Interactive search interfaces for young children – The PuppyIR approach

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Abstract—Finding and understanding information is key for children’s development. The Internet offers exciting new ways to meet people, learn about different cultures and develop their creative potential. However, children’s ability to use the Internet is severely hampered by the lack of appropriate search tools. Most Information Retrieval (IR) systems are designed for adults and unsuitable for children. In this paper we present an approach to provide appropriate IR interfaces for children.

Keywords—Information retrieval; technology enhanced learning; collaboration; multi modal interfaces

I. INTRODUCTION

The majority of research on IR interfaces and interaction design has been on software intended for literate, adult users. The increased use of computers and the Internet by children has focused attention on software for younger computer users and studying their search behaviour and interaction styles [1]–[3]. But beyond a few basic design principles, we do not yet know what interfaces for children’s search should look like. The response by search engine developers is to simplify or visualize the content or to reduce the interaction with the interface, treating children as simple versions of adults rather than responding to their specific needs as searchers [4]. The aim of PuppyIR is to overcome the gap in interface design and promote new interaction paradigms for children’s search systems.

II. INFORMATION SERVICES FOR CHILDREN

A good IR system should ‘grow’ with children, giving more support for younger children and allowing older children to take more control as their confidence and experience increases [1]. The younger children are the more likely they make spelling errors of different type and complexity [5]. A good system would help children in query formulation, but current approaches either offer a fixed vocabulary [6] or use automatic query reformulation. Fixed vocabularies must be manually created and adopted to children’s age and ability to help them understand what queries can be submitted, but they do not support children in learning how to create own queries. Automatic query reformulation tools can help children to correct queries [5], but have large vocabulary gaps and are primarily developed for adult vocabularies. Children also struggle with long lists of search

results and need support in managing complex searches [1]. The high cognitive load resulting from traditional result list presentations leads to children’s high failure rates in searches, particular in cross-media search. Even though children want combinations of media [7], current search engines force children to run separate searches for each media type. Aggregated information from multiple searches can help reducing the cognitive load on young children.

A. Designing Interfaces

The project PuppyIR aims at overcoming the gap between existing IR systems and the possibilities given by innovative technologies and multimodal systems to enable children not only search for information but also understand and handle retrieved information in an appropriate way. Developing software for children does not only affect the design of web pages or user interfaces. Since children’s behaviour and interaction patterns may be significantly different from those of adults, design approaches for children should take into account the whole interaction process. A careful selection of hardware components in combination with a participatory software design process can lead to an appropriate definition of scenarios for children [8]. PuppyIR will deliver an open source environment which can be used to build innovative, multi-modal IR systems for young children for various situations, e.g. for large input devices, open learning situations, or simple web-based information queries.

B. Searching for information

By analyzing requirements for the design of the user interface, we identified several challenges. Children cope with complex displays in many situations but struggle with the precision of searching. One reason for this is that children, particularly those with low reading and writing skills, have difficulties to formulate appropriate queries when using text-based search interfaces. If a child does not know how to exactly spell a word it is very likely that formulating a query will fail. And unlike adults or pupils with high literate skills, children with low or without literate skills do not benefit from correction mechanisms of standard search engines. PuppyIR will provide interface techniques that allow children to search with simple interaction techniques where

Figure 1. PuppyIR interface prototype on a dual-touch tablet pc.

queries can be formulated and refined through combining simple typing, pre-set query objects, images or concept icons and, where applicable, tangible objects or special defined multi-touch gestures. Standard search interfaces very often overload users when providing additional information like relevance, external links or number of hits. For children, complex result presentation can quickly lead to an increased cognitive load and distract them from finishing the task successfully. PuppyIR will research different techniques, e.g. latent semantic analysis, text-to-speech, content filtering or concept graphs, to optimize visualization of search results for children depending on age, ability and used hardware. Figure 1 shows a first prototype of a possible interface.

C. Keeping the flow

Users experience various emotions during a search, ranging from confusion and uncertainty to confidence and satisfaction. To successfully finish a search a child has to remain interested and confident, i.e., the child has to be in the flow experience of the search. Often applied in the context of gaming [9], flow experience is defined as an optimum between challenges posed to the user and abilities of the user [10]. Personalization, difficulty, and interest/enjoyment are key issues. We will research several techniques to combine difficulty of search results, interest, personalization and relevance feedback. Together, these techniques are expected to help keeping the child in the flow of the search.

D. Supporting collaboration

Collaboration can happen in different ways depending on context and complexity of a search task. In PuppyIR we aim to provide solutions for different collaborative situations. Children in a museum are likely to collaborate in very short cycles while groups change once or more times a day. In contrast, children in schools are likely to collaborate on closed long term tasks. These activities must be supported by appropriate interfaces and feedback. And children staying away from the classroom, e.g. while ill, should be able to collaborate with their classmates by getting access to classroom activities and (re-)use information.

III. CONCLUSION AND OUTLOOK

Except in the gaming industry, the commercial world has not found its way yet to develop appropriate information services for children and teens. In PuppyIR we will construct an Open Source Framework that will provide the infrastructure to develop *child-focused* and *child-friendly* components to be deployed within child information services.

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