

DanceAlong: Supporting Positive Social Exchange and Exercise for the Elderly Through Dance

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ABSTRACT

The elderly face serious social, environmental, and physical constraints that impact their well-being. Some of the most serious of these are shrinking social connections, limitations in building new relationships, and diminished health. To address these issues, we have designed an augmented dancing environment that allows elders to select dance sequences from well-known movies and dance along with them. The goal of DanceAlong is twofold: (1) to provide entertainment and exercise for each individual user and (2) to promote social engagement within the group. We deployed DanceAlong in a cultural celebration at a senior community center and conducted evaluations. In this paper, we present the design process of DanceAlong, evaluations of DanceAlong, and design guidelines for creating similar interactive systems for the elderly.

Author Keywords

User centered design, interaction design, elders, dance, aging, exercise, elderly

ACM Classification Keywords

H.5.0 HCI General, H.5.2 User centered design, H.5.m Interaction Design

INTRODUCTION

As the world's population ages, the concerns of supporting well-being in later life become increasingly important. With age comes a decline in personal mobility, health, and social networks [7,8,9]. It is of central importance to understand the relevant environmental factors that affect elders in order to create meaningful technology to address their specific needs. Our approach expands on studies by Hirsch et al. of elders in their natural settings [4]. Their work starts with detailed observations to develop a model of elders and the important dynamics of their engagement with people around them, and their environment. Thus for our research, we observed elders in their environment at a local senior community center. We observed that small exclusive cliques form which greatly limits opportunities for social exchange. We also noted that

there was a distinct lack of group activities, particularly dance events.

Based on our observations, our approach to promoting well-being among the elderly focuses on creating new opportunities for social interaction through dance. Dancing is not only a catalyst for social exchange but also provides an entertaining form of maintainable exercise [1,5]. Previous work on interactive music exhibit and interactive dance system demonstrates that people are interested in interacting with these systems to express themselves, and provides further motivation for this work [2,11]. Our system, called DanceAlong, is an augmented dancing environment that allows elders to select dance scenes from well-known classic movies and dance along with them (see Figure 1). Once a song has been selected, the dance scene is projected on a large screen and the elder(s) dance along with the actors in the movie. The idea is similar to karaoke where participants sing along to the music, but in DanceAlong the main emphasis is on free-form self-expression and enjoyment.

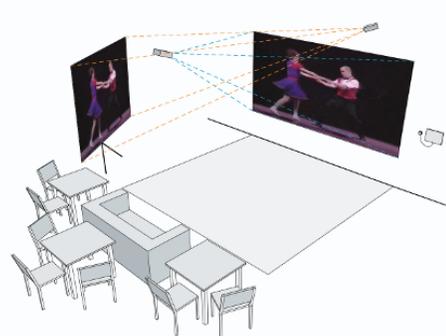


Figure 1. DanceAlong system.

In this paper, we discuss the goals, design process, and evaluation of the DanceAlong system. We then close with a discussion of the contributions, future work and conclusion.

THE DESIGN PROCESS OF DANCEALONG

We regarded the elders' decreasing social networks as a starting point of our inquiry into how technology could be used to satisfy human needs. Through the iterative design process described below, we discovered that the aging, and mostly female, population greatly missed being able to dance. Our process consisted of initial user studies and

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ideation to identify a need and possible approach, two rounds of scenarios-of-use and evaluation of these scenarios to develop the approach, followed by two iterations of implementation and evaluation.

Framing the Problem: Mood Boards, User Observation and Interviews

To design a technology to promote social interaction, the problem had to be made specific and concrete, in this case by using mood boards, user observations, and interviews. For example, an initial hypothesis was that we could create new opportunities for elders to interact by using tangible, networked games. After showing the elders “mood boards” (3x5 cards depicting games), it became immediately apparent that using tangible networked games was unlikely to succeed as elders were neither interested nor inclined to play games with tele-present opponents.

Simultaneously, we conducted informal observations and interviews focused on elders’ daily lives, relationships and social activities to identify additional opportunities and needs. This data revealed that dancing is an important activity for many elders, but is an activity that involves many barriers including the lack of male partners, a shortage of specialized space for dancing, and a paucity of dance events. We also learned that physical activities, such as aerobics classes are an important part of their lives. However, such events have inflexible schedules where missing a class means missing their exercise for that day. In addition, exercise classes may not promote social engagement between elders.

