Children and Embodied Interaction: Seeking Common Ground

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ABSTRACT

As computation plays an ever larger role as an embedded part of the environment, research that seeks to understand the embodied nature of children's interactions with computation becomes increasingly important. *Embodied interaction* is an approach to understanding human-computer interaction that seeks to investigate and support the complex interplay of mind, body and environment in interaction. Recently, such a perspective has been used to discuss human actions and interactions with a range of computational applications including tangibles, mobiles, robotics and gesture-based interfaces. Physically-based forms of child computer interaction including body movements, the ability to touch, feel, manipulate and build sensory awareness of the relationships in the world are crucial to children's cognitive and social development. This workshop aims to critically explore the different approaches to incorporating an embodied perspective in children's interaction design and HCI research, and to develop a shared set of understandings and identification of differences, similarities and synergies between our research approaches.

Categories and Subject Descriptors

H.1.2 [**Models and Principles**]: User/Machine Systems – *software psychology*; H.5.2 [**Information interfaces and presentation**]: User Interfaces – *theory and methods*.

General Terms

Design, Theory.

Keywords

Embodied interaction, embodiment, children, interaction design, child computer interaction, research agenda.

1. INTRODUCTION

The human-computer interaction community has carried on a long tradition of understanding, designing and evaluating interactive artifacts under a Cartesian perspective on cognition and interaction. This has tended to focus on information processing, underemphasizing the roles played by bodily structure, action and context (e.g. [7]). Within the learning sciences, in contrast, there has historically been a greater focus on embodied action in the physical and sociocultural world (e.g. [17, 18, 21]).

In recent years, and reflecting broader intellectual trends [6, 7], researchers have shown an increasing focus on embodiment as an alternative perspective on the design of learning technologies for children. This is reflected in a variety of research projects concerned specifically with bodily action, human experiences, and physicality, in the context of interaction with and through a world comprised of computationally mediated artifacts and environments [2-4, 5, 8-10, 15] This shift is an extremely important development which, while not without precedent (e.g., [17]), has been underappreciated in human-computer interaction research in general and in child computer interaction research in particular [1]. In this workshop we will bring together a community of researchers who are creating interactive technologies for children based on an embodied perspective on cognition.

The workshop aims to address a series of challenges or issues, which we see as essential to overcome in order for a discourse grounded on embodiment to become fully integrated into the IDC community.

2. ISSUES

2.1 What do we mean when we say "embodiment"?

The first goal of this workshop is to work towards a common understanding of what we mean when we say "embodiment" in the context of children's interaction design and HCI. From a perspective of cognitive science, Rohrer describes a dozen different uses of the term embodiment in the literature [19]. The term also has several usages in the HCI literature [9]. Observational studies of activity and social action have emphasized the embodied nature of meaning making (e.g., [12, 20]) and social organization [8, 15]. Mechanisms underlying intuitive meaning making in various settings, such as embodied metaphors, have been applied in interaction models (e.g., [2-4]). The concept of embodiment is also used with tangible interfaces

to describe how physical objects may be used simultaneously as input and output for computational processes [14]. The term has also been used loosely to classify the extent that the user perceives computation is embodied within a particular physical form [11]. In all cases, the ideas of embodiment provide a fundamentally different perspective than a Cartesian information processing perspective on interaction. What is needed is a shared understanding of the underlying concept of embodiment, and how that can be used as a theoretical foundation for understanding how these aspects can be taken into account in children's interaction design.

2.2 Moving Beyond Description

Understanding an embodied perspective requires moving beyond descriptions of children's behavior. It requires exploring and understanding the mechanisms that underlay an embodied approach to cognition. The concepts of embodiment reach from the perceptual processes of simple organisms to complex social systems [6]. In humans, these mechanisms operate on a variety of scales from the neurological and the individual through to distributed social groups, each in dynamic interplay with the surrounding environment. Important interpersonal and intrapersonal themes that have emerged to date include the concepts of: affordances [16]; dynamic couplings [7]; representational forms as resources [8]; embodied metaphors [3], the semiotics of action [12] and conceptual blends [13].

The second goal of this workshop is to identify and explore some key explanatory concepts from theories of embodied cognition in order to develop a shared understanding of what these concepts mean and why they are important for design of interactive systems. A common language is essential to create a unified approach. Knowledge advancement in embodied interaction requires both rich descriptions of interactional patterns and explications of explanatory concepts which can be instantiated in prototypes and form the basis for testable hypotheses.

2.3 Moving Beyond Interpretation

An embodied view on interaction provides us with an interpretive perspective that can be used to describe and explain the actions and interactions of users with a range of applications including mobile, tangible, robotic and gesture-based interfaces, as well as more conventional laptop or PC based applications. However, to date, there has been more work that deconstructs existing systems than empirical research that generates guidelines that can inform the design of such systems [3, 14]. While Dourish [7] provided some high level design principles based on embodied interaction, these principles require further exploration and empirical validation [1, 4]. The final goal of this workshop is to formulate research agendas that might explore and extend concepts in embodiment into design principles or methodologies which can guide the development of children's interactive systems.

3. WORKSHOP GOALS

The three primary goals for the workshop are:

- To bring together a community of researchers and designers who are creating interactive technologies for children based on an embodied perspective on interaction to share and develop understandings;

- To generate a shared set of explanatory concepts that can be used for creating a theoretical foundation for children's interaction design and evaluation based on embodied cognition;

- To identity fundamental differences, similarities and synergies between our different research approaches based on focus, scale and approach in order to lay out a common research agenda.

4. WORKSHOP STRUCTURE

Before the workshop potential participants must submit a four page position paper related to their own experiences with workshop issues, themes and goals. Authors are to include a working definition of how "embodied interaction" is used as a foundation for their own work, and give two questions they would most like to see addressed in the workshop. Participants are expected to read all position papers prior to the workshop.

At the workshop: The one day workshop is split into three sections. In the first section of the morning attendees give a five minute presentation in which they define how the perspective of embodiment is reflected in their own concrete research practice, give a short statement of what they mean by "embodied interaction" and iterate the two questions they hoped to see addressed in the workshop. This sets the stage for small group work to come to a shared understanding of each other's work and the concept "embodied interaction". In the second section of the workshop small groups form to identify and discuss *explanatory* embodiment concepts that they think are important for the design of interactive systems for children. Each group will focus on and later present one key concept with care to avoid duplication. In the final section of the workshop, new small groups classify and iterate their research topics using the articulated concepts and brainstorm future questions in order to integrate ideas and directions with other group members. The session concludes with the formation of a preliminary conceptual framework on doing research in children's embodied interaction using dimensions of focus, scale and approach and the "embodiment" concepts focused on in the workshop.

After the workshop: Outcomes of the workshop will be disseminated to the HCI community in a co-authored paper which will be submitted to IDC 2010 as well as made available on a public workshop website. The paper will outline a shared research agenda for children and embodied interaction.

5. ACKNOWLEDGMENTS

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