
My Name is Sonny, How May I help You Searching for Information?

Monica Landoni*

Università della Svizzera Italiana
Lugano, Switzerland
monica.landoni@usi.ch

Emiliana Murgia

Università degli Studi di Milano-Bicocca
Milano, Italy
emiliana.murgia@unimib.it

Theo Huibers

University of Twente
Enschede, The Netherlands
t.w.c.huibers@utwente.nl

Maria Soledad Pera

People & Information Research Team –
Computer Science – Boise State University
Boise, Idaho
solepera@boisestate.edu

*Corresponding author.

ABSTRACT

In this paper, we describe the set up and procedure followed in an initial study where we observe a small group of primary school children interact with a vocal assistant or a standard GUI interface, while looking for online resources that can help them answer a set of predefined questions. We examine log files, observations, and feedback provided by the young users via an elementary interview at the end of each search section. Results from our analysis prompt us to consider how to evaluate the search process, specially one initiated with a vocal assistant, while considering both correctness of results, children preferences, and context of the search.

CCS CONCEPTS

• **Social and professional topics** → **Children**; • **Information systems** → *Query representation; Search interfaces*; • **Human-centered computing** → *Interaction paradigms*.

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KEYWORDS

Vocal assistant, search, primary schools, teachers, design stages, expectation, query.

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INTRODUCTION

Nowadays, children use digital devices to look for information, starting at a young age. Whilst for adults using a vocal assistant (**VA**) to initiate the search is often simple and intuitive, this is not necessarily the case for children.

In this work, we built upon the work in [3] and continue to explore children's use of VAs. Rather than examining children preferences on different types of VAs, as in [3], we focus on discovering how children can take advantage of VAs when interrogating search engines for information to be used in a school context. The goal of this research work is three-fold: (a) better understand how to support children in their quests for information, (b) outline considerations that can guide future development of a VA interface suitable for young users, and (c) start the conversation regarding how to best evaluate VA-based search tools for children, balancing both children needs and tool correctness. This will enable researchers to get a detailed and rich view of the searching experience.

THE STUDY

Given the exploratory nature of this research, we started by setting up a user study involving children from a local primary school. Below, we describe the VA strategy we considered, along with the protocol of our study and information pertaining to study participants.

VA strategy. In order to mimic a VA in this initial iteration of our work, we used a Wizard of Oz approach [2]. This is a method, first used in the early 1980's, in which the researcher (the "wizard") pretends to be an intelligent machine or computer application. The researcher and the testing subject are located in different rooms (or scattered in some way), so that the participant does not know he is, in fact, interacting with a human being. Occasionally, this test can also be carried out with the participant having a-priori knowledge about the tester being another human. In our study, however, we opted for separating research and study participants, as we wanted to encourage kids' natural behaviour.

Search tasks. To take this method to practise, we created a set of questions focused on school subjects. Following existing literature [1], we crafted these questions with the help of local teachers

Table 1: Age distribution across children who participated in the study.

Age	Children
6 years-old	2
7 years-old	2
8 years-old	4
9 years-old	5
10 years-old	2

Table 2: Interview questions to capture children preferences when it comes to their interactions with Sonny.

Question
1 Did you like working with Sonny?
2 Would you like to interact again with Sonny?
3 Did you find what you were looking for?
4 Do you like Sonny?
5 Would you use Sonny again to work on school researches?

¹<http://irlab.boisestate.edu/searchengineIT/>

and ensured we addressed a variety of subjects: geography, history, science, sports and health. Each set of questions contained two straightforward ones, looking for facts, one open ended, looking for information, and one multi-step that had to be split into multiple questions, to test the ability of a child to search for more complex information.

