wanted to read them. The tweet was there; I had to look at it”.

She also said about her experience: “A good way to waste time [...]” and when discussing the time spent she answered: “I felt exploratory and just waiting for something to come up, clicking around and seeing new tweets pop up”.

This scenario illustrates the effect of eliciting curiosity using context triggered search for social media rather than query-response search. Designing the search experience with spatio-temporal context features (e.g Now, Recent, Near Me, Around a Location of Interest) encouraged hedonistic motivation instead of a pure informational by inviting people to keep exploring and waiting for more tweets whether relevant, non-relevant, interesting, etc.

In the post questionnaire, participants had similar scores to the item “The search experience was fun” both using Twitter ($\bar{x} = 3.8, \sigma = 1.02$) or Ambiecities ($\bar{x} = 3.4, \sigma = 0.92$). But when they were asked “which of the following features made the information display by the App enjoyable for you?”: 21% participants using Ambiecities selected Topical Relevance in comparison with 71% using Twitter. This interesting finding highlights how the experience (e.g. the interaction using spatio-temporal context) was more important than retrieving relevant results. Figure 2 depicts the answers to this question. In a way, the search journey

⁴All names and identifying details reported have been changed. Minor changes to the transcripts have been made for readability.

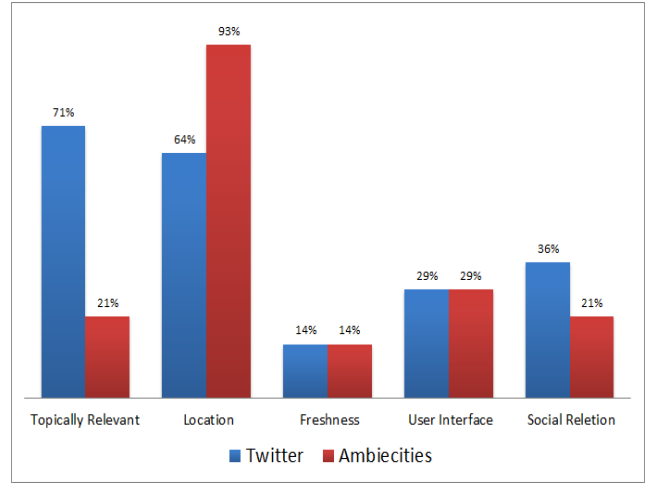


Figure 2: Which of the following features made the information displayed by the App enjoyable for you?

Table 1: Time Spent Searching in Minutes

Application	n	Σ Time	\bar{x}	σ
Ambiecities	14	233.46m	16.67m	13.59m
Twitter	14	110.42m	8.49m	7.36m

for some became more important than the outcome of the process in terms of relevance and usefulness (e.g finding a relevant tweet) as reported in [5].

When using Ambiecities, Caroline and other users’ behaviour were very similar to real casual search “wasting time scenarios” where behaviours like “exploring for the experience” and “needless browsing” were identified [5]. Four participants used Ambiecities in the on-line survey for more than 29 minutes whilst the longest Twitter search session was less than 17 minutes. Table 1 summarizes the time spent in the simulated scenario for all participants.

Some participants experience telepresence [13] and absorption during the simulated search scenario. In the post-questionnaire, 71% of Ambiecities ($\bar{x} = 3.8, \sigma = 1.2$) and 50% of Twitter ($\bar{x} = 3.2, \sigma = 1.3$) participants answered ‘Agree’ or ‘Strongly Agree’ to the item “The time I spent searching just slipped away”. For example after finishing the task, Peter wrote on the text area where the users should put their results (e.g places or events, relevant tweets, etc): “Absorbing and made the time go quickly with the map interface”.

Instead of submitting his results, he decided to put how the application made him feel and described his search journey. Peter later described, why he felt this way when he answered the question, “while using Ambiecities, did you enjoy your exploration?”: “Yes, it was great being able to visit different cities and regions following the twitter traffic”.

At the end of the session, after navigating around his locality, his place of birth and another city he had visited in South America, he asked the interviewer: “Do I close the app?, Everyone will know where I have been”.

Spatio-temporal triggered social media content made some people focus on “being there” or being in some other spatio-temporal context rather than “being here” [13]. So the participants who experienced telepresence did not evaluate their

interaction process in terms of finding relevant or useful tweets. Instead, they evaluated their search experience based how much they forgot their immediate surroundings (similar to escapism [5]).

The participants' ISB using Ambicities usually followed an initial navigation to known places around their current city. Then they navigated to places where they had some emotional relationship or interest, like "my hometown", "my home country", other cities they have visited, where friends live, or where they wish to travel.

