

Hand Motion Tracking as a Human Computer Interaction for People with Cerebral Palsy

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Abstract : This paper describes experiments using Scratch games, to check the feasibility of employing cerebral palsy users gestures as an alternative of interaction with a computer carried out by students of Master Human Computer Interaction (HCI) of IPC Coimbra. The main focus of this work is to study the usability of a Web Camera as a motion tracking device to achieve a virtual human-computer interaction used by individuals with CP. An approach for Human-computer Interaction (HCI) is present, where individuals with cerebral palsy react and interact with a scratch game through the use of a webcam as an external interaction device. Motion tracking interaction is an emerging technology that is becoming more useful, effective and affordable. However, it raises new questions from the HCI viewpoint, for example, which environments are most suitable for interaction by users with disabilities. In our case, we put emphasis on the accessibility and usability aspects of such interaction devices to meet the special needs of people with disabilities, and specifically people with CP. Despite the fact that our work has just started, preliminary results show that, in general, computer vision interaction systems are very useful; in some cases, these systems are the only way by which some people can interact with a computer. The purpose of the experiments was to verify two hypothesis: 1) people with cerebral palsy can interact with a computer using their natural gestures, 2) scratch games can be a research tool in experiments with disabled young people. A game in Scratch with three levels is created to be played through the use of a webcam. This device permits the detection of certain key points of the user's body, which allows to assume the head, arms and specially the hands as the most important aspects of recognition. Tests with 5 individuals of different age and gender were made throughout 3 days through periods of 30 minutes with each participant. For a more extensive and reliable statistical analysis, the number of both participants and repetitions in further investigations should be increased. However, already at this stage of research, it is possible to draw some conclusions. First, and the most important, is that simple scratch games on the computer can be a research tool that allows investigating the interaction with computer performed by young persons with CP using intentional gestures. Measurements performed with the assistance of games are attractive for young disabled users. The second important conclusion is that they are able to play scratch games using their gestures. Therefore, the proposed interaction method is promising for them as a human-computer interface. In the future, we plan to include the development of multimodal interfaces that combine various computer vision devices with other input devices improvements in the existing systems to accommodate more the special needs of individuals, in addition, to perform experiments on a larger number of participants.

Keywords : motion tracking, cerebral palsy, rehabilitation, HCI

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