

Towards Accessible Search Systems

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Abstract

The SIGIR workshop *Towards Accessible Search Systems* was the first workshop in the field to raise the discussion on how to make search engines accessible for different types of users. We report on the results of the workshop that was held on 23 July 2010 in conjunction with the 33rd Annual ACM SIGIR Conference in Geneva, Switzerland.

1 Introduction

Current search systems are not adequate for individuals with specific needs: children, older adults, people with visual or motor impairments, or people with intellectual disabilities or low literacy. Search services are typically created for average users (young or middle-aged adults without physical or mental disabilities) and information retrieval methods are based on their perception of relevance as well. The SIGIR workshop *Towards Accessible Search Systems* was the first workshop in the field to raise the discussion on how to make search engines accessible for different types of users, including those with problems in reading, writing or comprehension of complex content. Search accessibility means that people whose abilities are considerably different from those that average users have will be able to use search systems with the same success.

The papers selected for this workshop, which was held in conjunction with the 33rd Annual ACM SIGIR Conference in Geneva, Switzerland on 23 July 2010, are a mixture of research, discussion and position papers. The range of papers for this workshop reflects the diverse research areas that contribute to the discipline of Accessible Search. Two main themes can be identified: information retrieval for children, discussed in Section 2, and information retrieval for people with special requirements, discussed in Section 3. For both themes, the workshop invited a keynote speaker: Allison Druin from University of Maryland discussed children's actions and roles in searching; T.V. Raman from Google discussed how to support users with highly varying abilities to use the Google search engine.

2 Children and search systems

The workshop hosted two keynote speakers. The first keynote was given by Dr. Allison Druin, Director of the Human-Computer Interaction Lab at the University of Maryland and entitled ‘Searching for the Future: Understanding Children's Challenges, Actions, and Roles in Searching’. Allison’s research focus is on the interaction between children and technology, particularly using children as design partners when developing new interactive systems. In her presentation, she discussed the results of a home study of 83 children using Internet keyword-based search interfaces.

Based on her study she identified 7 main search roles that children display: *developing* searchers who display the willingness to learn how to search but who may be unsuccessful in searching, *domain specific* searchers who limit their searches to areas of personal interest, *power searchers* who have sophisticated search abilities, *non-motivated* searchers who lack the willingness to learn how to search, *distracted* searchers who easily go off target when searching, *visual* searchers who prefer to search within visual contexts and have visual results and *rule-based* searchers who have implicit rules for how to search learned from previous search experience or advice. Children may take on several roles and there were clear links between different roles.

In a fascinating presentation Allison mapped out these roles not only by the children’s search actions, but also by who influences their searching (mothers are popular influences!), their perceived success, and trends in age and gender. These roles suggest a need for new interfaces that expand the notion of keywords, scaffold results, and develop a search culture among children.

The first paper presentation was ‘A closer look at children’s information retrieval usage’ by Frans Van der Sluis and Betsy Van Dijk of the University of Twente. Based on a review of the available literature this paper started by discussing four specific groupings of problems that children have with the current model of IR systems. Firstly, *insufficient mental models* of search systems. That is, children often misunderstand how IR systems work resulting in poor queries or difficulties creating queries that require operators. The second issue is the *vocabulary* problem: children often have weaker or more limited vocabularies resulting in poor choices of keywords to use in queries. A third problem identified is that of *chaotic search behaviour* – children having limited and ineffective search behaviour and the fourth problem is that of *relevance behaviour* where children, perhaps due to their limited ability to read, make judgments by simply scanning for keywords in text or expect ready-made answers that may not be available from the information being searched. These four problems are problems for IR system designers rather than being problems of children and, as the paper notes, some do pertain to adult searchers as well. However, the paper suggests, they are characteristic of children searchers and may make it difficult for some age groups of children to search effectively.

The paper proposes a detailed framework for thinking about the variables that are important in childrens’ search processes and interaction. Usefully, it also provides a discussion on what aspects of relevance might be appropriate for childrens’ search systems. The particular aspects proposed are complexity (reducing the complexity of a search process by good system design or reducing the complexity of information provided can both help children search more effectively), interest (interest in a task being one way to increase intrinsic motivation) and affectiveness (targeting affectively powerful information objects).

The second paper presentation was ‘Assessing Fun: Young Children as Evaluators of Interactive Systems’ by Yusrita Mohd Yusoff, Monica Landoni and Ian Ruthven of the University of Strathclyde. This paper looked at evaluation of interactive systems by children. Children are often encouraged to help evaluate systems designed for their use and employed in studies of information seeking. Usually these are older children who have higher levels of literacy, verbal dexterity and patience. Using the same study design, but deployed in two settings, this paper looks at the challenges of working with young children (5-6) and the very young children (3-4) years old. As more interactive systems, including search systems, are being designed for young children this paper addresses the question of what evaluation techniques are appropriate and useful for young children.

The major findings were on the challenges of working with very young children: they can easily feel bored, do not understand some kind of questions, often cannot reason about experience, may experience language barriers due to low vocabularies and may have physical limitations such as hand and eye coordination in using computers. This has implications for the design of search systems for children but also for evaluation: evaluations of search systems with very young children cannot rely on the relatively open-ended data gathering methods (such as interviews and think-aloud) common in search evaluations of older people. Neither can search evaluations rely so strictly on the comparative experimental method commonly seen in IR evaluations where the same participants operate two or more versions of a system for fixed times and on given search tasks. The experience suggests that, given very young children are emotionally driven, evaluation techniques will require to be flexible in coping with children’s emotional states (including boredom and shyness), and focus on concepts that are accessible, understandable and interesting to children.

