Interaction Design Project Encouraging Contact Between Elderly and Children

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Abstract

Contact and bonding between grandparents and grandchild might not be easy to achieve, but still, both parts might benefit from communicating with each other, sharing experiences.

This paper describes a student project, still under development, designed to facilitate and differentiate connection between senior citizens and children. The proposed solution consists of two prototypes (a birdhouse and a music board) which were built with the open source platform of Arduino and Processing, both of them are connected to the theme of nature and birdwatching.

Author Keywords

Family bonding; elderly; cross-generational; emotional interaction; interaction design; tangle interaction; music; nature.

ACM Classification Keywords

H.5. Information interfaces and presentation

Introduction

Elderly residents, attempting to share experiences with young children, relatives or not, will possibly stand in front of many challenges such as personal health issues (e.g. limited physical mobility or mental impairments),

but also age-related stereotypes which can easily occur in young children [6].

On the other hand, research shows that children who have contact with elderly people will develop a more positive attitude toward adults in general [3]. Other research show that children who have contact with non-related elders will also more likely open up to grandparents in the future [7]. Emotional closeness to grandparents might help children at risk for poorer social competence [1]. It's not only children who can benefit from relation to older adults. It has been observed that grandparents' mental health could be positively influenced by communication between grandchildren and grandparent [4].

Grandparents also play an important role in children's well-being. Previous research has found that grandparents exert significant direct or indirect influences on their grandchildren's outcomes. Involvement of grandparents in caring for their grandchildren can benefit parental health and influence the three-generation relationship [8].

The existing theories suggest that contact between the elderly and children can be beneficial for both sides. The proposed project in this paper was inspired by the theme of the NTNUs' *Design, Creativity and Innovation* course, and a visit to the elderly center. Both prototypes intended to facilitate the cross-generation connection by facilitating shared activities between the elderly and children. The ability to personalize and build upon the pre-designed platform was also an element of the design.

Design

Elderly center visit
During the preparation of the project, we visited Brumunddal bo- og aktivitetssenter in Ringsaker kommune (Brumunddal elderly care center in Ringsaker, Norway). We observed two shared activity (singing and dancing). One which involved three generations; the elderly alongside young mothers and their babies, one which involved kindergarten children and elderly, as well as the more functional residents of the workshop in which were able to perform occupational therapy crafting artisanal objects with wool, paper and wood. During the visit, we had the opportunity to interview four elderly women and two men inside their everyday environment, we observed their daily activities. One of the nurses showed us a birdhouse installed outside a window in a common area and explained the routine of observing birds that a few residents have.
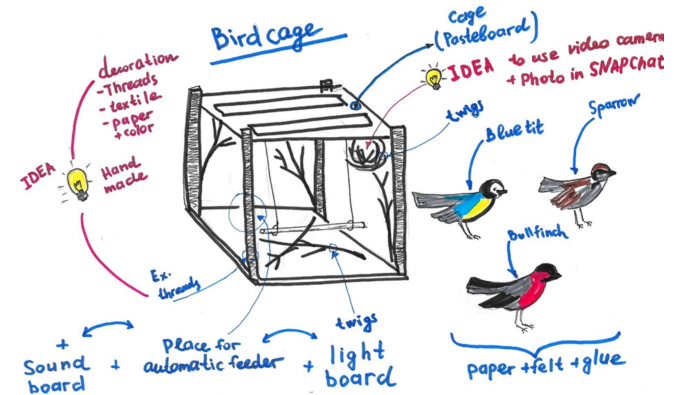

