Multimedia Metaphors for Young Children: TVM a Case Study

Kirsten Ellis and Dr. Katherine Blashki
Monash University, Berwick Campus
Clyde Road, Berwick, Victoria 3806, Australia

(T) +61 3 9904 7132	+61 3 9904 7118
(F) +61 3 9904 7169	+61 3 9904 7169
kirsten.ellis@infotech.monash.edu.au	kathy.blashki@infotech.monash.edu.au

ABSTRACT

Incorporating age appropriate metaphors in computer interfaces designed for two and three year old children can facilitate competent and independent interactions. Young children have a different experience of the world to adults. Children have neither the knowledge nor confidence required to interpret the requisite interactions. Therefore interfaces that are suitable for adults may not be suitable for young children. Interfaces designed for two and three year old children must be sensitive to the nuances of meaningful and age appropriate source domains for young children. The relationship between young children and computers is bound by various physical and mental abilities, and the knowledge that the user brings to the interface. By using an interface that incorporates an age appropriate metaphor and appropriate interactions, multimedia products and services can be developed that ensure comprehension by young children and facilitate independent interactions with a computer.

INTERFACES FOR TWO AND THREE YEAR OLD CHILDREN

Developing multimedia for young children requires a number of special considerations to be addressed. Two and three year old children need to be introduced to computing skills progressively and their experience should be positive. Young children have a restricted knowledge base in comparison to adult users and therefore their interactions with computers are necessarily limited. Metaphors are usually suited for use with young children as they can convey the method of interaction required both pictorially and conceptually thus eliminating the need for text which most young children are unable to understand. However the metaphors selected for use with young children must be age appropriate to enable children to interpret them as intended. Thus the creation of interactive multimedia for young children is dependent on accessing the

Figure 1: A screen shot of the "TVM" Peekaboo

child's prior knowledge and working within the limitations of their ability.

"TVM" is a fully functional model of a multimedia product developed for young children. The system revolves around a television metaphor incorporating nine channels, a volume control facility and a power switch. The nine activities are available, are Balloon popping, Peekaboo, Old Mac Donald, Felt Pictures, Sing Along, Colouring Book, Three part book, Ball sort and Shape Sort. A "teddy" is also included on the lower right hand side to provide assistance to the child. "TVM" was developed as an exemplar of interfaces for two and three year old children, it was designed specifically to meet the needs of this unique audience.

CONSIDERATION IN DESIGNING MULTIMEDIA FOR YOUNG CHILDREN

Two and three year old children can benefit from using computers as part of a balanced program designed to develop the whole child (Clements and Nastasi, 1993). Children can develop self-esteem by using a computer and are able to acquire specific skills and knowledge to aid in their interactions (Jones and Liu, 1997).

Age Limitations

Children as young as two can use computer in a meaningful way (Pardeck and Murphy, 1989). Their natural curiosity motivates exploration of computer environments. Children are comfortable with computers as they perceive computers as part of their everyday environment through observing parents and/or other adults using them frequently.

Interactions

Young children are capable of independent interactions with a computer using a number of standard input and output devices (Lane and Ziviani, 1997: King and Alloway, 1993). The touch screen, mouse and keyboard are suitable input devices for young children to use. Input should be designed in an age appropriate manner such as; large non-moving areas for mouse selection or colour coded keys on the keyboard. The activities in "TVM" can be completed in any order however they require progressively more complex interaction with the mouse. The first activities only require moving the mouse over an area. The next activities require a single button click over an area. Later activities require that a button is pressed over an object to *pick it up* and button press to *put it down*. The traditional *double click* and *drag and drop* are not used because they require a level of co-ordination not yet obtainable by the target audience (Ellis, 2001).

Drill and Open Activities

Drill activities have a regimented starting and finishing point and often reward successful completion. The advantage of drill activities is that they are often easy to access, can be engaging and can develop

computing skills. Drill style activities incorporated in "TVM" include balloon popping, ball sorting and shape sorting. Drill activities are useful with young children because the interactions are simple and the purpose is clear. The disadvantage of drill style activities is that they do not encourage creativity and can become repetitive and boring, to counter this "TVM" provides a range of drill and open activities.

