

Designing interfaces for children with motor impairments

An ethnographic approach

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Abstract— The purpose of this paper is to convey the results of an HCI ethnographic research developed in a school for children with spinal cord injuries and cerebral palsy in order to understand how they interact with the environment, which activities they carry out and which tools we can provide as interaction designers. The result of this work may serve as a case study for interaction designers interested in developing interfaces for children in this situation. Furthermore, we expect that the experience of driving an ethnographic research for gathering users' needs will serve as an income for HCI researchers interested in performing a requirement analysis in this context.

Keywords—accessibility to motor impaired children; assistive technology; ethnography in HCI

I. INTRODUCTION

Designing interfaces for users with impairments is a challenge, especially if those users are children. Gathering information about their specific needs, understanding how they interact with the environment, may need the aid of proxy users and a lot of intensive observation. Moreover, because of the complex story behind these users, it is fundamental to involve them in Human-Computer Interaction (HCI) research, design and evaluation. It is important to work with users with impairments themselves [1]. Due to the characteristics of this population, a good starting point to improve interfaces or design new ones for children with impairments is to conduct an initial ethnographic research.

The purpose of this paper is to convey the results of an ethnographic research developed in a uruguayan public school for children with motor impairments, specially children with spinal cord injuries and cerebral palsy. It is important to take into account that all public schools in Uruguay are under the *One Laptop Per Child* (OLPC) program, so every children, including children with impairments, receives a laptop (named XO) with the same characteristics and the same technical constraints. Besides, children can take their laptops to their own homes.

II. MOTIVATION

The results of our work will serve as an income for a broader project whose main objective is to help children in the mentioned context, integrating multiple perceptual modalities into the user interface. These interfaces are known as *perceptual interfaces* [2]. The underlying hypothesis of this

broader project is that the factory default settings of the XO represent an obstacle for children with motor impairments and that perceptual interfaces would improve their interaction with these machines without adding extra hardware to the XO. The factory default settings of the XO are the following: 433 Mhz, 256 Mb of RAM memory, 640x480 30 fps webcam, WI-FI, tiny keyboard, touchpad and a 7.5 inches LCD screen.

III. CONTEXT

Our study was developed in the uruguayan public school 'Dr. Ricardo Caritat', the only public school in Montevideo, the capital city of Uruguay, for children with motor impairments¹. In Uruguay the prevalence of disability reaches the 7.6 percent of the population. This means that near 260 000 people in Uruguay have some kind of disability. Children, teenagers and young people represent the 17.9 percent of this population.

Every day, about one hundred children with different kind of motor impairments attend to the Caritat center. 90 percent of these children have cerebral palsy, 8 percent spina bifida, and 2 percent other pathologies. The objective of the center is to partially or fully rehabilitate their students through different strategies to take their abilities to its maximum potential and to insert them into the society. The participants of this study were 16 students between eight and twelve years old, with severe, moderated and mild impairments, their teachers, the director of the center and physiotherapists. Our research team was conformed by three observers that took notes independently in order to triangulate the results properly. We observed students using the XO and students in their daily school activities, without using computers.

IV. RESULTS

Working with the children, we found out that they are very flexible working with their XO's despite the software was originally designed for other kind of abilities. Most of the XO's have a conventional mouse connected. In spite of their dystonic movements, we observed that they managed to use the mouse fairly well. Moreover, some XO's were aimed with assistive technology, in particular accessibility switches. However, due to their economic context, not every child has access to

¹ More information about the Caritat center in the URL:
http://www.ccp.edu.uy/index.php?option=com_content&view=article&id=42&Itemid=121

assistive peripherals. We also observed that the keyboard size is too small, not only for the children motor impairment but for children with visual impairments. Teachers encourage them to use a magnifier tool but we noticed that this tool is not easy to control so it become useless. Finally, as an example of the potential of the XO's, one student was capable to solve arithmetic problems but it was very difficult for him to take their pencil and write down the result in his notebook. However, he was very stimulated by the XO because with this technology he can develop easier.

According to the teachers and the director, working with computers is very motivating for the children. Every day they see children with very severe pathologies that perform better with the XO, gaining autonomy, which is important for their self-esteem. The use of the XO is also useful for families who live far away from the center and for whom following their children improvements it's a difficult task. For example, the children can take their XO to their homes and show to their parents the daily activities and its results. Furthermore, teachers highlight that the children feel very motivated with the technology because they take it as a game and as a competence with the machine at the same time.

On the other hand, the director expressed that they have had all kind of difficulties with the XO. The main problem is that the XO is not adapted for children with motor impairments. In spite of the fact that the teachers make their best effort to

include the XO in their daily activities, some of them doesn't feel very confident with this technology and tend to avoid using it.

V. CONCLUSION

To conclude, we have put in practice a not widely known research method in the HCI research community -an ethnographic study. We could observe children's activities, playing in their school environment, carrying out activities some of them involving the use of their laptops. This approach turned out to be extremely useful in order to have an authentic perspective of how the interaction takes place. As a result of this work, we could confirm that the studied context is particularly suitable for the development of new interaction techniques that take advantage of the limited XO characteristics. In particular, this context is a fertile ground for interfaces that integrate computer vision, speech and sound processing, like perceptual interfaces.

REFERENCES

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