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Understanding the Human-Computer Interface Requirements in Developing Applications for Children

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Abstract

The impact of technology on children is said to be very crucial in this era, so every single issues are needed to take into consideration on designing an interactive layout of design for children. This research focuses on understanding the design needed for children's applications in terms of perception, memory, symbolic representation, problem solving and language. The definition of children used in this research is broad rather than narrow, it can include toddlers and teenagers but the core work of this survey focuses on children in primary schools. However, children at preoperational stage which are at the age of 2 to7 are the main target for this research. A simple testing process was conducted with children in order to understand the current situation related to interactive design on mobile software applications. This research concludes by congesting all the guidelines relating to interactive design and human computer interaction on children, extract the methods testing which are conducted with children and come out with recommendations to improve the current design for children's mobile software applications.
Keywords: Children & HCI, Software Requirements, Interactive design

1. Introduction

Interactive design and human computer interaction is more likely about shaping digital things for people's use. It is a user-oriented field of study that focuses on meaningful communication of media through cyclical and collaborative processes between people and technology. Successful interactive designs have simple, clearly defined goals, a strong purpose and intuitive interface [1][2][9].

Children are still on learning stage so some complicated design might not work on children. Parents have exposed their children to these technologies at earlier stage since toddlers. Children's ideology is intriguing and unpredictable, in order to find out what is in their thoughts this might need to be studied psychologically.

Thus, this implies that children's wishes especially regarding the fun and motivating aspects may be difficult for adult designers to envision [2][5]. The main objective of our research paper is to explore and examine the characteristics of children related to HCI and methods for designing and testing with children in order to provide useful guidelines or requirements' list for designing application for children.

Understanding the requirements needed for designing children's applications is important to ensure that the applications designed are really suitable to be used by children. The characteristics of children from different categories such as cognitive, physical, and social/emotional development are needed to be discovered as children act differently compared with adults [3]. Thus, these elements have to be taken into consideration when designing applications for children. Researchers have come out with several methods for testing with children on HCI. The methods proposed are about the proper ways to interact with children in order to observe and analyze them. There are no specific illustrations about the special requirements needed on designing applications for children from any researchers. Therefore, this research aims to come out with few design elements to test on children to understand the demand of design tips for children. This research paper focuses on understanding the design needed for children's applications in terms of perception, memory, symbolic representation, problem solving and language.

2. Characteristics of Children towards HCI

Human behaviors are very important for interactive design. Human's mind is an unpredictable segment in the

world. That is why we need to study and understand children's minds so that adults can give a better interactive design for them. There are three categories of design principles which are cognitive development, physical development and social/emotional development.

2.1 Cognitive Development

Most adult user-interfaces assume that users are proficient readers with fairly extensive vocabularies; most children, however, have not reached this proficiency level. Older children may not fully understand text -based instructions, while young children may not even know the alphabet yet. Conventional interfaces include menus and help functions that are text -based, making them inappropriate for young users. Interfaces that require textual input can also be problematic. Children can be very creative spellers, making it difficult for an interface to recognize text input [3].

The written word is a central vehicle for communicating information to humans in human-computer interfaces. Thus, developing reading skills on computer technology for young children has become a great challenge [1]. Different stages of ages of children have different understanding level. For designing computer technology based on this criterion, considerations have to be taken on font sizes and language levels. Designers are hard to predict the font sizes for different ages of children as they do not know which size is suitable for children. Since reading and writing levels vary significantly, children's interfaces must be designed with a narrow age-group in mind to adequately meet the needs of its users.

2.2 Physical Development

This section indicates the fine motor control of young children. Children's fine motor control skills develop over time. Young children and adults have different size on physical movement area. Devices for adults are definitely not suitable for young children. They are still on learning stage of physical posting; they might face difficulties on dragging the button and double-clicking the mouse. Understanding on way to use the devices has become the main problem for young children. They know how to move their fingers around but they do not know how to move them in proper way. They know how to touch on things but they do not know how to touch it in a correct way. Few researchers state that kids may have trouble double-clicking, and their small hands may have trouble using a three-button mouse [1][2][3].

