Some philosophical choices within cognitive modelling (1)

Richard Shillcock

Today's goals

To look at some of the choices that are made in cognitive modelling and the implications that flow from them.

Today's reading

Issues to be addressed

Can we transcend the idiographic-nomothetic divide in Psychology?
TRACE is hugely successful ...

... but ...

TRACE has remained in its original form, with only minor parametric explorations.

Our field contains a large number of cognitive models.

We want them to be vehicles of scientific exploration ...
... but ...

TRACE has remained in its original form.
TRACE is (trivially) defeated by new data.
TRACE has participated in a long-running debate:

Merging information in speech recognition: Feedback is never necessary.

Issues to be addressed

Can we transcend the idiographic-nomothetic divide in Psychology?

Should our models be static or developing?

Should we be able to say something about simplicity, completeness, complexity, theory of knowledge, explanation, …?
What does TRACE contain?

Psychologists intend the entities in a model to be universals.

What do universals give us?

A universal unifies different entities.

“true of all human minds”

“true of the expressions of all languages”

The myth of language universals:
Language diversity and its importance for cognitive science.
“Can we know the real world?”

- Subjective idealism
- Positivism
- Pragmatism
- Fictionalism

Generic Realism: a, b, and c and so on exist, and the fact that they exist and have properties such as F-ness, G-ness, and H-ness is independent of anyone’s beliefs, linguistic practices, conceptual schemes, and so on (Stanford Encyclopaedia of Philosophy)

There is very graded landscape of philosophical beliefs about the existence and independence of particular entities.

Generating an abstract universal

Verb

\{ breathe, sneeze, inhabit, invest, speak ... \}

N.B. Verb itself does not participate in the set.
Creating entities in models

In generating (in the theory) the phoneme /b/, for instance, we take that which is common to a number of entities: “bid”, “bag”, “bun”, etc. We then implement (in the model) some algorithmic instantiation of this abstract entity. (In other parts of cognition, we carry out the same process with “attentional processor”, “eye”, “word”, “the word dog”, etc. – this can be tricky to recognize.)

An abstract universal ...

... needs to be created.
... is not self-participating.
... allows us to express ordered relations within the domain.
... is perhaps a necessary way of getting traction on a domain.
... invariably comes up against new data it cannot handle.
... does not provide a conceptual understanding of the domain in question.

A concrete universal

The concrete universal has a venerable philosophical history.

Finding a concrete universal

\{\, , \, , \, , \, , \, \ldots \, \} \\

\(\) is a concrete universal with respect to the atoms of the Periodic Table.

N.B. \(\) itself participates in the set.

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A concrete universal ...

... needs to be found.
... is self-participating.
... is the simplest, paradigm example of the set.
... mediates everything else in the domain.
... goes beyond the ordered relations captured by abstract universals.
... cannot be defeated by new data in the way that abstract universals are always defeated (cf. the abstract universal “noble gas”).
The orienting reflex (Pavlov, 1947; Sokolov, 1963), in which the animal orients to novelty, is perhaps a candidate for a concrete universal in the domain of neurophysiology.

Mediation can mean more than just a crankshaft sort of relation. There can be reciprocal mediation. One thing can be the mode of existence of another. Something can mediate itself via something else. Internal content can be created and totalized.
A concrete universal ...

… provides a conceptual understanding of the domain in question.
… is a material thing, reached by a far abstraction within the domain.
… still has content, itself.
… has all the richness of the particular.

Completeness and explanation

We can analyze down to the concrete universal.
We can synthesize other aspects of the real world around it, in necessary ways.
Explanation resides in this dialectical view of analysis ⇔ synthesis.
The goal is completeness, not simplicity.
Parsimony increases with each move towards completeness.

A concrete approach

Some models in science contain a fictional entity that seems to play a useful role; many cognitive models contain exclusively fictional entities.
A concrete universal is the point in the model at which we can pour in new, material detail.
Challenges

(... to be continued in Lecture 30)

To think careful about how we define the domain in which we are working.

To think about the philosophical status of the entities with which we are working.

References


