New insights into motion-based video game design for young disabled players

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Computer games controlled through wheelchair movements have the potential to improve quality of life for young people with severe mobility impairments but more needs to be done to to meet their needs in game design, new research shows.

Computer scientists from the University of Lincoln, UK, the University of Copenhagen, Denmark, and University College Cork, Ireland, worked with a leading special needs school in Lincoln to examine whether new motion-based gaming technologies and interactive design approaches could make video games more accessible and appealing for children who use powered wheelchairs.

Lead researcher Dr Kathrin Gerling, Senior Lecturer in the University of

Lincoln's School of Computer Science, said young people with special needs often experience barriers when trying to engage in leisure activities, including motion-based video games. She and her co-researchers have previously developed a system called KINECTWheels, which integrates existing motion sensor gaming technology with powered wheelchair controls.

In their latest study, the researchers worked with nine young people at the special school who use powered wheelchairs in an attempt to better understand what they would want as players from new movement-based video games - a process called 'participatory design'. Based on those sessions, the researchers developed three new games specifically with those users' needs in mind. It works with any kind of wheelchair; the basic version tracks wheelchair movement through body position, while the extended version is marker-based if the user has a very limited ability to move.

The three games were a downhill skiing game, Speed Slope; a robot boxing game, Rumble Robots; and an experiential adventure game, Rainbow Journey. In each game, wheelchair movements controlled aspects of the game. For example, left and right movement translated to slaloming in the skiing game, with forward and back movement changing the pace.

"Our results showed that the games provided engaging experiences for players with a wide range of cognitive and physical abilities, and that the users appreciated the combination of physical and in-game challenge," said Dr Gerling.

"Most importantly, our findings suggest that movement-based games can help empower players with mobility impairments by providing experiences that are relevant to their personal situations, opening up new perspectives.

"This work suggests that the participatory development of movement-based games has potential to create engaging playful experiences with a physical dimension."

The researchers concluded that accessibility in game design should not be limited to the user interface and game mechanics, but also content, such as the characters, activities and themes represented in games. In particular, they and the young people involved noted the lack of disabled characters as protagonists in video games, compared to other media such as television and film.

Dr Gerling added: "We need to ensure that games reflect how players view themselves, and enable them to become who they strive to be through empowering playing experiences."

The findings will be presented at the ACM SIGCHI Conference on Human-Computer Interaction (CHI), in San Hose, USA, between 7th May and 12th May 2016.

Dr Gerling, who studied in Canada and Germany, worked in the games industry before joining the University of Lincoln.

She intends in future to investigate the design of games for players with different cognitive abilities and to explore the idea of sandbox-style play to accommodate a range of player abilities and interests.

Provided by University of Lincoln