2.3 Social/Emotional Development

This involves motivation and engagement, social interaction and collaboration. For motivation and engagement, Children use technology for educational, social, and entertainment purposes. In order to be successful, a product needs to keep their interest and attention. This may mean sacrificing efficiency or turning away from adult design principles that advocate lean, simple interfaces. One way to address engagement is by supporting the idea that children need to feel empowered and in control of the interaction. Social interaction is an important part of children's lives and this interaction in increasingly taking place online. While safety concerns must be addressed, children's technology can encourage and facilitate this interaction [9]. Moreover, children's patterns of attention have to be considered. Task-oriented analyses of activity may fail to capture the playful, spontaneous nature of children's interactions with technology. Children's interaction style on computer technology has become an important issue to be examined. Their interaction patterns are quite different from adults. For example, some functions are designed for message delivery purposes and it works on adults, but children are unable to understand it and might thought it is interesting to do it repeatedly. We need to understand deeply on children's interaction style about this issue when designing HCI for children [1].

3. Proposed Work

Children are the creatures which are hardly to predict on their thoughts and behaviors. Designing an application which is specifically for children needs to take serious consideration on the suitability of the GUI and interactive design of the application itself. Researchers have mentioned all kind of characteristics of children and their abilities to interpret. This shows that special requirements for developing an application for children are definitely needed. This research focuses on three groups of people which are the children, the developers, and the people.

There are a lot of elements to be considered about when designing an application as the developers do not really know which the most suitable one for children is, especially for children at the age of 2 to 7. Thus, this research tends to carry out a simple testing process with the children at the age of 2-7 in order to understand the most

suitable criteria for application interactive design. For sure, this testing process is carried out to children from age of 2-7 accordingly and that different ages of children possess different growing progress. This testing process selects one or two current software applications which are available in the market now instead of creating a new application. From this testing process, few aspects are to be focused on such as the font of size, color contrast, the navigation links, icon, sounds and character. Children's responses on these few aspects are very important to prove that which would be the most suitable to be applied on the application's design.

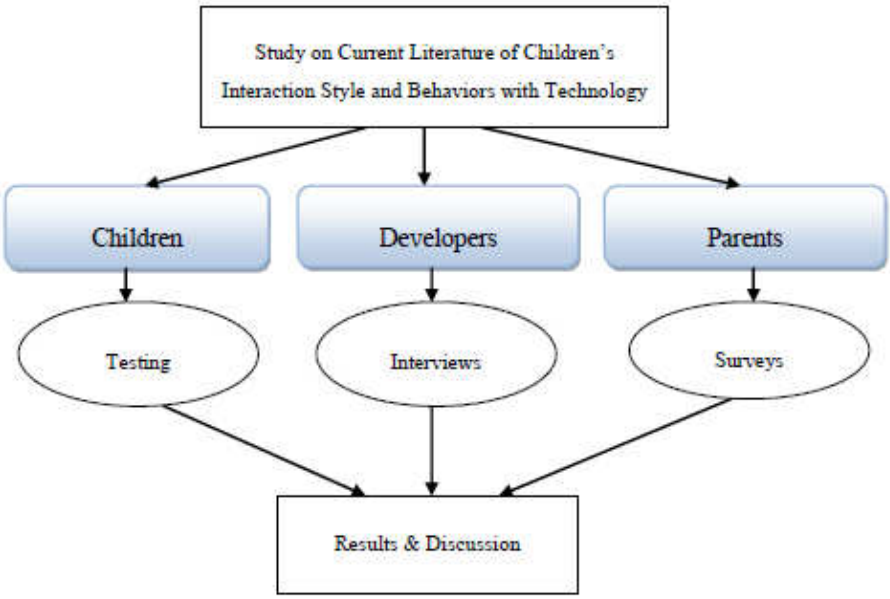

Figure 1: Proposed Framework for Determine the Requirements needed for children's Applications

An interview session with current developers is required to be conducted in order to absorb their professional comments/suggestions or experiences regarding the children's applications. We need to understand how a developer create a children's applications, how are they going to fulfill the needs of the children on the applications they are designing.

