RoboCup structures

Prof. Minoru Asada[1]

[1] Graduate School of Engineering, Adaptive Machine Systems/HANDI FRC, RoboCup Humanoid Robot Project Leader ,Osaka University, asada@ams.eng.osaka-u.ac.jp

Abstract 1

RoboCup is an attempt to foster intelligent robotics research by providing a standard problem of which the ultimate goal is to build a team of eleven humanoid robots that can beat the human world cup champion soccer team by 2050. In this talk, I show to what extent we have achieved so far in the past RoboCups with video clips and what the future issues are towards the final goal. Industrialization is another main target in RoboCup to make an impact on our daily lives by providing RT (robot technologies) as intelligent artifacts. To do so, we need an open testbeds for RT products to be monitored by as many people. I proposed RoboCity CoRE (Center of Rt Experiments) as such a place in Osaka City. The details of my proposal is also shown.

Cognitive Developmental Robotics

Abstract 2

Cognitive developmental robotics has been proposed as a new way of understanding ourselves and as a new design theory of robotics. Case studies towards emergence of communication are introduced, which are constructive models of mother-infant interaction towards infants' vowel articulation, and of primary joint attention mechanism. The former is inspired by the observation that infants acquire phonemes common to adults without having the capability to articulate, and without having explicit knowledge about the relationship between the sensorimotor system and phonemes. We experiment with an artificial articulatory system consisting of a 5-DOF mechanical system deforming a silicon-made vocal track, connected to an artificial larynx. The processing unit of the system consists in an extractor of formants and a learning mechanism with self-organizing auditory and articulatory layers. Starting off with random vocalization, the system uses the caregiver's parroting to boostrap its learning. As an illustration of the power of imitation, the system's utterance doesn't necessarily have to be the same as the caregiver's.

The latter argues how a human infant acquires the ability of joint attention through interactions with its caregiver. A constructive model by which a robot learns a sensorimotor coordination for joint attention based on visual attention and self learning is introduced. Because visual attention does not always correspond to joint attention, the robot has incorrect learning situations as well as correct ones. However, the robot is expected to statistically lose the data of the incorrect ones as outliers through the learning, and consequently acquires the ability of joint attention even if the environment is not controlled nor the caregiver provides any task evaluation.