The innovative approach to user modelling for information retrieval system

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ABSTRACT

This paper deals with the problem of Information Retrieval System (IRS) that integrate the user profile that contains novelty dimensions such as psychological state, the emotional state, the mental state and the facial expression. In this paper we will fuse these dimensions to satisfy the query user needs. The architecture of the proposed system is described in details.

Keywords

IR system, user profile, psychological state, emotional state.

1. PROBLEM STATEMENT

In this era of information explosion, providing the right information to the right person within reasonable time duration is a very important goal for today's Information Retrieval Systems (IRS). Due to the characteristics of retrieving methods, the conventional IRS often suffers from inaccurate and incomplete queries as well as inconsistent document relevance. Thus, to satisfy a user's information needs by retrieving information quickly and with good quality the employment of user profile for information retrieval has been investigated such as [6], [2]. The user profile is distinguished in two parts: static and dynamic. An example of a static user profile is his demographic data such as gender, age and profession. A dynamic user profile is his domain knowledge, goals, and preferences. The emergence of these systems brought the problem of the User Profile Evolution (UPE) that will be treated in our approach.

Few works have explored the problem of UPE under the angle of temporal dimension (short term, long run) such as the work of [10]. Additionally, many Techniques for classification and heuristic analysis of the concept of centers of interest have been proposed in the work of [4], [1] address also this problem by providing techniques for classification and heuristics related to the concept of centers of interest.

Recently, several studies have proposed the addition of new indicators in the profile such as the Interests, Preferences and Context of the user (IPC Model) [3] or determining the user's Interest [9]. However, these indicators are still insufficient to satisfy the user request.

We identify few problems to satisfy the user query for example:

1- The existing IRS does not generally take into account the evolution of a human behavior,
2- Absence of a psychological aspect in user profile,
3- Absence of an emotional aspect in user profile.

These indicators have been integrated in user profile and justified in recommendation systems [8].

Our contribution is to fuse these indicators mentioned below for use in IRS integrated in EMASPEL E-Learning Framework [7]. This system will be presented in the next section.

2. OUR CONTRIBUTION

On the one hand, in terms of User Profile described in the proposed architecture (figure 1), we have been based on [5] that proposes an Ontology of General User Model (GUMO) which is a conceptual overview of a ubiquitous User Model including many basic aspects of user, coming from contact information, demographics, abilities to the psychological and physiological human features like personality, emotional state, mental state and nutrition, etc.

On the other hand, we detail the proposed architecture:

The activities of information retrieval in our system are performed by two processes: a query process and a feedback process.

Firstly, the user formulates the appropriate query; secondly, adding the contact information and demographics dimension to the query; thirdly, the query process handles the query and retrieves the related documents.

At this stage, two cases can be distinguished: the user is satisfied or not satisfied with the results. At the last case, the reformulation of the query is triggered.

It is to improve the initial query by keywords and by indicators contained in the profile whose values are calculated on the basis of the following examples scenarios:

1st: the historical navigation

2nd: the intent indicator of the user like (IPC model)

3rd: the emotional indicator like (the change of the user emotional state from joy to anger or anxiety)

4th: the fusion of some indicators like (psychological state and emotional state) or (the intention with personality), etc. The fusion of these indicators will be performed by the assignment to every indicator a weight that changes in the retrieval process and the evolution of the user behavior in general.
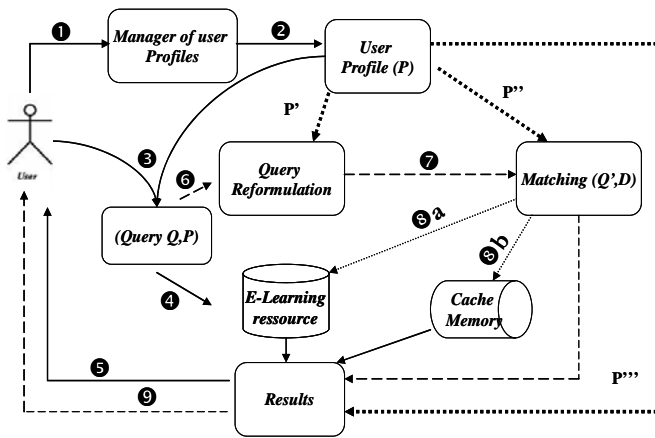
Legend:

→ the path of the initial query

- - → the path of the new query

······▸ Integration of different indicators of the profile during the search for documents
P': indicators taken into account in formulating the new query
P'': indicators taken into account during the phase matching documents / query
P''': indicators taken into consideration before displaying the result

Figure 1: the proposed architecture for the IRS.

Register of the new user (**1**). Once the user profile is registered (**2**), he formulates his query to be enhanced by indicators from the static part of its profile (**3**) like contact information and demographic dimension. The query process handles the query and retrieves the related documents (**4**). Finally, the result will be presented to the user (**5**) and stored in cache memory. The reformulation or not of the query is based on the measurement of the appropriate metric that notifies for the result relevance. If the metric $> \alpha$ (initialized by the system) the query reformulation is triggered (**6**). Other indicators (fusion of some indicators) will be added to the initial query (**7**). At this phase, the new query will be performed on the cache memory (**8a**) to accelerate the process or if no results on the e-learning resource (**8b**). Finally, the appropriate results are given to the user (**9**).

3. CONCLUSION

This work is an attempt to describe the architecture of an IRS that incorporates several dimensions such as accurate and essential (mental state, psychological state, emotional state …) indicators used to model the user profile.

Our future aim is to study the incorporation of dynamic and fusion of these dimensions in order satisfy the user query needs with relevance results and in real time in virtual community. For the domain area we believe in integrating the potential system in e-learning framework.

4. REFERENCES

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