Attentional Shift and Enactive Perception in Purposeful Agents

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Extended Abstract

Introduction

The case for enactive perception argues for perception to be understood in the context of sensorimotor activity. Indeed, Rensink (2000) presents visual perception itself as the active indexing of a sparse set of 'just in time' scene representations to a rich and detailed world which serves as its own best model (*cf.* Brooks, 1991).

Attention mediates this mapping, but discussion tends not to relate this to the overall activity of the agent enactive perception serves.

The view is presented here that situationally appropriate interactions with the world mostly rely on valid conceptions of it; selective attention serves to maintain the integrity of a situated, embodied agent's knowledge and understanding of that world. It is thought this view is compatible with Rensink's view of visual cognition and enactive perception in general.

Background

The background to my interest in these issues lies in the development of a situated, embodied computational agent, implemented within a simulated driving world (Wood, 1993).

The basis for the agent's interaction with its world, is a model reflecting the accumulation of sense data over time, combined with the agent's anticipations of the outcomes to the situations it observes.

These expectations of how a situation unfolds provide a knowledge of events in the agent's world outside of, and in addition to, its immediate sensory experience. This accumulated knowledge serves to contextualise that experience. It also provides to the agent a knowledge of its environment which goes beyond immediate sensory experience, providing a wider sense of 'what is out there'. This enables the actions of a purposeful agent to be more informed regarding their probable outcome (Wood, 1995).

The soundness of this model relies on the validity of the agent's initial anticipations. For a changing world, indentifying and seeking to update unreliable information guides the timely apprehension of relevant sense data (Wood, 1998).

It is an interest in the processes and mechanisms that support maintenance of the integrity of an agent's knowledge or beliefs about its world that have led me thus far.

Attention and 'a sense of what is out there'

What an agent senses is at the behest of its attentional mechanisms. The question arises in how a sense of what needs to be found out, maps onto an agent's interactions with its surroundings.

A possible approach is presented in Rensink's (2000) account of the dynamic representation of scenes. This offers a compelling account of a coherence theory of attention: an indexing of an agent's stable viewer-centred co-ordinate system to an "ever-changing retinotopic co-ordinate" system (2000, p20) of visual sense data.

Of course, Rensink's account goes further than this, in arguing that "little detailed information is being accumulated" (2000, p18) during our visual interactions with the world. That is, the coherence theory of attention underpins the notion that it is our ability to index spatio-temporally to our surroundings, at will, which gives us the experience "that we are surrounded by a coherent, richly detailed world where everything is present simultaneously" (2000, p17).

Rensink presents the notion of a virtual representation, impoverished in detail, but indexed to the richly detailed world that surrounds us. His proposition of a triadic architecture in which "representations…are structures that guide…" eye movements and attentional shifts (Rensink, 2000, p24) appears to offer an approach to guiding attention compatible with that proposed above: in which the need for up to date data, to support the purposeful activities of the agent, guides the maintenance of the agent's sense of 'what is out there'.

Summary

Rensink's (2000) account of visual perception appears to be compatible with the view presented here of constructing a world model based on the selected perceptions given it by attentional mechanisms, and is highly compatible with the notion of indexing to the world to supplement gaps introduced either by the absence of data, or by its demise.

I am interested in exploring further the compatibility of this stance with the basic premises of enactive perception.

References

Brooks, R.A. (1991). Intelligence without representation. *Artificial Intelligence*, 47, 139-159.
Rensink, R. A. (2000) The dynamic representation of scenes. *Visual Cognition,* **7**:17-42.
Wood, S. (1993). Planning and Decision-Making in Dynamic Domains. Chichester: Ellis Horwood.
Wood, S (1995). When being reactive just won't do. In *Proceedings of AAAI Spring Symposium on Integrated Planning Systems*, Stanford University, Ca., March 27-29, pp 102-106.