

## **MAS 966: Meaning Machines**

### **Week 2: Interaction and Interpretation**

#### **Readings**

Rodney Brooks. (1991). Intelligence without Representation. *Artificial Intelligence*, 47, 139-159.

Rodney Brooks. (1986). A robust layered control system for a mobile robot, *IEEE J. Rob. Autom.* 2, 14-23.

Mark Bickhard. (1993). Representational Content in Humans and Machines.

Ruth Millikan. (1993). White Queen psychology and other essays for Alice. Preface & Chapter 4 (Biosemantics).

**Assigned: Tuesday, February 17, 2004**

**Response due: Noon, Sunday, February 22, 2004**

Email response to [dkroy@media.mit.edu](mailto:dkroy@media.mit.edu) with subject "MAS 966 Week 2"

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**Q1.** Brooks (1986) describes the control of a robot using a "behavior based" approach. In his 1991 paper he points to this implementation and suggests that there is no representation of the traditional kind to be found in it.

- (a) Which of Millikan's six criteria of human-level beliefs (pages 98-101) does Brooks' robot pass? Why are the others not possible with the robot as it is described in the paper?
- (b) Sketch a design for how you would add language understanding to the robot, keeping within Brooks' layered control architecture, so that you could command it to go to specific locations and pick up specific objects.
- (c) Answer (a) again, this time applied to the system you have designed in part (b).

**Q2.** Bickhard points out limitations of the representational view advocated, for example, by Davis, Shrobe, Szolovits (1993) (one of last week's readings).

- (a) In your own words, summarize the main ideas in Bickhard's paper
- (b) "Surrogate" knowledge representations are clearly of value in numerous current

software systems. The appropriate approach appears to depend on the purposes of the system designer. For example, consider a chess playing program embedded in a physical chess set (the kind that you can readily buy). The program will contain a conventional surrogate representation of the physical board which it uses to plan its moves. The system can be called autonomous in the sense that it makes moves on its own, and in competition with its human partner. How would Bickhard critique this device which clearly uses an “encodingist” approach?

**Q3.** The study of word meaning (lexical semantics) is often focused on the problem (or power, depending on how you look at it) of context dependent meaning. In class we saw the example of meaning shifts of “red” depending on what it modified (“red wine”, “red brick”, “red hair”, “red blood “– each lead to a shift in the color that corresponds to “red”). Consider another example of meaning shifts. The word “cup” has a set of related meanings in the phrases “plastic cup”, “cup of rice”, “cup your hand”, “cup the spider” (catch the spider). Sketch an underlying representation of “cup” that could account for all these meaning shifts.