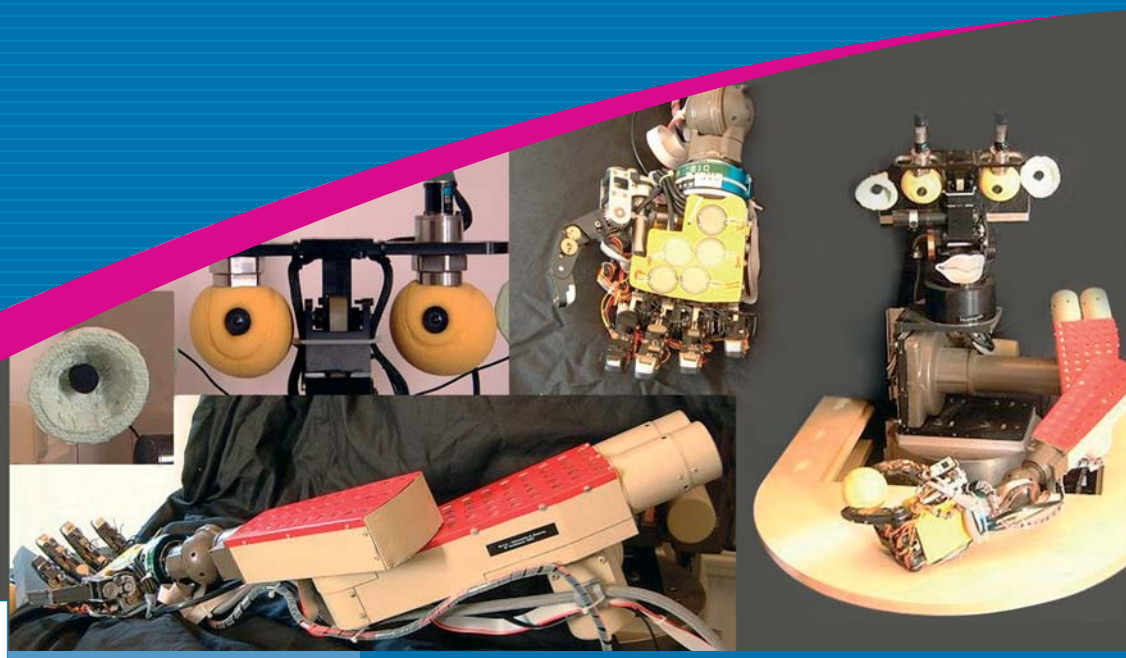

The robotics aspect of CONTACT involves a robot called 'Babybot' which mimics the human torso, head, arm and hand. © LIRA-Lab.

CONTACT
NEST ADVENTURE

Humans make contact

The links between different aspects of human learning are being explored by the CONTACT project. Partners with expertise in robotics, neuroscience and child development are exploring the parallels between learning to speak and learning to make gestures involved in both communication and manipulation. This is fundamental research, but may have practical applications in the design of artificial intelligence systems and the diagnosis and treatment of learning disabilities.

As infants, each one of us developed the ability to move our muscles to manipulate objects and also to communicate with gestures and speech. A key theoretical issue in this area is: did we learn to perceive and produce gestures for manipulation and speech independently, or are these two learning processes linked? The CONTACT project is an ambitious attempt to investigate the parallel development of manipulatory and speech-related motor acts from a multi-disciplinary perspective. It involves a tight collaboration of experts in robotics, neuroscience and child-development. The project is designed to test the hypothesis that fundamentally similar mechanisms are involved in the development of perception and production for both speech and manipulation.

The basic scientific incentive behind the work is to increase theoretical understanding of this crucial aspect of child development. Practical benefits could include a radical change and improvement in the way that automated speech recognition systems and visual action interpretation systems are built. The work may also improve the diagnosis and understanding of speech-related learning disabilities.

Robots and reality

The research programme of the CONTACT project has been stimulated by recent evidence suggesting the human brain interprets motor acts (basically movements) of other people in essentially the same way, regardless of whether the act generates speech or a manipulative gesture. These have traditionally been considered as separate processes. The project is trying to demonstrate how a human-like model system can perceive and produce speech and manipulatory gestures in a tightly coupled way.

The robotics aspect of CONTACT involve a robot called 'Babybot' which mimics the human torso, head, arm and hand. The robot's sensory systems include vision, hearing and touch. The project will be used to develop the existing Babybot system further, and to explore ways in which key aspects of human learning can be replicated by computationally controlled machinery.

Experimental work on living human subjects will use techniques such as functional magnetic resonance imaging and electroencephalographic recordings of

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Did we learn to perceive and produce gestures for manipulation and speech independently, or are these two learning processes linked?

CONTACT
NEST ADVENTURE

AT A GLANCE

Official title
Learning and development of Contextual Action

Coordinator
Italy: University of Genova

Partners
- *Portugal: Vis-Lab, Instituto Superior Técnico*
- *Italy University of Ferrara*
- *Sweden: University of Uppsala*
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36 months

Project costs
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EU funding
€ 2 000 000

Project reference
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Web: http://www.cordis.lu/nest

brain activity. These will attempt to learn more about the areas of the brain involved during speech development, and the processes underpinning it.

Other experiments will focus on the development of manipulation in human infants. The partners will study how infants learn to solve spatial problems by imitation. When infants are presented with particular objects, how does their observation of other people handling similar objects help them learn how to manipulate them?

The work may improve the diagnosis and understanding of speech-related learning disabilities

A series of what are called 'babbling experiments' will also be performed with infants. These will characterise the variability in spontaneous babbling and look for insights in studies of babbling that help explain how infants are learning to speak.

Understanding how we become human

The work of the CONTACT project is fundamental research driven by a desire to gain new theoretical insight into the links between the early development of different human activities. Its immediate end products will be advances in theory, but it is hoped these will in turn have an impact on the practice of paediatric medicine and robotic technology.

The project should yield four fundamental deliverables: 1) Procedures that enable the Babybot robot to mimic significant aspects of the way in which human infants learn to perceive and produce simple manipulatory gestures and words. 2) New understanding of the role of specific areas of the brain, particularly 'Broca's area', in speech development and production. 3) New insights into how exploration allows infants to develop manipulative skills. 4) An improved model and overall theoretical understanding of the links between gesturing for manipulation and for communication.

SIXTH FRAMEWORK PROGRAMME