

ITALK: Integration and Transfer of Action and Language Knowledge in robots

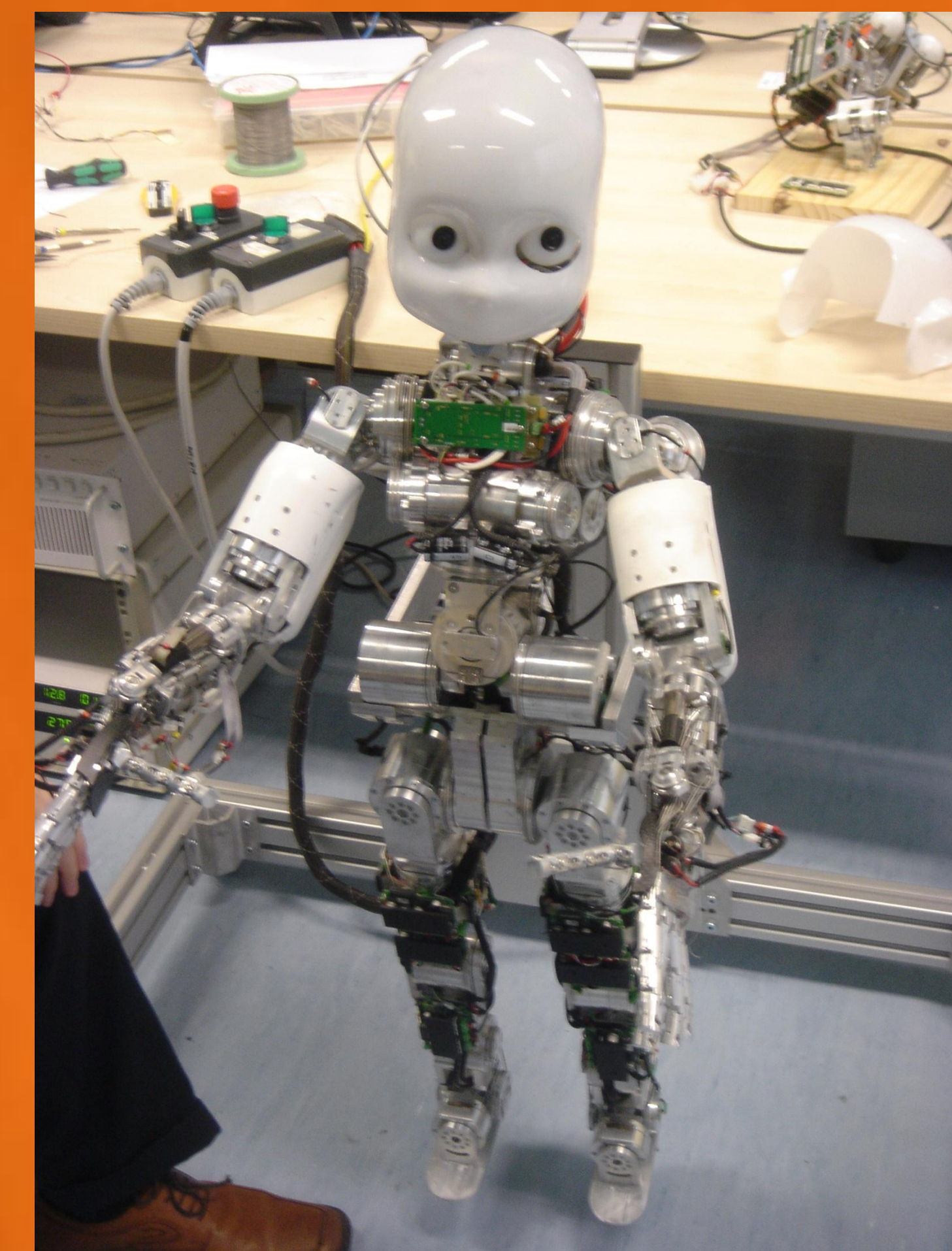
An EU Cognitive Systems, Robotics and Interaction project (214668)

Overview and Aims

The ITALK project aims to develop artificial embodied agents able to acquire complex behavioural, cognitive, and linguistic skills through individual and social learning. This will be achieved through experiments with the iCub humanoid robot to learn to handle and manipulate objects and tools autonomously, to cooperate and communicate with other robots and humans, and to adapt to changing internal, environmental, and social conditions.

The project will lead to the development of:

- new theoretical insights, models and scientific explanations of the integration of action, social and linguistic skills to bootstrap cognitive development
- new interdisciplinary sets of methods for analysing the interaction of language, action and cognition in humans and artificial cognitive agents,
- new cognitively-plausible engineering principles and approaches for the design of robots with behavioural, cognitive, social and linguistic skills
- robotic experiments on object manipulation and language with the iCub robot



The humanoid robot iCub

Scientific Hypothesis

The main theoretical hypothesis is that *the parallel development of action, conceptualisation and social interaction permits the bootstrapping of language capabilities, which on their part enhance cognitive development.* This is possible through the integration and transfer of knowledge and cognitive processes involved in sensorimotor learning, imitation and social learning, and the development of the grammatical structure of language.

