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# Growing-Up Hand in Hand with Robots: Designing and Evaluating Child-Robot Interaction from a Developmental Perspective

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## ABSTRACT

Robots are becoming part of children's care, entertainment, education, social assistance and therapy. A steadily growing body of Human-Robot Interaction (HRI) research shows that child-robot interaction (CRI) holds promises to support children's development in novel ways. However, research has shown that technologies that do not take into account children's needs, abilities, interests, and developmental characteristics may have a limited or even negative impact on their physical, cognitive, social, emotional, and moral development. As a result, robotic technology that aims to support children via means of social interaction has to take the developmental perspective into consideration. With this workshop (the third of a series of workshops focusing CRI research), we aim to bring together researchers to discuss how a developmental perspective play a role for *smart* and natural interaction between robots and children. We invite participants to share their experiences on the challenges of taking the developmental perspective in CRI, such as long term sustained interactions in the wild, involving children and other stakeholders in the design process and more. Looking across disciplinary boundaries, we hope to stimulate thought-provoking discussions on epistemology, methods, approaches, techniques, interaction scenarios and design principles focused on supporting children's development through interaction with robotic technology. Our goal does not only focus on the conception and formulation of the outcomes in the context of the workshop venue, but also on their establishment and availability for the HRI community in different forms.

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## Keywords

child-robot interaction; developmental perspective;

## 1. OVERVIEW OF THE WORKSHOP

Robotic technology for children can affect the way children develop. Robots are becoming part of children's care, education, entertainment, social assistance and therapy holding promises to support children's development in novel ways [1, 2, 3, 5]. However, research has shown that technologies that do not take into account children's needs, abilities, interests, and developmental characteristics may have limited and sometimes even a negative impact on their physical, cognitive, social, emotional, and moral development. As a result, taking a developmental perspective seems imperative for the design, development and evaluation of robotic technology that aims to support children via means of social interaction. Research on child development and child-computer interaction provides CRI research with a starting point to draw design principles, interaction-design guidelines, approaches and evaluation methodologies from a developmental perspective. However, the affordances and the moral attributes that robots convey, make the design and evaluation of the interaction between robots and children complicated. A developmental perspective on CRI would explore the strengths and vulnerabilities of children at different stages of their development, with respect to their cognitive, emotional and social abilities as well as the potential of their development when they interact with robots. The plurality of theoretical and methodological approaches and the richness of well-investigated paradigms on child development can inform developmentally appropriate design and evaluation for CRI. More specifically, developmental approaches for CRI will investigate short and long-term interplay between child and robot in laboratory and naturalistic settings and the ways that this interplay develops over time. In addition to typically developing children, it takes into account particular characteristics of non-typically developing children, such as the neuro-developmental characteristics of children with autistic spectrum condition. At the same

time, it may open new perspectives in understanding children's behavior and development within the context of CRI that would allow for a possible expansion of current theories of child development. Designing and evaluating CRI from a developmental perspective poses ethical, design and methodological considerations which cannot be addressed by researchers alone, but require a collaborative endeavor among stakeholders in CRI (e.g., parents, educators, therapists) and with the end-users as well.

With this workshop, we aim to bring researchers together to discuss how a developmental perspective play a role for *smart* and natural interaction between robot and children. We invite participants to share their experiences on the challenges of taking the developmental perspective in CRI, such as long term sustained interaction in the wild, involving children and other stakeholders in the design process and more. Looking across disciplinary boundaries, we hope to stimulate thought-provoking discussions on epistemology, methods, approaches, techniques and design principles focused on supporting children's development through interaction with robotic technology. Expected outcomes are guidelines and recommendations for the aspiring CRI researcher in terms of design process, technological advances and analysis of CRI (both qualitative and quantitative) from a developmental perspective.

Our goal does not only focus on the conception and formulation of the outcomes in the context of the workshop venue, but also on their establishment and availability for the Human-Robot Interaction community in different forms (i.e. special issue and as readily accessible resources on our web platform).

This workshop is part of a successful series of workshops focusing on various aspects of CRI started in 2015, which involved a community of more than 90 international researchers from various disciplines [4].

## 1.1 Format types of activities and schedule

Our workshop will be a full-day workshop. The morning schedule includes keynote speakers from various disciplines. We plan to invite experts on developmental psychology, interaction design with children, CRI and evaluation methods for panel discussions. In the early afternoon, we plan a poster session, which we deem an effective way for participants of the workshop to get in touch with each other. Afterwards, we will organize parallel interactive break-out sessions to discuss different aspects of designing and evaluating CRI from a developmental perspective. In these sessions, we will make sure that all participants get a chance to share their ideas, insights, and challenges. Building upon the results of the break-out sessions, we will report the outcomes of the workshop in a white paper.

## 1.2 Topics and Target Audience

We welcome topics related to various CRI applications (e.g. education, social assistance, health-care, rehabilitation, behavior change, robots to support collaborative learning, entertainment), research areas (e.g., product design, interaction design, developmental psychology, educational technology, socially assistive robotics, robot-assisted therapy, autism research, artificial intelligence, social signal processing, ethics) and methodologies (e.g., qualitative, quantitative, mixed methods, generative methods, computational methods). In particular, we are interested in soliciting con-

tributions concerning new approaches, best practices, and guidelines in designing and evaluating CRI from a developmental perspective.

The target audience includes academic and industry researchers working on the topic of HRI for and with children. We would like to highlight the multidisciplinary nature of this workshop and we invite people with all kinds of backgrounds.

## 2. POSITION PAPER REQUIREMENTS

We will accept submissions of position papers up to 4 pages (A4) including references. Submissions will be selected on the relevance of the contribution in regard to the potential to generate interesting discussions at the workshop.

## 3. PLAN TO DOCUMENT THE WORKSHOP

We will make the workshop proceedings and discussion outcomes accessible online on the workshop website. We envision our website as an open access and growing resource for researchers and practitioners of HRI and CRI. Depending on the outcome of the workshop we will consider a Special Issue.

## 4. ORGANIZERS

Information about the organizers can be found on the workshop website<sup>1</sup>.

## 5. REFERENCES

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<sup>1</sup>[www.childrobotinteraction.org](http://www.childrobotinteraction.org)