

Modeling User's Browsing Behaviour through the Intertemporal Choice Model

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Abstract – *Browsing is an important but inefficient information seeking strategy in information retrieval (IR). It is argued that an effective recommendation model can improve user's browsing experience through modeling the user's browsing behaviour. This paper proposes the use of the intertemporal choice approach to model browsing behaviour of the user, which can be adopted in a browsing recommendation model. It is based on the assumption that the browsing recommendation problem is an intertemporal choice problem. An extensive discussion of the proposed model is provided in this paper including the framework for adopting the successful model in economics into solving an IR problem.*

Keywords: information retrieval, browsing model, intertemporal choice, recommendation.

1 Introduction

Browsing is regarded as an important strategy for information seeking [1], especially in an interactive information retrieval (IR) setting, such as on the Web, or in an *implicit relevance feedback* (RF) system [2]. While browsing, the user moves from one document to another to find the information he/she is looking for. Usually, browsing is guided by the information need of the user [3] such that the next document to be browsed is chosen by anticipating that the document will satisfy his/her information need. Browsing eliminates the need to formulate a query representing users' information needs, which is the case for the query-based searching strategy.

However, browsing is considered to be an inefficient strategy [4] because it relies on the user to make decision on the selection of documents to be browsed in a particular session. Usually, the documents selected by the user in the previous stage of browsing will determine the documents to be offered in the next iteration. For an implicit RF system, the selected documents are used as evidence to formulate a *refined query* to retrieve another set of documents in the next iteration [2]. In the case of the Web, the candidate documents to be selected in the next iteration are those linked to the document visited

currently. Therefore, a mistake in selecting a wrong document may result in an unsuccessful browsing session. Although backtracking is possible on the Web, it is troublesome and inefficient. Such problems can be overcome by using a recommendation model to suggest an effective browsing path to be followed by users.

The *information foraging theory* suggests that the user modifies his/her information seeking strategy or modifies the structure of the information environment to maximise his/her *rate* of getting the relevant information [5]. Based on the theory, it is understood that an effective browsing path should be determined by modelling the decision behaviour of the user while browsing. However, it is a non-trivial task since it requires a lot of data concerning how the user makes decisions while browsing. This paper attempts to overcome the problem by adopting the intertemporal choice model to model the user's browsing behaviour. The *intertemporal choice* model [6] is used to capture human decision behaviour on the choices for the rewards received or expenses paid at different times (or in succession).

In the next section, various techniques for modelling browsing behaviour of the users are investigated. Then, the proposed model, the intertemporal choice model for browsing, and its properties are presented and discussed in details. Finally, this paper concludes with an example application of the model.

2 Related Work

In [7], the author suggested that an effective IR system should take into consideration the behavioural aspects of the user's information seeking strategy in the design of the system. Moreover, the "*berrypicking*" search model suggests that real users will start with a broad topic, find the relevant documents, refine or modify their information need based on the documents they encounter and will then decide on new directions for their search, which is also known as *evolving search* [1].

The information foraging theory [5] indicates that the user will modify the structure of the information environment to maximise the rate of getting the