LECTURE 1

Human Robot Interaction: A review

Introduction

the study of how humans interact with robots

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how best to design and implement robot systems capable of accomplishing interactive tasks in human environments

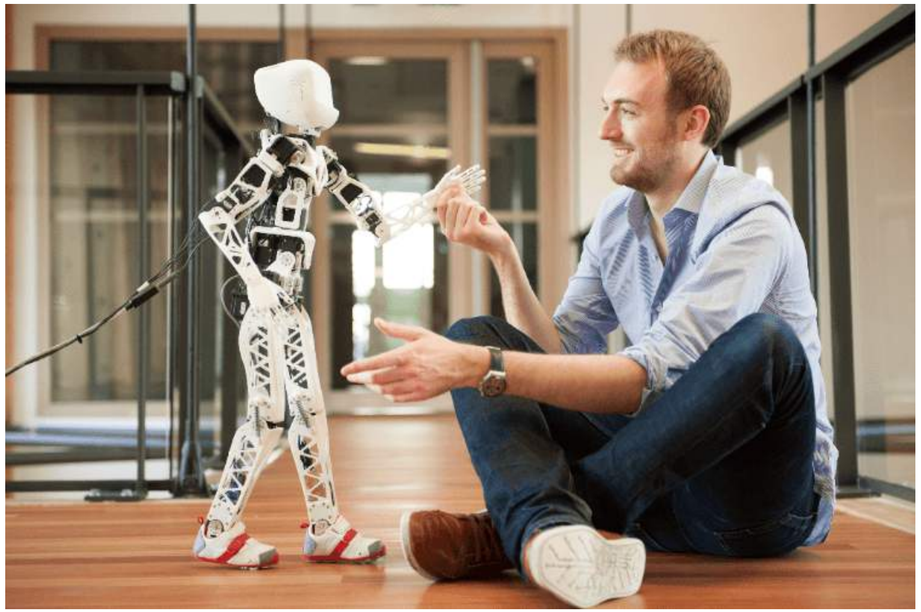
Evolvement

From

human-controlled
master–slave
servomechanisms

To

a broad range of robots incorporating artificial intelligence for many applications and under human supervisory control



State of the art

proven successful

robots under human teleoperation in hazardous environments and medical application

telerobots under human supervisory control for space and repetitive industrial tasks