The open activities enable creative input from the user as they have no definite completion point, the child decides when the activity is complete. Open activities are often creative and provide the tools for the child to develop and design their own activities. "TVM" has several open activities including felt pictures, paint and the three part book. The three part books is a particularly appropriate open activity for two and three year old children. The activity requires the children to turn one of three parts of a book using a single button press. The children can create their own story for example a sailor, wearing a tutu and gum boots. It provides a high degree of creativity without requiring a high degree of computing or reading skills.

The Role Of Adults And Attachment Objects

Adults are essential to young children's initial use of computers; Jones and Liu state that "at the age of two, human interaction is of critical importance" (1997: 340). Adult often act as a helper in children's computer use. As Anselmo and Zinck (1987), and Jones and Liu (1997) suggest, very young children will require assistance with the computer until their fine motor skills develop enough to enable them to be independent. It is important for the adult to provide appropriate levels of assistance rather than arbitrary intervention. If the child is required to passively observe the superior skills of control and dexterity of the adult, they will inevitably get bored, not feel in control, become frustrated and not have the opportunity to develop their own skills. Without sufficient assistance the child may feel frustrated in not being able to do what they want or they may feel inadequate and not want to use the computer in the future. Once young children have had initial assistance, it can be decreased progressively until the child is working competently with minimal supervision (Clements and Nastasi, 1993; Bredekamp and Rosegrant, 1994).

"TVM" is designed to be used with the assistance of an adult in the initial stages. Once the child has developed the required skills to interact, the "teddy" takes over the role of the adult as emotional support. In the transition from early dependence on an adult to independence in the outside world a child can become emotionally attached to an inanimate object. They rely on it for support at they would their primary carer. This phenomenon aids the child in the transitional phase of development. The attachment object has been provided in the form of a "teddy" bear that is soft in appearance and is always visible on screen. The teddy also provides simple statements on how to interact with the activity.

Figure 2: A Screen Shot of the "TVM" Three Part Book
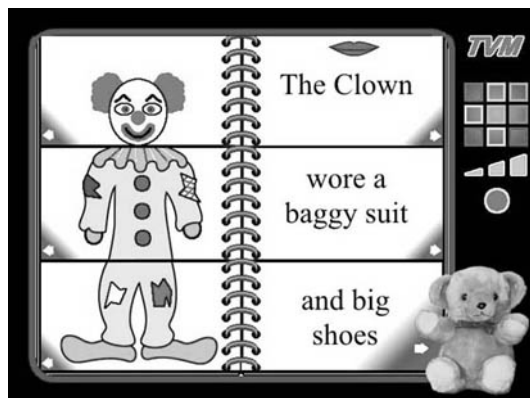
METAPHORS FOR YOUNG CHILDREN

Metaphors in interface design have traditionally been used to help users interact with a computer system premised on the knowledge that they have gained via real world experience. Metaphors designed for young children have a particularly important role in interfaces as they need to convey the logistics of interactions with the interface as young children are unable to read text. Metaphors for young children utilise "affordance" in order to effectively guide the child on appropriate interactions required to navigate a computer system and to complete the activities offered.

Suitable Metaphors For Young Children

Metaphor designs for children require the use of source domains that are familiar to young children in order for appropriate and successful interactions to occur. The environments that young children are exposed to differ from those of adults thus the metaphors that are appropriate for adults are inappropriate for use with young children. Sources domains that may be suitable for young children include objects and places that young children are familiar with such as; books, posters, activities centres, bed rooms, houses and televisions.

Metaphors Incorporated In "TVM"

"TVM" uses a metaphor of a television to enable children to select one of the nine *channels* to access activities. The television metaphor also enables volume control and an off switch. Children are able to interact with the program because the television provides a familiar object with already known and experienced modes of interaction. Each of the activities also incorporates a number of metaphors which guide the child in the appropriate way to interact. One of the activities presents coloured balls and coloured boxes, the balls afford placing in the boxes so this is the purpose of this activity. In this way the activities and the metaphors are interrelated.

