From Experience to Meaning through Semantic Memory

Meaning can only be partially analysed by means of logical tools such as conceptual analysis and model theory. The use of definition by ostension only partly alleviates this problem. The paper develops a notion of semantic memory based on experience that can explain semantic judgments of individuals and discusses the contribution semantic memory can make to the problem of characterising semantic content for words in natural language.

Experience can be seen as the information state built up by updating with all experiences of a subject. Without loss of generalisation, such an information state can be modeled as a collection of frames, sets of points connected by arrows, in which the arrows are labeled by natural attributes and the points by natural classes of objects or of points in some conceptual domain like space, time, color, size, weight, shape, etc.

Assume that part of the experience is verbalised, i.e. that there are subframes in experience which have been evoked by words or complex expressions of some natural language: it is that part of experience that has been acquired by interpreting the utterances of others. This is a partial function f from the set of tokens of subframes of experience to linguistic expressions. It can be turned around to give the set of subframes a word has been known to express: f^{-1} maps words and other expressions to a set of subframe types, with the cardinality of the set of tokens. A lexicon given by experience can then be defined as $l = f^{-1-1}$.

Semantic memory can be thought of as the function that assigns $(freq_E(G), freq_E(F))$ to pairs of subframes F and G, such that F is a subframe of F and G is verbalised (this is necessary if semantic memory is to be semantic). The pair of frequency numbers can be turned into a normal distribution that gives the probability that $p(G|F) = x$ under the assumption that ongoing experience produces fair samples of the natural occurrences of F and G.

$sm(G, F) = h : (0, 1) \rightarrow (0, 1)$ such that $h(x) = p(p(G|F) = x))$

This notion of semantic memory explains whether and to what degree a word activates other words. But more importantly, it helps to build an account of semantic content.

1. Cats and dogs have a very similar structure and for many natural attributes there is a considerable overlap: cat colours can be dog colours, cat shapes can be dog shapes, cat sizes can be dog sizes. This stands in marked contrast to the human, feline and canine competence to tell cats from dogs. And it is clear how people,dogs and cats manage: they take the derived normal distribution of probabilities for the values of a number of attributes for cats and dogs respectively: this gives a reliable discriminator. The normal distributions for the values are determined by semantic memory.

This is a special case: we know cats and dogs are genetically different, making them different biological kinds thus making it the case that cats cannot be partly

dogs as well. Our discriminator is a heuristics for a proper distinction in reality. This is typical for all natural kinds, but also for natural phenomena like walking, eating, salty, etc.

Non-natural kinds —with the exception of mathematical notions— are typically vague and subject to cultural variation: blonde, spaghetti bolognese, game, red, tall, hill, etc. Also notions that derive from natual kinds (the border between a dog and what surrounds it, the border between the arm and the hand) are not natural kinds and therefore vague. Semantic memory provides vague content for all concepts and can help to make natural kind concepts crisp. This is as it should be.

2. The discriminators in (1) are a general possibility for a frame F in the range of semantic memory. Consider F for which attribute α is still undefined. Let $G = F + \alpha = x$ and look at the probability that given $F, F + \alpha = x$ is the case. This gives a probability distribution over values for α which can be notated and defined as follows.

α^F

$\alpha^F = g : X \rightarrow (0, 1)$ such that $g(x) = max(sm(F + \alpha = x, F))$

High uncertainty due to lack of experience leads to depressed values for α^F.

Many natural notions that are of this kind. The generic length of men is one.

$length^{man}$

The notion of a possible cause of a type of event is another.

$cause^{event}$

The causes and effects of specific event types are crucial for causal inference.

Affordances can be approached by a natural attribute purpose, the reason why an action is carried by an agent. The affordance of an instrument like cup is a distribution over such purposes. Drinking a hot liquid is the one for which cups were designed, but cups can be used as containers of sugar or of pens.

$purpose^{cup\ as\ instrument\ in\ action}$

$shape^{dog}$

This gives a distribution over the many shapes of dogs. Given the finite number of rather diverse shapes in experience, this example brings in the need of smoothing the distribution by giving large amounts of probability to in-between shapes.

3. Everybody knows that if John is a man he is not 3 meters tall. If conceptual structure is all that is involved, this is not given with the concept man. But, if semantic memory is part of conceptual structure of a concept like man, it is given with the concept and thus should count as analytic. It is dependent on subject's experience of men and such experience can be insufficient. It is crucially independent of knowledge of John, and so is not synthetic.

4. The contention is that adding semantic memory to conceptual structure brings

content to the notion of lexical meaning as involved in judgment, even where there are no clear truth-conditional effects, such as in predicates of personal taste or in aesthetic predicates. Like in other cases, such predicates can be analysed by attributes that get their values in experiences. Unlike the cognitive attributes, there is a much weaker prediction about what happens to the values for the same attributes in other people. One can figure out that others are similar or different or one can attempt to educate people in matters of taste, but that gives the limit. In such judgments, one reports ones own experience and since it is predictive of other people's experience it is useful to communicate such experience.

5. Predicates of personal taste are merely one extreme in the possibility of failing intersubjectivity. Cultural factors may make the distinctions between spaghetti bolognese and other kinds of spaghetti quite different and the same holds for distinctions between blonde women and others in say Italy or Sweden. It is only where the distinctions have a strong basis in reality as in the case of natural kinds or a strong conceptual basis as in mathematics that intersubjectivity can be guaranteed (for suitably expert subjects) or that objectivity can arise. But failure of intersubjectivity or objectivity has only a marginal effect on inference and logical consequence (vagueness is a real problem). For determining our actions, we need to know what we want and what can be done. This means we need to decide not just what to do, but what is the case and what is good, overcoming uncertainty.