at initial stages

intimate collaboration with humans in manipulation tasks

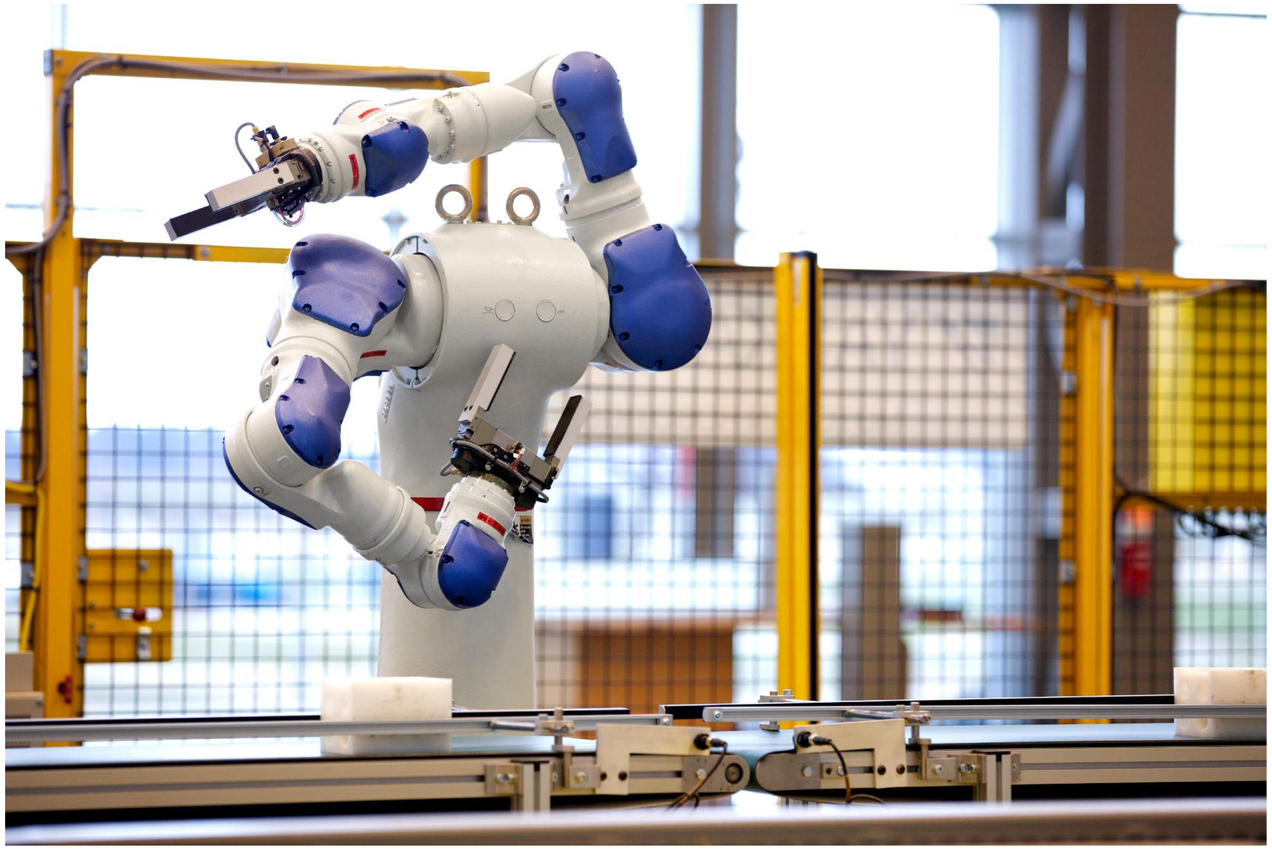
human control of humanoid robots for hazardous environments

social interaction with robots

Applications

Robot Tasks

