

Applying Cognitive Classification Principles to the Study of Prepositions

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Abstract

This paper will explain how previous network representations of prepositions have not been able to adequately show the syntactic and semantic properties of prepositional clusters. It will then propose a superordinate categorisation for prepositions and illustrate using prepositional clusters how such a categorisation can unify and describe as explicitly as possible the syntactic formation, semantic relationship between constituent elements and the overall grammatical function of the cluster. The prepositional representation proposed is one that mirrors the human cognitive learning process and is based on linguistic principles of cognitive semantics.

1. Introduction

One of the first studies which investigated the relationship between human categorisation and Natural Language Processing was by Rosch (1978). She hypothesised five principles of human categorisation and it is the second principle about perceived world structure which is perhaps relevant to explaining how prototypes can also exist in language structures. According to Rosch, the perceived world structure contains an organised and structured set of correlational attributes and that the ability by humans to perceive these attributes is a result of their interaction with the physical and social environment. One result of these interactions is the formation of the culture of the community, which influences how the attributes are perceived and defined by members of that community.

Rosch's work also emphasised the notion of prototypicality derived from psychological investigations as a criterion to classification in the mental lexicon. According to Rosch, meanings of words are tied closely to their use in sentences. This means that in superordinate categories, member terms can only be substitutable for superordinate words in sentences, provided they are logical in their usage. Frequency should not be a factor when making the choice. She gives the example of the sentence "Twenty or so birds often perch on the telephone wires outside my window and twitter in the morning", where it is logically possible to substitute the term "sparrow" for "bird", but not "turkey".

2. Applying categorisation in the mental lexicon to pedagogy

An advantage of Rosch's (1978) work on categorisation and prototypes to pedagogy is the value of logic that would accompany the process of categorisation. For example, a classification of binomials or compounds could be organised using a criterion based on metaphorical concepts. Thus, members in the classification had to share some sort of correlational attributes. The benefit to students in terms of mental processing is that they could extend this logic based on such a criterion to any other binomial or compound. Taking the example of a binomial, a rule which could dictate the formation might depend on:

1) constituents which possessed metaphorical concepts that opposed or reinforced on another. Thus formations such as: *in and out, ins and outs, far and away, over and beyond, inside out, upside down* are allowed, but not * *in and up, * out and over, * indown or * inup.*

In the application of the above logic, students are being made more aware of how simple metaphorical language involving prepositions is formed, so that they can apply this logic to other particle clusters such as adverbs. Ultimately, another benefit for the student would be a decrease in the lexical strain of having to memorise meanings of simple idiomatic or metaphorical expressions.

3. Traditional representations of grammatical words : The case of prepositions

Prepositions are notorious for their ambiguous nature of belonging to both lexical and grammatical domains. Much research (see Brugman 1981; Rauh 1991; Rice 1992, 1993; Boers 1996 and Lindstromberg 1996, 1998) has been conducted on the overlapping membership of single prepositions and attempts have been made to classify single prepositions. Furthermore, work by Sandra and Rice (1995) which has investigated traditional network representations of prepositions has shown that such networks have a number of weaknesses, some of which are summarised below:

- 1) there is a lack of clear methodological principles for the identification of distinct usage types
- 2) there is too wide a range of representational variants of network models
- 3) there is a vagueness of whether the usual types refer to semantic distinctions (different meanings of the words) or referential distinctions (different contextualisations of a single meaning)

They also conducted three experiments which attempted to discover the relationship between the linguistic distinctions in lexical networks and the distinctions in mental representation made by native speakers. They discovered that language users are able to make distinctions between the general spatial and temporal usages of preposition types as well as distinctions at a more specific level such as effects in "landmark dimensionality". Sandra and Rice concluded their study claiming that network representations which predict that distinctions are made simply at the level of mental representation are not tenable with the cognitive linguistics approach to meaning.

It is clear from Sandra and Rice's findings that network models fail because of their attempt to unify diverse lexical domains and their inability to identify the distinct usages of prepositions. Network models thus give a general representation of the various usages of prepositions at the surface level and do not address the issue of whether the various usages are semantic or referential.

The findings of Sandra and Rice about the general weaknesses of network models highlight important reasons for the need to use a more realistic model which does not reflect simply the superficial basic spatial and temporal similarities and differences between different prepositions. There needs to be a model that shows also distinctive abstract relationship between them, from which metaphorical expressions and extended meanings are created.

