Usability Evaluation of an Application Designed for the Older Adults

André Luiz Satoshi Kawamoto[1,2], Valéria Farinazzo Martins[3],
and Flávio Soares Corrêa da Silva[2]

[1] Federal University of Technology - Paraná
Via Rosalina Maria dos Santos, 1233, Campo Mourão - PR, Brazil
kawamoto@utfpr.edu.br
http://www.cm.utfpr.edu.br
[2] University of São Paulo, IME
R. do Matão, 1010 - Cidade Universitária, São Paulo, Brazil
fcs@ime.usp.br
http://ime.usp.br
[3] Universidade Presbiteriana Mackenzie
Rua da Consolação, 930, São Paulo, Brazil
valfarinazzo@gmail.com
http://www.mackenzie.br

Abstract. Nowadays, population aging has attracted the interest of research areas such as Health, Social Sciences, and Economics. Aging can trigger unwanted phenomena associated to muscle weakness, loss of memory and loss of autonomy. This paper presents a computer application based on the Corsi Test designed for the elderly audience, which can be used for testing and for training of the visuospatial memory. The application development is presented, as well as the results of an Usability Evaluation. This work aims to contribute to the usability evaluation of gesture interfaces, especially in applications aimed to the elderly audience.

Keywords: Gesture-based interface, Usability Evaluation, Kinect.

1 Introduction

According to the IBGE (Brazilian Institute of Geography and Statistics) [7], by the year of 2050, one fifth of the Brazil population will be formed by people over 60 years-old. This increase in the elderly population is due to factors related to medical and technological advances, like basic sanitation improvements, reduction of the mortality rate and the augment of the life expectancy.

Despite the clear advantages associated to seniority, aging can also have negative physical, cognitive, and social consequences. The average visual and auditory acuity decline considerably with age, as well as the average strength and speed of response. Some people may experience loss of at least some kinds of memory functions, declines in perceptual flexibility, slowing of "stimulus encoding" and increased difficulty in the acquisition of complex mental skills [10].

It is possible to compensate, at least partially, cognitive deficits [1, 4]. In fact, stimulating the memory in the elderly improves considerably the cognitive aspects [1, 3, 4]. In this sense, playing games can have positive effects on the emotional and physical well-being of elderly people, and can motivate them to maintain a basic level of physical and memory activity [2, 8].

Non-conventional devices, such as the Microsoft Kinect, may offer a good opportunity to create games able to motivate the physical and memory features of older adults. However, such games can provide real danger to these people [6]. Thus, it is necessary to consider usability criteria, such as exertion management, age-inclusive design and simple setup routines [5]. This work presents the development of a digital memory application based on Microsoft Kinect that reproduces the Corsi Test, and the results of an Usability Evaluation performed to determine usability issues.

2   Application Development and Evaluation

Prior to the development of the application, a professional specialized in memory issues was consulted. He suggested creating a computer version of a test, named Corsi Test, which is used to analyze the amount of information stored as part of the treatment for visuospatial memory. The test consists of a table presented to the patient. On top of it, 9 blocks are randomly placed. The conductor of the experiment touches the blocks, one after the other, in a sequence that must be repeated by the patient. The first sequence is composed by only one block, the second one takes 2 blocks, and so on, until the maximum number of 9 blocks. Each sequence is different from the previous one. The average number of blocks remembrance is in the order of 4 or 5 blocks. The interface of the application is shown in Fig. 1.
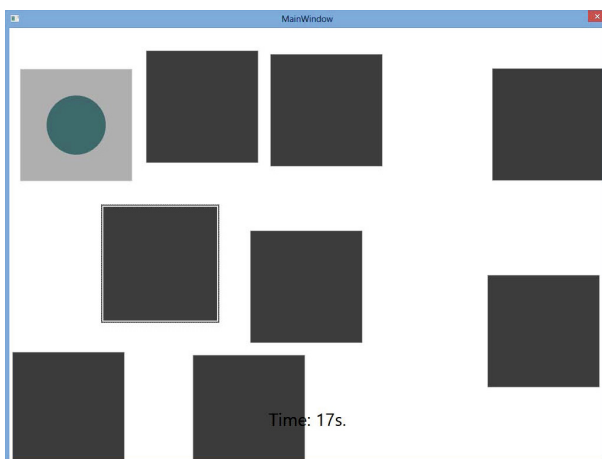

Fig. 1. Application Interface

The Usability Evaluation of the application was carried out with 11 people from both genders, with ages varying from 18 to 63 years old. The mixed age group is due the fact that, albeit being originally designed for the elderly audience, this first test aims to report enhancements and adjustments to the development team. In a second moment, the usability evaluation will be carried out with the target audience.

Three questionnaires were conceived for the evaluation: Profile, Expectations and Post-test. The Profile Questionnaire investigated the age, gender, computer games expertise, physical activities history and whether the user was familiar with the Microsoft Kinect or not. The Expectations Questionnaire was aimed to investigated the level of interest of the user on the application, ease of use, level of motivation, and whether the user like to try new technologies or not. The results of these two first questionnaires are not discussed in this paper. Finally, the Post-test questionnaire addressed usability issues pointed out by [9], like feedback, time of learning, and user satisfaction. This questionnaire attracts more attention, and its results are discussed in the next section.

3   Results

The answers of the Post-test Questionnaire pointed that the users considered undesirable not providing a feedback when they committed a mistake. This was not considered an error, because this version was designed to be used accomplished by a psychologist, with access to the error rate through a log file. Despite interacting with hands is not always as fast or as precise as with the mouse, the users were still interested in repeating the activity. The interface was considered intuitive, easy to learn, to play - even in the first time - and to remember. Playing for long periods of time was considered uncomfortable. Concerning the precision of the movements, the users did not consider annoying to have to repeat the action until reach the correct movement.

Two users, older than 60 years, attended an interview after the experiment in order to obtain more usability-related information. They revealed that had never used the Kinect before, and rarely use computer games. Both users had good expectations about the application, but in the beginning they were not sure whether it would be easy to use or not. They considered the game very motivational, and would certainly use it again. The users claimed to be able to master the game in very few time, with appropriate practice.

4   Final Considerations and Future Work

There are several studies for attenuating the memory loss in the elderly by means of stimuli, as well as there are studies in the Human-Computer Interface area to establish guidelines for building interfaces able to adapt themselves to the human memory characteristics. In Games Development area, it is possible to couple these interests and build games and interfaces adaptable to the memory characteristics, which can inhibit the memory loss in the elderly audience.

Computer games stimulate social interaction, enhance dexterity, and improve reaction time. Development for older adults requires a multidisciplinary team, including skilled health professionals able to provide guidance during the development, correctly focus the application, as well as to provide real test conditions and appropriate environments for the target audience.

This paper presented the development of a Kinect application for older adults. Its main contribution relies on the usability evaluation of applications for this particular target audience. Future work include applying usability tests with the target audience; verifying if the application can really improve the memory storage capacity of older adults; and make available to download the game.

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