manufacturing
space
aviation
undersea
surgery
rehabilitation
agriculture
education
package fetch and delivery
policing
military operations
creative field



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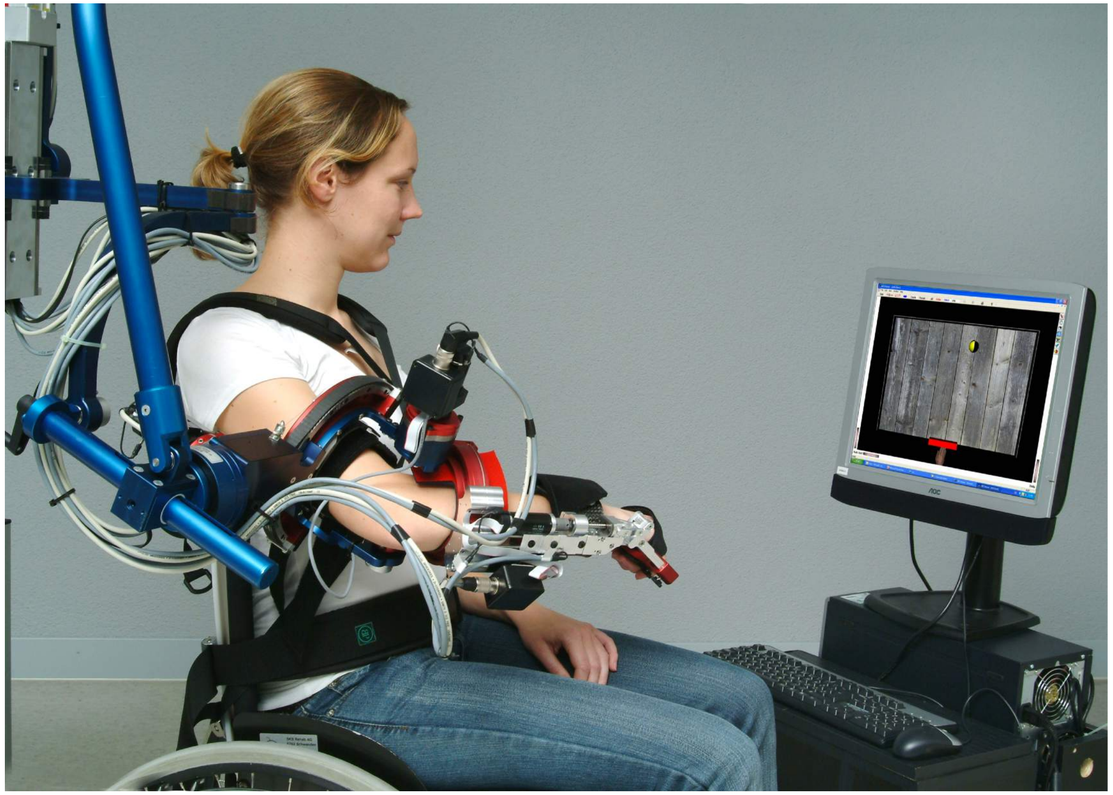

