VARIABLE TEMPORAL INTEGRATION
BETWEEN MOTIONAL VERBS AND LOCATIONAL PREPOSITIONS

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This paper presents a semantic analysis of certain ambiguities which arise in structures involving the interaction of 'motional' verbs with 'locational' prepositions. It will be shown that the ambiguities can be accounted for within a descriptive framework that does not appeal to multiple-level syntactic derivations. With a semantic representational scheme that is primarily configurational in nature, it is shown that the ambiguities can be attributed to the various semantic processes by which the configuration of a given 'motional' verb integrates with that of a 'locational' preposition.

0. Introduction

The central problem to be confronted in this paper revolves around the multiple ambiguity of (1).

(1) The cat ran behind the couch.

This structure has (at least) four possible readings:

(1)a. The cat (running) was behind the couch (moving).
b. The cat (running) was behind the couch (not moving).
c. The cat ran to behind the couch.
d. The cat ran via behind the couch.

The present paper assumes that the ambiguity of (1) is attributable to the fact that the single surface syntactic structure of (1) is related to four different semantic structures. This assumption is relatively uncontroversial in view of the fact that early transformational accounts of similar cases of structural ambiguity were based on essentially the same assumption. In those earlier TG accounts, a single surface structure like (1) would be related first to a varied set of syntactic deep structures by means of different types of syntactic transformational rules, primarily movements, deletions, and insertions. These different syntactic deep structures would then be related to a varied set of semantic structures (the nature of which was never seriously investigated in any generative framework). The TG analyses, then, did assume this relation between a single syntactic surface structure and multiple semantic structures, but necessarily assumed an intermediary level of syntactic deep structure

so that the ambiguity could be attributed to the syntactic transformation rules relating deep and surface structures.

In confronting the problem at hand, I will make use of various descriptive tools and theoretical assumptions from the developing theory of Space Grammar (SG). At present, one of the foremost contributions that SG can make to linguistics in general is that it provides a reasonably explicit framework for describing the semantic structures not only of individual lexical items but of higher-order linguistic structures as well. Section 1 of this paper will introduce that SG machinery that will be important in the present discussion. Through this discussion, it should be noted that SG representations of semantic structures are generally of a distinct configurational nature (as opposed, for example, to the logical form of Montague Grammar). This is important for the discussion in section 2, which presents an analysis of the ambiguity phenomena evident in (1). This analysis is crucially dependent upon a set of strategies for the integration of various lexically-designated configurations. It is seen that these distinct strategies can result in variable patterns of integration between the same two configurations, ultimately leading to cases of ambiguity such as that in (1).

This paper is basically descriptive in nature. It is not my intention to provide any argumentation that would compare the merits of this analysis with those of some other analyses. However, the present analysis is offered as a viable alternative to any account which must appeal to a level of linguistic structure (be it syntactic or other) intermediary between the surface syntactic structure and the semantic structure. It will be seen that with the descriptive capacity afforded us by SG, it is possible to account for the ambiguity of (1) without dependence upon any kind of rule for syntactic restructuring. In that case, neither is there any necessity to appeal to levels of structure other than the surface syntax and the semantics.

1. Space Grammar preliminaries

1.1 Definitions

Space Grammar assumes, quite uncontroversially, that the communicational medium of human language functions symbolically. Every unit within the language is actually a symbolic function that is bi-polar in nature. At one pole of the symbolic function is the phonological string. At the opposite pole is the semantic structure that that phonological string symbolizes. At the semantic pole, the minimal unit of meaning that stands in a symbolic relation to some phonological string is referred to in SG as a predicate.