Developing the Concept: Scenarios and User Feedback

Although the mood board and interviews helped us to define the problem and select a promising approach, we wanted to have a design specification that would have a reasonable chance of succeeding before we committed to implementation. To flesh out the design, we created scenarios – storyboards illustrating how users would interact with the system. One of the interactions described in our scenario combined dancing with ‘Movieoke’ (an acting game similar to the more widely-known ‘Karaoke’) [6]. In these scenarios, elders would dance along to famous scenes from old musicals. Footprints would be projected onto the floor as cues for where and when to step. For dance scenes with complicated steps, the steps projected onto the floor would be simplified. We presented our ideas to elders at the local community center in two rounds of scenarios. Elders greeted the DanceAlong concept with a strong positive response and administrators at the center asked to use the system at a holiday celebration. The scenarios not only allowed us to test the concept before investing in implementation, but also helped us to secure resources, interest, and commitment from various stake-holders at the community center.

Implementation: System Design

For the technology to be appropriate for elders to use, it had to be simple, intuitive, easy to learn, familiar, and (wherever possible) off-the-shelf. Therefore, our design allowed users

to select songs to dance along to from a simple, single button interface where turning an analog knob scrolled through dance/movie clips and pressing the knob started and stopped the dance clip (see Figure 2).



Figure 2. Song selection interface.

The visual design of the interface with its large font sizes and a simple color scheme was well suited to users with low vision [10]. From the selection interface, users could see and hear the dance clip and judge the expected difficulty of the dance steps in the song. Two projectors on either side of the dance floor projected footsteps showing dancers where to step and prevented the dancers’ shadow from occluding the image. A third projector displayed the movie on a screen behind the dancer for the audience to watch.



Figure 3. First user testing.

Within minutes of testing the setup with a small group of elders, it became clear that projecting the footsteps on the ground was problematic, as focusing elders’ attention on the floor made it difficult for them to dance. Elders instead looked to the movie clip projected on the wall behind them for visual cues of how they should dance (see Figure 3).

Second Iteration Design and User Testing

It was apparent from the first implementation that the movie projected on the wall provided better dance cues than the footsteps on the ground; our second implementation removed the projected footsteps and added a second smaller projection of the video clip to the front and right of the dancer (see Figure 1). This small projection provided the dancing cues to the performer and allowed them to face the audience. As in

the original setup, the movie was also projected on a large screen behind the dancer for the audience.

EVALUATION

DanceAlong was then deployed for a holiday celebration at a local elderly community center. The event lasted for one hour, and there were over one hundred elders in attendance. We began the event by demonstrating how one would interact with DanceAlong, then four elders (2 men, 2 women) approached the dance floor, selected a song, and started dancing. For the duration of that hour, between 4 and 20 dancers were on the floor at any given time.

While DanceAlong was being used, we observed a number of interesting trends. Individuals who could not follow along the dance moves from the videos would follow the dancing of the people around them. We also observed that DanceAlong acted not only as entertainment for those dancing, but also those watching. Numerous times during the event, we heard laughter and clapping from the audience, reacting to what they are seeing on the dance floor. There was also an observable correlation between the number of dancers on the floor and the type of video clips played. DanceAlong had the most dancers when cultural songs were playing, and second most when simple line dancing songs were playing.

During deployment we interviewed twelve event attendees using a questionnaire about their exercise and dancing habits, and interaction with DanceAlong. Their ages range from 56 to 83. In general, the interviewees felt that this year's event with DanceAlong was much better than previous years.

The elders we talked to were very concerned about staying in shape and many of them enjoy dancing. A major obstacle for them to dance was the lack of male dance partners; this observation reconfirmed the sentiment from our initial interviews.

“My husband passed away and it is hard to find good dance partners.”

Most participants also noted that they would use DanceAlong to exercise. One participant noted that DanceAlong would not provide as much feedback as her instructor would. However, others felt that DanceAlong was not as monotonous as exercise classes. Furthermore, they thought DanceAlong was more entertaining and felt that it was more energizing than an aerobics class.

“It's better than aerobics; exercise is too boring, too much repetition.”

