



Study on the User-oriented Individualized Information Push Service

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Abstract

Individualized information service is the service which could fulfill user's individual information demand, offer information service according to user's definite demands, or forwardly offer probable needed information service through analysis of user individuality and using habits. Individualized information service could help to quickly and exactly acquire information for user and offer conveniences for user. Based on that, in this article, we will study the character, implementation mode and flow of information push mode, and develop the theory and method of individualized information push.

Keywords: Individualized information service, Information push, User orientation

1. Definition and actuality analysis of individualized information service

1.1 Definition of individualized information service

Individuality is one research content of many subjects such as individuality psychology and social psychology, and it is always defined as the sum of psychological characters with certain orientations in the individuality psychology. The individuation is to make things possess individuality or display individuality. The essential of individuation service is to respect users and research users' behavior habits and interests, select more exact resources for users and offer better services. It is the activity which is to fulfill customers' individuation demand, and the individualized information service is not only a sort of individuation service, but a sort of information service. The individualized information service first should be the service which could fulfill users' individual information demands, i.e. it could offer information service according to users' definite demands or forwardly offer their possibly needed information service through analysis of users' individuality and using habits. Second, individualized information service should fully encourage users' demands, promote effective searches and information acquirements for users, and promote users' effective utilization for information and implement knowledge innovation based on that.

1.2 Actuality analysis of individualized information service

At present, there are more 2500 search engines on the network, which almost cover all aspects of internet information content. But the biggest shortcoming of the internet information search engines which could establish content keyword index and offer corresponding service is that they could not offer exact and effective internet information services for internet users, and it has not fulfilled the demand of internet information service only depending on these information search engines, and people more and more urgently need the internet information service tool which could fulfill their own special and individualized information and service demands. These information tools should automatically search the web page that the information material is located for internet users from thousands of information net sites. Then these tools could abstract relative information contents which are related with users' demands closely in these web pages, and integrate these abstracted information materials, and form a relatively complete information material set, and feedback them to users. And it is one standard process to realize the individualized service of internet information. There are three main problems to actualize the process (Yang, 2003), (1) how to effectively describe users' information demands, (2) how to exactly and effectively search the web page needed, (3) how to effectively integrate acquired relative information contents. Through analysis of all process that user interviews the network, we could find that in the process users interview, there are seven sorts of information could be collected (Ou, 2001, P.112-115), (1) inquiry keywords inputted by users, (2) Bookmark maintained by users, (3) page browsed by users, (4) behaviors browsed by users, (5) server log, (6) user download, stored pages and materials, (7) other information manual inputted by users. The inquiry keywords inputted by users obviously could reflect users' preferences, because users most know their own interests and intentions. To inquire about keywords is the start to search information for users, but it is not the whole process that

users search information. Users don't inquire about information to every interested topic through search engine, and users always could not exactly express the content what they want to inquire. So there are five sorts of methods to acquire users' preferences (Zhao, 2004), (1) users forwardly fill in, (2) keywords study, (3) feedback study, (4) sample study, (5) following users browser behaviors study.

The implementation process of internet information individualized service is the process of information collection, machining, analysis and treatment with high intelligence in fact. With the further development of internet, to realize the individualized service of internet information must be one very important development direction for the application of internet.

2. Information push technology and its characters

2.1 Introduction of information push technology

The so-called information push technology is to automatically search information that users need through software and transfer the information to users' computer. It could automatically send the information what users are interested to users' computers on schedule, i.e. realize "information looks for users". At present, there are three modes for people to acquire information from internet (Hao, 2002).

- (1) Information push. Actively push information to users by the information source.
- (2) Information pull. Actively pull information by users from the information source.
- (3) Push and pull. In the information acquirement process, both the push from the information source and the actively pull by users are included.

At present, there are two basic push modes, i.e. automatic push and affair drive. Automatic push is to put in new information according to users' conventional time and requirements in advance. Its concrete implementation approaches include, first, users put forward they are interested in certain special web site or topic, or they require to automatically update software and data, second, information sender looks for new content through the application of push software according to users' requests, and the content is transmitted to the "channel" in the "receiver" of push application, finally, users could look over new content or new link what they made to order according to their own settings. This sort of push mode is similar to the ordered material selection service which is very popular in modern information searches.

