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Procedia Computer Science 00 (2016) 000–000

Procedia Computer Science

www.elsevier.com/locate/procedia

The 8th International Symposium on Frontiers in Ambient and Mobile Systems (FAMS 2018)

Enhance daily live and health of elderly people

Panagiotis Kostopoulos*, Athanasios I. Kyritsis, Vincent Ricard, Michel Deriaz, Dimitri Konstantas

Information Science Institute, GSEM/CUI, University of Geneva, Switzerland

Abstract

As people get older, they tend to become more and more vulnerable to physical disabilities and mental illnesses. In order to prevent the deterioration of their quality of life we have created a system that helps elderly to sustain and extend their activities of daily living (ADL). Older people, especially those who may have just left the working environment, can suffer a sense of loss, particularly of value, purpose, confidence. This can lead to mood swings, isolation and possibly depression. The EDLAH2 (Enhance Daily Live And Health) project tries to combat these negative experiences of elderly people and give the opportunity for a fuller lifestyle. These older adults have a determination to live in their homes and enjoy living in their homes for as long as they can. The idea of the system presented in this paper is to bring an increased level of motivation, interest and engagement into areas that may be important but mundane. This results in a greater drive to be involved in this area of action and a positive feeling when rewards are achieved. EDLAH2 enables the continuity of motivation for elderly people. We set goals and achievements in line with realistic expectations for the older adults and importantly, we provide a guide to their well being improvement. Finally we utilize gamification in order to reinforce the elderly people to stay active and improve their well-being.

Peer-review under responsibility of the Conference Program Chairs.

Keywords: Physical Activity; Elderly; Motivation; Gamification

1. Introduction

Due to the ageing society, there has been a rapid surge in the developed AAL tools and applications. These promote independent and safe living and aim to reduce the cost of health care as well as the caregiver burden[1]. Improving the quality of life of elderly people with the help of technology is a key topic in the current research. There are numerous advantages of using technology in order to complete tasks that otherwise would be very difficult for a human. Technology can help elderly overcome different challenges.

In this paper, we propose a solution for motivating elderly people to be more active in their daily life. Regular physical activity (PA) can bring significant health benefits to people of all ages and the need for PA

* Corresponding author. Tel.: +41-22-379-0042.
E-mail address: panagiotis.kostopoulos@unige.ch

Peer-review under responsibility of the Conference Program Chairs.

does not end in later life with evidence increasingly indicating the PA can extend years of active independent living, reduce disability and improve the quality of life for older people[2]. PA in older adults is extremely important in the prevention of disease, maintenance of independence and improved quality of life. Increasing PA for older adults will also help minimise the burden on health and social care costs. The UK Chief Medical Officer's report presented convincing evidence that low to moderate intensity PA significantly reduces risk for all cause mortality, cardiovascular disease and type 2 diabetes in older adults. Moreover, the report noted that higher levels of PA are associated with reduced risk of depression, cognitive impairment, dementia, and attainment of higher levels of mental well-being.

The rest of this paper is organized as follows. In Section 2 our designed system is described in detail. Experimental results using real data are reported and discussed in Section 3. Future improvements of our work to make EDLAH2 more robust are presented in Section 4. Finally, a brief conclusion is drawn in Section 5.

2. System overview

EDLAH2 is an easy to use tablet application for the elderly people that has main goal to enhance their daily life and health, e.g. to support communication between older adults, their families and caregivers, to improve patient compliance to doctor's instruction (diet, intake of medicine). Elements such as photo sharing, video calling and family involvement, promote a healthy social input to the older persons life. Step count, weight, blood pressure monitoring all assist with healthy living. EDLAH2 aims to provide a holistic easy to use technological hub for the older person to gain from technology in a way they maybe thought impossible, with the aim to improve their quality of life for as long as possible.

