Funded PhD Position

Attention and communication between humans and robots in collaborative tasks

Supervisors: Gerard Bailly, DR, Gipsa-lab, Grenoble
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When: September 2012 – August 2015
Where: Grenoble, 2 or 3 stays of 6 months in Lyon
Keywords: Humanoid robotics, human-robot interaction, modeling, simulation, behavior models, human action recognition: analysis, capture, tracking, synthesis
Type of funding: Region Rhône-Alpes, ARC 6
Salary: > 1300€ (net/after taxes) + 2000€ per year for conference participation and traveling.

Description
The PhD project deals with learning by observation. The objective is to learn a model of multi-modal behavior (gestures, gaze, speech etc.) for a humanoid robot given interaction traces recorded from humans performing the same task of co-manipulating objects in a shared environment. The challenge is to create statistical generative models, which allow the analysis and the synthesis of human activities as well as an online adaptation of the behavior of the robot to the variations of the behavior of the human partner.

The thesis will proceed in 4 steps:
1. An experimental phase, where verbal and non-verbal behavior of a person involved in a collaborative task is studied, including co-manipulation of objects with different human partners. The figure illustrates an example of a task involving co-manipulation of cubes by two human partners and then by a human-robot couple.
2. A modeling phase where multi-modal actions of the subject are estimated given the observed actions of each partner as well as the task model. This phase will use the multi-model traces of the previous phase (speech, gaze, head and eye movement and gestures).
3. An implementation phase where the behavior models will be implemented on humanoid robot of type ICUBE2.
4. A validation and evaluation phase where the importance of each component of the behavior for the performance of the given task is questioned.

The sensor equipment of the robot is voluntarily limited to two microphones and two cameras placed instead of the ears and eyes of the articulated head.

A part from the work on automatic machine learning of human behavior, the main goal of this thesis is to work on adaptive models allowing to modulate a generic behavior (given by the task at hand) through variables observed from the behavior of the partner, highlighting effects of synchronization, imitation and adaptation, which are typical for human interaction. The expected gains should be an increased credibility of the humanoid robot.

Applications:
Send an (extended) CV, a motivation letter, recommendation letters and eventually a list of referees (including email addresses) to:
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