

Augmented Home

Integrating a Virtual World Game in a Physical Environment

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Abstract. To combine these opportunities offered by both virtual worlds and the physical world, we have developed the Augmented Home, a game which combines the qualities of both worlds and integrates them into one. The Augmented Home draws the virtual world into the physical by binding it to the physical environment for children and parents to experience the virtual world together, being engaged in activities that benefit the child's educational, social and creative development.

Keywords: virtual worlds, physical play, educational games, development of children.

1 Introduction

A disadvantage of the recent development in computer games and virtual worlds is that children could be addicted to these virtual worlds and games [1]. This leads to problems such as social isolation [2] and obesity [3]. Most of these virtual worlds and games separate the children from their physical environments. This also means that other people from the physical world, such as parents, can hardly be involved in the virtual experiences. This paper presents 'the Augmented Home', a virtual world game that appears to be part of our everyday physicality, for parents and children to play together. This is a computationally generated and mediated world that is not bound to its generative medium - a personal computer, but rather is accessible in the physical world. It combines the qualities of both the physical and the virtual world.

The augmented home draws the virtual world into the physical by binding it to the physical environment and placing the virtual (objects and characters) in our physical world. Interaction with the world is made possible through a device that functions as a channel between the two worlds. It channels audio from one world to the other and allows you to 'feel' and manipulate the world through movement and touch, which stimulates the children's imagination. Through the interaction devices of the augmented home, the children can, together with the parents, participate in challenges and educational games, and experience narratives that stimulate the development of creativity, reasoning and social skills.

2 The Augmented Home

The Augmented Home is realized by creating an overlap of the virtual world over the physical environment [4], by integrating the values of both the virtual and the physical [5], and by making the virtual world available to all members of the family, allowing them to perceive it as part of their daily life.

2.1 Design Concept

A virtual world is designed to be an overlapped layer of the physical home, as a game platform for children (age between 4 and 12) to play together with parents at home. The story in this is about a group of characters live inside the house with some virtual objects. The users can communicate with the characters and do something with the objects. This is the basis for progression in the world, very similar to various digital virtual worlds. Different from the most of the virtual worlds available online, the Augmented Home is only apparent through sound and touch, allowing and encouraging the imagination of users and especially the children. The approach taken here is very similar to reading a book or telling a story; the visual aspect of the virtual world is constructed by the person listening to it or reading it [6]. This stimulation of imagination contributes to the child's development, especially in terms of creativity.

2.2 Scenario and Prototype

One scenario of the Augmented Home is worked out as a working prototype for user evaluation. The scenario and the prototype are briefly described next.

Scenario. The story is about a character called Dibbel who has lost his cat (Fig. 1, see also Fig. 3). Dibbel asks for cooperation from the user to help him find his cat and return the cat to him. There are however some difficulties. The cat is asleep and can't be found unless the user ring its bell in the same room. Furthermore, the cat is quite shy, and therefore tends to run away if the user approaches. If the user keeps the cat at ease with a cup of milk, the user can pick up the cat and return it to Dibbel. For the cup of milk the user needs to get it from Lilly, another character. She is somewhere in the house and the user has to find her first. If the user gets the milk from Lilly, the user has to walk carefully in order not to spill the milk from the cup.

Prototype. The prototype initiates the conversation with prerecorded sentences; the user can talk back to the virtual world through the channeling device (Fig. 2). Speech recognition is used to understand possible responses. The virtual objects that can be carried using the channeling device in the prototype are the bell, the milk and the cat. When carrying a virtual object, the user would feel the channeling device to be heavier. When carrying the bell, shaking it will create a ringing sound. When carrying a cup of milk, tilting the device will spill a bit of the virtual milk. When it is tilted too far, it will spill all the virtual milk and the user would feel the device to be lighter. The user has to return to Lilly to get new milk. When the cat is picked up, a purring sound would be heard from the channeling device.

The channeling device uses sound and tactile feedback to let the users experience the virtual world, and in turn, the users can influence the world via the same modalities. The users can talk to the characters in the virtual world. The sounds from the virtual world come out on one end of the channel, and are ‘physically’ output through the speaker on the other end. Speech from the user to the virtual world goes exactly the other way round.

The channeling device is also used for exploring the virtual world in the physical environment. The user can point the device at places around the room, until a character or an object is felt or heard. Distance to the virtual character or object can be felt through vibration with different levels of intensity. The closer, the stronger the vibration is. At the same time an identifier sound can be heard for the user to identify the character. The volume of the identifier also indicates the distance to the character.

When a virtual object is received, the channeling device can be felt heavier – the illusion is created using a weight distribution system inside. The virtual object can then be carried around and given to other characters by moving it closer. Depending on the object, having or using the object may also generate sounds. When the user would carry a bell, shaking the device will generate the sound as if the bell is ringing.

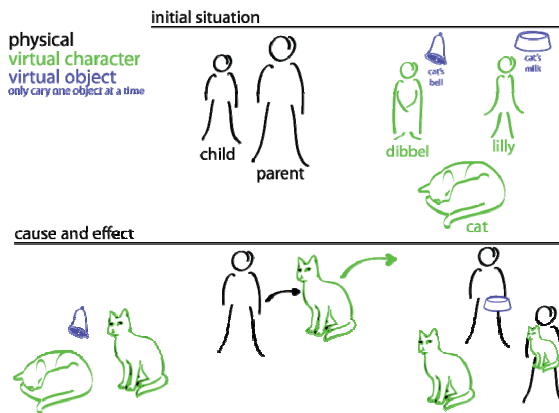


Fig. 1. Scenario



Fig. 2. Channeling device between the virtual and the physical in Augmented Home

3 Evaluation

The Augmented Home was evaluated with three groups of a child and one of the parents. The evaluation consisted of observations and semi-structured interviews.

