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# Exploring the Potential of Gamification Among Frail Elderly Persons

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**Abstract**

The application of game elements in a non-gaming context offers a great potential regarding the engagement of senior citizens with information systems. In this paper, we suggest the application of gamification to routine tasks and leisure activities, namely physical and cognitive therapy, the gamification of real-life activities which are no longer accessible due to age-related changes and the application of game design elements to foster social interaction. Furthermore, we point out important chances and challenges such as the lack of gaming experience among the target audience and highlight possible areas for future work which offer valuable design opportunities for frail elderly audiences.

**Keywords**

Gamification, accessibility, user experience, elderly, digital game design, serious games

**ACM Classification Keywords**

H.5.m [Information Interfaces and Presentation (e.g., HCI)]: Miscellaneous; K.4.2 [Computers and Society]: Social Issues – *Assistive technologies for people with disabilities, Handicapped persons/special needs*; K.8.0 [Personal Computing]: General – *Games*.

## Introduction

Western societies are faced with the challenge of the demographic transition which leads to a drastic increase of the group of senior citizens during the next decades [8]. Also, the rising number of persons living in full-care nursing homes challenges common practices of elderly care which needs to encourage frail elderly to remain cognitively, physically and thus socially active.

In this context, preliminary research results suggest that the application of digital games and regular applications incorporating game elements may positively influence the physical, cognitive and emotional well-being of this demographic: A study examining the psychological effects of engaging in digital games suggests that playing commercially available Wii games positively affects the overall well-being of seniors living in retirement homes [6]. Apart from that, gamified applications have been implemented in physical therapy, e.g. stroke rehabilitation [1]. Tools such as SilverBalance which incorporate game elements may be used to further analyze the use of digital games among seniors, e.g. exertion games [4]. Also, the implementation of game elements allows for the development of motivational information systems for cognitive training [7].

Hence, the further exploration of gamification of routine tasks as well as leisure activities among frail elderly represents a valuable design opportunity. Yet, a set of challenges has to be addressed when designing for seniors, for instance a lack of gaming experience as well as cognitive decrements caused by age-related processes. In the following section, we suggest applications of gamified information systems and highlight design issues which need to be addressed.

## Gamification and Frail Elderly Persons

Game elements can be integrated into information systems for elderly audiences in different ways, for instance to augment routine tasks, to offer new user experiences and to foster social interaction.



**figure 1.** Re-creating real-world experiences through gamification: SilverPromenade.

### *Augmentation of Regular Tasks*

One of the most basic design opportunities is the gamification of regular tasks which have to be performed routinely. On the one hand, this includes the idea of motivating users to participate in physical or cognitive therapy by providing game-like experiences which resemble leisure activities and foster the user's engagement and long-term motivation [2]. In this context, offering achievements and highscore lists may encourage elderly persons to compete with peers. On the other hand, data provided by these applications may be used by medical or nursing staff in order to monitor and analyze the user's performance. Thereby, decrements or advances in the user's abilities could be detected at an early stage and quickly be acted upon.

### *Re-Creating Inaccessible Real-World Experiences*

With the wide availability of full-body interfaces and haptic input devices, another design opportunity is the re-creation of real-world experiences which have become inaccessible due to age-related changes and decrements. In this context, the term gamification needs to be applied on a broader level. An example is SilverPromenade (cf. figure 1) which enables the user to set out on virtual walks in well-known areas, for instance through the city forest, while corresponding video material is played based on his or her movements on the Nintendo Wii Balance Board.



**figure 2.** Elderly users interacting during a playtesting session.

### *Gamification for Social Interaction*

Finally, the presentation of playful activities and the integration of game elements such as game metrics offer the possibility of fostering social interaction between senior citizens living in nursing homes. First focus group results suggest that offering common ground for discussion, e.g. by providing highscores for

mini-game challenges, is a great way of playfully getting into touch and transferring positive experiences from the virtual to the real world [4].

### **Chances and Challenges**

Generally speaking and regardless of the integration of game elements, it is important to account for the most important age-related changes when designing for senior citizens, such as decrements in sensory processes [5] and cognition [3], as well as physical limitations [3, 4] which may occur during late life.

In this context, two main challenges have to be addressed when creating gamified information systems for elderly users. First, the lack of digital gaming experience among today's senior citizens has to be accounted for [5]. While younger users are familiar with gaming systems and game elements can be integrated into regular applications based on common domain knowledge, this is not possible when designing for elderly users. Hence, one of the main advantages of gamification - motivating users based on offering game-like, enjoyable experiences - cannot draw from similarities between digital games and gamified applications. Instead, designers have to rely on board and card game experience of elderly users, thus the advantage of gamification lies within the general opportunity of engaging users in playful activities regardless of previous engagement with digital games. Furthermore, a lack of gaming experience may have a negative impact on the general understanding of metaphors derived from digital games, which is expected to further hinder the engagement of elderly persons with gamified applications. Therefore, it is especially important to create systems featuring carefully selected, easily accessible game elements

which do not rely on the user's prior gaming experience, which partially contradicts the basic principles of gamification. Second, another challenge is created by necessity of appropriately augmenting routine tasks, which need to be meaningful and entertaining in order to engage elderly players in the long run: The inclusion of game elements in everyday life has to provide an additional benefit to the user instead of being a mere add-on. Thereby, it is possible to avoid the extension of a tiresome task without engaging the user. Also, it is important to consider the workload and computer literacy of nursing staff in the context of design for institutionalized elderly which may not be increased by attempts at gamification.

The chances of gamified systems for frail elderly users are manifold. First, applying data mining algorithms to metrics logged by gamified applications offer interesting information for medical and nursing staff and an easier way of monitoring one's cognitive and physical health. Second, gamified information systems provide a range of new leisure activities for frail elderly which may add to their quality of life. Also, existing work including focus groups has shown that learning and understanding game elements is possible and may be enjoyed by users of all ages. Finally, to design senior-friendly applications featuring game elements, further collaboration between game designers, researchers and gerontologists is necessary. By bringing these groups together, it is eventually possible to create challenging yet enjoyable experiences for senior citizens.

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