4. Proposing a superordinate classification for prepositions

A type of classification that could illustrate a cognitive linguistics approach to human

categorisation and natural language processing, as well as address the limitations of traditional network representations of prepositions is a superordinate classification. The classification will focus however on not the single preposition but on the prepositional cluster. A prepositional cluster can be defined as a fixed expression which includes all binomials (e.g. ups and downs, ins and outs, etc) and compound constructions (upside down, inside out, etc) that comprise prepositional constituents. A superordinate classification for prepositions could be a systematic way of addressing the limitations of previous network models because it combines the syntactic patterns of prepositional clusters with the common metaphorical concepts they express, thus binding the subordinate members of the superordinate classification according to specific criteria. This kind of categorisation reflects the cognitive processing abilities of how a language user is able to integrate his or her own linguistic knowledge with knowledge about the world.

The cognitive processing begins by placing any generator or prototype member at the top of the superordinate hierarchy. The presence of the generator triggers off various associations in the mind (spatial, metaphorical, abstract) based on world knowledge as well as on linguistic knowledge (e.g. syntactic or semantic) about that particular preposition. Of course the extent and degree of triggering off various associations depends very much upon context. This proposal of using a hierarchical model which illustrates the mental processing abilities of the language user as a result of his or her linguistic knowledge (syntactic or semantic) is supported by Langacker (1991:2) who says that "the linguistic system subsumes units representing the same phenomenon at varying levels of detail and resolution. These form hierarchies in which a schema at a given level is elaborated or instantiated by subschemas....".

Based on Langacker's assertions, an example of a unit which can "represent the same phenomenon at varying levels of detail and resolution" is that of the prepositional cluster. Here, basic spatial and extended meanings of the prepositional clusters can be represented in a hierarchy where there is a schema (prototype meaning) at a given level which is "instantiated by subschemas" such as syntactic patterning and related metaphorical concepts at the subordinate level.

Besides its use as a cognitive model reflecting mental processing abilities, the superordinate categorisation is also preferred as a more realistic representation of prepositional usage over traditional network models for the following reasons:

- 1) a superordinate categorisation has the advantage over network representations in that it is able to capture surface-level (referential spatial distinctions) as well as deep-level semantic distinctions (abstract conceptual relationships) of various prepositions. These distinctions can be seen at the phonological, syntactic and semantic levels of representations.
- 2) network models cannot adequately illustrate the referential and semantic distinction between prepositions, because network models are designed to unify diverse lexical domains. They are not designed to show distinctions in usages, whereas hierarchical models can.
- 3) network representations lack clear methodological principles for the identification of distinct usage types whereas in a superordinate categorisation of prepositional clusters, criteria such as syntactic patterning and metaphorical concepts form the basis of identification of basic spatial meanings and metaphorical extensions.

With regard to the superordinate classification proposed for the study of prepositional clusters, the model used in this research is found below:

5. Model proposed for categorisation of prepositional clusters

Level 1: Superordinate:

Level 2: Type:

Level 3: Syntactic Pattern:

Level 4: Prototype/Generator member:

- Level 5: General metaphorical concept of prototype and related concepts:
- Level 6: Members that oppose prototypical attribute:
- Level 7: Members that reinforce prototypical attribute:
- Level 8: Grammatical function(s):

The basic principle guiding the structure of the superordinate model is that it seeks to combine a basic syntactic pattern of prepositional cluster with common metaphorical concepts or abstract domains associated with the constituent elements. The categorisation uses a top-down approach in which each subsequent level below can only be filled after information at the top level has been completed. Thus when the Superordinate level has been filled with information e.g. "Prepositional clusters", only then can we proceed to fill the next level - Type. In this level, we fill in the number of prepositional constituents for the cluster - one or two. Based on the number of prepositional constituents, some common Syntactic Patterns for the prepositional clusters can be entered e.g. Prep + and + Prep, Adj/Adv + Prep, Prep + Noun, Noun + Prep, etc. Next, a Prototype/Generator member is entered which sets the criteria for screening prospective subordinate members based on related metaphorical concepts (see Lakoff 1987; Lakoff and Johnson 1980) and common syntactic patterns formed with the generator member. At the lowest level, the grammatical function for each cluster can be entered after having observed their collocation and colligational patterns from principles of corpus analysis. Some examples of prepositional clusters which can be represented in a superordinate categorisation are given below:

EXAMPLE 1:

Superordinate: Prepositional Clusters

Type: two prepositional constituents;

Syntactic Pattern: Prep + and + Prep, Prep + Prep

Prototype/Generator member: down

General metaphorical concept of prototype and related concepts: DOWN IS BAD, UP IS GOOD, OUT IS EXCLUSION

Subordinate members that oppose prototypical attribute: up, upside down, up and down, ups and downs

Subordinate members that reinforce prototypical attribute: out, down and out

Grammatical function: noun, adverb, complement

EXAMPLE 2:

Superordinate: Prepositional Clusters

Type: two prepositional constituents

Syntactic Pattern: Prep + and + Prep, Prep + Prep

Prototype/Generator Member: in, inside

General metaphorical concept of prototype and related concepts: IN/ INSIDE IS INCLUSION, OUT IS EXCLUSION, FOR IS DIRECTED TO,