There are numerous linguistically significant parameters along which the predicates of a particular language can be classified. In English, one of the most salient is a parameter of time. There is a basic dichotomy in the predicates of English between those which present a semantic structure obligatorily instantiated through time, and those for which the semantic structure is independent of time. The former are referred to in SG as process predicates. The defining feature, semantically, of process predicates is that their semantic structure presents a positive

temporal profile. That is, the configuration that they designate obligatorily develops over some period of time.[1] The latter are referred to as atemporal or stative predicates. The 'atemporal' characterization refers to the fact that these predicates designate configurations that are conceptually independent of time. When placed in a temporal perspective, such configurations can be instantiated at a single point in time. This is in direct opposition to process predicates, which require more than a single point in time for instantiation. It is this temporal perspective on an atemporal configuration which gives rise to the characterization 'stative', referring to the feature of temporal instantiation at a single point in time.

The semantic contrast between temporally extended processes and atemporal states is pointed out rather clearly by the pairs 'surround' vs. 'around' and 'enter' vs. 'into'. While each pair seems to present the same basic conceptual configuration in the spatial domain, they differ significantly in their temporal characteristics. In SG, 'surround' and 'enter' are characterized as processes. As they are semantically temporal entities, it is predictable that they should take temporal modification in the form of tense and aspect marking.

(2)a. The army surrounds the castle.
b. The army surrounded the castle.
c. The army will/may/can/.../surround the castle.
d. The army has surrounded the castle.
e. The army is surrounding the castle.

(3)a. The enemy enters the city.
b. The enemy entered the city.
c. The enemy will/may/can/.../enter the city.
d. The enemy has entered the city.
e. The enemy is entering the city.

In contrast, 'around' and 'into' are characteristically atemporal states. That is, the configurations which they depict are conceptually independent of time. In this way, they are crucially different from processes. Characteristic of prepositions in English, and indeed of all non-process predicates, is the fact that they cannot be marked for tense or aspect.

(4)a. *The army arounds the castle.
b. *The army arounded the castle.
c. *The army will/may/can/.../around the castle.
d. *The army has arounded the castle.
e. *The army is arounding the castle.

(5)a. *The enemy intoes the city.
b. *The enemy intoed the city.
c. *The enemy will/may/can/.../into the city.
d. *The enemy has intoed the city.
e. *The enemy is intoing the city.

This points out another (not unrelated) indicator of temporal status. In converting (4) and (5) to well-formed finite clauses, inclusion of the copula 'be' is necessary.

(6)a. The army is around the castle.
b. The army was around the castle.
c. The army will/may/can/.../be around the castle.
d. The army has been around the castle.
e. ?The army is being around the castle.

(7)a. The enemy is into the city.
b. The enemy was into the city.
c. The enemy will/may/can/.../be into the city.
d. The enemy has been into the city.
e. ?The enemy is being into the city.

Notice that it is 'be' that carries the tense and aspect marking that affixes characteristically to process predicates. This is one of the phenomena that led Langacker (1979) to identify 'be' as a minimally specified process predicate. It characteristically performs a temporalizing function, thus it can accept temporal modification just like other process predicates.

In contrast, it has been noted for quite some time now that there are certain syntactic environments which require a verb to be supported by the auxiliary 'do' in order to have a well-formed structure. This is actually quite analogous to the case of 'be', which is consistently needed for support of stative predicates in well-formed finite clauses. Any predicate which requires such 'do-support', for example in structures which convey questions or emphasis, will be identifiable as a process predicate.[2]

(8)a. Did the army surround the castle?
b. The army did surround the castle.

(9)a. Did the enemy enter the city?
b. The enemy did enter the city.

(10)a. *Did the army around the castle?
b. *The army did around the castle.

(11)a. *Did the enemy into the city?
b. *The enemy did into the city.

A second parameter along which predicates can be classified concerns what might be termed the 'figural integrity' of semantic structures. Here again, there is an important dichotomy to be introduced. Predicates can either designate things or relations. The term 'thing' can be characterized as a predicate whose referrent is construed as a bounded region in some domain.[3] In English, things are typically designated by nouns. In this paper, we will be focusing on prepositions, which are relational in nature. "A relation[4] is defined as a predicate in which two or more entities are profiled."