The third paper presentation was ‘Text simplification for children’ by Jan De Belder and Marie-Francine Moens of the Leuven University, Belgium. The goal of their work was to automatically transform text into a simpler text, so that it could be easier understood by children. They performed syntactic simplification, i.e. the splitting of sentences, and lexical simplification, i.e. replacing difficult words with more popular synonyms that children could be familiar with. Lexical simplification was approached with a language modeling for word sense disambiguation purposes. Sentences were split based on their syntax. At the same time, the simplification was controlled on the document level as authors tried to reach the certain readability level for the simplified text. Authors proposed to use Integer Linear Programming which allowed setting age intervals as constraints in the simplification process. The work is especially interesting in discussing its successes and failures. As authors reported, it was possible to reduce the reading difficulty only by removing information from documents under study. It was particularly hard to simplify the most difficult words when there were no simple synonyms for them. It also turned out that syntactic parsing of complex sentences is far from perfect and its erroneous output seriously affects the quality of simplification.

The fourth paper presentation was ‘Children Search Information on the Internet: Performance on children’s interfaces compared to Google’ by Hanna Jochmann-Mannak, Theo Huibers, Leo Lentz, Ted Sanders of the University of Utrecht and University of Twente. Authors compared children’s search performance on four interfaces designed for children (Traditional interface, Highly textual interface, Question-answering interface and Metaphorical navigation interface), with their performance on Google. Using special equipment, they observed eye traces of 33 children in the age of 8-12 years old, including 11 girls and 22 boys, when they conducted fact-based search. Their

findings were quite surprising and important for the development of future information retrieval systems for children.

Basically, they found out that children did not perform better on these interfaces than on Google. Metaphorical and highly textual interfaces appeared to be the most difficult for children. Children could not understand clearly the principles of novel ways of metaphorical navigation and also had difficulties with matching abstract categories to their actual information needs. Textual interfaces appeared to be too non-intuitive and confusing as they did not offer enough help in understanding and navigation the search result. According to their study, children actually preferred searching over browsing when looking for information, though taking advantage of query suggestion and spelling correction to a greater extent than adults. Question answering interface was also very well accepted by children – they could submit queries as questions in natural language and they appreciated the response in the form of short answers.

Their work suggested that it is important to always empirically test hypotheses about how to support children’s digital search behavior. Besides, it confirmed that Google influence on today’s children should not be overestimated. At the same time, it showed that well-meant designs for children are not so effective as one could think. However, some of their interface features are certainly needed to be adopted by search engines to make them children-friendly, such as visual summarization of results, faceted navigation and easily accessible long and short-term search history.

3 Users with Special Requirements

T.V. Raman is research scientist at Google Research, Mountain View, and a pioneer in customizing technology for blind users. His accessibility research interests are auditory user interfaces and XML specifications for the next generation world wide web.

In his keynote presentation, T.V. Raman stressed that for Google, providing accessible search does not mean developing systems for special user groups. Google is not likely to provide a “Google kids” as done by for instance Yahoo. Search engines like Google and Yahoo perform increasingly well at providing *relevant results* for “queries in the long tail”, i.e., the unusual, infrequent queries. Similarly, providing *accessible results* should be all about providing results for “users in the long tail”, i.e. users with unusual characteristics. Users in the long tail might search in unusual contexts, on unusual devices, or using unusual user interfaces. For example, consider the query: Lufthansa 455, a query for a specific flight: On a desktop, one might serve up a detailed Web page showing flight tracking, status and, available future travel. On a mobile device, one might show a light-weight version of the above. When using a voice-only interface, one might only speak the current flight status. Raman presented several interesting search applications, such as voice-only interfaces for Android phones. Speech is the next natural dimension in user interfaces. Raman is developing application frameworks that: “combine speech technologies with the power of the Web to deliver innovative multimodal solutions that are available anytime, anywhere.”

Hesham M. Kamel from the United Arab Emirates University presented WebMark, a technique for the personalization of internet access. WebMark provides visually impaired users with a navigational procedure to easily search and access internet content via voice synthesis feedback. The system allows blind users, while browsing the internet, to mark desired Web pages temporarily without using

the browser's feature of bookmarking them. Additionally, the method gives the user the flexibility to quickly revisit and access these marked pages during the same browsing session.

The final paper presentation, 'The Mediated Information World of Children on the Autism Spectrum Disorder (ASD)', was by Dania Bilal from the University of Tennessee. This paper reported on the first findings from a new study looking at the information worlds of children on the autism spectrum disorder (ASD). This paper particularly looked at the role of mediators for children with ASD – parents, teachers and other adults searching for information on behalf of children with ASD or for use by carers of children with ASD. Parents in particular were often 'information seeking proxies' for children, using a variety of information systems to support their children's lives and daily activities. The presentation also raised very interesting discussions on parents' perceptions of their children's abilities to conduct their own searches and on what kind of information retrieval support would meet the needs of children with ASD.

4 Panel discussion

Several important questions were raised during the panel discussion. First, all workshop participants experienced their worries about the absence of support for their research from companies developing services for children. It is still next to impossible to get any logs and other details on the usage of information retrieval services by children. The problem often lies in the strictness of laws forbidding the disclosure of any private information regarding children without consent of their parents. Second question regarded the developing of official standards for search engines, so they could be accessible for children. However, as was noticed, such standards, like WGAG, would not necessarily raise the awareness of search engine developers and do not represent the universal way to spread the word about the importance to take care about children as their users. The discussion also demonstrated the variety of challenges in developing accessible search systems, from novel interface design to intelligent filtering of information and new algorithms for finding accessible information.

5 Acknowledgments

Many thanks to the EU project PuppyIR, the University of Twente, Delft University of Technology, and the University of Strathclyde, for sponsoring the workshop.