Through trials and discussions we have identified the gaps that need to be addressed for making the new technology easily available to the elderly. First of all the continuity of motivation. Especially for older adults it is difficult to develop new habits and to integrate new activities into their daily routines. Secondly the social activities. To our surprise older people we surveyed have been less interested to communicate with their doctors and carers than we expected. On the other hand they showed strong interest to use social media to chat and connect with like-minded seniors. Moreover quiz-games and well known game classics stood out as the favourite pastimes they would like to engage in with others. Finally and most importantly the activity monitoring. While apps for monitoring of physical activities are already widespread in the market (e.g. Nike+, Samsung Health, Runtastic, etc.), we found that none of them are particularly targeted or well suited for older adults. Therefore EDLAH2 aims to close this gap by allowing tracking of physical activity in a way adapted to the needs of elderly people.

Wearable technology and the internet of things are trending technologies at the moment. However, specific developments for the older adult are not commonly available. Applications are often focused on health and healthy living but aimed at a fit and active individual, rather than an older one. The associated applications and user expectations of these devices are not aligned with the older people, we will provide this realignment through our applications. In our system we set goals and achievements in line with realistic expectations for the older adults and importantly, we provide a guide to their well being improvement. We monitor their activity and determine whether there is too little, too much or a significant event, in the activity pattern of the older adult. For example is the older persons sleep pattern altered? Have they used the bathroom more or less frequently? Are they staying in the same room longer than normal?

2.1. Tracking physical activity

Physical activity plays a key role in the control of neuroendocrine, autonomic, and behavioral responses to physical and phychosocial stress. Physical activity is commonly regarded as beneficial to both physical and psychological health, and is seen as an effective preventive measure and treatment for stress-related diseases. Physically active people show reduced reactivity to physical stressors as well as reduced susceptibility to the adverse influences of life stress[3]. Several studies have linked exercise to improved depression, self-esteem and stress[4,5].

We use MiBand 2[6] which is discrete, comfortable to wear and socially acceptable device to monitor the activity of the users encouraging them with daily and weekly goals. All the users are able to monitor their daily physical activity and check regularly the personal goals that they have set. This is a very motivating procedure that gives the initiative to the elderly people to improve their physical activity.

2.1.1. Daily progress

The users are able to see their daily progress as seen in Figure 1 and to compare it with the previous days. Therefore the elderly people are able to keep track of their physical activity, they can improve their performance and at the same time motivate themselves to achieve even more in the future. Moreover they are able to see their progress during the hours of the day as depicted in Figure 2. This is very motivating for the users especially the active ones since they are able to immediately check their tablets right after going for a walk and see their progress in terms of physical activity. This is a very pleasant procedure for them that keeps them active.

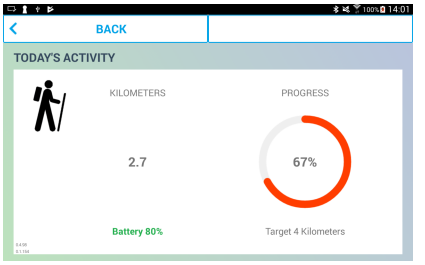

Fig. 1. Daily steps of the user.

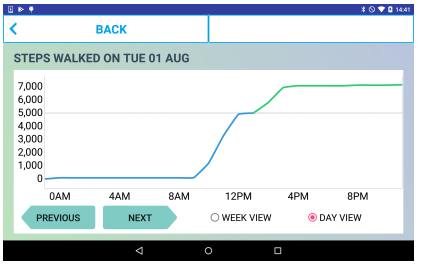

Fig. 2. Day view.

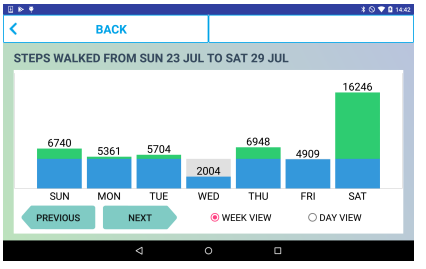

Fig. 3. Week view.

2.1.2. Weekly progress

Moreover the end-users are able to keep track of their historical data. They are able to check their weekly progress in terms of physical activity and therefore being able to compare their daily progress with their

progress the previous days of usage of the system as depicted in Figure 3. This option is very useful also for a caretaker or a member of the family that is responsible for each elderly because they are able to check if there was an unusual behavior some days of the last weeks or month.

