Metonymy and Metaphor: What's the Difference?

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ABSTRACT

A computational approach to metonymy and metaphor is proposed that distinguishes between them, literalness, and anomaly. The approach supports Lakoff and Johnson's (1980) views that metonymy and metaphor are quite different phenomena, that in metonymy an entity *stands for* another, whereas in metaphor an entity is *viewed as* another.

1 Introduction

This paper describes a computational approach to metonymy and metaphor that distinguishes between them, literalness, and anomaly. The approach lends support to the views of Lakoff and Johnson (1980) that metonymy and metaphor are quite different phenomena, that metonymy is a means by which one entity *stands for* another, whereas metaphor is a way in which one entity *is viewed as* another.

The three main features of the computational approach are that: (a) literalness, metaphor, and anomaly share common features and form a group distinct from metonymy which has characteristics that requires a quite different treatment; (b) chains of metonymies occur, supporting an observation by Reddy (1979); and (c) metonymies can co-occur with instances of either literalness, metaphor, or anomaly. An example is given of the computer analysis of a metonymy which illustrates the above three features. The example is analysed by a natural language program called meta5 that uses Collative Semantics, hereafter CS. CS is a recently proposed domain-independent semantics for natural language processing which is, in many respects, a development of Preference Semantics (Wilks 1973, 1975a, 1975b).

2 Overview: The Relationship between Metonymy and Metaphor

This section outlines some of the main similarities and differences between metonymy and metaphor, starting with their main similarities. One similarity is that both metonymy and metaphor are highly pervasive in language: there is linguistic evidence of the widespread use of metaphor (e.g., Brooke-Rose 1958; Levin 1977; Reddy 1979; Lakoff and Johnson 1980) and metonymy (e.g., Stern 1931; Lakoff and Johnson 1980; Van Eynde 1982; Yamanashi 1987). A second similarity is that both metonymy and metaphor are significant in language change, notably in word sense extension (see Stern 1931; Waldron 1967). A third and perhaps most important similarity is that both metonymy and metaphor are non-literal. We will not review the nature of metaphor here because that has been covered elsewhere (see Ortony 1979a; Honeck and Hoffman 1980; Johnson 1981) but will instead focus on the nature of metonymy.

In a metonymy, the name of one thing is substituted for that of another related to it. Several attempts have been made to organise instances of metonymy into categories (e.g., Stern 1931; Lakoff and Johnson 1980; Yamanashi 1987) or "metonymic concepts," as Lakoff and Johnson call them. One kind of metonymic concept is synechdoche or, in Lakoff and Johnson's terms, **Part for Whole**. Below are three examples of another metonymic concept, **Container for Contents.**

(1) "Denise drank the *bottle*." (= the liquid in the bottle)

(2) "Dave drank the *glasses*." (= the liquid in the glasses)

(3) "The *kettle* is boiling." (= the liquid in the kettle)
(Waldron 1967, p.186; Yamanashi 1987, p.78)

None of the three sentences is literally true. The non-literalness in each sentence is indicated by a violation of a selection restriction of the verb. In (1) and (2), 'drink' expects a potable liquid but neither bottles nor glasses are potable liquids; in (3) 'boil' expects a liquid, but a kettle is not a liquid. However, there is something regular about the nature of the selection restriction violation in all three sentences. Observe that in (1) and (2), it is not bottles or glasses that are drunk, but the potable *liquids* in them, and in (3), it is the *liquids* in kettles that are boiled, not the kettles themselves. In each case, the selection restriction is a liquid and the surface noun against which it is matched is a container of liquids; hence in each case, there is a regular relationship between a **container** (a bottle, glass, and kettle) and its typical **contents** (a liquid): this relationship is the metonymic concept **Container for Contents**.

(4) "You'll find better ideas than that in the library."
(Reddy 1979, p.309)

It has also been observed that metonymies occur in chains (Reddy, Ibid). Reddy suggests that (4) contains a chain of **Part for Whole** metonymies between 'ideas' and 'library': the ideas are expressed in words, words are printed on pages, pages are in books, and books are found in a library.

