SafeMove – Safe mobility of elderly in the vicinity of their home and on journeys

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Abstract. The demographic change that is foreseeable in the future will permeate all throughout society, and require new approaches to ageing and its concomitant challenges. Serious games are one of the answers towards this challenge. Herein, we describe ways how the SafeMove project plans to employ serious games in the context of helping elderly people with light dementia to operate on their own. Due to the multi-facetted approach of the SafeMove project, serious games are embedded in a holistic system for the elderly, which will ultimately help them stay active and ambulatory as long as possible, while feeling safe and well cared for. This will enable them to stay in the comfort of their own homes for as long as possible, while helping them stay active and socially connected. The serious games will provide the impetus to exercise more, as well as connect with others playing the same games.

Keywords: Light Dementia, aMCI, elderly, mobility, safe mobility, social groups

1 Overview

By 2020, 25% of the EU´s population will be older than 65 years, which will lead to a shrinking of the European working-age population. This demographic and financial shift will increase the cost of the healthcare systems, as more people will need some sort of physical, social or mental care allowing them to remain an integrated and active part of society. One of the key factors, which enables a person to remain an active member of society and enjoy a high quality of living is the ability to freely, safely and easily travel from point to point. This ability becomes less available to

people as they grow old and the capability to remain active and to maintain a high level of well-being becomes compromised.

There are many reasons, both physical and cognitive, why elderly people become reluctant or unable to travel or even take a walk. This lack of movement and motivation leads to social isolation and to an excessive need for personal care.

The SafeMove project vision is to enable elderly people with amnestic Mild Cognitive Impairment – (aMCI, i.e. light dementia) to stay active and in the comfort of their own homes for a longer period of time, while simultaneously being able to go out and to join social activities. The project aims to achieve this vision by assisting them to become well trained users of modern IT devices and by creating both a physical and a virtual community.

SafeMove aims to reach its goals by creating an integrative and personalised system comprised of three key synergetic elements:

1. **SafeMove@Home:** home-based physical and cognitive training, also through serious games. IT training games and devices (based on the Kinect sensor) are being developed to enhance both the mental and physical fitness of the elderly in an interactive, effective and enjoyable way: The system allows the users to practice their outdoor routes at home, play serious games (that are being developed based on professional knowledge from various clinical researches on dementia). The system also addresses the development of social relationships by encouraging contact between users.

2. **SafeMove on Tour:** Location-based mobile assistance for outdoor life activities. An application for mobile devices is being developed in order to support elderly persons with aMCI to find their way outside their homes, navigate through public traffic or at social events etc. By using the real-time assistance provided by their mobile devices, they remember daily life routines such as dressing themselves according to the weather conditions, taking the keys with them when leaving the house or even making sure they're still on the route they planned in advance.

3. **SafeMove Assist:** Caregivers and family members have the opportunity to assess the health of their clients remotely and to support them in keeping them healthy and mobile. With the help of the SafeMove assist platform, caregivers receive valuable information concerning the users and are able to assist several users simultaneously.

The SafeMove project is funded by the Ambient Assisted Living (AAL) Joint Programme and is carried out by a collaborative interdisciplinary group of experts working including physicians, scientists, consultants, designers, health-care providers etc.

2 SafeMove Games

The games for the SafeMove project are being developed to inspire confidence in the user's physical and mental abilities.

Using the gesture based Microsoft Kinect, the elderly can play fun and challenging mini-games to keep their faculties sharp, interact with peers and enjoy gentle guided exercise all while in the safety of their own home.

It is our hope that these features will not replace their trips outdoors but that it would encourage them to be strong and confident when going out, preventing their lifestyle from declining and giving them the courage to keep going in the event of a fall or other troubling event.

The games will all be set in one environment, a park, where the user will be able to explore and launch mini-games which are each designed around Physical, Cognitive and Social elements.

Physical, Cognitive and Social elements are not mutually exclusive and we expect a significant amount of cross over in the mini games.

The combined activities are designed to provide a holistic approach to improving social interaction skills, providing an awareness of social skills and improve confidence and promote a feeling of wellbeing.

