Symposium on Humanoid Robotics

Organized by the I.E.T. and the Italian Embassy in London

8 March 2010

The I.E.T., 2 Savoy Place, London WC2R 0BL

Preliminary Programme

Name	**Time**	**Title**	**Abstract**
Welcome: Engineering Humanoid Robots			
Prof Darwin Caldwell	09:00	Current and Future Humanoid Technologies	
Dr Nikos Tsagarakis	09:30	Mechatronic Design of the iCub	
Dr Giorgio Metta	10:00	The Robotcub project and the iCub humanoid platform.	
Coffee 10:30			

Prof David Owens	10:45	Multivariable Repetitive Control for Gait Control	The paper will discuss the application of structured PD and Repetitive Control to the probhlem of gait control regarded as a multivariable design problem. The potential for good performance is apparent as is the need to have appropriate specifications of gait drive files to avoid peaks in motor torques.
Dr Martin Brown, Dr Gustavo Medrano-Cerda & Mr Houman Dallali	11:15	Walking with the iCub	This talk will discuss the iCub's mechanical design and software interfaces from the context of developing a walking humanoid robot. It will also consider the development of several dynamic models of the iCub using Robotran (http://www.prm.ucl.ac.be/robotran/) in order to design stabilising controllers and simulate their behaviour. Robotran generates symbolic models for single and double support of iCub in a syntax compatible with Matlab. These symbolic equations are easily interfaced in the Matlab environment where we can make use of special toolboxes. The actuator dynamics, including drive inertia and compliance, are incorporated in the models. We will present a summary of the control system architecture and design using linear quadratic optimal control and reduced order state observers. We will also discuss some issues regarding the implementation of the control system including sampling time selection, effects of sensor quantization errors and communication time delays. Initial results about getting the iCub to walk for the first time will be presented at the symposium. This include, static balancing, centre of gravity control and a strategy for transferring the robot from double to single support and back to double support. Future work about making the walking gait more robust, natural and how the behaviour can be learnt will also be discussed.

Prof Chris Melhuish	11:45	Engineering Safe Human-Robot Interaction	
Lunch 12:15			
Welcome: Cognitive Robotics			
Prof Giulio Sandini	13:15	From Neuroscience to Humanoids (the pre-iCub era)	
Prof Steve Furber	13:45	Building Robot Brains	The SpiNNaker project aims to develop parallel computer systems with more than a million embedded processors. The goal of the project is to support large-scale simulations of systems of spiking neurons in biological real time, an application that is highly parallel but also places very high loads on the communication infrastructure due to the very high connectivity of biological neurons. The objective of the research is to provide a generic platform that can be used by neuroscientists and psychologists to test hypotheses of brain function. One application for the system will be to provide a model neurological "brain" for a robot, and we will actively seek opportunities to collaborate with roboticists when we have a functioning system.
Dr Yiannis Demiris	14:15	Embodied Social Cognition for Humanoid Robots	Mental simulation theories of cognitive function advocate the use of the observer¹s cognitive and motor structures in a dual role: on-line, for the purposes of perceiving and acting overtly, and off-line, for simulating actions and their consequences. In this talk I will review our research in developing computational architectures for enabling humanoid robots to understand actions of humans, in order to learn from them or assist them.
Coffee	14:45		

Dr Frank Broz	15:00	Social perception, learning, and interaction with a childlike humanoid robot	A crucial part of achieving natural human-robot interaction for humanoid robots involves being able to perceive and respond to the social cues that people use to regulate interaction. Our group's research focuses on learning and development within the context of social interaction. Our work with the iCub and similar childlike humanoid robots attempts to understand the social structure of these interactions and leverage that structure. This approach is demonstrated through experiments in turn-taking, imitation, and language learning. The results of these studies yield insight into how roboticists may make use people's willingness to treat childlike robots similarly to children in certain contexts. Building on this body of work, a learning architecture was designed for the iCub. Making use of social cues such as visual attention through gaze, the robot learns behavior sequences that are successful at maintaining engagement with a person during an open-ended social interaction game.
Prof Mark Lee	15:30	Developmental Robotics or How to Rear an Infant Robot	No one has yet succeeded in creating a truly autonomous embodied learning agent, despite the many advances in robotics and machine learning. Developmental Robotics is a new approach that promotes robot adaptation and learning through analogy with growth and development in humans. This talk will describe a project at Aberystwyth University and will outline the challenges. Experimental work will be described and the novelty and implications of this approach will be discussed.

Dr Tony Belpaeme Prof A. Cangelosi	16:00	Developmental robotics on humanoids: integrating action and language on the iCub	Developmental robotics, as opposed to a more classic approach to artificial intelligence, takes inspiration from the human developmental process to build robots that, just as young children, go through a developmental phase. In the developmental or epigenetic robotics field it is believed that the developmental process and the gradual accrual of cognitive skills is essential for acquiring human-like intelligence. Researchers focus on what learning mechanisms are needed to drive development, which knowledge needs to be innately present to bootstrap cognition and what learning experiences are needed to scaffold cognition. A crucial aspect of this approach is that cognition cannot be seen as separate from the physical body in which it resides. This "embodiment" perspective puts the physical implementation of the robot central to cognition: if human-like intelligence is to be developed, the robot will need a human-like embodiment. In this talk we will present how the iCub humanoid robot is used as platform to on the one hand understand more about human cognition and on the other hand used to replicate the early stages of the cognition of a young child. The talk will focus on action, such as using hands to manipulate objects, and language, such as understand simple commands to manipulate objects. We will discuss algorithms and show a number of results from the ITALK project.
Dr Subramanian Ramamoorthy	16:30	ED view	