

The Role of Affordances at the Semantics/Pragmatics Boundary

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Abstract

The paper introduces the concept of *affordance* within frame semantics as a significant factor in the semantics/pragmatics boundary issue. Specifically, it is argued that expansions of literal meanings, which have been argued to be required for the complete interpretation of sentences, are constrained and guided by affordances, in contrast to the generally assumed complete freedom of the pragmatic mechanisms used to generate the expansions. A first hint at some general properties of affordances are presented, as well as some indications of the significance of affordances.

Keywords: affordances; implicature; explicature; implicature; expansions; semantics; pragmatics.

This paper addresses the role of linguistic affordances in the expansion of lexical meaning during sentence processing. It shows that affordances, which are a part of the frame-semantic meaning of the lexical items, constrain and guide the expansion process. Therefore the image of a passive semantic “said” that gets molded by pragmatic inferences needs to be re-envisioned as a two-way street in which expansions are guided and constrained by semantic data.

The Semantics/Pragmatics Interface

Extensive debate on the semantics/pragmatics interface has taken place recently, resulting in a significant shift from the traditional view that semantics is equal to meaning minus pragmatics and instead advocating an increasingly strong role for pragmatics in determining what would be defined pre-theoretically as the “literal meaning” of the sentence (cf. the work by Recanati, Bach, Carston, and others on the issues of explicatures/implicatures; e.g., Recanati 1989, 1993, 1994, 1998, 2001, 2004a/b; Bach 1994a/b, 1999, 2001, 2004; Carston 1988, 1997, 1999, 2000, 2002, 2004).

While the above reassessment was well needed and redressed an unacknowledged aspect of semantic/pragmatics processing, a parallel influence of lexical/encyclopedic information on pragmatic inferencing has been neglected. In this paper I will examine two aspects of this influence: the directing of pragmatic inferencing by lexical affordances and the (partial) determination of implicatures by frame-based knowledge. In short, I will show that not only does pragmatics affect the semantics of a sentence, but that the semantics of a sentence constrains pragmatic inferencing.

This is a significant fact, because beyond the obvious sense that the semantics of a sentence is the starting point of pragmatic inferencing, the inferencing can take virtually any path and, given the proper context, any utterance can imply any

proposition. What this paper seeks to demonstrate is that, while it is true that, in principle, any utterance can produce an infinite number of implicatures, in practice the implicatures are severely constrained by the affordances of the lexical items activated by the utterance and by encyclopedic knowledge (frames).

The paper will begin by considering the definition of “affordance” and by briefly reviewing the (scant) literature on the subject in linguistics. It will then develop a linguistic theory of affordances which has direct repercussions on the explicature/implicature debate and on current research based on the “embodied meaning” approach (cognitive linguistics).

The definition of affordances

Developed in the field of vision by perceptual psychologists (Gibson 1977, 1979), affordances are what the environment of an “animal” offers as possibilities to the animal itself. Affordances are not limited to the visual aspect of reality. For example,

if a terrestrial surface is nearly horizontal (instead of slanted), nearly flat (instead of convex or concave), and sufficiently extended (relative to the size of the animal) and if its substance is rigid (relative to the weight of the animal), the the surface *affords support* (Gibson 1979: 127)

Gibson’s approach is one of the foundations of ecological psychology. This is not the place to consider the psychology of perception debate around affordances. We will instead consider linguistic treatments of affordances.

There has been little discussion of the relationship between affordances and semantics. However, recent work has established some significant points for a linguistic theory of affordances. Contrary to the original definition of affordance, they are not exclusively a feature of the referent, as would follow from Gibson’s definition.¹ It has been established that words activate affordances, including motor-perceptive ones, see (Glover et al., 2004). In fact, a social-constructivist view of affordances is possible: on the social nature of (some, perhaps many, but not all) affordances, see Noble (1991), Costall (1995). I think an intensional definition of affordance, in terms of beliefs and belief systems, is entirely possible and actually necessary (for example, how could a referential theory of affordance explain the fact that swimming after eating

¹The reluctance to acknowledge the significance of language in relation to affordances has been noted even among ecological psychologists, cf. Costall and Leuder (1998: 169).

affords potential death in Italian culture and nothing of the sort in (some parts of) American culture?). Moreover, syntactic parsing is affected by affordances (Chambers et al. 2004). In short, the main objection to a linguistic theory of affordances, i.e., that affordances are simply non-linguistic can be rejected.