In contrast, most participants using Twitter followed look-up search with shorter search sessions. Others just used what people or organizations in their network were talking about. For example, Karen, who followed Londonist⁵, without triggering any search looked at her Twitter timeline when performing the simulated scenario. She found a tweet from Londonist and went to the official site. Later she said: "I need to check Londonist more often, there are cool things". She described orienteering behaviour similar to Teevan et al. [15] by using her social context (e.g. friends, organizations she follow, etc.).

5. CONCLUSION AND FUTURE WORK

This paper presents initial evidence from ongoing research on how, by eliciting curiosity using spatio-temporal context in simulated social media search scenarios, participants were more likely to display "casual searching behaviours" and not typical look-up behaviour. Some participants were compelled to explore and stay longer to enjoy the experience rather than to find relevant information.

Designing the search experience encouraging curiosity and telepresence factors using the user's context could have a positive effect in other serious leisure search scenarios such as planning holidays, or choosing a new fiction book to read. Many participants in the user study mentioned that they were willing to participate in a longitudinal user study with an enhanced version of Ambicities and that a search scenario for tourism should be targeted using both curated content and live information from social media. We also plan to report a full user engagement evaluation similar to O'Brien et al. [11] and correlate the data with the recorded interaction history.

Finally, additional dimensions of user's context (e.g. Personal, Social Context) are being considered both to create the user experience and the IR model to see if the users will spend even longer exploring out of curiosity [6]. Understanding leisure search behaviour would help to go beyond the query-response paradigm and design search experiences, where the search journey itself becomes more important than reaching the destination.

6. ACKNOWLEDGEMENT

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7. REFERENCES

- [1] D. Berlyne. *Conflict, Arousal and Curiosity*. McGraw-Hill, 1960.
- [2] P. Borlund. The iir evaluation model: a framework for evaluation of interactive information retrieval systems. *Information Research*, 8(3), 2003.
- [3] M. Csikszentmihalyi. Flow and the psychology of discovery and invention. *HarperPerennial, New York*, 1997.
- [4] A. K. Dey. Understanding and using context. *Personal Ubiquitous Comput.*, 5(1):4–7, Jan. 2001.
- [5] D. Elswiler, M. L. Wilson, and B. K. Lunn. Understanding casual-leisure information behaviour. *Library and Information Science*, 1:211–241, 2011.
- [6] A. Goker, H. Myrhaug, and R. Bierig. Context and information retrieval. *Information Retrieval: Searching in the 21st Century*, pages 131–57, 2009.
- [7] A. Göker and H. I. Myrhaug. User context and personalisation. In *ECCBR Workshop on Case Based Reasoning and Personalisation, Aberdeen*, 2002.
- [8] Y. Hu, S. D. Farnham, and A. Monroy-Hernández. Whoo. ly: Facilitating information seeking for hyperlocal communities using social media. In *Proceedings of the 2013 ACM annual conference on Human factors in computing systems*, pages 3481–3490. ACM, 2013.
- [9] T. B. Kashdan, P. Rose, and F. D. Fincham. Curiosity and exploration: Facilitating positive subjective experiences and personal growth opportunities. *Journal of personality assessment*, 82(3):291–305, 2004.
- [10] D. Kelly. Methods for evaluating interactive information retrieval systems with users. *Foundations and Trends in Information Retrieval*, 3(1-2):1–224, 2009.
- [11] H. L. O'Brien and E. G. Toms. What is user engagement? a conceptual framework for defining user engagement with technology. *J. Am. Soc. Inf. Sci. Technol.*, 59(6):938–955, Apr. 2008.
- [12] T. Russell-Rose and T. Tate. *Designing the Search Experience: The Information Architecture of Discovery*. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA, 2013.
- [13] J. Steuer. Defining virtual reality: Dimensions determining telepresence. *Journal of communication*, 42(4):73–93, 1992.
- [14] R. S. Taylor. The process of asking questions. *American documentation*, 13(4):391–396, 1962.
- [15] J. Teevan, C. Alvarado, M. S. Ackerman, and D. R. Karger. The perfect search engine is not enough: A study of orienteering behavior in directed search. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '04, pages 415–422, New York, NY, USA, 2004. ACM.
- [16] R. Tieben, T. Bekker, and B. Schouten. Curiosity and interaction: Making people curious through interactive systems. In *Proceedings of the 25th BCS Conference on Human-Computer Interaction*, BCS-HCI '11, pages 361–370, Swinton, UK, 2011. British Computer Society.
- [17] R. W. White and R. A. Roth. Exploratory search: Beyond the query-response paradigm. *Synthesis Lectures on Information Concepts, Retrieval, and Services*, 1(1):1–98, 2009.
- [18] M. L. Wilson and D. Elswiler. Casual-leisure searching: the exploratory search scenarios that break our current models. *HCIR 2010*, page 28, 2010.

⁵<http://londonist.com/>