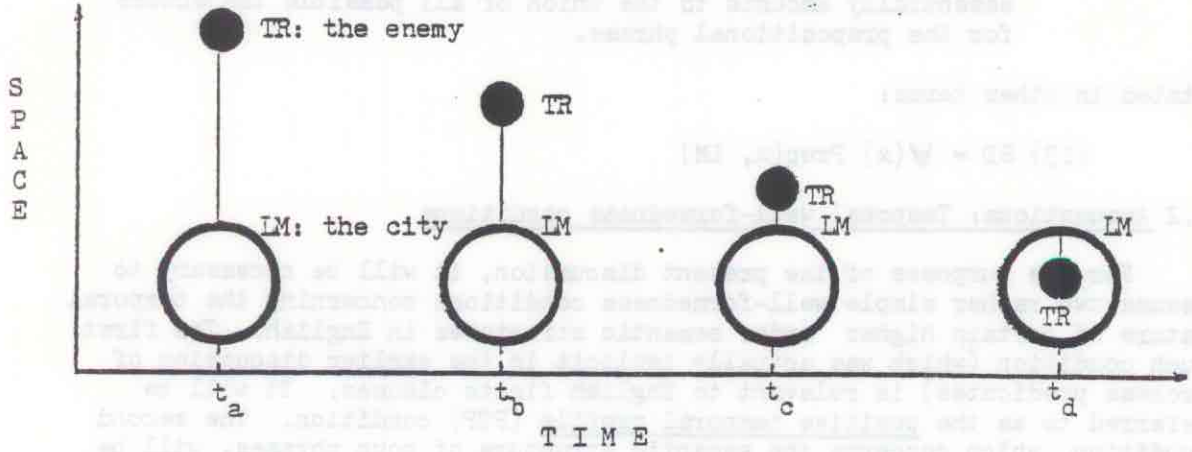
In describing any relational predicate, be it stative or processual, SG makes crucial use of a concept of trajectory, along with the entities which play central roles in any trajectory, the trajector (TR) and landmark (LM).[5] There is an inherent figure/ground organization operating within all relational predicates which results in a natural assymetry in

the salience or importance of the entities which enter into the particular relation. That entity within a relation which assumes greatest prominence by virtue of being in the figure is identified in SG as the trajector. Any other entity within the relation provides a point of reference or landmark, relative to which the situation of the trajector can be specified. For purposes of illustration, let us look back to the processual relation described in (3)a., repeated below.

(3)a. The enemy enters the city.

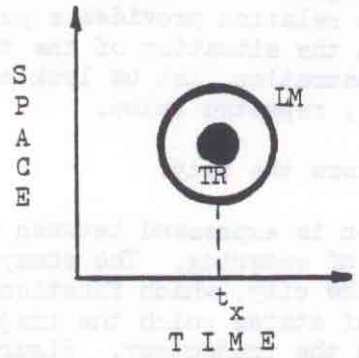
In this instance, a relation is expressed between the enemy and the city. Relating them is a process of entering. The enemy is the trajector, and it is located relative to the city, which functions as a landmark. The temporally-ordered series of states which the trajector occupies relative to the landmark constitutes the trajectory. Figure 1 is a relatively simple SG representation of the situation described in (3)a. The horizontal axis represents the passage of time, in this case during a process which is traced from a beginning time, t_a, to a point of completion, t_d. The vertical axis represents the spatial aspects of the relation. Over the period of time t_a - t_d, the trajector (TR) bears a continuous series of spatial relations to the landmark (LM). Notice that the LM is represented as being constant in its spatial location while the TR is in motion relative to the LM.

Figure 1. The enemy enters the city.



In contrast, note that when the relational predicate designating a trajectory is stative and not processual, the result is a stative trajectory, i.e., a trajectory that exists at a single point in time. Compare the stative trajectory in figure 2 with the related processual trajectory in figure 1.