The most significant point, however, about a linguistic theory of affordances, is not so much that it is possible, but rather that it is inscribed within frame-semantics (FS), a long-standing theory of semantic representation which originated in psychology and was adopted in artificial intelligence and from there into linguistics. There exists no comprehensive treatment of FS that surveys the entirety of the literature. Useful surveys are Andor (1985), Raskin (1985a ch. 3), Attardo (2001 ch. 3). Collections of papers were edited by Raskin (1985b, 1986) and Lehrer and Kittay (1992). On Fillmore's FS see Petrucci (1996). Besides artificial intelligence and psychology, FS is particularly popular in reading theory and has recently been co-opted by cognitive linguistics. In an interesting turn, frame semantics has turned toward computational linguistics, see Fillmore et al. (2001) and Nirenburg and Raskin (2004).²

This is not the place to produce a summary of FS, so we will be satisfied with a brief definition. A frame (a.k.a., script, MOP, schema, daemon, etc.) is an organized set of labeled links among concepts which, taken together, describe the meaning of a lexical item (though not all frames are necessarily tied to a lexeme). Thus the frame HAMMER includes in its definition a link labeled "ISA" which connects it to TOOL, and a link for "parts" which would connect it to HANDLE and HEAD, etc. It should be noted that the meaning of a lexical item in a frame goes far beyond a dictionary definition and includes "encyclopedic" information.

Affordances can be defined as a sub-graph of each frame, with particular emphasis on the object-of, instrument, and agent slots (i.e., affordances typically are concerned with what an object is used for, or what can be done to/with it, or what it does). Artifacts are a particularly significant group of lexical items because they come with a pre-specified "core" affordance, i.e., the goal or purpose for which they were manufactured (hence a rake has a core affordance of raking, a hammer of pounding, etc.) Of course, a hammer can be used as a weight (it being an object with mass allows it to afford weighting), etc. This explains why those psychological experiments that require lateral thinking (such as using a pair of pliers as a weight) are typically difficult to visualize for subjects, because they use non-core affordances of the object. In other words, affordances, like frames come with "weights" (i.e., saliency values).

Saliency is the term used, in frame-based semantics, to describe the fact that the components of a frame are not organized flatly, but that some are more "important" (i.e., salient) than others. For example, in the frame for DOCTOR the feature HUMAN is less salient than CURES DISEASES. Affordances differ from saliency in that saliency is lexicalized (i.e., words come with a default setting), whereas affordances are

relative to the perceiver and/or situation. Needless to say, saliency may change due to contextual pressure, but that does not affect the point just made.

Application of Affordances to the Semantics/Pragmatics boundary issue

One of the central points of contention in the recent debate about the semantics/pragmatics boundary has been the issue of expansions. In a nutshell, expansions are significant for the boundary issue, because they show very clearly that the "literal meaning" of a sentence cannot be determined without the use of implicatures, a pragmatic tool, and hence that pragmatics encroaches on the turf of semantics.³

In what follows, I will argue that, while indeed expansions are pragmatic phenomena, they are constrained and directed by the lexical semantics of the sentence, and specifically by the affordances of the lexical items.

Consider the following example, also quoted in Récanati (2004b),

- (1) He ran to the edge of the cliff and jumped. (Carston 1988: 165)

which Carston analyzes as follows:

The interpretation of (1) in most contexts of utterance will include the understanding that he jumped over the cliff although there's no linguistic expression there telling us this or requiring us to fill in a prepositional phrase. The verb *jump* is not subcategorized for an obligatory following PP. (...) this is simply the most natural interpretation to give. (Ibid.)

Carston does not explain why this is the most natural interpretation of *jumped*. This is peculiar, since of course *jump* may occur without the understanding that one is jumping *over* or *off* something, cf.

- (2) The kids jumped on the trampoline all afternoon.

The answer of course lies not in the semantics of *jump* but in the semantics of *cliff*. Coincidentally, we do have a description of the affordances of *cliff* by Gibson himself: "The brink of a cliff affords falling off" (1977: 80).

Let us now turn to Récanati's (2001: 85) claim of semantic indeterminacy for such constructions such as the possessive. Récanati claims that "John's car (...) means something like *the car that bears relation R to John*, where R is a free variable" (Récanati 2001: 85) is most likely in error, in the sense that R is not a free variable, but is constrained by the affordances of the frames involved. Consider the following examples:

- (3) John's horse [= the horse owned by John; the horse ridden by John; the horse bet upon by John]
 (4) John's comet [= the comet observed/discovered/studied by John]

(note how ownership is excluded). Contrast now

²Obviously the various approaches to FS differ in their implementation. These differences are irrelevant in this context. The argument developed in the text hold in whatever formalism/representation of knowledge one cares to select.