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Three Areas of Application of HRI

Human Supervisory control of robots for routine Industrial tasks

Telerobotics in Hazardous or Inaccessible Environments

Human–robot Social Interaction

Human Supervisory control of robots for routine Industrial tasks

Features

- capable of carrying out a limited series of actions automatically
- capable of sensing its human subjects, environment and its own joint positions
- capable of communicating acquired information back to a human operator

Human Supervisory control of robots for routine Industrial tasks

Interactive Tasks

Robot:

1. handling of parts on manufacturing assembly lines (picking and placing, welding, painting)
2. accessing and delivery of packages, components, mail, and medicines in warehouses, offices, and hospitals

Human operators:

supervisory control (collaboration, planning, teaching, monitoring of automatic control, making repairs, learning from experience)

The Baxter

Interactive ROBOTICS

Analyzing the Effects of Human-Aware Motion Planning on Close-Proximity Human-Robot Collaboration

Przemyslaw A. Lasota
Julie A. Shah

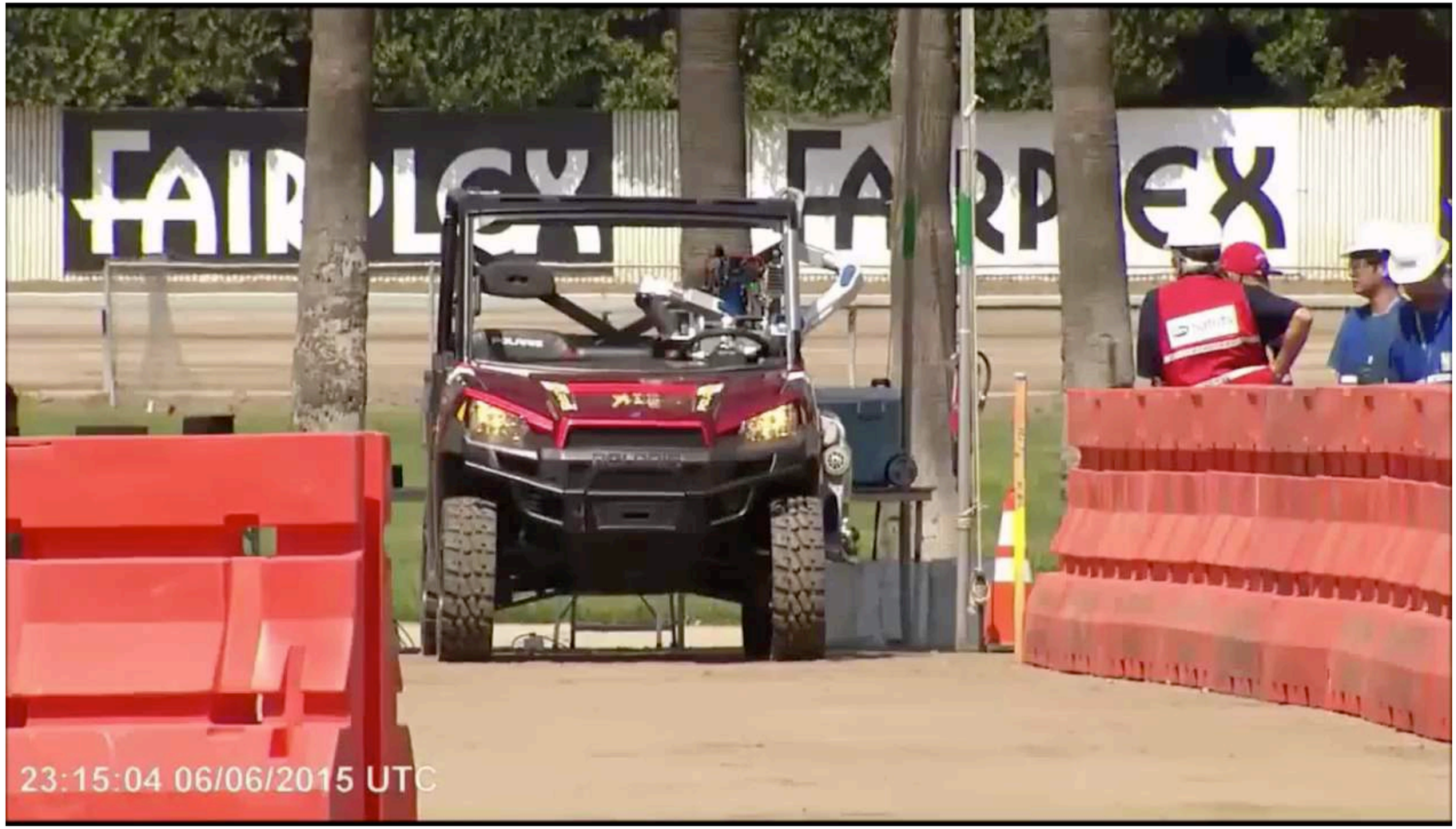
CSAIL

Telerobotics
in Hazardous or Inaccessible Environments

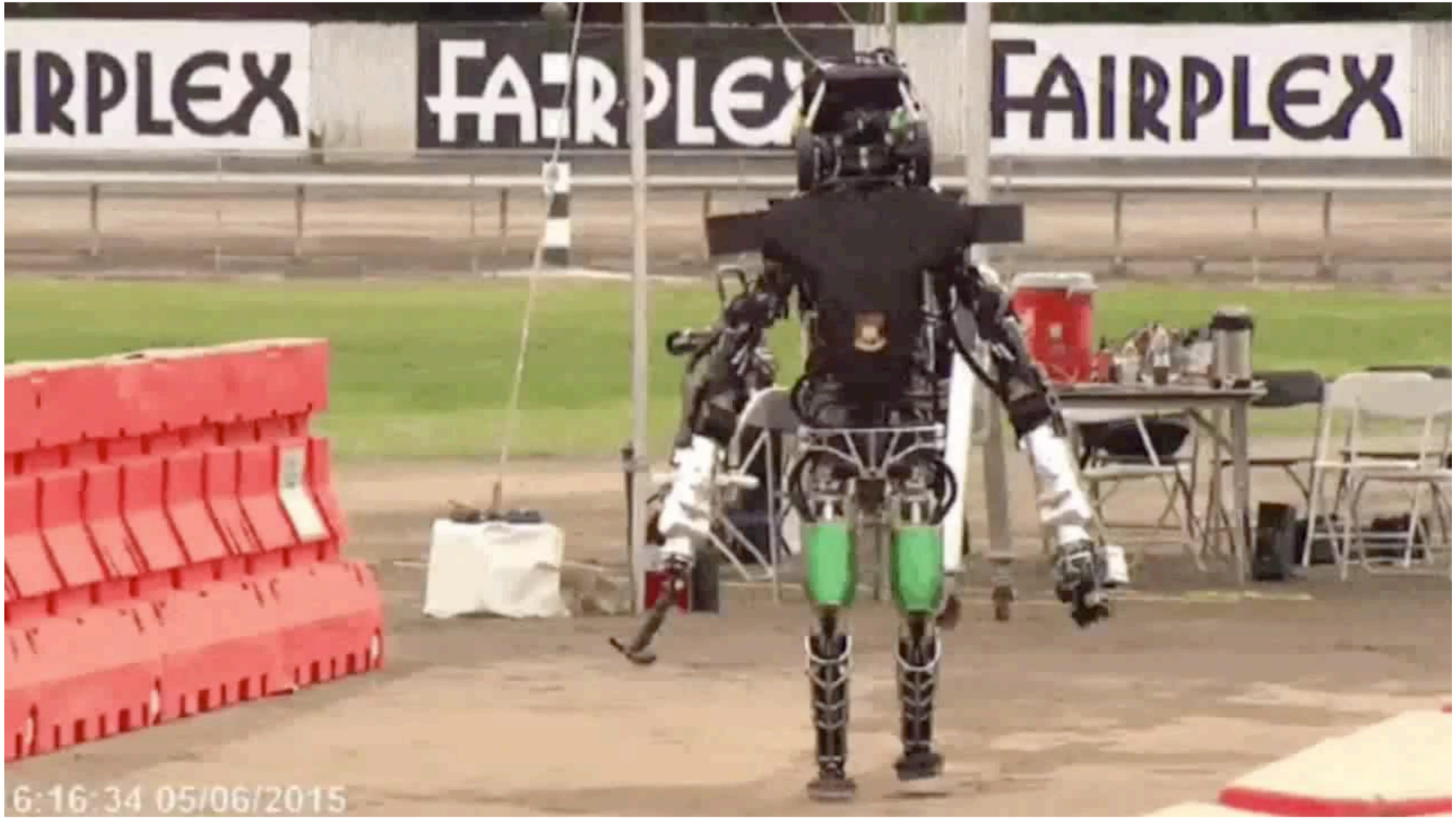
Features

- capable of performing manipulation and mobility tasks in the remote physical environment
- capable of operating remote control or programming

winner of DARPA



winner of DARPA



Human–robot Social Interaction

Features

- capable of socially interacting with human
- capable of providing entertainment, teaching, companion, service
- capable of providing assistance for children and elderly, and handicapped persons
- capable of providing expressive emotion, speech and movement
- eliciting mental models from children, human, anima
- imitating the embodiment of toy, therapeutic animal, human figure and humanoid