Protocol. To ensure consistency across user/system interactions observed during our study, we outlined a protocol to be followed during each Wizard of Oz session. **Sonny**, the VA personification, would introduce himself informally and ask the child if he required help searching for information. Once the child would issue a query Sonny would get back with the results of the search by reading the titles of the first five retrieved resources, and enquired if indeed more titles needed to be read. If not, Sonny would ask the child to select the title of the document to be read, and proceeded to read its first five lines. In addition to asking Sonny to initiate a *search* and *read* introductory lines in the retrieved documents, children could also ask Sonny to *repeat* the last five lines or the last five results just being read. The protocol included a request for reading more *slowly* or *stop* reading, to allow children to set their own pace during the search process.

Participants. We recruited 15 students from a local school, who took part of our study during the after-school time, over four days. We had a mixture of ages from 6 to 10 year-olds (see distribution in Table 1). After each session, we asked children a number of questions, that would allow us to infer how satisfied they were with their interaction with Sonny (see Table 2 for the full list of questions included in the survey completed by each of the children).

We used an ad-hoc search engine powered by Bing¹, that enabled us to register the grade of the child before starting the search session, and record log files for each session.

RESULTS AND ANALYSIS

To further understand children’s expectations when it comes to conducting inquiry tasks using a VA, we examined children responses to the interview questions in Table 2, as well as the query log generated as a result of interactions with the system guided by the protocol detailed earlier in this manuscript.

What do children think of Sonny as a search helper? Responses obtained from the informal interview conducted at the end of each testing session revealed the following results: all of the participants enjoyed working with Sonny; that is probably because it was something new for each one of them. It is important to note, however, that some children were already familiar with VAs, such as Alexa or Siri. Responses related to children’s willingness to interact with Sonny again in the future followed a similar trend: kids unanimously agreed that they would like to collaborate again with the VA. This result is even strengthened by the fact that, during the 4 days of testing, every kid that had the possibility to do so, came back to interact with Sonny. Another complete agreement

among children, is that everyone gave a positive answer regarding whether they found what they were looking for.

Was Sonny actually helpful in guiding the search? By looking at log files, we instead found that more than a half of the participants did not actually answer correctly to questions meant to be answered as a result of interactions with Sonny. Looking further into this matter, we discovered three different cases in which to group outcomes that resulted from interactions with Sonny to complete the search process: (i) some kids did not manage to find results while analysing available data, (ii) some kids got distracted while searching for answers, and, finally, (iii) the last group of children was not able to structure a query (or a set of queries) to get the desired results. Not surprisingly, age is a strong factor influencing our overall analysis. This matter will be discussed later in this section.

Do children like Sonny? Based on interview responses, there is a 100% agreement about liking Sonny. Again, this is strictly related to kids seeing our VA as something new and "magical" in the classroom. Moreover, Sonny's behaviour as a VA was very kind, since in this study we wanted to specifically initiate our exploration using a VA that fostered a welcoming environment while helping children with their online inquiries related to school work.

Would children turn to Sonny to complete school assignments? Regarding the wish of using Sonny again to work on search tasks related to school assignments, the results vary. While the majority of the participants expressed they would gladly use Sonny, a small percentage of them did not completely agree. Specifically, two kids disagreed because of two different personal opinions:

- A 7 year-old girl said she would not like to work with Sonny as she prefers to work on her own with a mouse and keyboard—something that could not be done with Sonny, which only has audio as means of input.
- A 6 year-old boy who would not want to work with Sonny as he would like to practice reading on its own.

It is important to note that these two children were the youngest among the participants, and thus may not yet be ready to recognize the benefits of using a VA to initiate the search process. In their opinion, working with Sonny would, in fact, interfere with the practice of reading and writing. Theoretically, this is not the case, since our VA has to be specifically asked to read some text in order to do so.

Is age a factor influencing perception on Sonny's helpfulness? Regarding age, some peculiar behaviour can be recognised. As expected, younger kids found it difficult to formulate correct queries to submit to Sonny in order to initiate the search process. They tended to ask Sonny questions in the same manner in which they were outlined in the task assigned to them, leading to disappointing results. Moreover, children had difficulty in extracting answers for their inquiry tasks among the selected, retrieved documents, even though it may had just been read by the VA. This sometimes led children to complete their assigned tasks by including a random answer, as opposed to stating none.