³Needless to say, this is not an uncontroversial claim. For example, Bach 2004 claims that the "said" need not include expansions.

(5) John's hat [the hat owned/worn by John]

with

(6) John's chair [the chair owned/sat upon by John]

note how if John had clumsily sat on a hat (not his own, for the sake of the argument), we could not describe it as *John's hat*.

A contrasting view to the one presented above is discussed in (Sperber and Wilson 1998) who claim that

a word like 'open' can be used to convey indefinitely many concepts. It is impossible for all of these to be listed in the lexicon. Nor can they be generated at a purely linguistic level by taking the linguistic context, and in particular the direct object, into account. It seems reasonable to conclude that a word like 'open' is often used to convey a concept that is encoded neither by the word itself nor by the verb phrase 'open X' (Sperber and Wilson 1998)

while it is by and large true that many, perhaps most, concepts are not lexicalized (for example, things that irritate me), and that often, perhaps most of the time, we mean things that are not precisely determined,⁴ as Sperber and Wilson argue, nonetheless their claim is clearly an overstating of their position. Words come with a semantic baggage that restricts seriously the latitude of their applicability to concepts (cf. Travis 1997: 100 "Given words may have any of many semantics, *compatibly with what they mean*." My emphasis). It would be hard to convey the concept of "cat" by using the word *open*, barring prior stipulation. If Sperber and Wilson meant more reasonably that *open* may convey indefinitely many nuances of "opening," the claim is either trivial (language always underdetermines reality) or wrong: there are numerous concepts of "open" that simply cannot be conveyed by the word *open* under normal circumstances. For example, the command to

(7) Open the gate

cannot be taken to have been performed adequately if the gap between the two sides of the gate is of one micron (since the scale of gates and their manufacturing tolerance is such that a gap of one micron is well within the parameters of a closed gate). Thus *open* (under normal circumstances) may mean only indefinitely many concepts that include the specification that whatever the kind of entity that prototypically passes through the opening that is (to be) opened can do so without excessive difficulty.⁵ This is far from the inferential free for all that Sperber and Wilson seem to advocate.

Scope of expansions

We are now in the position of drawing a few conclusions from the present discussion. But before we do so, we can address an important issue, namely the degree of representativeness of

⁴After all we communicate for practical purposes and therefore when the degree of understanding we achieve is sufficient to accomplish what we set out to do we no longer bother to achieve further precision, or to put it differently, we communicate for a purpose, not to provide examples to truth-theoretic semanticists.

⁵The details of the analysis of *open* may be debatable (and it is not a complete analysis). The point remains.

such examples as those mentioned by Carston, Récanati and Bach. In other words, how common are those phenomena? I would contend that they are in fact pervasive of linguistic use, in fact much more so than one would think from the relevant literature. Consider the following example: the speaker is a customer ordering a the made-to-order sandwich, at a local Italian deli, in December 2001. He is addressing a store employee. The customer has made it clear that he is ordering the sandwich for himself (and a colleague, who is a silent participant in the conversation)

(8) You don't have to wrap 'em too good, cuz we're gonna eat them.

Ignoring the dialectal markers, we will focus exclusively on the completely implicit expansion "right away" which specifies that the time of the action is the *immediate* future.⁶

Note that there is absolutely no trace of the expansion in the utterance's form, that the expansion is compulsory (otherwise the causal connection between the two sentences is unjustified), and that a Gricean implicatural path can be provided: since the purpose of prototypical sandwiches is to be eaten, specifying that one will eat a sandwich is redundant and therefore violates (the maxim of) relevance. Therefore we can trigger the search for an implicature, which would be found in the claim that the eating of the sandwich will take place in the *near* future (note how this takes care abductively of the causal relation predicated by the utterance between the two clauses).

An interesting note, is that the expansion seems to work only in the immediate future sense, cf. the following (where the impossible candidate for expansion is in square brackets)

(9) * You have to wrap 'em good, cuz we're gonna eat them [later].