The purpose of conducting interviews with the application developers, conducting surveys with parents and conducting a simple testing with children is to study and evaluate the judgments made by three different groups of people in order to meet the design's requirements. Applications developers might be as parents but sometimes they might not be able to think in the way how an ordinary parent thinks. Thus, this research would like to obtain justifications from ordinary parents in order to provide more accurate judgments on the design's requirements for children's applications. However, children are the users for their applications; they are the only one who can judge the usability and suitability of the applications. Thus, we acquire their comments or suggestions regarding their applications by observing their responses through the interaction of themselves with the applications.

4. Results & Discussion

Figure 2 shows the special requirements of interactive design for children's applications which parents think that it is needed to be taken into consideration. From the data on the bar chart, the criteria of font size and font color has the highest percentage among all. The second highest percentage is the criteria of language, followed by sound which is 47 percent, icon which is 43 percent and color contrast which is 40 percent. From this survey, we can see that parents think that the most important requirements on children's application design are font size and color, language used for the applications, the sound in the applications and the icon used in the applications. Others criteria such as navigation links, keypad size and screen size which have less percentage are seem to be not so important from the parents' opinions.

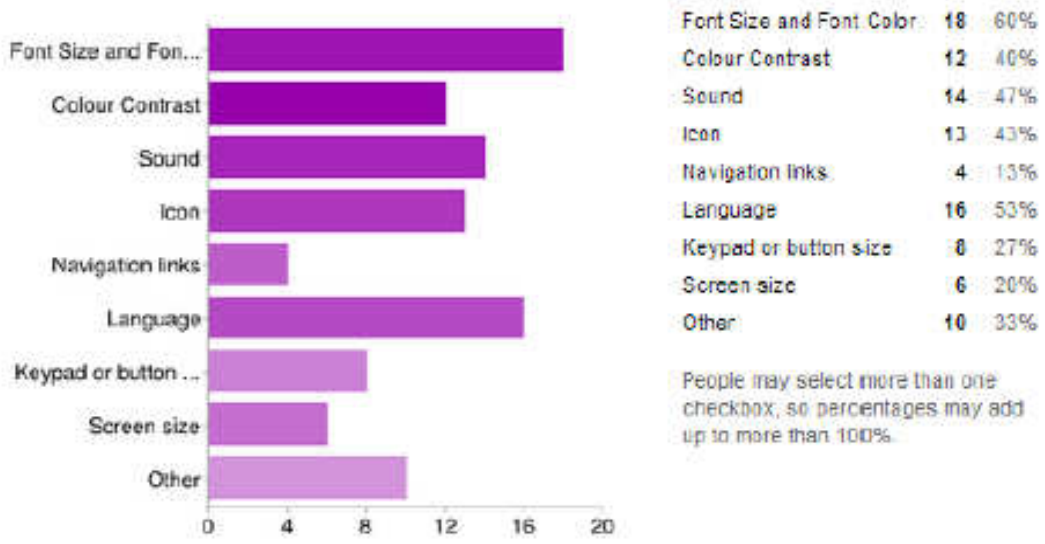

Figure 2 - Bar Chart of the Crucial Requirements for Designing Children's Applications

A detail requirements suggestions have been delivered by having children itself to interact with the applications. We get to see their responses during the testing process and analyzes out the most important criteria which are needed to be considered during designation of applications. Children's fine motor skills have become an issue when they are attached to applications usage. From the results, we can see that children at the age of 2 to 4 are not able to click properly when doing some tasks on the applications. They need to be assisted during the task performances. Children tend to be more interested to attractive interfaces which mean that the interfaces are colorful. The method of drawing presented by the researchers [11] also indicates the drawings made from children inspired developers about the choice of colors or layout. From our observation results, we are able to notice the color contrast which attracted children the most by estimating their participant time on both tested applications. It seems that children tend to be attracted by the most colorful application 2 compared to the least colorful of application 1. Thus, color contrast of an application seems to be very important requirements in children's applications.