Figure 1 - Birdhouse sketch

Birdhouse project design

We observed that shared activity positively influenced both elderly and children, which motivated us to focus on creating a common experience for both of them during the design process. Another inspiration for us was the routine of observing birds and proficiency of bird recognition among elderly which we believe might provide an opportunity to initiate conversation and activities among the elderly and children who are interested in nature.
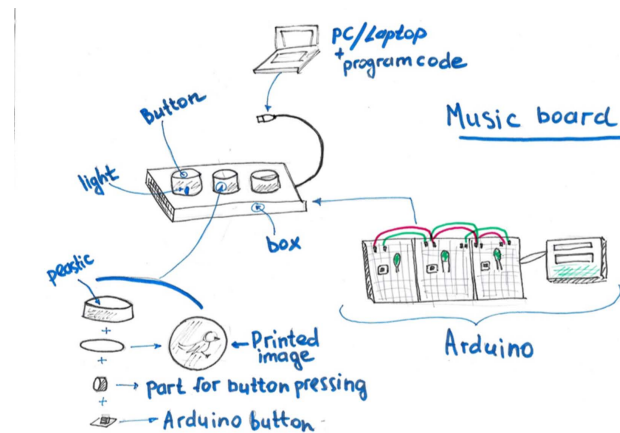

Figure 2 - Music board sketch

The developed project consists of two prototypes: a birdhouse (*Figure 1*) and a music board (*Figure 2*). All prototypes are based on the Arduino prototyping platform. Arduino allows interconnecting components such as buttons, stepper motors, rotary encoders or light detectors. All components could be programmed with the built in Arduino software platform [2]. To

reproduce sounds we used another open source platform, Processing, which is an easy-to-use software sketchbook and a programming language [5]. The birdhouse and the music board were designed to be used together, but users might freely use them also as separate solutions.

Implemented prototype

The implemented prototype (*Figure 3*) consists of two parts: 1) The bird house, 2) The music board.

1) **The birdhouse**: The birdhouse itself consists of three components, the bird cage, the bird feeder, the light board. The framework of the birdcage was prototyped with reinforced and wrapped cardboard, decorated with branches, which was not only to make the birds feel safe and comfortable but also to create a stand because the structure of their feet is more suitable to grab. The columns of the birdcage were decorated with wool thread, a familiar visual element for the elderly, it also allows them to be able to knit their own decorations to redesign the birdcage. To make the birdhouse attractive to children, we designed a swing in the birdcage and made bird models with paper and wool to make the birdhouse more appealing. The bird feeder was 3D printed and is powered by a stepper motor to deliver the food. It is connected to an Arduino board and controlled by a rotary switcher mounted on an easy to grab knob.

The light board consists of a frame, LEDs, a light sensor and an Arduino board. The LEDs and the light sensor are controlled by the Arduino board. The light sensor is placed inside the birdhouse and is used as motion

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sensors so that if a bird approaches, it can detect the change of lightness and turn on the LEDs in the frame to inform the residents that there are birds in the birdhouse. The light board was placed in a wooden frame, which suits the whole environment in the elderly center. We used wool to soften the light from the LEDs, to make it less disturbing to the residents.

Among all the parts of the birdhouse, the birdcage, light sensor and the bird feeder should be placed outside the room, while the rotary switcher and the light board should be inside the room. The scenario for the birdhouse is: 1) Attach a bottle of bird food to the bird feeder, 2) A bird comes to the birdhouse, 3) The light sensor detects the bird, 4) The light board is lit up, 5) People in the room notice the light board, 6) They gather around the birdcage to observe the bird, 7) They rotate the switcher to transport the bird food from the bottle to the plate to feed the bird.

2) **The music board**: The music board is prototyped with cardboard, plastic covers, printed papers and an Arduino board. There are three big buttons on the music board, which was designed to make it easier for both the elderly and the children to interact with. Each of them represents one bird species (Blue Tit, Sparrow and Bulfinch) which is indicated by the printed image of different birds. When users press the button, the music board will turn on the lights and play the chirp sound of the bird it represents. The music board was design to generate a bond between children and elderly. The scenario for the music board is: 1) Children visit their grandparents in the elderly center, 2) Children find a bird in the birdhouse, 3) Children play with the music board to find out how the bird sounds like, 4) Children ask grandparents for more information about the bird,

