

## MAS 966: Meaning Machines

### Readings

R. Davis, H. Shrobe, and P. Szolovits. What is a Knowledge Representation? AI Magazine, 14(1):17-33, 1993.

Satosi Watanabe. (1985). Pattern recognition: Human and mechanical. (Chapter 2, p 21-44), Wiley.

Stevan Harnad. (1990). The Symbol Grounding Problem. Physica D 42: 335-346.

D. Roy. (draft) Meaning Machines. Excerpt of Chapter 1.

*(pdfs of readings are found at <http://courses.media.mit.edu/2004spring/mas966/index.html>)*

**Assigned: February 9, 2004**

**Response due: Noon, February 17, 2004**

Email response to [dkroy@media.mit.edu](mailto:dkroy@media.mit.edu) with subject "MAS 966 Week 1"

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**Q1.** Draw a circle on paper or using your choice of drawing software. Now draw a second closed contour of whatever shape you want that has an area exactly one half that of the circle. Finally, draw a square with the same area as the circle. What method of representation did you use to draw the second and third shapes? If you switched representations, why did you do so?

**Q2.** Google responds to words by retrieving web pages that usually contain words, and sometimes images, audio, and video. Let us think of Google as an autonomous agent with input from the world (your words) and output behavior (the contents of web sites that it selects).

(a) How would you describe the meaning of words "from Google's point of view"? In what ways might Google be said to understand?

(b) Repeat your analysis of (a) with Weizenbaum's Eliza program. An interactive demonstration of Eliza can be found online at <http://www-ai.ijs.si/eliza/eliza.html>. For a technical description, see <http://i5.nyu.edu/~mm64/x52.9265/january1966.html>

**Q3.** Consider the following device designed to verbalize ambient light conditions. A light sensor generates an analog signal that varies in level depending on the amount of ambient light. A simple threshold circuit monitors the value of this single feature and triggers a speech synthesizer to announce “It’s dark!” and “It’s light!” whenever the light level passes preset high and low threshold values.

(a) How would Harnad analyze the operation of this device? Is the output signal from the light sensor “iconic”? Once the threshold circuit fires (and is translated into spoken words), is there a “categorical” representation somewhere in the system?

(b) Do you feel anything is missing from Harnad’s sketched solution to the ‘symbol grounding problem’ or are you satisfied with his solution?

**Q4.** Watanabe highlights the fact that the choice of features for representing entities in the world depends on the purpose(s) for representing.

(a) Provide an example of three objects, A, B, and C, such that using one set of descriptive features and similarity metric, A and B are more similar, and using a different set of features, B and C are more similar.

(b) Are there any objects in the world that are intrinsically similar to one another and relatively dissimilar to other things, independent of what features you choose to represent them? If so, provide an example. If not, explain why.

**Q5.** I have proposed three aspects of meaning that are an attempt to capture the central characteristics of “meaning” in its common usage. Suggest one more missing aspect that you think I should add to the list, and if you disagree with one or more of my three aspects, explain why.