Figure 2. the enemy in the city



In discussing the semantic structure of English prepositions, it will be necessary to introduce the concept search domain. In the representational scheme being assumed herein, all locational (as opposed to path) prepositions are considered to be relations between a particular landmark and a search domain (SD). The landmark in an English locative expression such as that in figure 2 is designated by the object of the preposition. The search domain is designated by the entire prepositional phrase itself. It is a product of the particular relation expressed by the preposition and the specific landmark to which that relation applies. The concept of search domain can be formally defined as follows:

(12) The SEARCH DOMAIN for any given prepositional phrase consists of all points in space that meet the condition identified by that prepositional phrase. In that sense, the search domain essentially amounts to the union of all possible trajectors for the prepositional phrase.

Stated in other terms:

(13) SD = $\forall$(x) Prep(x, LM)

1.2 Assumptions: Temporal well-formedness conditions

For the purposes of the present discussion, it will be necessary to assume two rather simple well-formedness conditions concerning the temporal nature of certain higher order semantic structures in English. The first such condition (which was actually implicit in the earlier discussion of process predicates) is relevant to English finite clauses. It will be referred to as the positive temporal profile (PTP) condition. The second condition, which concerns the semantic structure of noun phrases, will be referred to as the zero temporal profile (ZTP) condition. Both conditions have been implicit in recent discussions of tense and aspect marking in English within the SG framework.

1.2.1 Positive temporal profile condition

SG assumes that finite clauses in English meet the condition stated in (14).

(14) PTP condition
Every finite clause in English must have a positive temporal profile. That is, a semantically well-formed finite clause in English describes the evolution of some situation through a temporally-ordered series of states. The number of such states is necessarily greater than one.

The lexical item which contributes this positive temporal profile to a finite clause is the process predicate. What this amounts to, then, is a claim that every finite clause in English must have a process predicate to be well-formed. As we have seen, process predicates are identifiable by virtue of the fact that they take the morphological markings for tense and aspect. It is to the PTP condition that we attribute the well-formedness of the structures in (1) - (3) and (6) - (9). This condition also accounts for the ill-formedness of (4), (5), (10) and (11).

1.2.2 Zero temporal profile condition

A primary semantic difference between finite clauses and noun phrases in English resides in the temporal characteristics of each. While English finite clauses obligatorily contain a process predicate, there is no such condition on noun phrases. The lexical items identified syntactically as nouns are not process predicates, attested to by the fact that (when functioning syntactically as nouns) they are never marked for tense or aspect. Nominals are perhaps the prototype of all atemporal or stative predicates in English. Especially when considering nominals which represent physical objects, it becomes readily apparent that nouns identify entities that are conceptually independent of time. Further, it should be noted that any predicate serving an adjectival function within a well-formed NP is also atemporal in nature. As evidenced below, prepositions are quite conducive to this adjectival function, while the corresponding process predicates are not.

(15) the army around the castle

(16) the road into the city

(17) *the army surround the castle

(18) *the road enter the city

Similarly, syntactic adjectives result in well-formed NPs but ill-formed finite clauses for the same reason; they are inherently atemporal.

(19) the tall man

(20)a. *The man talls.
b. *The man talled.
c. *The man will/may/can/.../tall.
d. *The man has talled.
e. *The man is talling.

There are morphological processes in English which essentially rob a process predicate of its positive temporal profile. The resulting lexical items, generally referred to as participials, can function adjectivally in well-formed NPs but cannot provide the temporal profile needed

for a well-formed finite clause.

(21) the aging actress

(22) the broken promise

(23)a. *The actress agings.
b. *The actress aginged.
c. *The actress will/may/can/.../aging.
d. *The actress has aginged.
e. *The actress is aginging.

(24)a. *The promise brokens.
b. *The promise brokened.
c. *The promise will/may/can/.../broken.
d. *The promise has brokened.
e. *The promise is brokening.

Notice that the NPs in (19), (21) and (22), like those in (15) and (16), can be temporalized into well-formed finite clauses through the mediation of the copula 'be', the minimally-specified process predicate identified earlier in similar environments in (6) and (7).

