The role of a search agent for disenfranchised users

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Abstract

Connected Kids project is about developing a searchable database system for the disenfranchised people of the city of Troy, New York. The various events and programs for the young people of the city as created by the various not-for-profit organizations are searched by the parents, kids, teachers, and counselors. Testing the beta version of the tool pointed out that users have found the system challenging to use, though they participated in designing it. Therefore, a new adaptive system with a software agent is proposed to help users effectively perform the tasks without feeling intimidated or unnecessarily overwhelmed by the technology or the tool. The agent's aim is to understand the real goal of the user and help achieve results that match the needs as closely as possible. The overall strategy is to break up the puzzle into smaller answerable problems and build back the original piece by strewing the smaller pieces.

1 Introduction

Connected Kids project is about developing a searchable database system for the disenfranchised people of the city of Troy, New York. The various not-for-profit organizations would disseminate the various activities and programs they offer for the people of the city through this system. Hence the system will serve as the unique source both for information dissemination and retrieval. People of the city, no longer would need to rely on multiple channels for information on activities and programs of these organizations. This searchable database system would serve as a powerful system to connect the different organizers and their participants. However, the system design for such a tool will not be free from challenges. The users for such a tool has a wide variance in age, cognitive abilities, interests, skill sets, and knowledge levels within and between the groups. A study to find commonalities within a group pointed out interesting patterns. For example, most parents have remained naive users of technology. They are not confident to use the computers and they associate quite a bit of fear with technology use. It was concluded that this stigma might lead them not to try a search tool on a regular basis, if it is too challenging to use. As a result it was realized that the design of the search system has to fulfill a few roles in order to connect the members of this community. The process of search has to be simplified. It has to understand what each user needs from the search and has to suit itself to the individual user's unique goal. It has to be very easy to use and has to reduce the mental workload for its users. It has to help them in the process of decision-making while realizing their formed or unformed goals. It therefore has to act sometimes as an assistant and sometimes as an advisor through a process of exploration.

2 Lessons Learnt from Users

Although there has been no comprehensive study of technology use patterns in Troy, New York, the city presents a demographic profile similar to that which the NTIA (1999) has recently characterized as experiencing significant disparities in access to technology. That is, the population is poor, clustered in an aging urban central city, comprised of significant minorities, and poorly educated. City population is declining and getting poorer. 40% of households have very low income, 25% have low to moderate. More than 50% of the residents live in poverty. There is an increasing concen-

tration of residents at the lowest end on income scale. More than 25% of the adult population does not have a high school diploma. Unemployment rate in 2002 has risen to 7.7%. 50% of the children qualify for free lunch program. 75% of eighth graders have serious academic deficiencies or need help to meet required educational standards. Minority concentration is increasing (African American population grew by 50% and Hispanic population grew by 90%), creating greater diversity and some clashing of cultures. Household size is declining - homeownership, school involvement, etc. are difficult for single parents.

Participatory design methodology and focus groups were the two primary methods used to understand user needs. Different not-for-profit organizations, parents, kids participated in these participatory design sessions. It helped the system designers recognize the strengths as well as the gaps of the tool. Experience with the Connected Kids Project leads one to believe that participation through focus groups to either test or suggest system features are not enough to hand over a usable tool for the disenfranchised. For example, from one of the focus groups, it was found that the users wanted the opportunity to display photographs of activities on their home page. A system feature was designed with this need in mind. It required them to upload a saved electronic image from some source. When required to do this in a mock-up scenario, a user screamed, 'O, I can't do that! I do not know how to do it!' Participatory design principle incorporated the idea, joint application development tested it. However, both failed to make it work for the user! This is just one example of the multitude of problems that get communicated during testing. Although they are experts in what they want from the system, they are naive in using a tool that is driven by technology. Though we intend to provide tutoring, yet we have found from the focus groups that system knowledge cannot be formed from these sessions, alone. It will take the users quite long to feel comfortable and use the system effectively, on their own. They would need constant help from the system while they move around it, searching, retrieving or posting information. Though the users are participants in the system design for Connected Kids yet they are not power users of the computer itself. Being new and naive to the world of computing, they take time to understand the nuances of the new medium and the tool.

3 Solution: Agent Guidance in Search

As a result of this observation, we have decided to explore in detail how a software agent can be built as a major component of the system. This agent will understand the user's goal and simplify the complex search process into smaller definable goals that match the particular user's needs.

Searching for a specific event can become very complex and can require the user to think of all different keywords related to it, refine and re-refine queries, and sieve through pages of information to figure out the closest match [5]. This process can get even more complex for the disenfranchised users who are not only unaccustomed to searching information online but also not used to the nuances of such a tool. For them, this is a multifaceted task requiring several different skill sets. Therefore a software agent can play the role of an assistant and an advisor, helping and guiding the users through this complex process of searching and browsing. To derive results to satisfy goals, any user needs to locate information. In order to locate information online, search strategies become an important criteria. Research [6] has shown that novice users favored less cognitively demanding browsing strategies and more experienced ones preferred analytical approach. Furthermore, experienced users are better able to prioritize their search tasks [2].

The intelligent agent devised and developed for the Connected Kids project will help naive users explore the priorities of a given search task by showing information in a way that can help them browse through it and then analyse the results and choose from it. For naive users, search interfaces that ask the user to specify multiple criteria are not only confusing due to their complexity, but can get frustrating if they end up producing no results due to problems associated with the choice of wording. In such a case, an agent program may help a user get through the search process by asking each search question separately and explaining the question as well as the answers. The search questions range from where, what, when, how much and for whom for every event and program. The important issue in the design of the agent is to adapt the sequence of questions to the user's needs and also adjust the displays to provide the most useful display. These preferences can become a starting point for the user the next time he or she visits the site, assuming of course an appropriate user id is created for him or

her.

