Workshop on Robots for Learning - R4L

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ABSTRACT

While robots have been popular as a tool for STEM teaching, the use of robots in other learning scenario is novel. The field of HRI has started to report on how to make effective robots usable in educational contexts. However, many challenges remain. For instance, what interaction strategies aid learning, and which hamper learning? How can we deal with the current technical limitations of robots? Answering these and other questions requires a multidisciplinary effort, including contributions from pedagogy, developmental psychology, (computational) linguistics, artificial intelligence and HRI, among others. This abstract provides an overview of the current state-of-the-art in robots designed for learning with social aspects and describes the aims of the Robots for Learning (R4L) workshop in bringing together a multidisciplinary audience for furthering the development of market-ready educational robots.

Keywords

Human-Robot Interaction, Robots in Education, Tutor Robots, Child-Robot Interaction

1. INTRODUCTION

An increasing amount of HRI research is focused on the development of applications of service robots in everyday life. In education, while robots have been popular as a focus for STEM teaching (see Lego Mindstorms or Thymio [5]), the use of robots in other learning scenario is novel. The field of HRI has started reporting on how to make effective robot and how to measure their efficacy [2, 6]. Robots have the potential to enhance learning via kinesthetic interaction [3, **?**], can improve the learner's self-esteem [3], and can provide empathic feedback [1]. Finally, robots have been shown to engage the learner, to motivate her in the learning task or to stimulate collaboration in a group []. However, many challenges remain and this workshop aims to bring together a multidisciplinary group of researchers to discuss these challenges and share expertise.

The second iteration of this workshop builds on the previous version hosted at the IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), 2016. The previous workshop utilised keynote speakers, participant speakers, and small group discussions to raise issues and challenges facing the community researching robots for use in delivering educational content. The second version of this workshop seeks to engage with more researchers in the field, and draw a more multidisciplinary audience to further the development of market-ready educational robots.

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2. BACKGROUND

Mubin [4] distinguish three roles for robots in education: **tutors** - providing help to students, **peers** - stimulating learning and **tools** - physically enhancing a concept to learn.

At first, in the 70's qnd 80's robots tented to be introduce in schools as a tool for teachers to teach about robotics or other STEM sciences. However, this specificity of usage of robots penalized their adoption in educational contexts []. Nowadays, with robots being cheaper and more easily deployable, applications in education and deployment in schools become possible for other types of learning.

The current state of the art presents robots used in various learning scenarios related to non-programming curricula. Often involving social robots these scenario usually investigate the social aspect of the robot-learner relationship: empathy [], immediacy, spatial arrangement[], ... While certain research focus in one-to-one setup [] exploiting social and task adaptive systems to individuals, others aim to provide a tool for the therapist or educators in their teaching practice[].

limits of the soa: - Design of this experiment often with-

out involving educational specialist or practitioners. - long term use of robots - many works have been done in CSCL to introduce technologies (computers, tablets and other hci device ias tools) need to llok at how and why - proving the impact of learning with a robot, is it only motivational?

3. OUTLINE OF THE WORKSHOP

The aim of this workshop is to engage scholars who wish to gain expertise in education and in robotics. Participants will benefit from hearing from the forefront of field and from discussions on how to move from fundamental research towards the development of market-ready educational robots.

The workshop aims will be achieved through presentations and discussions. Prospective participants are invited to submit 4-6 page papers describing work in progress, or containing preliminary results to discuss with the community. In order to stimulate interactions, the workshop will include short position paper presentations (10+2min) and poster sessions. the afternoon will be dedicated to discussion taking the form of panel session and semi-structured group discussions. The

4. ORGANIZERS

Wafa Johal, PhD. is a postdoctoral researcher within the CoWriter and Cellulo projects dealing with robots for education in the CHILI and LSRO Labs at EPFL. She obtained her PhD in 2015 from the University of Grenoble (France) focusing on body signals in Child-Robot Interaction.

Paul Vogt is Associate Professor in Language learning and HRI. He is a trained cognitive scientist and holds a PhD in Artificial Intelligence. His research focuses on first and second language acquisition using methods ranging from ethnographic research and psycholinguistics to computational modelling of language acquisition and HRI. Paul is one of the principal investigators in the L2TOR project.

James is currently completing his PhD in Human-Robot Interaction at Plymouth University (U.K.). His research interests centre around social companion robots, particularly in educational interactions with children. He has been involved with the ALIZ-E, DREAM and L2TOR European projects.

Mirjam finished her master in Artificial Intelligence and is a PhD student in the L2TOR project. Her research focuses on the interaction between robots and children and how to design a child-friendly robot.

Ana Maria Paiva's main scientific interests lay in the area of Autonomous Agents, Embodied Conversational Agents and Robots and Multiagent Simulation Systems. She has been researching in the area of artificial intelligence for the past twenty years. She is the principal investigator of the eCUTE aiming in exploring technologically-enhanced learning approaches for intercultural understanding.

Ginevra Castellano is an associate senior lecturer in intelligent interactive systems at Uppsala University, where she leads the Social Robotics Lab. She was the coordinator of the EMOTE project (2012-2016), which developed educational robots to support teachers in a classroom environment.

Sandra Okita is an Associate Professor of Technology and Education at Teachers College, Columbia University. Her current research interest is focused on the learning partnership between individuals and technology, and how technology intersects with learning and instructional processes.

Fumihide Tanaka, PhD, has been actively working in the area of educational robots and child-robot interaction, and now is recognized as one of the pioneers in this research area. He moved to academia in 2008, the University of Tokyo (2014), and is now at the University of Tsukuba.

Tony Belpaeme's research focuses on cognitive robotics and social Human-Robot Interaction, in which natural and artificial cognition is considered to be closely intertwined with social interaction. He coordinates the L2TOR project on learning a second language using robot tutors, and collaborates on several international research projects on HRI and cognitive robotics.

Pierre Dillenbourg is a former teacher in elementary school. He graduated in educational science (University of Mons, Belgium). His research on learning technologies started in 1984. He obtained a PhD in computer science from the University of Lancaster (UK), in artificial intelligence applications for educational software. He is currently full professor in learning technologies, head of the CHILI Lab involved in both CoWriter and Cellulo projects.

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