In fact, "push" and "pull" are compensatory each other, the "push-pull" technology combining "push" and "pull" will be a very important development direction for future network information acquirement. Real individualized service should be dynamic and active, i.e. the system could automatically follow users' using preference after the initial rules are made. Such individualized service should not only stay in popular amusements or professional information provisions, but join many users' personal services into the service and push information what users are interests in timely and actively.

2.2 Characters of information push technology

The information push technology changes the mode of network information interview from user search to purposeful information receive. It not only changes the direction of information flow, but reduces the load of internet through the decrease of information flux. Its main characters include following aspects.

- (1) Seamless link. The seamless link is to automatically establish link under the situation without user interaction or few user interaction.
- (2) Flexible user setting. Users possess sufficient right of decision-making, and they can set up link time, push content, local resource allocation and other parameters.
- (3) Document with made to order contents. Users write the subscription document, and the push server transmits the content and transmission parameters according the subscription document.
- (4) Sustainable document transmission. The sustainable document transmission means break point retransmission, i.e. when data transmission is broken by certain reason, the system could store the present transmission state in client part, and when the link recovers the system could continually transmit information from the break point.
- (5) Effectively utilizing bandwidth. Client could transmit data through using the leisure time, which could utilize the bandwidth maximally, and the server reduce the transmitting data to the least limit to reduce the bandwidth waste according to subassembly reusing principle.
- (6) Natural link of new and old contents. Client subassembly could definitely acquire and alternate information and the parts of information, and updated contents could combine with existing information and confirm where the system stores information.
- (7) Flexible informing mode. When new information arrives, client part could inform users to read. According to different type and importance of transmission information, the informing has many modes from simple dialog box to

the cartoon with audio frequency and video frequency.

(8) Security. The content pushing to users should be ensured safe to avoid destroying user's system.

(9) Application agreement. Use IP agreement group based on internet. The application agreement has prominent function to adjust the order of network information.

3. Implementation modes of individualized information push technology

Through certain standard or technological agreement, the information push technology directly pushes the information what users are interested in to them and accordingly enhances the efficiency of information acquirement. The push technology could be visually compared to familiar concept of "subscription" in post service, but the mediums of information become internet from post office and carrier.

The implementation mode of information push technology could be divided into following sorts.

(1) Simple push. Users fill in subscription order at the provider station, and server reads the order and pushes information according to the requirement. The difference of this sort of push mode with common push technologies is that it could collect information according to requirement and push the information to users one time or several times after the sever receives the order. Because this push mode needs users' intervention, so the information pushing to users could accord with users' individualized demands.

(2) Agent push. In the project, the system could collect relative user information through setting up agent server, then establish association with information provider, scan relative websites, collect information what users are interested in and then push the information to users. Under this mode, the request and push for information are implemented by the agent server, and it is transparent and easy to be realized for users.

(3) Subscription channel. In this mode, all information is divided into different channels according to contents, and users could acquire information through subscribing the channel which they are interested in. This sort of technology could set up filter service to filter relative contents in the channel and push them to users.

(4) IP multicast technology. IP multicast is based on IP address of D type. One independent address could point to multiple users or several users. In the multicast system, information provider only needs issue once information, and the information is copied in the network many times, and multiple group members could acquire the information what they need, which could fully save the bandwidth and realize the real time updating of information and data.

4. Work flow of individualized information push technology

Through analysis of concept, character and implementation mode of information push technology, we could see the work flow of information technology include following three approaches (seen in Figure 1). First, establish the user demand management database. Users need to complete enrollment and express their information demands, and the system will make an effective electrical ID through statistical analysis and offer active information service in time to users. Second, establish the information base. The information base takes charge to search information form Web, and classify information, confirm the standard, set up individualized information standard, and make abundant information enter into the information base following this standard. The third approach is the information pushes of pushing sever. According to the corresponding relation of users and information and the best time and mode that users receive various information, the pushing sever actively pushes proper information to users' computer in proper time.

5. Individualized information push arithmetic based on user preference

The individualized information push includes direct push and indirect push. The direct push is to push the document with near interests that users subscribe, and the indirect push is to consider the click amount of document and push the document with maximum click amount when ranking the document. Because the user interest model is composed by multiple individualized vectors, so the judgment rule with close interest is to approach with certain individualized vector. When pushing, the system should push the reading document corresponding with this individualized vector, and different individualized vectors correspond with pushing information and form different types, and the pushing information in same type could be ranked according to the similarity degree with user interest model.

