The Musical Box Garden

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Abstract

The Cardboard Box Garden (CBG) originated from a dissatisfaction with current computer technology as it is presented to children. This paper shall briefly review the process involved in the creation of this installation, from motivation through to design and subsequent implementation and user experience with the CBG. Through the augmentation of an everyday artefact, namely the standard cardboard box, a simple yet powerful interactive environment was created that has achieved its goal of stirring childrens imagination - judging from the experience of our users.

Keywords

Education, play, augmented reality, pervasive computing, disappearing computer, assembly, cardboard box

Introduction

The CBG was created to explore the possibility of introducing an alternative form of computer interaction into the arena of primary education. First displayed at the Digital Arts Week Now (DAWN) exhibition held at the University of Limerick, Ireland in September 2001, the CBG was one of a number of projects that were exhibited from the Masters in Interactive Media course (2001)[1]. As the computer makes its presence felt within the area of education, more often than not, it is packaged into programmes about the technology, where the objective is that children must learn 'about computers' in order to secure a job in the technologically-empowered 21st Century. Even where the computer is used more as a tool, its role is rarely stretched beyond being used to do word processing or find information on the Internet. Our goal is to fundamentally question this role of the computer in our childrens educational environment. In doing so, we wish to create a radically new form of computer interaction, one that may fit more comfortably into the learning environment of the child. For example, the personal computer in its current form is notoriously poor when it comes to bodily interaction [2]. Healy [1] notes: "Body movements, the ability to touch feel, manipulate, and build sensory awareness of relationships in the physical world" are crucial to childrens development. From an interactional point of view, the physical limitations of using a WIMP-type computer can become a barrier to a more engaging experience. Thus our design brief was – " how can we combine elements of computer technology to augment creative possibilities for children – to create a playful learning environment that allows for exploration, discovery, and for collaborative physical activity?"

Design process

Realising that the focus of activity should be moved away from the computer, back to the child, led us to investigate the attraction children have for simple play items - tin cans, sock puppets and cardboard boxes. Intrigued by the cardboard box, we set about examining its natural characteristics, for example, questioning how people use cardboard boxes. We were attempting to ground our design ideas on the affordances of everyday objects, so as to create interfaces that would be experienced by our users as 'natural' and 'intuitive'. As Norman [3] notes: "When affordances are taken advantage of, the user knows what to do just by looking". Considering the possibility of making an interface out of real-world objects, the best place to start is by understanding how these objects function. Observing and analysing child - box interactions led to the effective use of these affordances in the prototyping stage.

Towards a box garden

Once a repertoire of box interactions was developed the design process began to focus on how the scenarios could be developed and enriched with technology without detracting from the boxes themselves. The role of the computer was seen as a facilitator of an activity. Allowing the computer to become part of the action – reaction scenario meant that while the overall interface may become much more sophisticated there is no need for the basic interactions to become any more intricate. Isolating a number of familiar box interactions, a decision was made to explore the creation of an interface which used the boxes as containers of sound. The design now moved into a phase where the notion of "assembly" - of boxes, interaction sequences – became important, as our focus was on creating a "box garden" – for children to explore.

The Cardboard Box Garden

The final CBG prototype is a sound installation piece made-up of fifteen boxes, varying in shape and size. (See Figures 1 & 2). The fifteen boxes are split into four different groups with each group supporting a specific sonic task. In turn each of the box clusters work collectively within MAX. The 'Record group' contains three boxes.

When opened, each of the boxes records a separate audio sample. Analysing the amplitude and frequency, the input sound is converted into one of three musical instruments, a piano, xylophone or percussion. As each 'Record' and 'Play' box functions as a pair, opening the corresponding 'Play' box will cause the sound - which was initially generated by the child -   play back as a predetermined instrument. Once the desired musical sounds are playing, the children can also alter the volume and tempo by stacking and pushing other specific cardboard boxes. Building upon the natural characteristics of a cardboard box, children are able to create and alter their own music in a playful manner, without being distracted by the 'computer'.

Audience Experiences.

The DAWN exhibition hosted by the University of Limerick (Sept. 24-28th, 2001) provided an ideal opportunity to test the CBG. Over a four-day period, the CBG was used by people of all ages. After the initial novelty factor subsided, people began to use the boxes to create and manipulate sounds. Building upon the natural affordances of cardboard boxes has proved successful. For example, the boxes were seen as containers of sounds, which, when opened, released their sounds. Children who used the interface made the most creative use of the boxes. Two young sisters, one aged seven and the other nine, were introduced to the interface. Together, the sisters slowly began to explore the boxes. After a few minutes they understood what each of the boxes could do and so began to play with the sounds they had created. As they became more confident, the pace of interaction speeded up, to the point that they were both running around the space, pushing and pulling the boxes with great enthusiasm. The robustness of the CBG was certainly put to the test.

Figures 1+2. The U.L and Ennis exhibitions.

The Box Garden was one of four interactive media exhibits selected for presentation at the Ennis October Arts Festival (Oct. 13-20th, 2001). The space in which the CBG was exhibited was much larger than the earlier exhibit space, allowing the boxes to spread over a wider area, and giving more of a garden 'feel' to the setting. As a result of our simple interactive design the children began to think more about the sounds they were able to create, from singing and clapping to recording and distorting their mobile phone ring tones. Allowing the children to create their own music meant that when the sound was played back they were able to fragment it, and in doing so they realised how specific parts were created.

Through the use of physical objects an increased awareness of tempo and volume was created. Control over the sounds was moved away from the computer onto the physical actions of the children.

Conclusion

Our design ideas have been influenced by several core themes that we have attempted to incorporate in our design thinking. Listing them briefly here, these are:

- Human Activity - as a fundamental aspect of human being in the world

- Materiality of Objects - the central role of material artefacts in children's play

- Engagement - the need to excite, motivate, enhance the user experience

- Interaction - human play with objects being seen as a narrative activity, not simple action-reaction (mouse event - action) pairs

- Multimodality - incorporating several sensory modalities - visual, tactual, kinaesthetic, sonic, auditory

- Sociality - creating artefacts or assemblies of artefacts that allow for collaborative activity

- Computer as an augmentation tool, not a substitute for existing practices

- Objects as Assemblies- designing an object world, allowing for object juxtaposition, linking, stacking, etc. Creating emergent behaviours as a result of human actions

In sum, we have been encouraged by the audience reaction to our small demonstration system, and hope that it will embolden others to explore the way in which computational devices can add value to existing objects and human activities, while being sensitive to, and building on, everyday practices in the "real" world.

Further research

Currently a number of simple refinements to the Garden are being explored. We aim to allow the user to have more control over both the environment and the music. Ideas that are being investigated include:

- Creating more control over individual musical instruments, e.g. increasing the pitch or tempo of each box separately.

- Allowing the users to specify the length of a recording.

- Making the boxes wireless, to allow the user to have complete control of environment.

- Allowing the users to choose the instrument, for example placing the lid of a box on in a particular way selects the instrument.

An mpeg of the Boxes in action can be found at http://richie.idc.ul.ie/~kieran/vid/

References

[1] Healy, J. M., 1999, Failure to Connect, How computers affect our children's minds – and what you can do about it, Touchstone.

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[3] Norman, D.A., 1988, The Psychology of Everyday Things, New York, Basic Books,