Language and sounds effects play an important role in children's applications too. It seems to be a great challenge to design an application which is suitable to the group aged of 2 to 7 because level of understanding varied with ages. Children at the age of 5 to 7 might be able to read, listen and understand; but children at the age of 2 to 4 might not be able to read at all. From our observations, in order to let the applications to be suitable to be used by the group aged of 2 to 7 may be the navigation links or buttons can be designed in a blinking way to attract children's attention. When something is attracted to them, they might have the intention to move their fine motor towards the blinking area. From the observation, children are able to understand some easy words thus this can be a little suggestion to be given to the developers in their implementation in the future.

5. Conclusions

The special requirements needed for children's mobile software applications are determined based on few criteria; there are color contrast, sound effect, font size and color, navigation links, icon and characters. Children's responses towards those criteria are examined to find out the most suitable requirements needed for their applications. The results showed that children's level of understanding varied with ages. Thus, the requirements of designing children's applications have to bring the problem of children's ages into consideration. As stated from the results, the applications which are suitable for group aged of 7 seem not suitable for children at group age of 2 to 4. The results on the survey with parents indicates to us that those listed criteria for designing requirements gathering are very crucial and need to be taken into serious consideration on designing children's applications. Suggestions or recommendations are provided by experienced applications developers those are, a simple, and easy and user friendly user interface design is needed when designing children's

applications.

In future evaluations, it would be interesting to examine the children's behaviours to determine the most relevant requirements needed for children's mobile applications by testing with more available software applications in terms of children's collaboration, interaction, verbal discussion, engagement, enjoyment and motivation. Due to time constraints, a simple testing had been conducted with children in a short period of time in this research. It would be more precise to have a testing conducted based on the psychological methods in order to get a more accurate results from children in the future. It would be interesting to research interactivity, engagement, enjoyment, motivation to such an extent that baselines for these variables could be produced.

References

[1] Amy, B., Alisa, B., Andrea, F. (2002). HCI FOR KIDS. The Human-ComputerInteraction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications. 794-809.

[2] Bruckman, A. and Bandlow, A. (2003). HCI for kids. The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications, J. Jacko and A. Sears, Eds. Lawrence Erlbaum, Mahwah, NJ, USA. 428-440.

[3] Druin, A. (2002). The Role of Children in the Design of New Technology. Behaviour and Information Technology. 21(1): 1-25.

[4] Hanna, L., Risden, K., & Alexander, K. (1997). Guidelines for usability testing with children. Interactions, 4(5), 9–14.

[5] Hourcade, J. P. (2007). Interaction Design and Children. Foundations and Trends in Human-Computer Interaction. 4(1): 277-392.

[6] Hourcade, J. P., Bederson, B. B., Druin, A., and Guimbretiere, F. (2004). Differences in pointing task performance between preschool children and adults using mice. ACM Transactions on Computer-Human Interaction. 11(4): 357-386.

[7] Red, J. (2005). The ABC of CCI (Child Computer Interaction). Interfaces 62. 8-9.

[8] Scaife, M. and Rogers, Y. (1999). Kids as informants: telling us what we didn't know or confirming what we knew already?. The Design of Children's Technology, A. Druin, Ed.,

[9] Yee, C.K., Ling, C.S., Yee, W.S., & Zainon, W.M.N.W (2012) GUI Design Based on Cognitive Psychology: Theoretical, Empirical and Practical Approaches. Proceedings of the 2012 8th International Conference on Computing Technology and Information Management (ICCM 2012), pp. 836-841.

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