In this article, we design the arithmetic of direct push (seen in Figure 2). Suppose the set of user interest is $\{(q_1, w_1), (q_2, w_2) \dots (q_n, w_n)\}$, and the waited set of web document set is $\{d_1, d_2, \dots, d_n\}$.

(1) Pick up the document d_j ($1 \leq j \leq m$), and obtain the vector space expression of the document, $\{(p_{1j}, w_{1j}), (p_{2j}, w_{2j}), \dots, (p_{kj}, w_{kj})\}$.

(2) Pick up lemma q_i , and if $q_i \in \{p_{1j}, p_{2j}, \dots, p_{kj}\}$, so continue next lemma q_{i+1} , or else go to (3).

(3) Add q_i into vector space expression of the document d_j , and the weight is 0, i.e. $\{(p_{1j}, w_{1j}), (p_{2j}, w_{2j}) \dots (p_{kj}, w_{kj}), (q_i, 0)\}$.

(4) So we can obtain a new vector space expression of d_j , $\{(q_1, 0), (q_2, 0), \dots, (q_n, 0), (p_{1j}, w_{1j}), (p_{2j}, w_{2j}), \dots, (p_{kj}, w_{kj})\}$, and

in the same way, we can obtain the new expression of user interest set, $\{(q_1, w_1), (q_2, w_2), \dots, (q_n, w_n), (p_{1j}, w_{1j}), (p_{2j}, w_{2j}), \dots, (p_{kj}, w_{kj})\}$.

(5) Compute the correlation degree of the document with user interest.

(6) Set up the push threshold value h . If the similarity of the document and user interest $\text{sim}(d_j, U) \geq h$, so push the document into the series.

(7) Rank the document in the push series according to the similarity, and the document with higher similarity is pushed first.

There is another form to confirm the threshold value h . when the document quantity is numerous, we can regulate that h is the limitation of document quantity, and then rank the document similarity in the same way, and take the document with quantity of h as the push document.

6. Conclusion

The individualized information service has been the development orientation for the information service industry, and it could help people to enhance the production efficiency, and it is one of important symbol to discriminate modern society and early modern society. The individualized information service is the development tendency of Web information service, and it is the super form of information service. To offer individualized information service is the necessity to develop modern information technology, and it is the aim that the information service department tries to pursue. However, many existing problems such as information parallel and increase of garbage information make users could not quickly and exactly acquire information what they need, which induces the wastes of time and energy.

In this article, we mainly study the individualized information push technology based on user preference, and research several implementation modes, give the work flow of information push, and mainly design and research the individualized information push arithmetic based on user preference according to the flow. In future works, there are many aspects to be further studied and discussed. For example, we should study various user behaviors including single behavior and combined behavior to reflect user's ability of interests and select the behavior, combined behavior or behavior sequence which could most embody user's interests through more advanced arithmetic, or we could implement character abstract and analysis of web page through more scientific method in order to find out the contents that users really are interested in the web pages browsed by users. Otherwise, how to apply these push technologies into various individualized intelligent system and security protection of users' individual information are also our future research directions.

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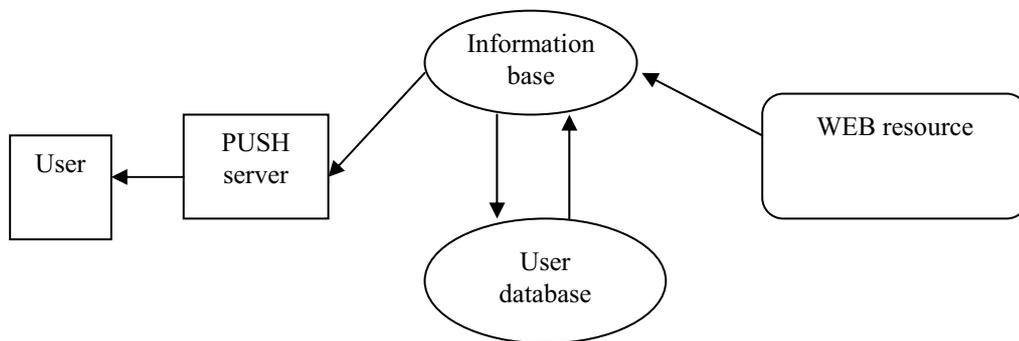


