

Intelligent User Interface for a Web Search Engine by Organizing Page Information Agents

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Abstract

This paper describes an organization method of page information agents for adaptive interface between a user and a Web search engine. Though a Web search engine indicates a hit list of relevant Web pages, it includes many useless ones. Thus a user often needs to select useful Web pages from them with page information like the title, the URL on the hit list, and actually fetch the Web pages for checking relevance. Since the page information is neither sufficient nor necessary for a user, adequate information is necessary for valid selection. Hence we propose adaptive interface AOAI in which different page information agents are organized through human evaluation.

INTRODUCTION

A Web search engine provides a list of matched Web pages (*hit list*) to queries from a user. Unfortunately it tends to indicate many irrelevant Web pages in a hit list. Hence a user needs to select useful pages from a hit list using page information indicated on each page in a hit list, and fetch the Web pages to investigate relevance. Since the information on the hit Web pages like a title, the size and head sentences of a Web page is fixed and neither sufficient nor necessary, a user needs adequate information for correct and quick selection. Thus we propose adaptive interface in which different page information agents are organized through human-computer interaction and suitable interface is gradually constructed. We call this framework AOAI (Agent Organization-based Adaptive Interface).

OVERVIEW OF AOAI

AOAI[1] is adaptive interface between a Web search engine and a user like shown in Fig.1. AOAI receives queries from a user and gives it to a search engine as it is. Then it obtains the hit list to the queries from a search engine and indicates them to a user with useful information for selecting a page which he/she wants. The page information is indicated by each PIA (Page Information Agent) like Fig.2.

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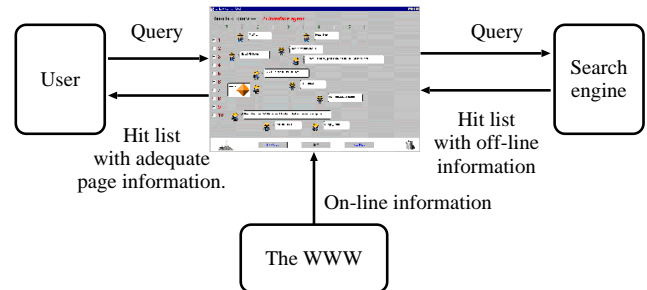


Figure 1: Overview of AOAI.

The following shows a main procedure of AOAI. Additionally to the following procedure, a user is able to deconstruct an integrated PIA by drag&drop it on the factory icon ((B) in Fig.2).

1. Give a query to AOAI.
2. A hit list to the query is indicated for a user. Fig.2 shows an initial window. When a user points a *target page number* ((A) in Fig.2) about which he/she wants the page information by a mouse cursor, all the PIAs indicate page information on the page.
3. Select the Web page which he/she wants with page information from PIAs.
4. Double click the target page number and see it through a Web browser.
5. If the page is what a user wants, he/she evaluates PIAs whose information contributed to user's selection, and organization is done. The positive/negative evaluation is done by clicking a right/center button of a mouse on a PIA. Otherwise, go to 3 and a user selects other pages. Also for seeing page information effectively, a user can directly arrange PIA by drag and drop it anytime.
6. This query is finish by pushing "Exit" button ((D) in Fig.2), and if necessary, AOAI organizes PIAs using the procedure described later. Go to 1 with the next query.

ORGANIZING PIAs

AOAI provides twelve PIAs indicating URL, traffic, title, head and so on. An agent has human-like appearance which

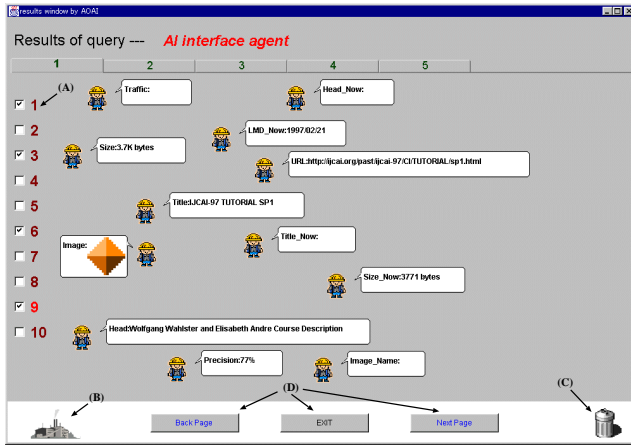


Figure 2: Interface window (initial state).