What we have assumed, then, is that NPs in English conform to a completely different temporal well-formedness condition than do finite clauses. That condition, the zero temporal profile condition, can be stated as follows:

(25) ZTP condition
Every noun phrase in English must have a zero temporal profile. That is, a semantically well-formed NP in English describes a configuration that is conceptually independent of time. It can be instantiated at any single point in time, throughout a period of time of indefinite duration, or conceptually abstracted away from the temporal realities of time completely.

This condition accounts for the well-formedness of (15), (16), (19), (21) and (22). It also accounts for the ill-formedness of (17) and (18). The ill-formedness of (20), (23) and (24) is attributable to the PTP condition.

2. Variable temporal integration

In this section, I will present an analysis for the ambiguity of (1) which depends crucially upon principles of temporal integration between predicates. The analysis attributes that ambiguity to variable patterns of integration between the process predicate 'run' and the atemporal/stative predicate 'behind'. This analysis assumes that prepositions serve both the adjectival function discussed in 1.2.2 as well as an adverbial function, directly modifying verbs and thereby integrating directly with process predicates.

2.0.1 Configurational representations

For the analysis in this section I will assume the state/process dichotomy exactly as it was discussed earlier. Throughout this discussion we will be concerned only with a single process predicate, 'run', and three stative predicates, 'cat', 'couch' and 'behind'.

In giving a SG configurational representation for the process predicate 'run', it is necessary to bear in mind that, as a process, 'run' presents a configuration that evolves through time. While this evolution is, in reality, continuous and coincidental with the passage of time, it will be represented here as a temporally ordered set of discrete states within the process. This is done simply for ease of representation. In interpreting the representations to be given throughout the rest of the paper, the reader should constantly bear this simplification in mind.

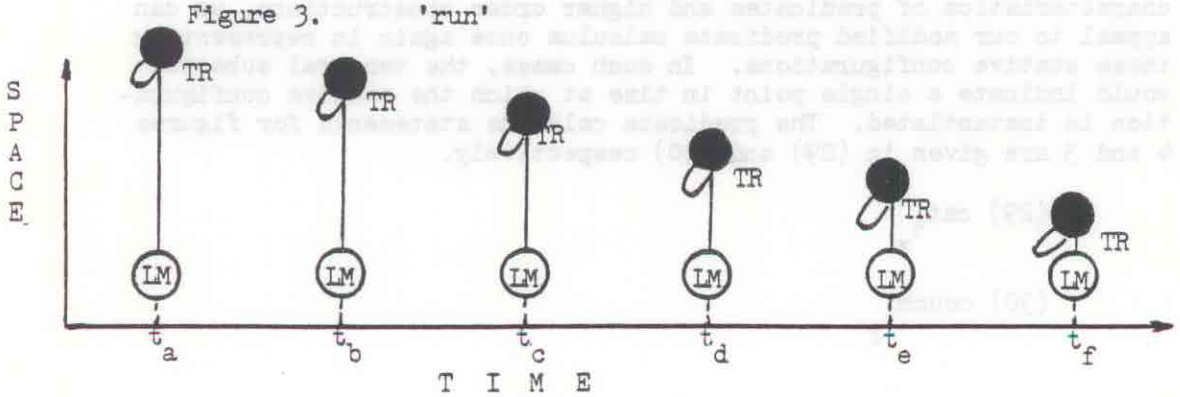
As for the specifications of the process in the spatial domain, it should be noted that 'run' is actually a complex configuration of two intimately coordinated trajectories, one being an external motion trajectory and the other a reflexive motion trajectory. In the case of the former, an accurate representation must depict the motion of the trajector relative to the external environment. In so doing, we simply isolate an arbitrary unspecified point in space as a locative landmark and trace the evolution of the trajector's physical relation to that landmark throughout the temporal profile of the process. As for the latter, it should be noted in our representation that the process 'run' consists not only of the movement of the trajector relative to the surrounding environment, but also of movements of parts of the body relative to the body itself. It is this reflexive trajectory, in which the trajector is also the landmark, which distinguishes predicates like 'run' and 'walk'[8] from other predicates of external motion, such as 'go' and 'move' in (26) and (27).