RELATIONSHIPS BETWEEN YOUNG CHILDREN AND COMPUTERS

A definable relationship exists between young children and computers and is dependent on the mechanisms that facilitate their interactions (Figure 3).

Figure 3: The Relationship Between Young Children and Computers
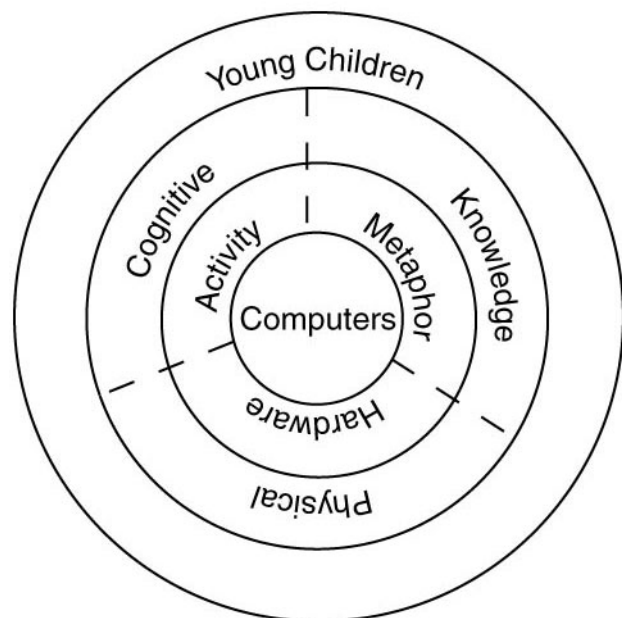
Young children require sufficiently developed cognitive ability, physical skills and knowledge in order to interact with the activities, hardware and metaphors used in computer systems. Successful interaction is dependent on each of the components within the relationship being at an appropriate level.

The first component required in order for a child to interact effectively with the computer is an appropriate level of physical development. The physical development required consists primarily of the fine motor co-ordination necessary to use input devices. A young child can only interact with a computer effectively if an appropriate method of input is provided such as a touch screen, mouse or trackball. If a young child is not able to use the input device independently this should not necessarily prohibit interactions. Initial interactions may require assistance from an adult, which can subsequently be withdrawn. The style of interactions may also be used to progressively develop the young child's physical skills.

The second ability required is an appropriate level of cognitive development. For the child to use the computer s/he must first possess a desire to interact with the computer. This curiosity may be generated from an internal source such as the young child attempting to simulate adult use of a computer. Alternatively, the desire to use a computer may emerge from an external source such as encouragement from parents, other adults or children. The other cognitive requirement that young children require is the ability to sustain concentration on a task. Both the desire and the concentration could be nurtured within young children by providing activities that are appropriate, interesting and engaging.

The third component that young children need to interact successfully with a computer is the requisite knowledge that enables them to interpret the interface and thereby complete the appropriate interactions offered. Young children depend on meagre and developing resources acquired in just two or three years in order to interact effectively with the computer. Children are lacking knowledge that an adult often takes for granted, such as the ability to read and interpret other symbolic representations. Therefore, the use of metaphors designed specifically for young children can aid their interactions with a computer by allowing them to access their limited experiential knowledge by the representation of material that is primarily visual and familiar. The metaphor must be necessarily within the realm of the young child's experience for the transference of knowledge to occur and thus aid their current interactions with the computer.

Successful interfaces are conceptualised via the use of metaphors to ensure immediate and satisfactory access to the computer for young children. Sensitivity to the level of knowledge that a young child has accumulated is critical to the successful design of computer interfaces using metaphors. If young children do not have the appropriate knowledge, then no transference via prior knowledge will occur, and they must postpone their current endeavours in order learn the required systemic information. Alternatively, they may learn the information implied by the metaphor during their interactions with the computer. Such knowl-

edge acquisitions will complicate their endeavours, and thus increase their cognitive load. For example, if a computer program uses the metaphor of a book, young children are able to interpret this as they are invariably familiar with the concept of turning pages. A young child may gain immediate access to the program and start to explore the translation of the "book to a computer" interface. In contrast, if the computer uses an unfamiliar metaphor such as a filing system, the young child may need to learn the concept of a filing system prior to interacting with the activity. Thus the child's cognitive load would be increased, as their lack of experiential knowledge necessitates learning the filing system as well as the method of interacting with the computer.

