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Leveraging exploratory search with personality traits and interactional context

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ABSTRACT

Exploratory search is a type of information seeking used by searchers who are either unfamiliar with the domain of their goal, are unsure about the ways to achieve their goals or uncertain about their goals in the first place. We present a method that utilizes interactional context and personality information in order to proactively prompt users to undertake actions for improving exploratory search and its outcome. Our approach is based on inferring exploration patterns based on the logged past behavior of users in order to produce models of behavior, which in turn are used to predict the next action in the current context. The user is classified into specific groups of users that share personality traits for which we have analyzed their search behaviors. At the same time, we assume that the users who belong within the same group show similar exploration tactics to reach their goal such as the sequence of actions performed. Having the models, we show how we can predict the next interaction of the user given a specific sequence of actions of the current session. In this way, we assist users in their exploration process and act proactively by providing meaningful recommendations and prompts towards possibly undiscovered facets of the topic under investigation.

1. Introduction

The abundance of information that exists in online information systems has prompted the need for effective ways to facilitate the discovery of useful information by users. Information seeking typically assumes a model of the search process involving the initial recognition and specification of an information need, followed by the examination of search results and repetition of the cycle until a satisfactory result set is located (Marchionini & White, 2007; Shneiderman, Byrd, & Croft, 1998). Exploratory search describes both an information-seeking problem context that is open-ended, persistent, and multi-faceted and an information-seeking process that is opportunistic, iterative and multi-tactical. Therefore, exploratory search involves many of the typical characteristics of information seeking in the sense that it is a process of attempting to obtain information. Moreover, it is a type of sense-making (i.e. a motivated, continuous effort to understand connections among people, places, and events) focused on the gathering and use of information to foster personal development and knowledge acquisition (White & Roth, 2009).

Fig. 1 shows the positioning of exploratory search relative to related disciplines and its overlap in relation to other aspects of information seeking such as: (1) information visualization as a great facilitator to have a quick overview of the information landscape; (2) exploratory behavior (browsing) for exploring the information landscape; (3) berry-picking and information foraging is mostly related to the user's ability to discover information; and (4) IIR and cognitive IR that describe the behavioral and mental processes

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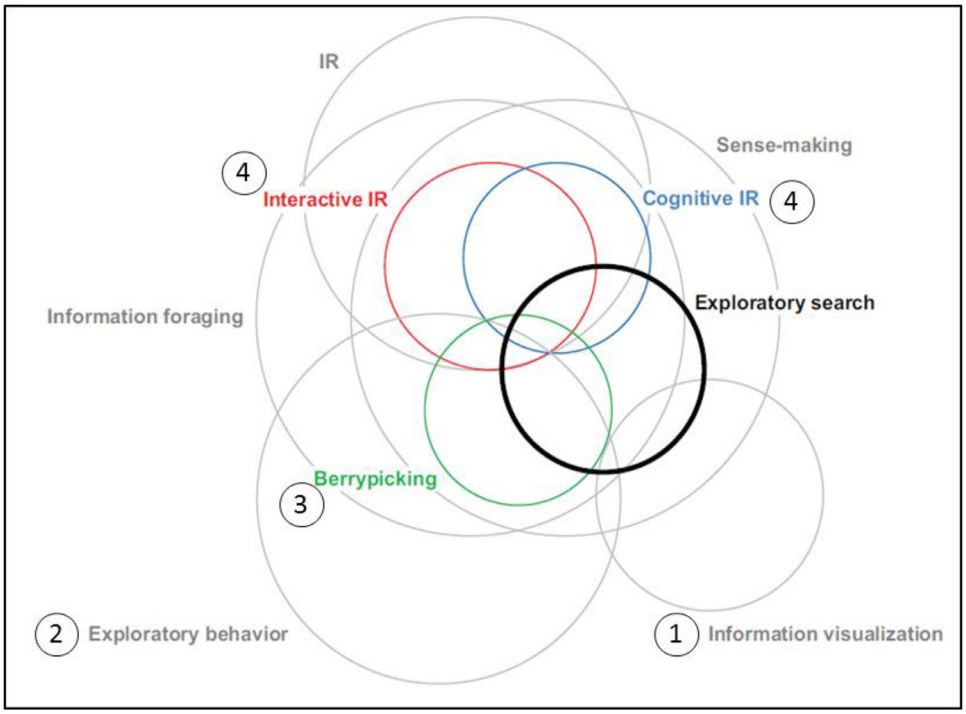

Fig. 1. Venn diagram positioning exploratory search relative to other related research disciplines. (Adapted from White & Roth 2009: Exploratory Search *Beyond the Query–Response Paradigm.*)

involved in finding information once the target is known (Marchionini, 2009). Exploratory search is tightly related to tasks that require investigation, learning, creativity, innovation having the role of the enabler towards tasks' success. Such tasks are searching for inspiring ideas about new products and services, investigating research works in a domain, or becoming familiar with a previous unknown domain.

A typical exploratory search session can generate rich context from rather complex user interactions including multiple queries and clicks for each query. Collectively, all user actions provide an overall picture of the user's intention as they interacts with the search tool. The multiple queries, clicked results, and underlying documents are all useful cues that can help reveal the user's search intent (Zhang, Chen, Wang, & Yang, 2011) and in a broader scope the user's exploration and search behavior (Yue, Han, & He, 2014). Clearly, exploratory search requires complex user interaction which cannot be predetermined or mean the same for all users. Arguably, the personality of users plays an important role in the actions they perform as well as their overall behavior in exploratory search tasks. Studies have shown that there is a relationship between personality and the information seeking behavior of users (Nie, Guan, & Zhu, 2014; Marchionini, 2009). Hence, personality is a user characteristic that needs to be considered as a factor affecting search behavior and information exploration tactics as it can be reflected in seeker's preferences (Marchionini, 2006).

Our work aims to analyze searchers' tactics linking them with their personality traits and utilize the analyses to generate recommendations, throughout an exploratory search session, to improve the users' creative outputs in exploratory search tasks. We propose an approach to anticipate users' information needs, predict the interactions they will most likely perform next, given the current context, past interactions and personality. Further generating recommendations to help them accomplish their information seeking quests. Moreover, our approach aims to improve users' experience and sense of engagement by maintaining their interest during exploratory search sessions and by ameliorating user's search outcomes.

Our approach infers exploration patterns based on the logged past behavior of users in order to produce models of behavior, which in turn are used to predict the next action in the current context. Two types of models are produced with the first one being a '*global model*' based on the logged sessions of the total population. In order to build the second type of models, called '*personality models*', each user is classified into a specific group of users that share specific personality traits. We analyze the models examining whether and which clusters show similar exploration tactics (i.e. the kind of actions or the sequence of actions performed). Having the models, we show how we can predict the next interaction of the user given a specific sequence of actions within the current session. In this way, we generate recommendations to assist users in their exploration process by providing prompts towards possibly undiscovered facets of the topic under investigation.

2. Related work

In this section, we discuss the three main axes that we deal with while building our approach: (a) the exploitation of interactional