



Thesis Project Form

Title (tentative): Mobile applications for remote monitoring and training of working memory

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Description

Motivation and application domain

An estimated 15-20% of persons over 65 years exhibit signs of mild cognitive impairment (MCI). A person with MCI has a greater risk of developing Alzheimer's disease or other forms of dementia. Lifestyle, regular exercise and cognitive stimulation may reduce the risk of cognitive decline and dementia. Many standardized therapist-mediated tests and cognitive stimulation protocols are available, but remote monitoring based on mobile applications would allow a more timely detection of signs of impairment. Memory span (the longest list of items that a person can remember) is a common measure of working memory capacity, and its reduction is a major determinant of cognitive decline.

General objectives and main activities

The objective of this work is to develop a method to reliably assess memory span, specifically designed to be self-administered at users' homes. The method will be based on a variant of the "memory" game. An explicit model of the play strategy and the involved knowledge structure has been derived through advanced psychometric techniques "the knowledge space theory formalism. This characterization will be used to design a variant of the game in which the chance component is minimized, thus minimizing variability of performance and enabling an accurate estimate of the memory span from observation of game performance. The activity includes the development of the minimum-variability game variant; the implementation of the method into a smartphone app; the collection of performance data from a population of users of different ages and conditions; and the analysis of these results. The work is carried out in collaboration with the Quantitative Psychology Group of University of Padua.

Training Objectives (technical/analytical tools, experimental methodologies)

- Design of telemedicine applications to monitor cognitive impairment
- Mobile applications and network (cloud) services (Java)
- Experimental studies to assess working memory and memory span
- Model-based analysis of the results (Matlab)

Place(s) where the thesis work will be carried out: DIBRIS@UNIGE, UNIPD

Additional information

Pre-requisite abilities/skills: matlab

Maximum number of students: 2