3.1 Participants, Setup and Procedure

The children participating in the evaluation were all between the age of 5 and 9. These age limits were chosen together with a primary school teacher based on complexity of the challenge that was worked out in the prototype. Both the parent and child received a channeling device. Before the experiment started, the participants are given the opportunity to ask questions if there was anything not understood. They were also told that questions could be asked during the assignment if needed. The participants then performed the task (Fig. 3), after which a semi-structured interview took place with both the parent and the child together.



Fig. 3. User evaluation with the Augmented Home

3.2 Results

All children perceived the overlapping virtual world as very “real”. After the evaluation, they indicated that they thought that Dibbel and the cat were still around. One of the children said: “I think they are playing together outside, because they are now reunited.” This also indicates that the Augmented Home triggered the imagination of children as they came up with their own stories.

Two of three children tried to find the virtual cat, based on the behavior of real cats. They started by looking for the virtual cat in the couch and the bed, as these were the places where the real cats they knew would usually stay. One child also kept on reasoning after the evaluation, about how they could have done better by trying to understand the behavior of the virtual cat. Although one of them did not manage to find the cat at the beginning, “We might have found the cat if we were a bit more quiet, she might be scared”. All children also immediately knew how to ring the bell with the channeling device when they were asked to do so by one of the characters.

All group showed roughly the same behavior concerning the division of their roles. The child did the primary conversations and took all the decisions that could be made, while the parent guided by asking rhetorical questions. The parents also carried the

milk as that allowed their child to carry the cat; “I would not want to take the opportunity away from my son to carry the cat, so therefore I took the milk.”

The cooperative nature of the game was considered to be a very positive aspect. Compared to the digital games that the participants played before, this was the first game where they could actually work together as equals in a team. “It allows you to do things together rather than play against each other or help from the sideline.” Another parent stated that “It’s a very social game...”

When asked about similarities and differences with other existing games, most comparisons were made with “hide and seek” for its explorative and surprising nature as well as for its physical part of the game. Comparisons were also made to other digital games. Similarities here were mainly the way you can progress through a narrative and the ‘quest’-like setup. Having virtual characters was mentioned by two of the parents as one of the similarities. Differences were mainly the interaction, except when comparing it to Nintendo Wii, a system that two out of three couples had experienced. The parents saw similarities in the interaction as it is both relatively physically active. “It’s like the Wii, but with this you can move around the house...”

Triggering the imagination of the children by removing the visual aspects of the virtual world and using only sound and tactile feedback was considered to be one of the strongest points of the design. One of the parents stated that “I didn’t notice that it did not have a screen or something, now that you mention it I believe that really allows my son to imagine it for himself.”

4 Discussion and Conclusion

The Augmented Home tries to integrate the qualities of both the physical and virtual worlds for the benefit of the development of children. The system was intended to be perceived as part of everyday reality, stimulating imagination and allowing children and parents to experience it together. In the evaluation of the Augmented Home, we have seen that the children perceived the virtual world as real and combined ideas presented in the virtual world with ideas from the physical world. This indicates that a clear distinction between the two was not made. The children were also able to imagine various aspects of the game that were not provided by the system such as character locations, activities and behavior. We have also seen a more cooperative relation emerge between parents and children. It allows the parents to support the development of the children while being engaged in a virtual world.

Furthermore the evaluation showed that children can be engage in a virtual world and benefit from its educative qualities without being separated from the ‘real world’. The qualities of the virtual world, such as the tailored complexity and interactivity, were present and not compromised by the lack of physical qualities such as physical play and the ability to involve others in their activities.

One could argue that the system proposed still tends to pull the children out of their everyday reality and into the virtual world. We however believe that with the proposed integration, the distinction between virtual and real is no longer relevant. We already live our lives surrounded by –and immersed in– various virtual worlds in a

broader sense. A reality is not determined by its material form, but by our common perception and agreement upon its existence.

The Augmented Home allows experiencing the designed virtual world with a large subset of its qualities in the everyday physical environment. Besides the combined qualities, there are some distinct qualities that are a result of this integration in the Augmented Home.

One of these distinct qualities is the cooperative opportunity that this approach offers. Parents and children can cooperate in an interactive narrative in their physical environment where they can together determine the path of the story whilst interacting with artificial actors and external influences. A second distinct quality is using sound and tactile feedback as interaction modalities, instead of the visual channel. Envisioning the virtual world requires and triggers imagination of children.

The proposition of the Augmented Home allows people to benefit from the qualities of virtual worlds in their physical daily live. In this paper this advantage is proposed as a part of the education development for children. This concept could however be implemented in a broader perspective, making the virtual available to in other everyday physical contexts. Similar benefits of the virtual world can be found for adults. The desire for such worlds can be observed in the popularity among adults of the online virtual worlds.

With the Augmented Home, we have done a first exploration of the design space, a preliminary evaluation of the system and the potential of its underlying principle. It would be interesting to see further explorations aiming at studying the effect of such systems in a more formal manner in the future.

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