Figure 1. Work Flow of Information Push Technology

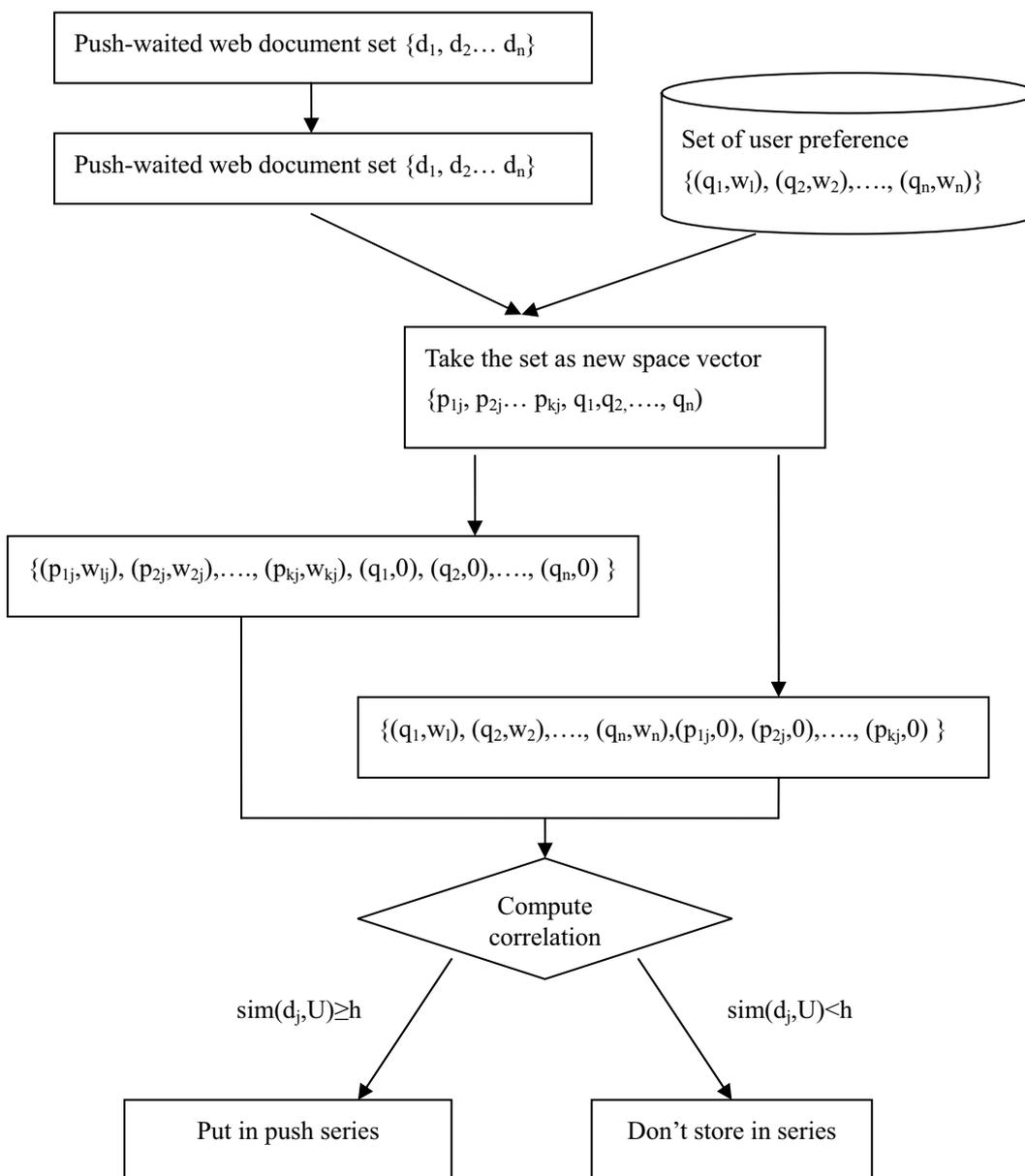


Figure 2. Individualized Information Pushing Arithmetic Based on User Preference