Smart Chair "A way to make exercising fun"

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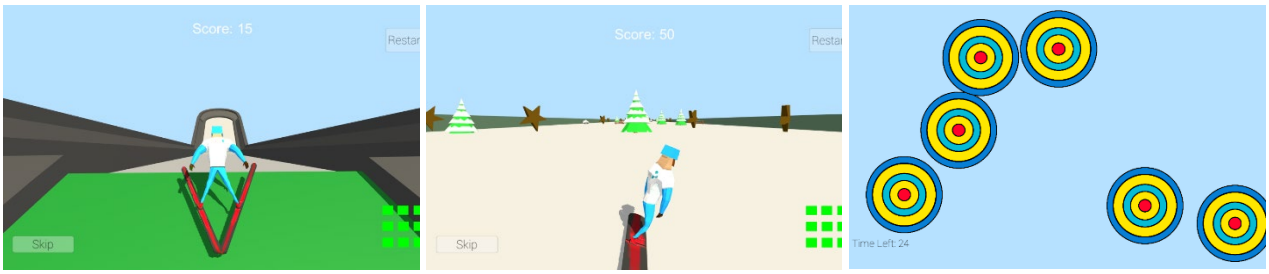
Staying active is important for elderly in order to minimize the risk of injuries but exercising is something that elderly are unlikely to do. The exercise movements are usually repetitive and often boring, and having to exercise quickly becomes a chore. On a positive note, elderly do not have to exercise hard; even slight training can help to stay active. Unfortunately, not all elderly people have access to a gym easily or the chance for physiotherapy.

To get people motivated to move and do exercises, the Smart Chair was developed. The chair enables the elderly train without it being felt as an exercise. This is offered through games, which motivate elderly to move every part of the body at least a little to progress in the game. It is not necessary to move much, small movements are enough to train. Addressing the problem that people cannot always go to a place where they would exercise, the chair has been made wireless and light so it can be easily installed in private apartments. In addition to being wireless and light, it also looks like an ordinary chair so it can be placed in the living room like part of the resident's furniture. Complementary to the chair, games have been made for Android devices, so it is possible to play them on a phone, tablet or on a bigger screen like a smart TV. The chair is connected to the device via Bluetooth. The movements are measured through nine pressure sensors under the sitting surface and are unobtrusive to not stigmatize the user.

An ordinary chair with armrests was used for installation of the pressure sensors (left photo). Bottom of the chair showing connectivity to the pressure sensors within the cushioning and a power bank (right photo).

Three minigames were developed for this purpose: ski-jumping, snowboarding and ball throwing. They require the player to move their body in relation to the smart chair. In ski-jumping, the player is required to stand up to initiate the jump and then return to the seated position. In snowboarding game, the player controls the game by leaning sideways while sitting in order to dodge obstacles and collect points. In the last game, the player has to hit the moving targets on screen be either throwing a ball on them or touching by hand. The game can be played in standing or sitting. The provided games can be adjusted to the individual needs through slow/fast and easy/difficult adjustments. In the end, a total score is displayed and the results can be saved and are later displayed on top ten list, which presents a motivational as well as competitive aspect of the game.



Ski-jumping minigame (left), snowboarding minigame (middle) and "hit the target" minigame (right).

Smart chair with touch-screen Yeti tablet in home setting. Photo: Jakub Wittchen.

Apart from the games that were developed for the purpose of Smart Chair, there are also two functions that the chair has. Firstly, the nine sensors detect and display the pressure distribution of the person sitting which provides feedback on proper sitting position, for example if the person is leaning too much to one side. Secondly, the chair can also measure functional ability used in a standardized test Timed up and go (TUG), where the sensors detect the person's standing up and sitting down during the test and accurately measure the time used to complete the test. The data from the test can be sent to any e-mail address. Elderly living at home can perform this test and track their functional ability over time. If the chair is used in elderly homes, the TUG test can help determine functional ability of its residents.

The Smart Chair concept, installation and games were developed by Venni Ihanakangas at Satakunta University of Applied Sciences (SAMK) in Finland as part of BaltSe@nioR project.