

Searching for the Gregorian: a Suggestion for New Directions in Situated Robotics

Henrik Svensson

School of Humanities and Informatics, University of Skövde, Sweden

henrik.svensson@his.se

Abstract

The traditional emphasis on internal computation and representation within cognitive science has during recent years been attacked by researchers that emphasize the close coupling between brain, body and world. This new emphasis is illustrated by the emergence of new approaches, such as situated robotics, within which real or simulated robots controlled by artificial neural networks are used as models of cognition. While this approach has been successful in the study of more or less continuous and reactive sensorimotor interaction between agent and environment, it has been argued that the models will not be able to scale up to higher-level cognition often thought to require some kind of inner model of the external world (e.g., Clark & Grush, 1999). In this paper, we review the previous and current work of situated robotics and discuss the prospects of investing higher-level cognition in such models. The review is structured by using the hierarchy of increasingly representationally complex creatures of Daniel Dennett as a scaffold. In Dennett's hierarchy, the two simplest animals are equipped with simple sensorimotor couplings that can be changed either by evolution (Darwinian creature) or experience (Skinnerian creature), while the two more complex creatures are able to model the world to anticipate future events (Popperian creature) and extend their cognitive abilities by using tools and artifacts (Gregorian creature). The review shows that while most work has centered on the two simpler creatures, less work has been investigating the two more complex creatures. A possible reason for this gap is argued to be the lack of understanding and use of embodied theories of internal and external cognitive states in situated robotics. The paper ends with a discussion of a possible synthesis of so called emulation theories of representation, which view cognition as the covert reactivation of perception and action, and distributed cognition theories, which emphasize the active use of the environment.