In attempting to promote social exchange, we asked questions to understand how effective DanceAlong was in getting people to get up and dance together as a group. A few participants felt comfortable with the DanceAlong and started using it right away. Others were more reluctant to dance and only started dancing through prompting by those already on stage. Once the participants started to dance, they did not appear to be self-conscious to dance in front of a

large group of people and felt that they were dancing with others even though they did not have a designated partner.

“Lot of fun especially if you don't have a partner – you don't feel as if you're really dancing alone.”

FUTURE DESIGN GUIDELINES

Previous research in a senior community uncovered many important social and environmental considerations for designing eldercare technology [4]. While we are not designing assistive technology, we have been able to apply many of the lessons learned. From our exploration for a technology intended to support the social needs of elders, we have also gained some valuable insights, and below, we list several future design guidelines for designing interactive technology for the elders.

Encourage Interaction Beyond Closed Social Circles

We have seen in our early interviews that, elders tend to organize themselves in groups that they have already established, and lack motivation to interact with people in other groups. Design of technologies that promote social interaction between elders should encourage them to explore and venture out beyond from their closed social circles.

One way of accomplishing this is to create a designated space for interaction. While Figure 4.a allows group participants to communicate with other people at their table, Figure 4.b provides a common area for dancing and is more conducive to movement.

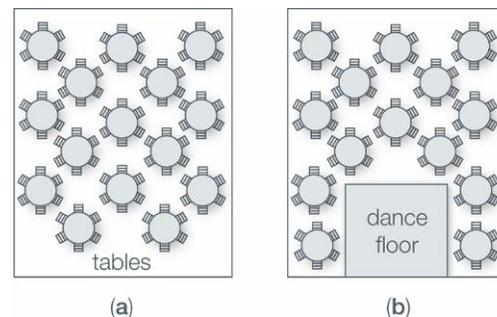


Figure 4. (a) Floor layout with no central social zone (b) Floor layout with central social zone.

Proxy for Reminiscence

Elders have a wealth of memories that can be leveraged when designing social technology for them. Previous work has demonstrated that a computer golf game enabled a retired professional golfer who is no longer physically capable of playing golf, to play as an expert and reminisce about his golfing past [3]. Our work indicates that elders using our technology reacted most positively to cultural songs; songs that had additional meanings to them. Therefore, if the technology can empower elders to perform certain activities that they are more likely to associate with and can trigger fond memories of the past, the technology will be more effective and beneficial to users.

Provide a Range of Support

Elders using social technology have various backgrounds and physical conditions. Therefore, thoughtful design will provide a range of support to facilitate interaction with the system. Some users of DanceAlong had no problem keeping up with the dances, and could simply look at the movie scene for direction. Others had difficulty keeping up with the steps and commented that they would have enjoyed DanceAlong more if the dance steps had been simpler. This issue could be addressed in a future version of DanceAlong by grading each scene with a difficulty level.

Encourage Exercise through Entertainment

While exercise is crucial to promoting good health, research indicates that it is more difficult for the elderly to initiate and maintain a consistent exercise regimen [9]. DanceAlong demonstrates that social technology that focuses on exercise can be both healthful and entertaining. We observed that dancing is generally preferred to aerobics because it is more enjoyable and does not feel like traditional exercise.

Approachable Interface

The general public's fear of using computers amplifies with age. A technology interface designed for elders should be simple and easy to interact with. An inviting, simple and intuitive interface design reduces reluctance to use the technology and increases enjoyment.

FUTURE WORK

When many people use DanceAlong together, there is a possibility of them bumping into one another and falling. While user testing indicated that projecting the footsteps was not practical, it is worth exploring other cues to guide dancers. One idea is to use auditory cues to tell what direction dancers should move but this might prove to be distracting to dancers. Another possible design is to overlay on the screen arrows indicating which direction to move.

CONCLUSION

In this paper, we presented our work on promoting positive social exchanges in the senior community center setting. Through user interviews, iterative design, deployment, and an evaluation of DanceAlong in a senior community center we developed a set of design guidelines for creating future systems for this type of environment. Specifically, we describe the importance of encouraging interaction beyond closed social circles for promoting social interaction,

leveraging reminiscence to engage users, providing a range of support to incorporate all potential users, using entertainment to get elders to exercise, and utilizing basic principles for designing interfaces that are approachable by our users.

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