4 The Issue of Personification

While designing software agents for Connected kids we agreed on having an agent without a visual representation believing in what Wexelblat and Maes [9] emphasized upon, as the most successful agents do not need one. The main justification being, anthropomorphic agents might deceive and confuse users because it leads them to overestimate the agent's capability as cautioned by King [4] and Wexelblat, and Maes [9]. Naive as they already are with the new technology, an anthropomorphic interface for Connected Kids system might increase the users anxiety instead of reducing it as suggested in a study by Kaasinen [1]. It may also easily distract our users from their primary task and would demand a higher degree of attention as pointed out by Koda and Maes [3]. Also studies have shown that people develop sympathies for the anthropomorphic character, and they might or might not like it. For interface designers, it might be difficult to find a character that will be unanimously liked by all users [7]. We were concerned about not being able to build one likeable character over a broad group of users that vary from kindergarten children to parents. Van Mulken, Andre and Muller [8] investigated the influence of an agent's interface on its trustworthiness. What can be concluded from the study is that credibility and trustworthiness do not come as a natural consequence of attaching a face to the agent interface. Credibility and trustworthiness are very important issues for our users. If the users get deceived by the anthropomorphic agent so much, that they begin to overestimate its capability, it might prove fatal. As a consequence, users might feel disillusioned and might decide never to revisit the system. Keeping all these factors in mind, this search agent did not get a face attached to its mind.

5 Uniqueness of this Agent

This search agent will create a dynamic user model for each user. Each query will be a learning data (mostly through implicit techniques of following the user through information exploration and rarely through explicit techniques) to generate a dynamic user model for the individual. Existing adaptive interfaces for searching and browsing try to filter and push to the user items that he/she might be interested based on her past queries. They do not address the problem of managing a set of interrelated queries as an integral unit. This agent will address the issue of continuous management of searching and browsing as a single continuous information exploration action. It will treat every search as a complex boolean query. Two different aspects of this approach is important to note: 1) Each different constraint ranks objects with respects to how well they answer the query and how well they suit the user's profile. 2) Each different component of a query has some inherent desirability, derived as a result of the user interaction with the system. It will then produce a final ranking of objects with respect to a complex criteria. Through this explorer system, the agent will guide the user through these objects by allowing the user to browse the objects, as well as allowing the user to specify new search constraints. The agent will assign ranking to the desirability of these constraints by observing user behavior, and will provide feedback on the desirability of different options to refine the ranking process. This capability is designed specifically to combine overlapping successive searches and proactively rank objects based on the desirability of the current options as well as the past user history.

Furthermore, the browser is also designed to seek specific feedback from the user, implicit and explicit. Implicit feedback is obtained from providing the user with objects from different searches and infer the user's priorities among these options. The explicit feedback is tuned to the actual data, that only seeks to distinguish between different choices and filter data when necessary due to the distribution of objects/ranks in the result. This is a way to seek user input when the system has insufficient information about the user, but too many results for the user to sift through. As all adaptive systems, the desirability of all of these functionalities can be inferred from the user's interaction with the system.

The search agent therefore balances multiple types of adaptivity such as (a) the changes in the interface in the form of interface elements for presenting results and collecting feedback from the user, (b) the inference of current user interests in deciding what the user is looking for, (c) the inference of global user interests in deciding the important factors for searching for a specific user as well as common search criteria, (d) the type of implicit feedback to gather useful information about user interests, effectiveness of various collaborative filtering

methods for the current user. All such adaptivity requires balancing many conflicting goals in a single interface.

6 An Example of the Exploratory Mind of the Agent

In our system, searching for activities normally involves multiple criteria, some of which are essential to some users and not that important to others. As users who are not experts in using various controls in a system, this can get very challenging. Also, users can be uninterested in something specific but can be curious about a general category of items. However, the process of getting to their eventual goal through a search interface may be very non-linear. For example, the user may look up an event from last year to remember a specific piece of information and apply it to the current search. Our search agent attempts to understand the goal of this user by breaking it into small definable parts. The search system is based around 5 broad notions of looking for a particular event for this database. These events can be thought of as: 'what', 'when', 'where' 'how much', 'for whom.' Suppose an user comes in and asks for skiing (which the agent understands as 'what') the next question would be any of the other remaining 4 choices, picked randomly for the first time (which changes as the Agent learns more about this user's interests). So lets say, the next question is 'when' and the user writes, 'Sat, 5th of February, 2003' (a format will be suggested), the subsequent results will be pulled up not as pages of relevant hits, but organized around the three remaining themes. Namely, (1) Different time spots in Albany, Troy, Schenectady (which satisfies the 'where' criterion). (2) Different time spots for different Age groups. (which satisfies the 'for whom' criterion). (3) Different time spots for different rates. (which satisfies the 'how much' criterion). In conjunction with this process of proactively showing what is available in the system, the system combines most current searches in a logically coherent group and builds a map of availabilities for the user. The agent continuously refines what it knows about the user and occasionally decides to interact with the user. This decision not only depends on the user's queries, but also what is available in the system.

7 Conclusions

The search agent aims to increase the usability for a system for the naive and disenfranchised users. One of its unique features is the ability to learn and adapt to both short term and long term interests of the users. By doing so it attempts to reduce the mental work load of the naive users and eventually reduce the fear associated with technology.

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