The mini-games which have so far been developed for the SafeMove project include:

Walking in a Virtual Park:
This is a simple physical game which uses a walking gesture. This game is designed to give the users gentle and guided exercise.

Hoopla
The user is faced with 3 colour posts in the ground at the same distance away. The colours are Red, Blue and Yellow. The user will be given hoops to throw to these posts.
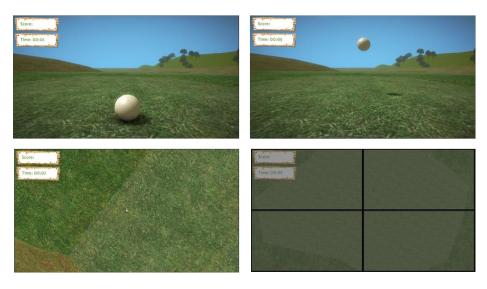
There will be a tombola sign which spins around and will have one of the 3 colours written on it but it may be displayed in a different colour. For example, the word says **RED** but it is written in blue. The user must then throw the hoop to the blue post. So the user must throw the hoop at the correct post according to the colour of the word and not the word itself.

This game is a variant of the classic Stroop Test. Dissonance between the colour presented and the mismatched name interferes with naming the colour. The Stroop Test causes elevated activation in the anterior cingulate cortex, which is involved in detecting the incongruity. The classic Stroop interference task [3] has provided a fruitful platform by which to test models of forced-choice decision and response selection under situations where compatible or incompatible components of the stimulus facilitate or impair task performance. In the typical Stroop task, participants are instructed to report the physical colour of a written colour word (e.g., "RED"), while ignoring the semantic meaning of the word. In cases where the physical colour of the presentation is congruent with the semantic meaning of the word, participants are both faster and more accurate at reporting the physical colour. However, when the physical colour differs from the semantic meaning of the word (i.e., is incongruent) participants are slower and more prone to error [2].

Golf
This is game is to help improve spatial memory. The user has to use a golf swing gesture to put the ball into play. They are then shown a view of the fairway with the golf ball displayed. The ball then disappears and a few distractors are displayed. The user then has to remember and select where the golf ball was displayed.

The spatial span task exercises your visuospatial working memory; the component of working memory that allows you to temporarily hold and manipulate information about places. Many everyday activities involve visuospatial working memory, including finding your way around your environment, judging the position of other motorists while you are driving and searching for your keys. According to one very influential cognitive model of working memory [1] visuospatial working memory depends on a specialised sub-component of the working memory system. This is referred to as the "visuospatial sketchpad" and is thought to have a visual "cache", responsible for storing visual form and colour information, and an "inner scribe" which deals with spatial and movement information.

Smiling

This is a social cognition game. The user will see a series of smiling, neutral and frowning faces and they have to select the smiling faces as quickly as possible. The idea is that each time the user drags their attention away from one of the frowning faces in order to find a smiling, accepting face, it helps to build a mental habit. The next time they are reminded of a rejection or criticism from someone else, rather than dwelling on it, they may be able to 'let it go'. This is because the mental habit generalizes beyond the visual domain of disengaging from frowning faces, to apply to disengaging from thoughts and worries about social rejection and criticism.

For all of the games we will measure the user reaction times, the accuracy and each game will have a scoring system. This will enable the SafeMove system to track user progress and help to identify a decline in the user's physical and cognitive abilities.

3 Benefits of conference participation

The core innovative component of the SafeMove solution is our ability to seamlessly integrate the 3 elements described above into a **holistic solution that is based on clinical research and can provide customized and effective assistance for elderly people, at home and on tour, thus creating a solution that will significantly improve their well-being.**

During the conference, we would like to present the innovative concept of the SafeMove solution and demonstrate key components and features that were already developed, emphasizing the serious games component. We are sure that in the project's present state (2 years out of 3), the knowledge we are able to convey would be beneficial to other participating consortia.

As the representatives of the SafeMove consortium, we look forward to receiving new ideas and best practices concerning technological integration and development of serious games for the elderly population.

Proposed conference Attendees
Mrs. Irit Luft Madar - Senior Consultant at Methodica Effective Learning.

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