(26) The cat went behind the couch.

(27) The cat moved behind the couch.

The reflexive component of the 'run' trajectory is represented as a loop leading from the trajector back to itself as the reflexive landmark. The external relation is captured in the line from the trajector to the unspecified external landmark. The resulting configuration is given in figure 3.

Figure 3. 'run'



There will be times during the discussion that we will be concerned only with the temporal profile of a predicate, and not the complete temporal configuration. For these cases, we can adopt a modified predicate calculus in which the temporal profile of a predicate is given by a temporal subscript on that predicate. The modified predicate calculus representation of 'run' in figure 3 is given in (28).

(28) $run_{t_a \ldots t_f}$ (TR)

As for the stative configurations to be posited for this discussion, we are not deeply concerned with the configurations presented by the nominals 'cat' and 'couch'. Thus, without any further discussion, I will accept figures 4 and 5 as adequate representations of those things (but adequate only for our present purposes).

Figure 4. 'cat'

a. atemporal b. stative

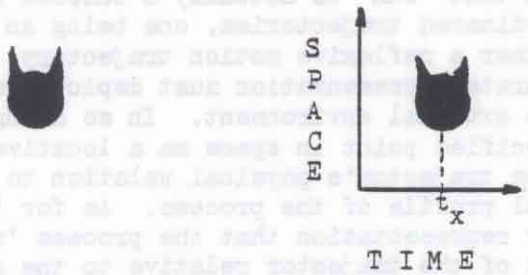
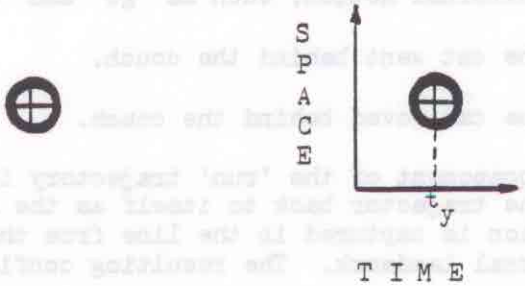


Figure 5. 'couch'

a. atemporal b. stative



Notice that when the discussion focusses only upon the temporal characteristics of predicates and higher order constructions, we can appeal to our modified predicate calculus once again in representing these stative configurations. In such cases, the temporal subscript would indicate a single point in time at which the stative configuration is instantiated. The predicate calculus statements for figures 4 and 5 are given in (29) and (30) respectively.

(29) cat_{t_x}

(30) $couch_{t_y}$

The stative configuration that is of central concern here is that for the predicate 'behind'. Like all other English prepositions, 'behind' is relational in character. It will be identified here as a member of the class of locational prepositions. Characteristic of such locationals is the fact that they readily combine with posture verbs such as 'sit', 'stand', 'lie' and 'kneel'.

(31)a. The cat sat behind the couch.
b. The cat sat near the couch.
c. The cat sat beneath the couch.
d. The cat sat on the couch.

Non-locational prepositions, primarily those that designate paths rather than locations, do not so readily combine with posture verbs.

(32)a. *The cat sat to the couch.
b. *The cat sat from the couch.
c. *The cat sat through the couch.
d. *The cat sat via the couch.

These non-locational prepositions do combine readily with verbs of motion.

