



CODEFROR

COgnitive Development for Friendly Robots and Rehabilitation

FP7-PEOPLE-2013-IRSES

MARIE CURIE ACTIONS: International Research Staff Exchange Scheme

The objective of the joint exchange project CODEFROR is to investigate aspects of human cognitive development with the double goal of **developing robots able to interact with humans in a friendly way** and of designing and testing protocols and devices for **sensory and motor rehabilitation of disabled children**. The methodology we follow combines **science driven investigation** of human cognitive development and **engineering based implementation** of devices and protocols. The intended focus is on social interaction and how the knowledge of this aspect of development could lead to robots able to communicate with humans in a natural and “biological way” (friendly robots), and/or give rise to training and rehabilitation techniques for children with sensory, motor and cognitive disabilities.

Social interaction is a bidirectional process based on a shared representation of actions and on mutual understanding and its study will help discovering how infants develop the understanding of actions, intentions and emotions to progressively improve their social behaviors. In addition, implementing models derived from humans studies on robots provides an additional constructive approach to investigate cognitive development and could benefit both robotics (better robots) and neuroscience, providing a test-bed for the proposed theories.

To be successful this **multidisciplinary program** calls for a wide range of expertise both in terms of **scientific communities** (developmental psychology, robotics, sensory and motor rehabilitation), and in relation to **engineering implementation** (robots as well rehabilitation devices) and **social exploitation** (sensory and motor rehabilitation). The exchange program proposed has the goal of joining the forces and expertise of the participating partners (**Italian Institute of Technology, Bielefeld University, Osaka University and Tokyo University**) to help the formation and establishment of an **international community of young researchers** that shall effectively bridge the involved groups and their expertise in order to be effective in the long term.

The three main areas of research activity address: 1) The **development of cognitive functions** in humans; 2) The implementation of such functions in **human-friendly robots**; 3) The implementation and test of **rehabilitation** devices and protocols. Within these fields, 22 researchers (of nine different nationalities) among the partners staff has been **seconded 27 times**, for a total of about 73 months spent in the host institutions and through a large number of shorter stays and meetings (about 170 during the 4 years of the project).

CODEFROR has provided important **opportunities for Early Stage Researchers** to develop novel skills and to establish lasting collaborations and networking, not only through continues exchanges among partners but also thanks to a number of ad hoc training activities offered in the framework of the project.

The joint work has led to several **scientific achievements** along the three lines of research with a series of publications, with 12 papers on international journals, 75 contributions presented at international conferences and a book chapter. Some of the publications have been highlighted or awarded in their relative domain (see <https://www.codefror.eu/publications>). The projects results have been disseminated also to the larger public through a variety of channels, including to the participation to public Science Festivals, the coverage on popular press and the organization of round table at the EuroScience Open Forum.

In addition the results have been disseminated through a series of about 15 **workshop and symposia** organized in the framework of the project either at the partners' venues or in correspondence with international conferences on related topics (<https://www.codefror.eu/events>), where international speakers coming from a variety of scientific fields both from within and outside the project have presented their most recent research. This exchange has fostered further interest from researchers coming from other research centres leading to the formation of additional links to new research groups and institutions.

The joint work in these areas has **scientific, technological, social and political impact**. It brings advances in interaction science and technological advancement of humanoid robotics aimed at friendly interaction. The results of the scientific and technological studies are exploited to impact on social needs and, more specifically, on rehabilitation and support of persons with disabilities. Last, the collaborative research proposed in CODEFROR represents a small but important step in breaking down political, social and cultural barriers within and outside EU.