In this case, the FS explanation of the expansion seems to falter, since one can both eat immediately or later (hence the frame would consider both inferences acceptable). Consider the following examples:

(10) Customer to sales clerk in clothing store: "You don't have to wrap it, I am going to wear it. [right away]"

⁶Cf. also the following exchange, recorded on January 7th, 2002, between myself and my daughter Gaia (then aged seven): me "Will you give me a kiss?" Gaia "Yes, when I am ninety-nine." It is clear that developmentally these expansions are no problem even for young children. An interesting issue is the possible hypothesis that all requests, unless explicitly postponed, are to be assumed to have immediate value. However, as discussed in Attardo 1997, this hypothesis is not tenable: all requests are slotted for the time best compatible with the achievement of the ultimate perlocutionary goal for which the request is being made. A request for a kiss is made to receive a kiss, hence no ulterior goal is present and the time of the request can be assumed to be "immediately." Consider now a request to marry someone. It would be unduly demanding to request that the marriage take place immediately. This is because the goal of a request in marriage is for the marriage to take place, but marriages are very complex businesses to organize, and hence can be reasonably deferred for planning purposes.

Finally consider a request to deposit a check at the bank, uttered at 12:29 pm, when the bank closes for lunch at 12:30. an agent who would attempt fruitlessly to deposit the check at 12:30 would be acting irrationally (assuming the agent is aware of the closing times). A rational agent will postpone the depositing until the bank is open.

(11) * Customer to sales clerk in book store: “You don’t have to wrap it, I am going to read it. [right away]

(Although, (11) suddenly becomes fine if the antecedent is a newspaper. Which shows that it is the frame that is affecting the availability of the inference. Newspapers are readable “on the spot,” books are not.)

However, further examples show that indeed the explanation suggested above is correct:

(12) I am going to pay my balance in full. [later, when it is due]

(13) The proceedings will be closed by the business meeting. [later, at the end of the conference.]

As examples (12) and (13) show it is possible to have the implicature *later* or *not immediately* if the frame for the verb includes a set time for the action to take place and we assume that the time of speaking is not immediately adjacent to it.

The second example, was collected at a local bread/coffee shop which sells specialty bagels, such as “blueberry,” “sesame seeds,” and “onions.” One of their bagels is called “everything.” It consists a bagel covered with every⁷ topping/flavoring used on the bagels. The scope of *everything* is clearly limited. Consider that if the *everything* label were taken literally, these bagels would be very strange indeed, since they should include every object in the universe, including those very bagels as well, ad infinitum. Here the affordance of BAGEL delimits the universal quantifier to *things that people put on bagels and that go well together*.

The mechanism whereby the delimitation is achieved is of some interest. BAGEL affords being cooked (first boiled and then baked), being eaten, and being covered/baked with spices/condiments. These affordances interact interestingly, because since the bagels are made to be eaten, only tasteful combinations of flavors can be accepted (a blueberry/onion bagel would not be very appetizing to the average American) and *a fortiori* no inedible toppings may be used, or objects that would not fit in an oven (which rules out “galaxy” bagels—a seriously “everything” bagel would need to include our galaxy, at the very least).

It is precisely the unremarkable nature of the exchanges which attests that speakers are capable of processing these inferences without any trouble or visible effort. We have seen that these enrichment phenomena are much more widespread than the literature, which tends to treat them as exceptions, would lead us to believe. They are in fact very common and I believe that affordances underlie most semantic amalgamation.

Prolegomena to a Theory of Linguistic Affordances

We have shown that affordances of lexical items constrain and determine implicatures and related processes of expansion. We can now turn to the characterization of the linguistic theory of affordances (which is distinct from the theory of perceptual affordances). Given the extreme novelty of this approach, anything that follows should be taken as tentative and subject to revision.

⁷Actually, not even that, it is mostly non-sweet flavors.

How are Affordances Determined?

The first observation, is that there seems to be no “silver bullet” to determine the affordance of a frame. What I mean is that there is no general heuristic rule that given an arbitrary frame would algorithmically determine what are the affordances thereof. For example, we saw that artifacts are a special case, because they come generally with a built-in purpose (i.e., humans build artifacts teleologically) which is then the affordance of the object (cf. knife → cut, hammer → pound, etc.) However, once we move outside of artifacts, for example to natural objects, it is much harder to predict the affordances of a non-manufactured object. For example, “branch” affords floating, covering, burning, etc.

The second observation is that the theory of affordances that I am proposing is dynamic, insofar as the affordance weights are redistributed by context: in a shipwreck situation a wooden door affords floating, whereas in a “normal” situation it affords “going through,” “closing, or “slamming,” etc.