2.2. Other activities

It is very important that for the development of the EDLAH2 system we continuously take into account the feedback of the end-users. Therefore we have also included other activities that elderly people were particularly interested. With this functionality we give them the opportunity to keep track of these activities like swimming, yoga, dancing, etc. as seen in Figure 4 that are motivating for improving their well-being.

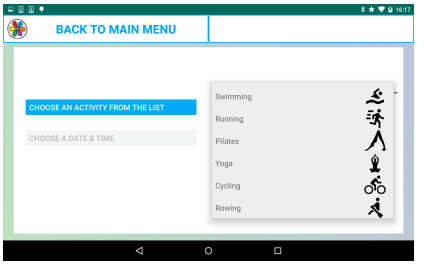

Fig. 4. Other activities.

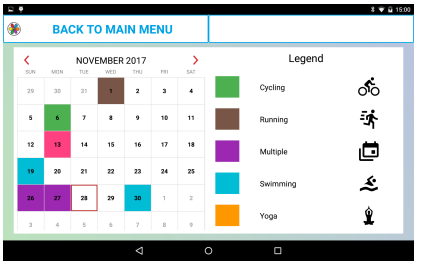

Fig. 5. Map of activities.

The users are able to select the type of activity that were doing, the date that did the activity and finally the duration of that activity. Then a map is created as seen in Figure 5 that helps them to keep track of the different physical activities that they were doing the last month. Finally they are able to preview the activity that they want from this month so that they can bring it back to their mind and compare with most recent activities as seen in Figure 6 with the dancing activity.

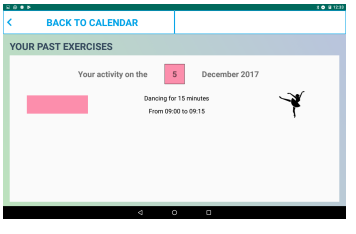

Fig. 6. Dance activity.

3. Trials and questionnaires

The goal of the project is to develop a platform and a set of tablet applications that are easy to use by older adults. Therefore we performed a survey in order to understand the needs and preferences of the elderly people that will use our system. The participants for the survey were recruited in the UK and in Switzerland. The improvement of personal fitness and the objective to stay active is important for all people. Especially elderly can improve their social connections if they have a good mental and physical health. As expected most of the participants in our trials would like to improve their physical and mental health. As we can see in Figure 7 a percentage of 26% would love to improve their fitness and 45% would quite like to do this. 28% would love to improve their mental health and 44% would quite like to do so. Just about one third would like to get some encouragement from others (31%). 27% do not like to get some encouragement and the rest of them are uncertain if they would like some encouragement (23%) or if they would not like to get it (15%). More than fifty percent could imagine to wear a measuring device. All these information have been taken into account in the development of the EDLAH2 system so that the elderly are satisfied with the proposed solution for improving their physical activity.

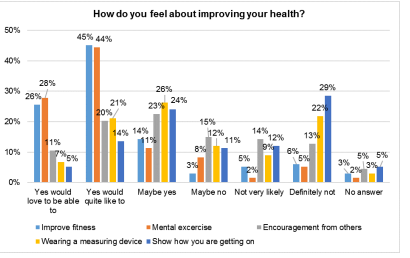

Fig. 7. User questionnaire responses.

4. Gamification and future work

The final goal of EDLAH2 is to combine gamification with the improvement of the physical activity of the users as seen in Figure 8. Gamification provides psychological rewards and motivation towards progression to an objective. Objectives are defined within each application, for example: Do the older adults reach their objective of a daily walk? Have the older adults engaged in a local community activity? Have the older adults exercised their memory?

The basic psychological principle behind gamification is to provide positive reinforcement for each favored action taken. Generally, we respond to incentives and enjoy some sort of response or reward to our involvement. The idea is to bring an increased level of motivation, interest and engagement into areas that may be important but mundane. This results in a greater drive to be involved in this area of action and a positive feeling when rewards are achieved.