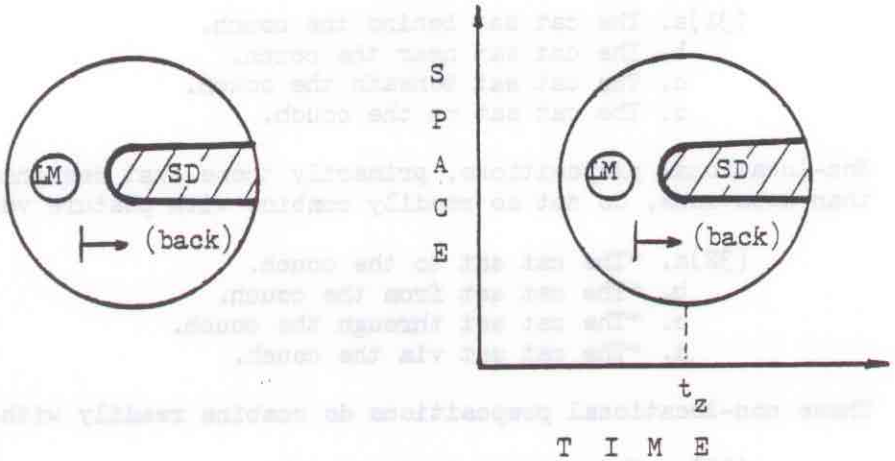
(33)a. The cat ran to the couch.
b. The cat leaped from the couch.
c. The cat sauntered through the door.
d. The cat went (to his litter box) via the kitchen sink.

Returning to the configurational representation for the 'behind' relation, it will contain a particular unique point in space identified as the landmark. It will also have some specific set of points in the FRONT/BACK horizontal dimension which constitute the search domain. That set of points will be represented by a set of parallel, diagonal lines enclosed within a boldface border. As 'front' and 'back' are inherently relational terms themselves, FRONT and BACK in the configuration are necessarily determined relative to the particular landmark. The search domain for 'behind' consists of those points in the BACK portion of the FRONT/BACK horizontal dimension with respect to the landmark.

One final note must be made concerning the configuration to be posited for 'behind'. The configuration will be enclosed, quite conspicuously, within a circle. That circle is meant to represent the neighborhood within which the spatial relation is discovered. The configurations of all English prepositions will be enclosed within such a neighborhood. This is based upon an assumption (which has its basis in the Piagetian account of the child's early adaptations to physical space) that we can productively express a spatial relation between two entities only if they are perceived as existing within a common neighborhood. Thus, if the neighborhood we are considering is this particular page, we can productively express a spatial relation between the first word and the last word on this page. However, it is completely impossible, given the same neighborhood, to express a spatial relation between the first word on this page and the first word on the preceding page. In addition, it is necessary to point out that the extent of the neighborhoods that are represented in these configurations is variable along lines of the particular scope attributed to the proximity relation defining the neigh-

borhood. The configuration that will be posited for 'behind' is given in figure 6. The modified predicate calculus statement for the same predicate follows in (34).

Figure 6. 'behind'
a. atemporal b. stative



(34) behind_{t_z} (SD, LM)

2.02 On the concept of temporal integration of predicates

It has been proposed that English predicates can be classified according to a feature of temporal profile. Predicates which designate configurations obligatorily extended through time are called processes. Within this class (but perhaps not exhaustive of it) is the set of predicates identified syntactically as verbs. English prepositions, as they have been characterized in this paper, are not, nor can they be, process predicates. They cannot take the temporal modifications of tense and aspect characteristic of process predicates. They are inherently atemporal/stative.

In assuming this linguistically significant dichotomy between process and state, an important question must be confronted. We know that in many cases prepositional phrases modify nominals, thus serving an adjectival function. In this case, it would have to be claimed that certain temporally harmonious predicates can readily combine to form a certain type of well-formed, higher order semantic structure. In other cases, prepositions seem to perform adverbial functions, modifying verbs. If that is the case, then the claim would have to be that temporally divergent predicates can also combine to form yet another type of well-formed, higher order semantic structure. Even if one were to claim that prepositions do not perform such an adverbial function, one would still have to account for the semantic combination between subject nominals (stative in nature) and the corresponding verbs (processual in nature). Thus, it would appear to be impossible to avoid a claim that temporally divergent predicates can be integrated into well-formed semantic structures. That being the case, it then becomes a necessary responsibility of such a grammar to propose

principles of temporal integration which accurately describe the semantic combination not only of temporally harmonious predicates (e.g., state and state), but also of temporally divergent predicates (state and process). In the remainder of this paper we will begin the investigation into the kinds of statements that need to be made in such a grammar.