In fact, we can be more specific: both contextual pressure from within the sentence (what is commonly referred to as co-text) and contextual pressure from the goals of the speakers in uttering the sentence can affect the affordances of a lexical item. So, “horse,” in the context of hunting, will afford “ride”, while in the context of a butchery will afford “eat.” Consider again example (1): the meaning of “jump” is constrained by the affordances of CLIFF, which is an object from which you jump off. Therefore, affordances depend on the contextual pressure of the rest of the sentence in which they occur. To put it differently, affordances are not fixed, they are determined in part by context. Thus, a first conclusion is that the enrichment of the semantics of sentences is constrained by the semantics of the rest of the sentence.

Let us now move on to a slightly different example: suppose that an agent is cold and he/she picks up a branch, it will afford burning. But if the agent is hot and the day is sunny, the branch will afford cover. These cases are different from the previous ones, insofar as they are independent of any linguistic presentation. In fact, they can be summed up as the observation that affordances vary according to the goals and plans of the agents. Once more, we reach the conclusion that affordances are dynamic, albeit for different reasons than before.

The general mechanism governing affordance thematization seems to be that contextual pressure selects a sub-graph of the frame according to the needs of the inferential engine.

Do we need affordances?

Affordances are merely part of a full semantic treatment of the meaning of a sentence, where semantics is understood a frame semantics and not as mere truth-functional semantics. If that is the case, one may object that it is unnecessary or impractical to distinguish the affordances of a frame from the full-blown frame, since any computational advantage that might derive from not having to process the entire frame would be offset by having to extract the affordances from them in the first place.⁸

⁸Two referees make this argument. Affordances are a subgraph of a frame, so in this sense, affordances are distinct from, say, a

The answer to this question is double: if our semantic theory is to be psychologically real, it will need affordances because humans (and animals) have them. It will need linguistic affordances because natural languages have them. Moreover, on a purely computational level, affordances allow a solution (or maybe the glimpse of a solution) to the old frame problem.

In a nutshell, the problem is concerned with the fact that if a robot is told to paint an object green, the color of the object is changed, but not its position, whereas if the object is moved (and not painted) its location changes, but not its color. This knowledge is very easy for a human to assume (and is in fact faintly ridiculous when stated explicitly) but extremely difficult for a computer program to figure out. Solutions to the frame problems essentially assume that things don't change unless acted upon. This solves the computationally sticky issue of having to calculate the potentially infinite set of things that don't change. The frame problem is tied to a much broader and more significant epistemological problem, which can be very roughly summed up as "when is it OK to stop computing the consequences of an action?" (this has been amusingly called the Hamlet problem; Fodor 1987; on affordances and the frame problem, see also Steedman 2002).

My suggestion here is that affordances tell us where to look for change, in a broad sense, in the frame problem. Or, in other words, they can tell us where to stop thinking: painting affords coloring, hence this is the domain where change is likely and about which one needs to be concerned. Painting does not afford changes in shape or mass, and hence one need not concern oneself with these issues.

It should be emphasized that I am not here trying to contribute to the literature on the frame problem, but rather arguing for the significance and relevance of an affordance-based semantics, by showing that it may quite possibly have interesting broad theoretical consequences.

Finally, I want to briefly mention that affordances, when properly conceptualized as partially socially constructed and conventional, are completely compatible with the cognitive program and this despite Lakoff (1987: 215-217) rejection of affordances from the domain of cognitive linguistics. Lakoff's argument only addresses the external referentialist definition of affordances (which, it should be stressed, is the original Gibsonian one). Within that definition, Lakoff's argument are quite effective. But the redefinition presented here (and implicit in most of the linguistic literature on affordances) sidesteps them entirely.

More significantly, however, a positive argument can be made for the incorporation of affordances, and namely that they end up being a very strong argument in favor of the embodied view of meaning. Cognitive linguistics has long argued that meaning is embodied, in the metaphorical sense that it makes reference to the bodies of the speakers of the language (e.g., the concepts of up and down depend on a

verb's more general argument structure, which is also implicitly activated (see Mauner et al. 2002). This is an important issue, which should be stressed, as it may lead to misunderstandings: affordances are not separate and distinct from the contents of semantic frames; they are part of, specifically, a sub-graph of, the frames. So it makes no sense to oppose affordances and frames: all affordances are part of a frame. The issue is that affordances are privileged parts of frames, that seem to be salient or somehow more active than the rest of the frame.

body with an orientation, provided by the placement of the visual organs on the top). However, affordances have very direct neuronal correlates: it has been shown that words activate affordances, including motor-perceptive ones (Glover et al. 2004). In other words, mention of a word like "glass" activates the body's motor system that will be needed to grasp (an affordance) the glass with one's hand.

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