Having discussed some areas of agreement about metonymy and metaphor, we now turn to a much disputed subject: the nature of the relationship between them. One view is that metonymy is a type of metaphor, a view that has been traced by Genette (1970), according to Levin (1977, p.80). Searle (1981, p.280) claims to hold this view, though he claims not strongly. A second and antithetical view is that metaphor is a type of metonymy. This view, also noted by Levin (Ibid), conjoins the views of Dubois et al. (1970), who reduce metaphor to synechdoche,

and Jakobson and Halle (1956), who reduce synechdoche to metonymy. Finally, a third view is that metonymy and metaphor are quite different, a view that has been advanced by Lakoff and Johnson (1980, pp.36-37), among others. To them, metaphor is "principally a way of conceiving of one thing in terms of another, and its primary function is understanding;" metonymy "has primarily a referential function, that is, it allows us to use one entity to *stand for* another" though it has a role in understanding because it focusses on certain aspects of what is being referred to. We subscribe to the third view.

Metonymy has recently become a topic of interest in natural language processing (e.g., Grosz, Appelt, Martin, Pereira, and Shinkle 1985; Martin 1986; Hobbs and Martin 1987; Stallard 1987; Wilensky 1987) though, to our knowledge, no one else has yet produced a theory embodied in a computer program that can process several different metonymic concepts or that can distinguish metonymies from metaphors. The next section outlines the treatment of metonymy in CS.

3 Collative Semantics: Description of Semantic Phenomena Addressed

In CS, we investigate metaphors, metonymies, anomalies, etc., by studying the **"semantic relations"** that underlie them. Semantic relations are relationships that arise between the meanings of words (or larger linguistic units). Seven types of semantic relations are distinguished in CS. These are termed literal, metonymic, metaphorical, anomalous, redundant, inconsistent, and novel relations. The seven semantic relations divide into two classes which we refer to as **"preference-based"** and **"assertion-based"** relations. Brief definitions of the preference-based semantic relations are now given, together with example sentences (see Fass 1986b, 1987b, 1988 for more details). These sentences assume a null context in which there are no complicating effects from prior sentences or the pre-existing beliefs of producers or understanders.

The preference-based class of semantic relations stems from matching the **semantic restrictions** of senses of words against the immediate context of the meanings of other senses of words. Such semantic restrictions have been called "selection restrictions" (Katz and Fodor 1964), "preferences" (Wilks 1973) and "expectations" (Schank 1975). We have adopted Wilks' term. Such preferences appear to be responsible for literal, metonymic, metaphorical, and anomalous semantic relations. Literal relations are signified by a satisfied preference whereas the remaining three relations, which are all non-literal, are indicated by a violated preference.

(5) "The man drank beer."

There is a literal relation between 'man' and 'drink' in (5) because 'drink' prefers an animal as its agent (i.e., it is animals that drink) and a man is a type of animal so the preference is satisfied.

(1) "Denise drank the bottle."

In (1), the semantic relation between 'drink' and 'bottle' is metonymic. 'Drink' prefers a potable liquid as its object. A bottle is not a type of potable liquid so there is a preference violation. Furthermore, there is a **Container for Contents** metonymy between 'bottle' (the container) and 'potable liquid' (its contents).

Metonymy is differentiated from metaphor in CS because we think that the core of a metonymy is a semantic relationship, e.g., **Container for Contents,** whereas the core of a metaphor is a relevant analogy. Others have argued for the importance of relevance in recognising metaphors (e.g., Tversky 1977; Hobbs 1983) and it has been frequently claimed that the critical match in a metaphorical relation is some correspondence or analogy between two properties (e.g., Wilks 1978; Ortony 1979b, p.167; Tourangeau and Sternberg 1982, pp.218-221; Gentner 1983) though, to our knowledge, no-one has brought the two observations together and emphasised the role of relevance in the discovery of an analogy critical to a metaphor.

(6) "The car drank gasoline." (adapted from Wilks 1978)

Thus, the semantic relation between 'car' and 'drink' in (6) is metaphorical because between 'car' and 'animal', the preferred agent of 'drink', there is a preference violation and an underlying relevant analogy. A car is not a type of animal, hence the preference violation. However, in the context of a sentence about drinking such as (6), there is a relevant analogy that animals drink potable liquids as cars use gasoline, hence the metaphorical relation between 'car' and 'drink'.

A third kind of non-literalness, in addition to metonymy and metaphor, is anomaly. Metonymy and metaphor are distinguished from anomaly in CS because anomalous relations have neither the semantic relationships of a metonymic relation nor the relevant analogy of a metaphorical relation.