Subordinate members that oppose prototypical attribute: out, in and out, inside out, ins and outs,

Subordinate members that reinforce prototypical attribute: for, in for

Grammatical function: adverbial, complement, noun

In the above cases where prepositional clusters containing two prepositions are classified, a point to note is that, although we do specify a prototype member at the top of the superordinate structure, the status is only a "token" one as there are no actual central or peripheral members. This is because any of the members can qualify as the prototype member at the top of the superordinate structure, by virtue of the common metaphorical concept that this prototype member expresses and functions only as a generator. Note that this approach of using a prototype generator member is different from network representations where a central member is used to unify peripheral members. Hence, a prototype member will generate related or opposing metaphorical concepts which will act as criterion for membership at the subordinate level. By using this particular criterion of generating only related or opposing metaphorical concepts at the subordinate level, it is possible to eliminate the problem of ill-formed prepositional clusters that are not found in everyday communication e.g. **in and about*, **out and for*, etc. Thus, we are able to enforce clear boundaries for membership at the subordinate level. There will be no such thing as a "fuzzy" member which has

membership in more than one superordinate structure, so the problem of misinterpretation which occurs frequently in single lexical words as a result of polysemy does not surface in the case of prepositional clusters because members are "monogamous" as they remain within the superordinate structure.

For prepositional clusters containing only one prepositional constituent, this superordinate classification can also be used, except that, instead of generating related or opposing metaphorical concepts for prospective members at the subordinate level, this time the prototype member will generate only one particular abstract conceptual domain e.g. the domain of emotions, spatial relationship, social relationship, etc. This is because in such clusters the lexical word that is attached to the single preposition tends to neutralise its deictic effect, thus not allowing any transformation to an extended or metaphorical meaning. Frozen structures conveying only literal meaning are formed instead. A slight modification of the categorisation is thus needed to take this observation into account. Membership at the subordinate level is strictly controlled by virtue of members belonging to only one particular abstract conceptual domain and not by related or opposing metaphorical concepts. However, the similarity between the classification of clusters with one and two prepositional constituents is that subordinate members do not have dual or multiple memberships in other domains. The examples below demonstrate this:

EXAMPLE 1:

Superordinate: Prepositional Clusters

Type: one prepositional constituent

Syntactic Pattern: Adj/Adv + Prep

Prototype/Generator member (Adj/Adv + of): afraid of

Abstract conceptual domain: concerned with emotional reaction or condition

Subordinate members of abstract conceptual domain: frightened of, scared of, proud of, jealous of, ashamed of, envious of, suspicious of

Grammatical Function: complement

EXAMPLE 2:

Superordinate: Prepositional Clusters

Type: one prepositional constituent

Syntactic pattern: Prep + Adj/Adv

Prototype/Generator member: in short

Abstract conceptual domain: concerned with measurement

Subordinate members of abstract conceptual domain: in general, in particular

Grammatical function: adverbial

EXAMPLE 3:

Superordinate: Prepositional Clusters

Type: one prepositional constituent

Syntactic pattern: Noun + Prep

Prototype/Generator member: answer to

Abstract conceptual domain: concerned with answers, reactions and requests

Subordinate members of abstract conceptual domain: response to, reply to, solution to, reaction to, invitation to

Grammatical function: complement

EXAMPLE 4:

Superordinate: Prepositional Clusters

Type: one prepositional constituent

Syntactic pattern: Prep + Noun

Prototype/Generator member: by chance

Abstract conceptual domain: concerned with unpredictable events
Subordinate members of abstract conceptual domain: by mistake, by accident, by coincidence
Grammatical function: adverbial

6. A note about prototype members

In the superordinate categorisation of prepositional clusters, the term "prototype/generator member" was used. This however is not meant to reflect that the "prototype member" has any special status but that it serves as what Rosch (1975: 532) terms, a "cognitive reference" point. In all cases, the prototype member functions as a generator in which prospective subordinate members can be assessed based on the related metaphorical concepts that the generator produced. Thus, the status of "prototype" given to the generator member is only a token one.

In short, where there is any reference made to the relationship between constituent parts of prepositional clusters in a superordinate categorisation, the term "prototype" or generator will be used. Thus, in a superordinate categorisation of prepositional clusters based on syntactic patterning and metaphorical concepts, any prepositional constituent could be a prototype or generator member.

7. Conclusion

The superordinate categorisation of prepositional clusters suggested here does not seek to replace all network representations for single prepositions. What it does offer is a more realistic representation of prepositional usage where prepositions are usually found in cluster combinations, rather than single words. By adding the criteria of metaphorical conceptual relationship, this categorisation is able to show a more interactive relationship between various prepositions and even related ones, by showing the referential and semantic differences between them.

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