The users will be able to view their progression on different objectives within the apps and an overall progression on the whole system. We will set up an achievement system that will unlock trophies when specific objectives are met, these trophies counting towards the user overall progress level.

We are intending that by using gamification in EDLAH2, it will give the older adults a sense of feedback when they carry out what may seem a routine action. Turning the routine into something rewarding will increase the motivation to do the routine, improve the overall engagement with the service and it's outcomes and give a great sense of satisfaction and accomplishment. We are aware of these techniques being used successfully in education and in corporate environments. The goal of EDLAH2 is to translate these insights and gamification techniques to close the gaps described above and to support a sustained use of tablet applications that enhance the daily lives of older adults.

Most of the elderly people think they have the biggest and, usually considered by themselves, most interesting part of their lives behind them. The EDLAH2 gamification theme and rewards is focused on

bringing back these nostalgic memories, events and entertainment to the elderly for them to enjoy again. Based on the interest of the users, the application creates rewards for them when they do certain tasks that improve either their physical health, mental health, social life or gives the application or caretaker more information about the users (for example sleep quality).

What these rewards will be specifically, will be based on the results of the surveys, research and testing. As it is a matter of content, these rewards can easily be swapped. The categories that could be used are, for example: music videos, world events, old objects/products and personal events uploaded by the family. When the players gain one of these rewards, it would be placed in their timeline. Their timeline will start at the year the users were born and is gradually filled up the more the users progress. The timeline can be customized and will be a digital overview of the life of the users and the things that interested them during their life. The timeline can be viewed by other users, family and friends and is meant to encourage the forming of social contacts.

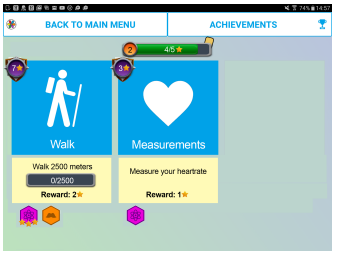

Fig. 8. Gamification and physical activity.

5. Conclusions

Improving the quality of life of elderly people with the help of technology is a key topic in the current research. EDLAH2 has investigated a set of tablet applications specifically designed, prototyped and tested to enhance the daily life and health of older adults. We are confident that the services we will develop here will help older adults engage with their community, peers and families both socially and through active skill based engagement. They will retain their dignity and individuality, whilst engaging in a secure way with those in the community that they want to engage with. Using gamification across every element of the service will provide a motivational element, ensuring that the older person enjoys and feels rewarded by their experience. This will increase the individual's self esteem, confidence and positive sense of well-being.

Acknowledgments

The authors would like to thank our partners KG&S (Karis Group), EverdreamSoft, terzStiftung and the University of Luxembourg for their contribution to the EDLAH2 system. This work was co-funded by the State Secretariat for Education, Research and Innovation of the Swiss federal government and the European Union, in the frame of the EU AAL project EDLAH2 (aal-2015-022).

References

1. P. Rashidi and A. Mihailidis, "A survey on ambient-assisted living tools for older adults," in IEEE journal of biomedical and health informatics, vol. 17, no. 3, 2013, pp. 579–590.
2. F. Sun, I. Norman, and A. While, "Physical activity in older people: a systematic review," in BMC Public Health, 2013.
3. U. Rimmele, R. Seiler, P. Wirtz, U. Ehlert, and M. Heinrichs, "The level of physical activity affects adrenal and cardiovascular reactivity to phychosocial stress," in Psychoneuroendocrinology, 2009, pp. 190–198.
4. K. Fox, "The inuence of physical activity on mental well-being," in PublicHealth Nutrition, 1999, pp. 411–418.
5. R. Paffenbarger, R. Hyde, A. Wing, and C. Hsieh, "Physical activity, allcause mortality, and longevity of college alumni," in New England journal of medicine, 1986, pp. 605–613.
6. "http://www.mi.com/en/miband2/."