(7) "The idea drank the heart."

In (7), the semantic relation between 'idea' and 'drink' is anomalous. This is because 'idea' is not a preferred agent of 'drink' and no relevant analogy can be found between animals (the preferred agent) and ideas.

Next, we describe the four components that comprise CS, which can discriminate among the semantic relations just presented.

4 Collative Semantics: Description of its Four Components

The four components of CS are **"sense-frames," "collation," "semantic vectors,"** and **"screening."** A fuller description of these components appears in Fass (1986, 1987c, 1988).

Sense-frames are dictionary entries for individual word-senses. Sense-frames are composed of other word-senses that have their own sense-frames, much like Quillian's (1968) planes. Each sense-frame consists of two parts, an **"arcs"** section and a **"node"** section, that correspond to the genus and differentia commonly found in a real dictionary definition. The arcs part of a sense-frame contains a labelled arc to its genus term (a word-sense with its own sense-frame). Together, the arcs of all the sense-frames comprise a densely structured semantic network of word-senses called the **"sense-network."** The node part of a sense-frame is the differentia that provides a "definition" of the word-sense represented by the sense-frame that differentiates it from other word-senses.

The second component of CS is the process of collation. Collation matches the sense-frames of two word-senses and finds a system of multiple mappings between those sense-frames, thereby discriminating the semantic relations between the word-senses. The two terms in a semantic relation are referred to as the **"source"** and the **"target"** (Martin 1985). The source initiates and directs the mapping process, the target has a complex system of mappings laid upon it, and there is direction from the source towards the target.

Figure 1 is a flow chart that shows how literal, metonymic, metaphorical and anomalous relations are distinguished. The main features of the flow chart are: (a) metonymy is given a very different treatment from literal, metaphorical, and anomalous relations; (b) chains of metonymies can be found, supporting Reddy's (1979) observation; (c) metonymies can co-occur with instances of either literal, metaphorical, or anomalous relations.

In the flow chart, a sense-network path denoting inclusion is sought first. If such a path is found then the semantic relation is a literal one. If the path is not inclusive then metonymic inferencing -- the application of metonymic inference rules -- is tried. Metonymic inferencing is thus a special strategy tried after failure to discover an initial literal semantic relation, hence metonymy is non-literal. A successful metonymic inference rule establishes the relationship between the original source or target ("the name of one thing") and another entity ("another related to it") that substitutes for one of them. The substitute source or tar-

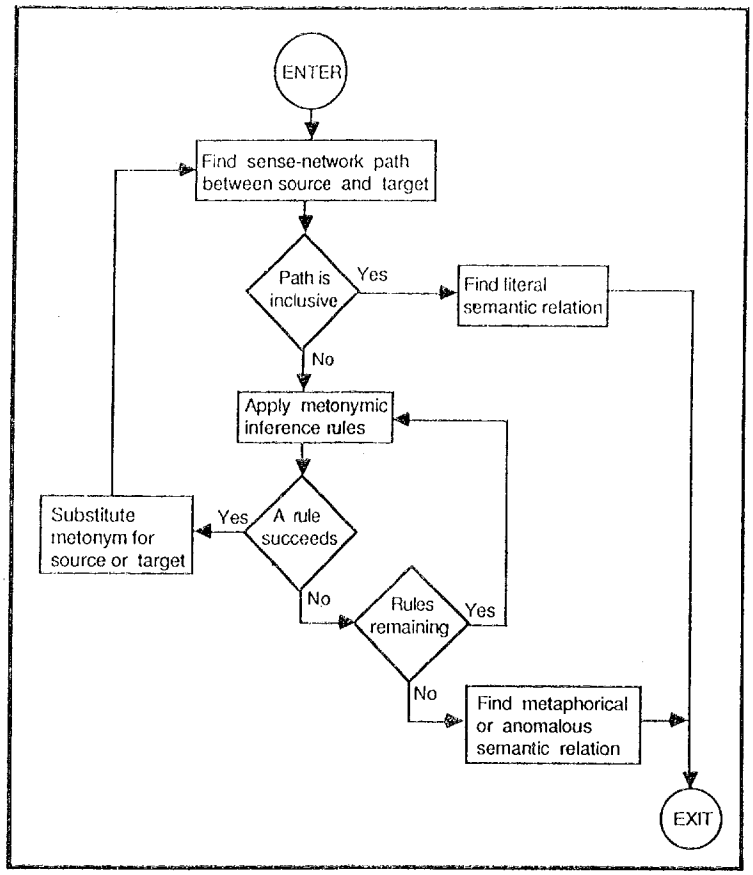

Figure 1. Preference-based semantic relations.

