

Functional Rehabilitation using advanced HCI for children's with cerebral palsy

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The SINA (Natural Advanced Interaction Systems) is a hands-free interface system that could be the best choice for Human-Computer Interaction (HCI) for people with physical disabilities that are not capable of using traditional input devices. Once a first prototype is developed in the laboratory taking into account design and usability requirements, real users is what finally categorize an interface as useful or not. An evaluation of our interface with users with cerebral palsy and multiple sclerosis has been carried out during a project of 9 months long. The SINA II is an improved version tested with more number of end user and with secondary positive effects: **functional rehabilitation** using the set of training exercises designed to reach natural mouse control. The project has been executed by a multidisciplinary group from intertwined roots: a technical group expertise in computer vision and HCI, a pedagogical group expertise in special education and assistance with new technologies, a centre of users with cerebral palsy (CP) and a centre with users with multiple sclerosis (MS) plus the therapists working there.

After implanting SINA in the centers and teaching its functioning to the therapists, we've been monitoring the sessions with the users, in order to improve the hands-free interface in usability and accessibility issues. The project was divided in four phases:

1. Choose the most appropriated users for participating in the project
2. A personal planning of tasks for each user as their characteristics
3. The sessions with the users were carried out
4. Evaluation of the results was made.

After the first phase of evaluation, changes in the design have been done during the whole project's duration. Some modifications were small and didn't suppose a great effort of programming but it meant a very important variation in usability issues. Changes were done in the interface appearance, a user's profile for each user was created with their own interface settings, new features in the user's profile were included, or the improvement of computer vision algorithms.

Another important consideration that the pedagogical group thought was the creation of simple games for learning the operation of SINA. Three kinds of games were planned by the pedagogical group: action/reaction, motion and practicing the execution of mouse's events, and they form the SINA training games. We have evaluated the interface, and in the seven CP cases of our study we have improved their access method, either offering an adequate interaction system or relaxing the working posture of the users. A very important fact is the discovery of SINA as **a rehabilitation tool**. Therapists are really pleased to observe how the users maintain their posture and head straight and the involuntary movements reduce once the user sits in front of the webcam and concentrates in the tasks. This work is subsidized by the projects TIN2007-67993 and TIN2007-67896 from the MCYT Spanish Government.