

On Transduction

Due — Tuesday, February 27, 2001 (9:30 a.m.)

I. Transduction

- A. In analysing counterexamples to (the negative reading of¹) the formal symbol manipulation claim, we identified four “boundaries” or distinctions that useful in characterising computer systems:²
- Physical** — Between a system and its surrounding environment (i.e., a distinction between the “inside” and the “outside” of a system);
 - Semantic** — Between symbols and their referents;
 - Digital** — Between things that are continuous (smooth) and things that are discrete or digital (neatly chopped up); and
 - Abstract** — Between things that are abstract or medium-independent, and those that are concrete or medium-dependent.

With respect to (any set of two or more of) these boundaries, we formulated two theses or propositions that seem to be implicit presuppositions of the formality claim:

- Alignment** — The boundaries in question line up; and
- Isolation** — The boundary is a “moat”: a barrier or gulf across which “dependence” (causal, semantic, explanatory, etc.) does not reach.

It was a consequence of our inspection of computation-in-the-wild, however, that both of these last two assumptions seem to be false in practice. Rather than being aligned, all four boundaries cross-cut. And rather than any of the resulting regions being isolated, mechanisms exist that mediate between entities of each relevant sort.

In general, as we said, given k boundaries, there are 2^k distinct regions and 2^{2k} types of potential boundary-crossing mechanisms. Since in this case $k = 4$, that means that the above 4-way typology generates 16 regions and 256 (potential) species of boundary crossing.

- B. Give an example of an entity that falls in each of the 16 regions. For example, a bottle of Coke, when someone asks “are you going to drink that Coke?”, is presumably a continuous, external, concrete, referent. Whereas this Coke example is taken from human experience, however, you should, for each category:
- If possible, give a computational example; or

¹The “objects” sub-sub-reading of the ontological sub-reading of the negative reading, to be (pedantic and) precise.

²Actually there was a fifth, having to do with a signal’s being in one or another medium, relevant to the physiologist’s (original) notion of transduction, but we will not be concerned with that here.

- b. If you do not believe that any computational examples exist, write a sentence saying why not, and list an example from human experience; or
- c. If you do not believe there are any examples in human experience, either, say why not.

N.B: in answering this question, you will encounter difficult ontological issues: such as whether a Scheme s-expression should be viewed as concrete or abstract. Don't worry: if you want to use an example, and can't decide how to classify it, just note that fact along with your answer, with a sentence saying why it is hard to decide.

- C. Identify a dozen (12) mechanisms or programs, as distinct from each other as possible, that mediate between one of these 16 regions and another. Note that ordinary numeral arithmetic, such as an operation taking the string '2+3' onto the string '5', doesn't cross *any* of these boundaries, and is therefore not an example, whereas a digital speedometer is an example of boundary-crossing, since it (presumably) goes from a continuous referent (velocity) to a discrete symbol.

(Note that the formulation of this last example—from a “continuous referent” to a “discrete symbol”—mentions only two out of the four dimensions; it doesn't say anything about the other two: whether speedometers should be considered as internal or external, or whether they should be considered as concrete or abstract. You may do the same: ignore any dimensions that are irrelevant—confusing, ill-specified, whatever—for the particular mechanism you present.)

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