Child-Computer Interaction: ICMI 2012 Special Session

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ABSTRACT
This is a short introduction to the special session on child computer interaction at the International Conference on Multimodal Interaction 2012 (ICMI 2012). In human-computer interaction users have become participants in the design process. This is not different for child computer interaction applications. However, technological advances have also led to developments where children not only have the role of future consumers of an application (a game, maybe an educational game), but also design and create the application, where designing and creating is both fun and serving educational purposes. In this special session the different aspects of child computer interaction (design, usability, learning, fun, creating, collaboration) are investigated and illustrated. In addition we pay attention to the efforts to create a child-computer interaction research community.

Author Keywords
Children; Interaction Design; Child Computer Interaction; Constructivism, Tangible Interfaces, Games, Virtual reality.

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces - Interaction styles.

General Terms
Human Factors; Design; Measurement.

INTRODUCTION
While in the late 1940s, early 1950s there were discussions about how many computers the world needed, now, sixty years later we are talking about computers everywhere, not only as one of the many personal computers in our home, but also embedded in our home environment, our personal devices, our clothes and in our social media and entertainment applications. Children have grown up with internet, the world wide web and mobile devices that give access to role-playing games and entertainment, news, and education, but most of all, communication using social media and games with friends and others that have similar interests. Many of them play games many hours a day. Mostly this is done using mouse, joystick, keyboard and screen. New interaction technologies become available. These new technologies process speech, gestures, facial expressions, body movements, and physiological information, including brain-computer interfacing.

In child-computer interaction (CCI) research children are the user group for which we want to design interfaces that take into account the special characteristics of this user group. Moreover, we want to take into account special applications, in particular applications that have educational goals, applications that aim at fun, and applications that combine fun and education..

FROM LOGO TO TANGIBLES
The development of Logo in the late 1960s by Seymour Papert and others [1] as a child-friendly programming language is often mentioned as a start of the interest in using the computer for educational purposes for children. Logo was designed as a tool for learning. In early Logo virtual and physical (including touch sensors) 'turtles' could be programmed to move and draw shapes and pictures ('turtle graphics'). Underlying the design of Logo was the (cognitive) constructivist educational philosophy, advocated by Jean Piaget: learners must construct their own knowledge through experience. Only with the advent of personal computers Logo got more widespread, various Logo environments were created for different teaching purposes and Logo projects were introduced at schools. Many interesting developments followed, for example LEGO Logo could be used to control machines built from LEGO blocks, with sensors, motors and light, while LEGO 'Programmable Bricks' (later called LEGO Mindstorms) could run programs autonomously. In later years, up until now, Logo programming environments have been extended to allow designing interactive stories, animations and music and art applications, and to interface with micro controller boards (e.g. Arduino) that allow reading sensors and controlling motors and other actuators, hence, integrating a constructivist view on programming with sensor-equipped environments and interactive objects, such as tangibles.

TECHNOLOGICAL ADVANCES AND HCI
Clearly, other 'historical' viewpoints can be mentioned as well. Independently of thoughts about constructionist learning and ways to implement them in educational software there have been technological advances that made it possible to have access to all kinds of information, to communicate with fellow-learners and teachers, and, in particular, to communicate with fellow-students. Hence, there is more than the typical HCI view, where now slowly it is understood that there is more than efficiency and

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control when talking about computer applications and when talking about personal preferences.

It has become common to have an ambient intelligence view, where the assumption is that we have sensor equipped environments, the sensors have intelligence, the environment knows about its inhabitants, how they communicate with each other and how they interact with the environment. And it assumes that the environment can act pro-actively, that is, can anticipate the activities of its users. These technological developments have, probably more than the previously mentioned developments with the Logo environments, made it possible that applications that address children make use of tangible and multi-touch interfaces, include interaction with robotic and mobile devices, and can include interaction with sensors embedded in the environment and its inhabitants.

A CCI RESEARCH COMMUNITY

CCI has become a well-established research area. Its main conference is Interaction Design and Children (IDC), first organized in 2002 in Eindhoven (the Netherlands), and since then yearly in various countries. The main global objectives that have been put forward are "*to understand children's needs and how to design for them, by presenting and discussing the most innovative research in the field of interaction design for children, by exhibiting the most recent developments in design and design methodologies, and by gathering the leading minds in the field of interaction design for children*". Each year a conference can have different theme, reflecting research progress and technological advances. In 2009 the aim was "*to foster an investigation of technological and methodological issues related not only to learning and play, but also to social awareness of young people in relationship to environment, cultural heritage, cultural roots of minorities, local identity vs. wider community identity*", in 2010 the main theme was "*Full-body interaction for children: to enhance physical, mental and social well-being of children*."

There are now many conferences and workshops, special sessions, and special issues of journals where research on child computer interaction can be published. We should mention the Workshops on CCI (WoCCI) held in conjunction with ICMI 2008, ICMI 2009, and Interspeech 2012. Growing interest has led to the establishment in 2012 of a journal: International Journal of Child-Computer Interaction (IJCCI), with the aim to serve as a forum to communicate research in CCI.

SUMMARY OF THE CONTRIBUTIONS

In this special session of ICMI 2012 we have five papers by distinguished researchers in the field. Some papers are along the lines of a recent review paper [2]. There are many claimed benefits of tangible user interfaces for children, but there is little theoretical or empirical work that supports these claims. Alissa Antle targets hands-on problem solving in spatial domains and discusses three theoretical mechanisms that may explain benefits two-handed and inter-hemispheric interaction, complementary actions that couple cognitive resources with external, physical elements, and manipulating the spatial structure of the environment to modify ideas.

Janet Read's paper is concerned with metrics and experience. She describes the main tools of the Fun Toolkit, a toolkit to collect opinions from children about interactive technology. These tools are the Smileyometer (faces that are meant to elicit opinions), a Fun-Sorter (a tool to rank activities), and the 'Again-Again' tool, meant to measure the willingness to repeat a certain activity. In this paper the results of various studies using the Smileyometer for measuring experience are reported.

Betsy van Dijk and co-authors present a study on the use of a multi-touch table in an educational museum environment. The study is part of a European project on constructing information services for children. This study aims at investigating how collaborative interaction with a multi-touch table can make children's visits more engaging and enjoyable. Results of a comparative study (with and without multi-touch table use) are presented. The Smileyometer was used as one of the measures for enjoyment.

In the paper by Paulo Blikstein the concept of bifocal modeling is introduced. A technological platform is offered that allows students to build - and with the use of sensors relate in real time - physical and virtual models to do .physics-oriented experiments. The paper addresses how students appreciate a linking of physical world activities with a computer simulation of these activities.

Casual science games can be played by children in Whyville, a free virtual world. In the final paper of this session by Kafai and Fields the learning and communication behavior of children in this virtual world is investigated using detailed log file data, interviews and observations. The main aim of this paper is to show different approaches to analyzing log file data and data obtained from other observations qualitatively.

Together these five papers give a good coverage of the current issues in state-of-the-art research in Child Computer Interaction

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