A good example is a 2nd grader who, after asking how many meals per day should be eaten by a kid and receiving 2 different pages with the correct and clear answer, started to get frustrated by not finding the solution he was looking for. He then asked Sonny to open two additional pages. When he finally ended on a page discussing how much water a newborn should drink per day, he said he had found what he was looking for and replied with "a kid should eat 1000 meals per day".

In terms of interface, age also led to contrasting results. Whilst most children did not experience any difficulty interfacing with Sonny and extracting answers to search tasks from retrieved resources, their behaviour varies. Some showed interest in the search subject and use of a VA as a means to get to the desired result, whilst others showed no interest in the research topic and used Sonny just as a means to enjoy themselves. They do so by trying to "break it" and finding its weakness. As an example, consider a 4th grader who asked Sonny to find his father's age. He also kept asking Sonny to *read* lines from web pages, instead of giving an amount of lines to read—the required syntax understood by Sonny and used by all other children. In other words, he gave Sonny useless information, such as "read from chapter one, paragraph two, lines from 3 to 23 ending on the word written in bold" where no chapters were present or shown at all.

An additional discovery emerged while analysing children's interviews: as participant age increased, satisfaction with results decreased, but the correctness of the results greatly improved. This serves as an indication that, while growing up, kids tend to want more freedom, hence the rising dissatisfaction for results found via Sonny.

EVALUATION STRATEGIES: WHY EXISTING FRAMEWORKS ARE NOT SUFFICIENT

In the previous section, we discussed outcomes from our study and outlined possible guidelines to consider in future iterations of VA search systems. However, when it comes to quantify performance beyond qualitative facts, we argue for the need of evaluation frameworks that can facilitate not only replication of analysis but, more importantly, foster comparisons across different systems when it comes to assess if a system is suitable and correct for the target audience. There is a plethora of criteria and methods, collections and specific evaluation initiatives devised over time, mostly by the information retrieval research community, for assessing the performance of similar systems used by adults. We can surely build on and be inspired by their work. But we also feel that this is the right time and place to coordinate an organised effort by the Child Computer Interaction (CCI) community to target specifically the design of a framework to assess the many facets of the searching experience involving children in a formal context.

CONCLUSIONS AND FUTURE WORK

Even if solely based on a small group of participants (15), ranging from 6 to 10 years old, our initial analysis revealed that children indeed have difficulties in formulating a question/query to be presented

to a Vocal Assistant (VA) to initiate a search process. From this analysis, we were also able to infer limitations that arise as a result of children interacting with a personalised and personified VA, in terms of locating intended resources. As result of the initial investigation detailed in this manuscript, we proposed some guidelines that can aid the development of more effective interactions between VAs and children.

The major issues to be considered moving forward when it comes to VA search systems include:

- share-ability: the multiple usage of the VA (the design for a VA shareable among school groups and family members);
- continuous feedback: specific attention has to go into helping kids staying focused and not getting frustrated while searching (such as helping them restating questions and giving them a feedback to make them understand the assistant is listening them, even though the question may have been wrongly posed);
- flexibility & integration: revisit the VA system to include the option of direct child-computer interaction via GUI.

A fundamental research question remains, in terms of how to evaluate an interaction system, such as Sonny: Beyond the qualitative aspects and feedback received from children, how do we capture (i) the correctness of the system, (ii) the quality of the interactions with the VA, and (iii) children's perception of correctness of the results and degree of conform interacting the VA in order to determine the overall "goodness" of such system when used in a formal setting?

In a follow-up study, we will make sure to match young participants' abilities, in terms of understanding, inferring and searching information, with suitable questions. The follow-up study will also offer children the possibility to interact with many different kind of systems (VA, websites, etc).

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