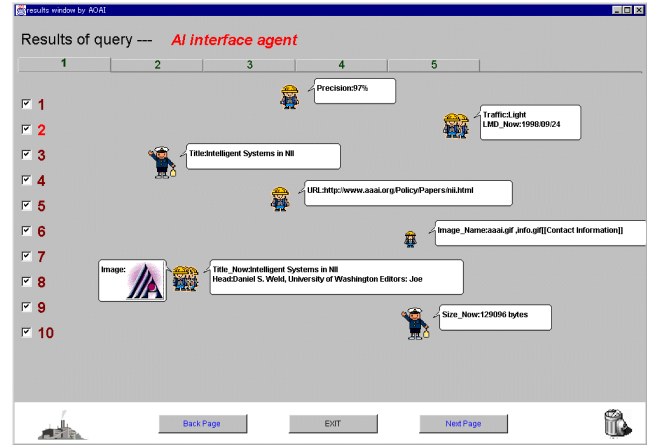


Figure 4: Some agents are integrated.

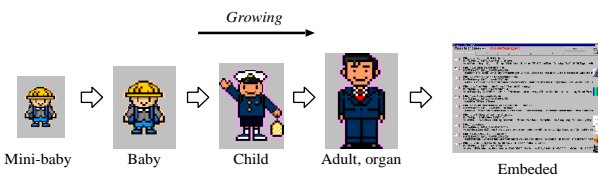


Figure 3: Growing character for each stage.

changes depending on the growth value, and a balloon in which page information is indicated.

A PIA A_i has the following properties on organization and itself activity.

- *Growth G_i* : This property indicates A_i 's activity of which is increased and decreased by human evaluation.
- *Stage S_i* : This takes seven values indicating A_i 's stage: *trash*, *mini-baby*, *baby*, *child*, *adult*, *organ* and *embedded* depending on the growth G_i like Fig.3.
- *Page information I_i* : This is a list of page information which A_i indicates.
- *Position $P_i(x, y)$* : Position (x, y) of an agent A_i .

The growth G_i is updated by a user's click for evaluation. We define some threshold for controlling the growth of interface agents. In addition to integration, AOAI provides a way to eliminate useless agents.

The relation between two adult agents is activated when the two organ agents are closed within a threshold. We use undirected graph representation for organizing PIAs. The nodes and arcs correspond to agents and activated relations. In the graph, groups of PIAs to be integrated are determined by investigating maximal connected sub-graphs.

EXECUTED EXAMPLES

We have been fully implemented AOAI using JAVA. Fig.2, Fig.4 and Fig.5 show the executed examples of AOAI with a query "AI Interface Agent". Fig.2 stands for an initial AOAI having all of the 12 PIAs. As the agents get user's evalua-

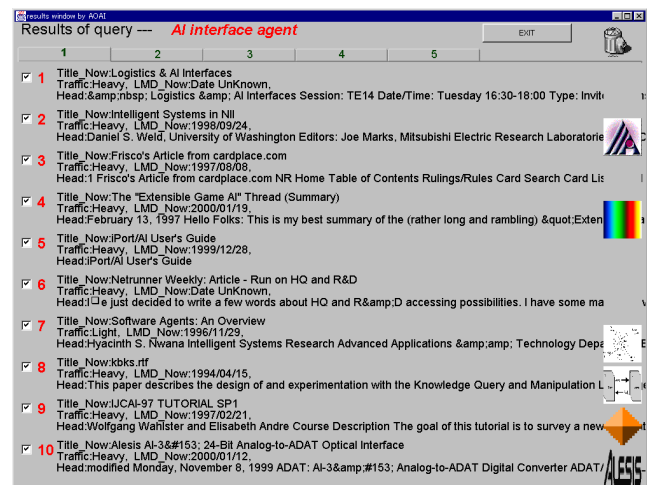


Figure 5: A hit list in which agents are embedded.

tion, they grew and were organized like Fig.4. Finally the single PIA made of Title, Traffic and Head agents survived and was embedded into a hit list like Fig.5. Also by making experiments with subjects, we found AOAI was a promising approach for providing adequate page information in a hit list.

CONCLUSION

We proposed AOAI: adaptive interface in which different page information agents are organized through human evaluation. In AOAI, the PIAs indicating different information in a hit list like file-size, network traffic and a page title are prepared at first. A user evaluates them through usage of a search engine, and they are organized. As results, different organization is achieved depending on a user and a task.

REFERENCES

1. S. Yamada and F. Murase. Adaptive user interface of a Web search engine by organizing page information agents. In *WebNet 2000*, pages 586–591, 2000.