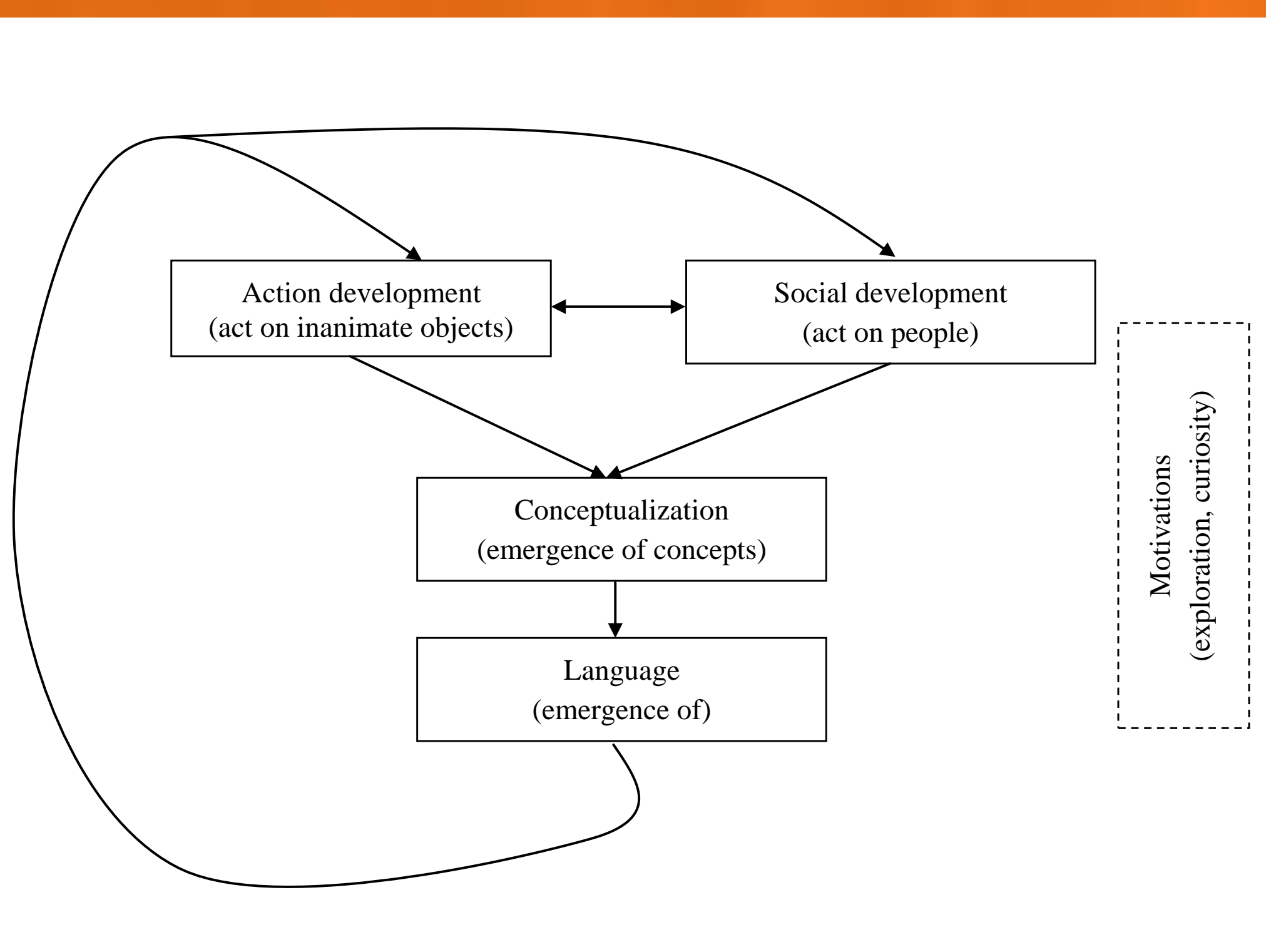
Research Themes

New studies will address the following research themes

- Action development and compositionality of action
- Embodied conceptualisation
- Social interaction and learning
- Emergence of language and compositional lexicons
- Integration and bootstrapping of action, language and cognition
- Demonstration and testing in humanoid robot iCub

Methodology

- Developmental and epigenetic robotics
- Neural network models of action and language grounding
- Developmental linguistics
- Neuroscience of action learning, imitation and gaze following
- Human-Robot experiments on social learning and interaction



Connections between the various elements of ITALK working hypothesis and research themes



Evidence of cognitive integration of action, language and social abilities and language grounding theories: Arbib and Rizzolatti (1998), Tomasello (2003), Glenberg & Kashack (2003), Cangelosi and Harnad (2000).

ITALK Consortium

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