CONCLUSION

Age-appropriate metaphors are an essential basis for interfaces for young children. They must use source domains that are familiar to children in order to be interpreted accurately. Young children are restricted by their knowledge and experience but this can be ameliorated by appropriate interface design. Children can independently interact with multimedia if the appropriate forms of interactions are conceptualised in the design.

REFERENCES

Anselmo, S. and Zinck, R.A.(1987) Computers for young children? Perhaps, in **Young Children, 42**(3), 22-27.

Bredekamp, S. and Rosegrant, T.(1994) Learning and teaching with technology, in J.L. Wright, and D.D. Shade (eds), **Young Children: Active Learners in a Technological Age,** Washington, DC, National Association for the Education of Young Children, 53-61.

Clements, D.H. and Nastasi, B.K.,(1993), Electronic media and early childhood education, in B.K. Spodek (ed.), **Handbook of Research on the Education of Young Children**, Macmillian Publishing Company, 251-75.

Ellis, K. (2001). Modelling Interface Metaphors: Developing Multimedia for Young Children, Thesis, Faculty of Information Technology, Monash University, Australia.

Jones, M. and Liu, M.(1997), Introducing interactive multimedia to young children: A case study of how two-year-olds interact with the technology, **Journal of computing in childhood education, 8**(4), 313-43.

King, J., Alloway, N.(1993) Young children's use of microcomputer input devices, in **Computers in the Schools, 9**(4), 39-53.

Lane, A. and Ziviani, J. (1997) The suitability of the mouse for children's use: A review of the literature, in **Journal of Computing in Childhood Education, 8**(2/3), 227-245.

Pardeck, J.T. and Murphy, J.W.(1989), Introduction: Microcomputers in early childhood education, in J.T. Pardeck and J.W. Murphy (eds.) **Microcomputer in Early Childhood Education,** Gordon and Breach Science Publishers, 1-10.

Related Content

High-Performance Reconfigurable Computing Granularity

Mário P. Véstias (2015). *Encyclopedia of Information Science and Technology, Third Edition (pp. 3558-3567).*

www.irma-international.org/chapter/high-performance-reconfigurable-computing-granularity/112787

Design of Healthcare Lighting in Medical Centers Based on Power Carrier Communication

Yan Huangand Yongfeng Zhang (2023). *International Journal of Information Technologies and Systems Approach (pp. 1-14).*

www.irma-international.org/article/design-of-healthcare-lighting-in-medical-centers-based-on-power-carrier-communication/324748

Medco: An Emergency Tele-Medicine System for Ambulance

Anurag Anil Saikar, Aditya Badve, Mihir Pradeep Parulekar, Ishan Patil, Sahil Shirish Belsareand Aaradhana Arvind Deshmukh (2017). *International Journal of Rough Sets and Data Analysis (pp. 1-23).*

www.irma-international.org/article/medco/178159

A Machine Translation System from Indian Sign Language to English Text

Kinjal Mistree, Devendra Thakorand Brijesh Bhatt (2022). *International Journal of Information Technologies and Systems Approach (pp. 1-23).*

www.irma-international.org/article/a-machine-translation-system-from-indian-sign-language-to-english-text/313419

Modeling of the Aerodisperse Systems Hydrodynamics in Devices With Directional Motion of the Fluidized Bed

Artem Artyukhov, Jan Krmela, Nadiia Artyukhovaand Ruslan Ostroha (2021). *Encyclopedia of Information Science and Technology, Fifth Edition (pp. 1289-1307).*

www.irma-international.org/chapter/modeling-of-the-aerodisperse-systems-hydrodynamics-in-devices-with-directional-motion-of-the-fluidized-bed/260266