Edinburgh Research Explorer

Supporting children with complex communication needs

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Abstract
Many children face significant challenges
communicating, expressing themselves, and sharing
their creative thoughts and ideas with others.
Interactive technologies are playing an increasing role
in addressing these challenges. This workshop will be
an opportunity to discuss design, implementation, and
evaluation methods, the needs of specific communities,
as well as experiences in previous and current projects.

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H.5.m. Information interfaces and presentation (e.g.,
HCI): Miscellaneous

Introduction
Many children face significant challenges
communicating, expressing themselves, and sharing
their creative thoughts and ideas with others. In this
workshop, we are particularly concerned with children
with complex communication needs: children who
have communication difficulties due to significant
speech, language, and/or cognitive impairments. In the
United States, for example, as of 2009, 13.1 percent of
children in primary and secondary public schools (ages

3-21) were receiving special education programs (nearly 6.5 million), including 2.9 percent with speech or language impairments (approximately 1.4 million), and 0.8 percent with autism [5]. These numbers do not include children who are homeschooled or whose parents enroll them in specialized private schools.

Challenges in children's ability to communicate and in children's environments not only reduce the likelihood that these children will grow up to live independently, but can lead to barriers in communicating basic needs, forming relationships, and sharing their gifts with the world. Interactive technologies are playing an increasing role in helping these children communicate, express their thoughts and feelings, and be creative. Some, like Augmentative and Alternative Communication (AAC) devices and apps, help with very basic communication skills. Others go beyond that and help children express their ideas and share them with the world. There are also interactive technologies that are used to foster and motivate social interaction as a way to start communication.

Workshop Goals
The primary goal of this workshop is to bring together researchers and stakeholders concerned with supporting children with complex communication needs [1] in communicating and expressing themselves with the help of interactive technologies. The workshop will be an opportunity to discuss design, implementation, and evaluation methods, the needs of specific communities, as well as experiences in previous and current projects.

It will also be an opportunity to begin creating a sub-community around this topic. There are specific challenges inherent in this line of research that could significantly benefit from collaboration and coordination across multiple research sites. The workshop will therefore be an opportunity to discuss the possibility of a research consortium.

Workshop Topics
We plan for the workshop to include the following topics:

- New and current interactive technologies to support speech-therapies, communication and self-expression for children with complex communication needs
- Body-based and tangible interactions used for self-expression
- New methods for design and evaluation (e.g. ethnography) applied to studying non-verbal populations and communication needs across multiple contexts (e.g. school, home)
- Experiences using interactive technologies to enable and encourage social interactions and language development
- Expressive art, interactive visual schedules and playful scripting and narratives tools supporting speech and communication therapies

Issues
High Variability, Low Numbers
Conducting research on interactive technologies for children with complex communication needs carries two significant challenges. The first is that in many cases, such as with children in the autism spectrum, there is a significant amount of variability in the needs, abilities, and behavior of children [2]. This is not only between-children variability, but even within-children, as in

many cases context has a significant influence on behavior [4]. High variability means it is difficult to reach conclusions when working with a relatively small number of children (as is typical in the HCI community), and in a limited number of contexts. The issue of variability is compounded by the small number of children with complex communication needs when compared to the entire population.

Given these challenges, it may be beneficial to many participants to discuss ways in which everyone's research projects could be improved by sharing resources and collaborating. In particular, for researchers working with the same populations, it may be significantly beneficial to evaluate technologies in multiple locations. This would not only increase numbers, but by adding multiple contexts it would also increase the validity of findings.

Need for Design and Evaluation Methods
Given the communication challenges facing the majority of the children on whom we are focusing, there is a need for novel or adjusted design and evaluation methods. Methods widely used in research, such as cooperative inquiry, make an assumption of a relatively high level of communication being possible with children. In the past, these methods have been adjusted based on children's ability to communicate [3], but the need remains for further exploration of methods.

An additional reason to consider novel approaches to design and evaluation is the large number of different stakeholders involved when thinking of children with complex communication needs. In the literature on child-computer interaction, it is rare to find examples of

research projects that go beyond incorporating the views of one or two stakeholders in addition to the children (the most common are parents and teachers). With children with complex communication needs, it would be ideal to include family members who live with the child, the school personnel or peers with whom the child interacts (usually more than teachers), as well as caregivers and therapists.

Finally, there is the fact that in general, most technology designers did not grow up with complex communication needs. There is therefore a need to deeply engage with these populations in order to understand their needs and the contexts in which technologies may be used. This calls for novel uses of methods that may include naturalistic approaches, such as ethnographies, that also accommodate the great diversity in many of these populations.

Leveraging Novel Interactive Technologies
Novel interactive technologies are often a reason for hope for children with complex communication needs. In particular, there is the possibility that they will enable children to communicate or express themselves in ways that were not previously possible, or not quite as convenient. A recent example can be found in the increased use of mobile and multitouch technologies. These have, for example, significantly lowered the cost and available choices of AAC devices, and provided a platform for a wide range of new applications and research projects.

Other novel interactive technologies have only been explored in a few research studies, such as full body interactions. These may be advantageous for children who may be hypersensitive to touch, or who may not

have the fine motor skills necessary for other types of interactions. They could also support providing feedback on how the body is used in social situations to better help with communication.

There are also many other kinds of trackers that have been used for specialized tasks, and to help people with complex communication needs for some time, but that could be explored further. These include head and eye trackers, which are most commonly used by people with severe motor impairments, but may prove advantageous for other populations, especially if used in combination with other interactive technologies.

Speech and audio processing has also been used in research projects, mainly to help children in the autism spectrum learn to vocalize words. It is still a somewhat underutilized technology that could prove useful for many populations, including those with hearing and speech impairments to supplement the help of speech pathologists.

Other novel interactive technologies include personalized hardware that may be produced with the help of 3D printers, and could even be designed by children with complex communication needs to fit their needs, or even to express themselves in three dimensions.

Translation into Practice
As the children who are the focus of this workshop often have great needs which can change significantly over the course of their development, it is important to discuss how to accelerate the translation of positive research findings into practice. Methods for quicker broader impacts need further exploration.

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