Human–robot Social Interaction

Type

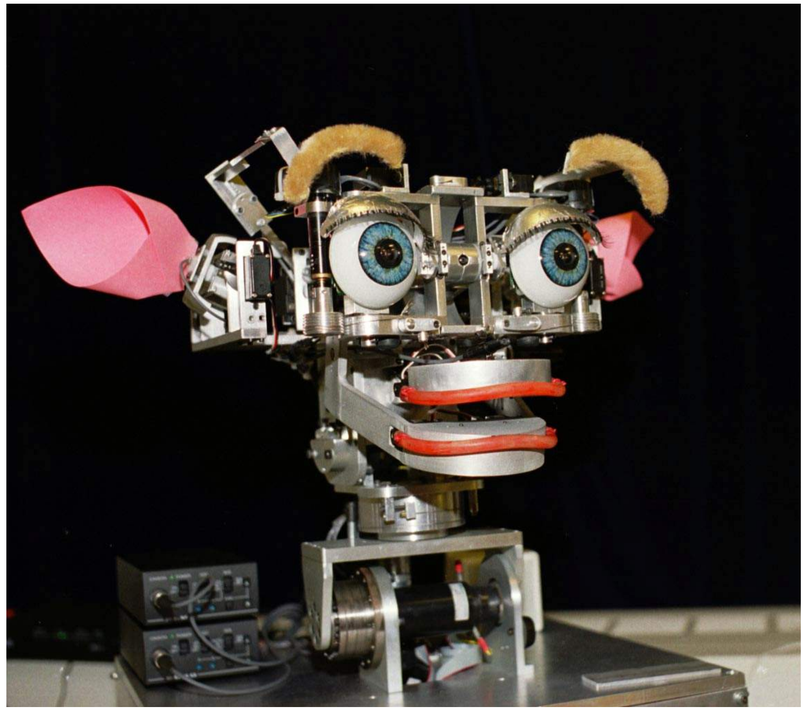
Entertainment Robot

Educational Robot

Assistive Robot

Human–robot Social Interaction

Entertainment Robot



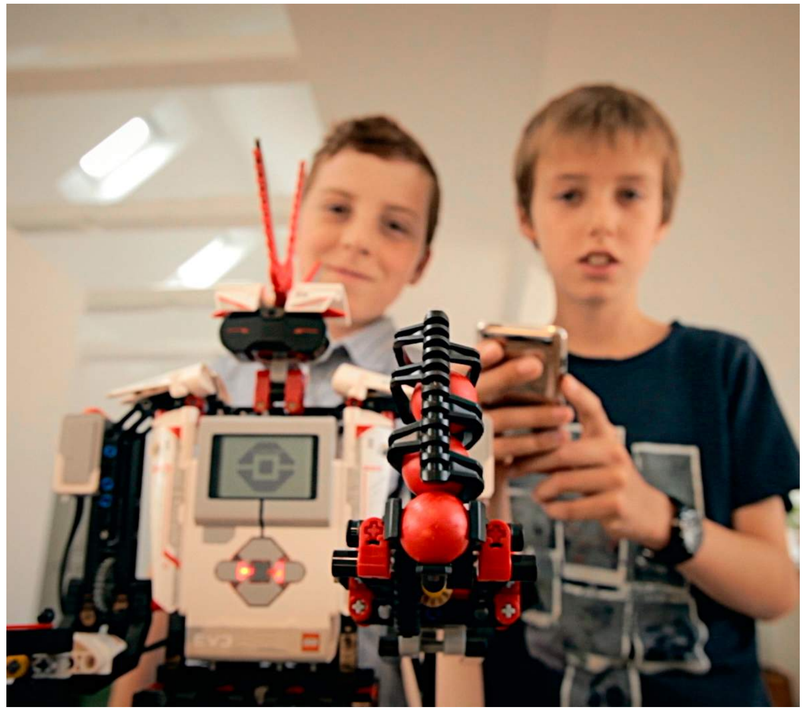
Kismet
2005

Leonard
2008-present

Hello Barbie
2015

Human–robot Social Interaction

Educational Robot: teaching STEAM (Science, Technology, Engineering, the Arts and Mathematics)



Lego EV3
present

Tega
2016

CellBot
2016

Human–robot Social Interaction

Educational Robot: teaching STEAM (Science, Technology, Engineering, the Arts and Mathematics)

Human–robot Social Interaction

Educational Robot: teaching STEAM (Science, Technology, Engineering, the Arts and Mathematics)

Human–robot Social Interaction

Socially Assistive Robot: assist people through physical interaction

Pets
for children with cerebral palsy

RIBA
lifting people up

Care-o-Bot
assist the Elderly