5) Grandparents introduce the bird to children. This activity can meet children's curiosity and the need for exploration. Moreover, it can promote the relationship between children and elderly because it provides a common interest and topic for both, and with the fun activity in the elderly center, children will be more willing to visit their grandparents and interact with them.
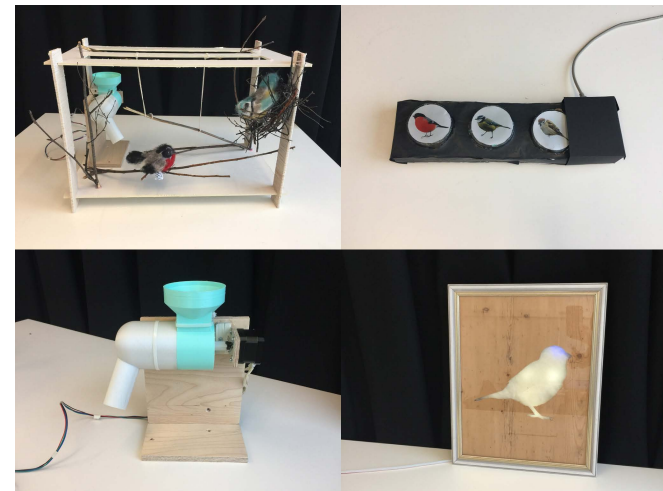

Figure 3 - The bird cage, music board, bird feeder, light board

Project presentations
After the first stage of prototyping, we presented our project in the Brumunddal elderly care center where we began with an explanation of our intentions and motivations. Then the nurses had an opportunity to try the prototype and share comments.

A few months later we were also invited to present our project on the Design Day, which took place on the 15th of March 2018, at NTNU in Gjøvik. Our work was exhibited in the corridor, close to the entrance of the conference room. Participants of the event were able to freely walk up and interact with the solution.

During both presentations, we first observed how people reacted when they notice our project and how they interact with our project. The observation was aimed to test if our solution was attractive to users and was it intuitive to understand and easy to use.

After people interacted with our project, we would have a talk with them to get their feedback and comments. This part was intended to understand how people felt about the idea and the solution.

Results

The presentation in the Brumunddal elderly care center resulted in receiving a positive feedback which indicated that our solution had a good support for connection building between elderly and children.

We received similar feedback during the Design Day at NTNU. The project attracted students, lectures and visitors to initiate an interaction. Many of them could operate the prototype independently and be able to understand our design intentions. This indicated that our project might have an appealing design and was easy and intuitive to use.

Unfortunately, we haven't got a chance to test our solution among elderly and children, but pilot studies are planned in June 2018.

Conclusions, improvements and further iterations based on the feedback and suggestions we have received, are introduced in the future work section below.

Future work

Below are presented our further iteration decisions:

1) **Improvement of visual style:** Currently the visual style of each component of the bird house is not consistent. We plan to conduct a more detailed visual research before next iteration to build a systematic visual identity which is appealing to both children and elderly for our project.

2) **Improvement of development:** A recurring feedback has been to allow the reproduction of more than one bird sound at the same time, the music board will need further tuning to allow this functionality as well as possibly redesign to include a bigger selection of species. Music board should consist of speaker and be independent from PC. The light sensor in the light board could be changed to a more advanced sensor.

3) **Improvement of mechanics:** The current mechanics of the bird feeder is functional but not friendly to birds. When the stepper motor drives the propeller inside the bird feeder, it makes too many noises which may scare the birds away. For this problem, we plan to select the motor which can make the smoother rotation and make a cover of the bird feeder using the sound absorbing material.

4) **Improvement of materials**: Since our bird house is a prototype, we used handy materials to build it up and did not think too much about attributions of materials. For further iteration, we plan to choose more

suitable material to redesign each component, especially components outside the window should be made of a more stable and durable (waterproof and easy to sanitize) material.

5) **Pilot study of the project:** As we mentioned above, the first iteration of our project hasn't got a chance to be tested by children and elderly. We planned to conduct user tests in June 2018 which will include elderly and children and will test our user scenarios.

Supplementary material

A video presentation of the prototypes is available at https://youtu.be/yU3YAx8k2og .

Acknowledgements

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