Localist Principles of Meaning in a Computational Model of Metaphor Interpretation

Tony Veale,
Hitachi Dublin Laboratory,
O'Reilly Institute,
Trinity College,
Dublin,
Ireland

Mark Keane,
Computer Science Dept.,
O'Reilly Institute,
Trinity College,
Dublin,
Ireland

Email: RAVEALE@vax1.tcd.ie

Abstract: Lakoff & Johnson (1980a) argue that no metaphor can be comprehended, or even adequately represented, without regard to its experiential basis in the physical world. Thus, they advocate that this experiential basis has to form part of a metaphor system's knowledge representation. This paper presents an analysis of various localist (spatially grounded) phenomena which are fundamental to the expression of abstraction in language. These spatial metaphors are used as the guiding principles for a new approach to metaphor interpretation, which posits language as a two stage process: the first stage, *Scaffolding*, creates a skeletal meaning structure, which is then fleshed out during the second stage, *Elaboration*. This organization both conforms to, and helps to explain, the empirical constraints placed upon models of metaphor comprehension. The use of localist metaphors also yields useful insights into the nature of semantic primitives for meaning representation.

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Declaration: We declare that this paper is neither currently under review for another journal or conference, nor will it be submitted during IJCAI's review period.

1. Introduction

The past number of years have seen a radical reappraisal of the role of metaphor in both language, and general cognitive, processing. Once viewed as a peripheral and somewhat aberrant or deviant phenomenon, metaphor is now recognized to play a central role in the organization and acquisition of conceptual structure. This new trend can be traced back to the work of philosopher Max Black (1962), and more recently, to the work of Lakoff & Johnson (1980a,b). A corollary to this *strong metaphor* position is that metaphor usage can be described ontologically, that is, a given metaphor can be classified as a variation of a particular metaphor type, where each type is grounded in experience of the physical world. Lakoff & Johnson (ibid) present a host of types, such as the Container Metaphor, while Martin (1990) claims that a competent treatment of metaphor can best be achieved when the system is given explicit knowledge of this ontology of metaphor types. This Metaphoric Knowledge Approach (see Martin, ibid) is also the basis of the Conceptual Scaffolding Model of metaphor interpretation, described in Veale & Keane (1992a,b). This model, which is implemented as part of the TWIG text understanding system (Cunningham & Veale 1991) describes language as a two-stage process: the first, *scaffolding*, creates a skeletal meaning structure representative of the organizing themes of an utterance, while the second, *elaboration*, builds around this skeleton to produce the full interpretation of the utterance. The connectives which comprise the initial scaffolding structure are themselves spatially-founded metaphors. This approach thus embodies a *localist* view of language, which states that spatial concepts underlie much of the grammatical and semantic structures of language (Lyons 1977). These metaphoric connectives, while not semantic primitives in the traditional sense, provide useful insights into the nature of primitives for meaning representation.

With these issues set down, the paper assumes the following structure: Section 2 describes the localist hypothesis in greater detail, and presents a localist ontology which provides the basic principles of the model to follow; Section 3 then outlines the mechanics of this Conceptual Scaffolding model, while Section 4 briefly discusses the model with relation to empirically determined constraints. Section 5 then presents

arguments relating to the nature of meaning primitives, provides a comparision with past primitive-based systems, and discusses the insights offered by the use of localist principles as a basis for meaning decomposition.

2. Localism and Metaphor in Language

The localist thesis states that spatial expressions, due to their experiential basis, are not only more fundamental than non-spatial abstract concepts, such as those that relate to time, emotion and social interaction, but that they actually provide a framework upon which our understanding of such abstractions is organized (Lyons 1977). Localism underlies many of the core metaphors described by Lakoff & Johnson (1980b), and has been employed as a basis of meaning in Jackendoff (1983). Localist effects are also manifest on a grammatical level, from simple word collocation to the structure of prepositional and deep case systems (Anderson 1971). In this section we illustrate the most prominent of such principles, and the linguistic phenomena that result from their use, to provide both a motivation and a basis for the Conceptual Scaffolding model. In addition to the localist observations which have been made before (for example, in Lakoff & Johnson 1980 a,b), we elucidate two principles of inferential use in 9 and 10.

1. Abstract States as Locations: Abstract states, such as emotion, are usually described in terms of physical location. Consider "Bill *went* mad", "Suzie *went to* sleep", "Bill *found* happiness" and "Mary *came to* an unhappy realization".

2. State Change as Movement: This fundamental localist principle builds upon the previous principle to describe abstract state changes as movement between locations. Consider "Bill *went into* sales but Ted *stayed* a researcher".

3. Abstract States as Containers: Just as locations can be viewed as containers (of people, buildings etc), abstract location states may also be viewed metaphorically as containers. Consider "We live *in* hope", "Bill went *into* a depression", "Ted came *out of* a coma", "Linda is *in* debt" and "ACME inc. was thrown *into* liquidation".

4. Time as a Location: Specific times, such as 6:30 pm, days of the week, and named holidays are viewed as temporal points (or *landmarks*), while other units of time, such as weeks, months, seasons and years are viewed as temporal areas or containers. We can say "*at* 5 o'clock" but not "*in* 7 o'clock", "*in* March" but not "*on* Summer".

5. Body Locations as Containers of Emotion: Consider, "Mary's heart is heavy with sorrow" (sadness) and "Ted vented his spleen" (anger). This principle employs the notion of a physical container to express varying degrees of emotion in terms of capacity or volume. Consider "Bill has a big heart", where friendliness is represented as a *capacity* for love, and "My head is bursting", where excessive *volume* represents stress and anxiety overload (the head is the metaphoric container of thoughts and ideas).

6. Containers as Boundaries and Enclosures: Just as containers act as physical boundaries for their contents (such as boxes and cages), metaphoric containers can