get is used to compute a semantic relation which can be literal, metonymic again, metaphorical, or anomalous. Hence a discovered semantic relation can be a single relation (i.e., literal, metaphorical, or anomalous) or a combination of relations consisting of a single metonymy or a chain of metonymies plus a literal, metaphorical, or anomalous relation.

A further set of processing steps distinguish metaphorical from anomalous semantic relations. The key step records the match of the relevant cell from the source sense-frame with one of the cells from the target sense-frame. For a metaphorical relation the match of cells is analogical whereas for an anomalous semantic relation the match of cells is not analogical (see Fass 1986, 1987a, 1988); in other words, a metaphorical relation contains a relevant analogy, as in (6), while an anomalous relation does not, as in (7).

The third component of CS is the semantic vector which is a form of representation, along with sense-frames; but sense-frames represent knowledge, whereas semantic vectors represent coherence. Semantic vectors are therefore a kind of **"coherence representation."**

The fourth component of CS is the process of screening. During analysis of a sentence constituent, a semantic vector is generated for each possible pairwise combination of word senses. These word-sense combinations are called **"semantic readings"** or simply "readings." Each reading has an associated semantic vector. Screening chooses between two semantic vectors and hence their attached semantic readings, thereby resolving lexical ambiguity.

5 Processing Metonymy: An Example

This section gives an example of a metonymy analysed by the meta5 program, which contains an implementation of CS. Another example of processing a metonymy can be found in Fass (1986b, to appear). The meta5 program analyses sentences, discriminates the seven kinds of semantic relation between pairs of word senses in those sentences (i.e., it actually *recognises* metaphors, metonymies, redundancies, etc), and resolves any lexical ambiguity in those sentences. Meta5 is written in Quintus Prolog and consists of a lexicon containing the sense-frames of 460 word-senses, a small grammar, and semantic routines that embody collation and screening, the two processes of CS. The process of collation currently contains metonymic inference rules for four types of metonymic concept, ordered from most to least common: **Part for Whole, Container for Contents, Co-Agent for Activity,** and **Artist for Artform.**

(8) "Ted played *Bach.*" (= the music of Bach)

In (8), there is a chain of metonymies plus a literal relation. The chain consists of **Artist for Artform** and **Container for Contents** metonymic concepts. When expressed as inference rules, some metonymic concepts appear to be drive "forward" from the source, while others are driven "backward" from the target. It is this direction of inferencing that determines whether the source or target is substituted in a successful metonym. Both **Artist for Artform** and **Container for Contents** are target-driven, hence in **Artist for Artform** the inference is from the target (the Artist) to the source (the Artform), so the substitute metonym replaces the target (the Artist) if the inference is successful.

Figure 2 shows the sense-frames of the verb-sense play12, music1 and johann_sebastian_bach. The metonymy results from matching the object preference of play12, which is for music, against the surface object, which is 'Bach', short for 'Johann Sebastian Bach'. In what follows, the preference (music1) is the source and the surface object (johann_sebastian_bach) is the target.

