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Cognitive Evaluation for the Diagnosis of Alzheimer's disease based on Turing Test and Virtual Environments

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Abstract

Alzheimer's screening tests are commonly used by doctors to diagnose the patient's condition and stage as early as possible. Most of these tests are based on pen-paper interaction and do not embrace the advantages provided by new technologies. This paper proposes novel Alzheimer's screening tests based on virtual environments and game principles using new immersive technologies combined with advanced Human Computer Interaction (HCI) systems. These new tests are focused on the immersion of the patient in a virtual room, in order to mislead and deceive the patient's mind. In addition, we propose two novel variations of Turing Test proposed by Alan Turing as a method to detect dementia. As a result, four tests are introduced demonstrating the wide range of screening mechanisms that could be designed using virtual environments and game concepts. The proposed tests are focused on the evaluation of memory loss related to common objects, recent conversations and events; the diagnosis of problems in expressing and understanding language; the ability to recognise abnormalities; and to differentiate between virtual worlds and reality, or humans and machines. The proposed screening tests were evaluated and tested using both patients and healthy adults in a comparative study with state-of-the-art Alzheimer's screening tests. The results show the capacity of the new tests to distinguish healthy people from Alzheimer's patients.

Keywords: `Alzheimer's disease, Dementia, Early detection,`

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