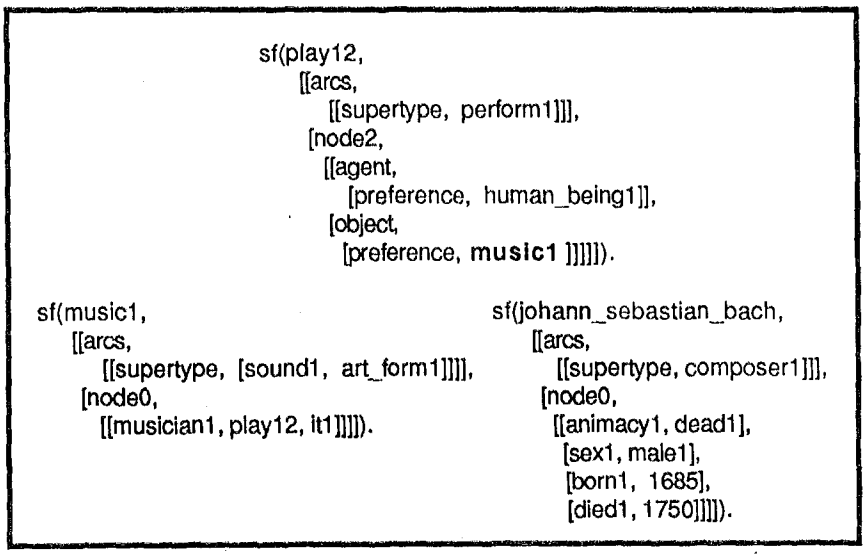

Figure 2. Sense-frames of music1, play12, and johann_sebastian_bach.

We shall use the flow chart of figure 1 to understand what happens. The rectangular boxes in the flow chart are called "statement boxes," the diamonds are "decision boxes." We shall follow what happens using instructions given as sentences in brackets. We now begin the example: (Enter the flow chart.) (Enter the uppermost statement box.) The sense-network path between the source (music1) and the target (johann_sebastian_bach) is sought.

(Enter the uppermost decision box of the the flow chart.) The path is not inclusive so metonymic inference rules are applied.

(Enter the middle decision box of the the flow chart.) The rule for **Artist for Artform** succeeds. The discovered metonymic inference is that johann_sebastian_bach (the Artist) composes musical pieces (the Artform). The metonymic inference is driven from the target (the Artist), which is johann_sebastian_bach. The successful metonymic inference is as follows: (a) johann_sebastian_bach (the Artist) is a composer1, (b) composers compose1 musical pieces (the Artform). Two additional tests confirm (a) and (b), which are that (c) composing is a type of creating, and (d) a musical_piece1 is a type of art_form1.

(Enter the leftmost statement box.) The original target (johann_sebastian_bach) is replaced by the substitute metonym (musical_piece1).

(Enter the uppermost statement box for a second time.) The sense-network path between the source (music1) and the new target (musical_piece1) is sought.

(Enter the uppermost decision box for a second time.) The path is not inclusive so metonymic inference rules are applied.

(Enter the middle decision box for a second time.) The rule for **Container for Contents** succeeds. The successful inference is that a musical_piece1 (the Container) contains music1 (the Contents).

(Enter the leftmost statement box for a second time.) The direction of inference in the **Container for Contents** metonymic concept is from the target (the Container) towards the source (the Contents), so the target (the Container) is replaced by the substitute metonym if such an inference should be successful. Hence in our example, the target (musical_piece1) is again replaced by a substitute metonym (music1). The source, which is music1, the object preference of play12, remains unchanged.

(Enter the uppermost statement box for a third time.) The sense-network path between the source (music1) and the latest target (music1) is sought.

(Re-enter the uppermost decision box a third time.) The path is inclusive so a literal relation is found, that music1 is a type of music1.

(Exit the the flow chart.) The processing of the preference-based semantic relation(s) between play12, with its object preference for music1, and johann_sebastian_bach is completed. After an initial preference violation (Johann Sebastian Bach is not a kind of music), the semantic relation found was an **Artist for Artform** metonymic relation (that johann_sebastian_bach composes musical pieces) followed by a **Container for Contents** metonymic relation (that musical pieces contain music) followed by a literal relation (that music is music).

6 Conclusions

The above analysis illustrates, we hope, why metonymy and metaphor are easily confused: both are non-literal and are found through the discovery of some aspect (a property) shared by the source, a preference, and the target, in the above case a surface noun. Our conclusion is that metonymy and metaphor are very different phenomena, much as Lakoff and Johnson (1980) have said, except that we add detailed suggestions as to why. We suggest that some key differences between metonymy and metaphor are: (a) how the shared aspect is selected, (b) the operations that happen after the selection, and (c) the effect those operations produce.

In the case of metonymy, (a) the selected aspect is a property that forms a regular semantic relationship with a property from the target; (b) there is substitution, i.e., replacement of one conceptual entity with another; hence (c) the observed referential function of metonymy.

In the case of metaphor, (a) the selected aspect is a relevant property; (b) forms an analogy with a property from the target; and (c) the effect is of surprise discovery of similarity between the two concepts.

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