2.1 Principles of temporal integration

In this section I will propose five different principles by which English predicates can integrate temporally. In 2.1.1, I will introduce the principle of stative coincidence, which applies to the temporal integration of stative predicates with other stative predicates. In 2.1.2, I propose four principles which apply to the temporal integration between process and stative predicates. These integration principles fall quite naturally into two classes; there is one class in which a stative configuration is maintained throughout the temporal profile of the process with which it integrates, and a second class in which a stative configuration selectively integrates with a single, specific state within the temporal profile of the process. The former will be referred to as maintenance principles, the latter as selection principles. Through the discussion in 2.1.2 it will be seen that the multiple ambiguity of (1) can be attributed to these variable patterns of temporal integration between 'run' and 'behind'.

2.1.1 Temporal integration in NPs: stative coincidence

Recall from the discussion of temporal well-formedness in NPs that all nominals in English are, by definition, stative predicates. Recall also that individual lexical items serving an adjectival function within a well-formed NP are also stative. Finally, recall that all well-formed NPs must meet the ZTP condition. That is, the higher order semantic structure of the NP must be instantiated at a single point in time. This provides the key to understanding the temporal integration in NPs.

For purposes of illustration, let us turn first to the well-formed NP in (19), repeated below.

(19) the tall man

This NP is composed of a head nominal 'the man'[10] and an adjective 'tall' which modifies it. As each is a stative predicate, they can be represented in the predicate calculus with the appropriate temporal subscript, as in (35) and (36).

(35) the man_{t_x}

(36) $\text{tall}_{t_x}\ (\text{TR})$

In achieving the necessary condition of temporal well-formedness for a NP, what is necessary is that the stative configurations of the component predicates coincide at a single point in time. Since the stative predicates in (35) and (36) bear the same temporal subscript, they can combine to form the well-formed NP represented in (37).

(37) tall_{t_x} (TR) + the man_{t_x} = the tall man_{t_x}

No temporal integration would be possible if the two predicates did not bear the same temporal subscript. Thus, the stative predicate in (36) can successfully integrate with that in (35), but not with the nominal represented in (38).

(38) the man_{t_y}

The temporal integration principle of stative coincidence can be stated as follows:

(39) Stative coincidence (SC)
Any two stative configurations can integrate into a well-formed, higher order structure if and only if they have the same temporal point of instantiation.

Notice that this same integration principle can account for the temporal integration between nominals and the participial modifiers discussed earlier.

(40) aging_{t_y} (TR) + the actress_{t_y} = the aging actress_{t_y} (SC)[11]

(41) broken_{t_z} (TR) + the promise_{t_z} = the broken promise_{t_z} (SC)

This same principle is applicable to those cases in English in which a noun serves an adjectival function within a well-formed NP.

(42) kitchen_{t_v} + the sink_{t_v} = the kitchen sink_{t_v} (SC)

Let us now consider the temporal integration in (43), which bears an obvious semantic relation to the ambiguous structure in (1).

(43) the cat behind the couch

This structure is slightly more complex than those represented in (37), (40), (41) and (42) only because it involves two applications of the SC principle. As in the previous examples, we have a NP structure composed of a nominal and a modifier. As before, the integration between the nominal and its modifier is accomplished by SC.

(44) the cat_{t_w} + $\text{behind the couch}_{t_w}$ (TR) =

$\text{the cat behind the couch}_{t_w}$ (SC)

In this case, however, the modifier is not an individual predicate but a complex semantic structure.[12] The components of that structure are 'behind' and 'the couch', both of which are stative predicates. Thus,

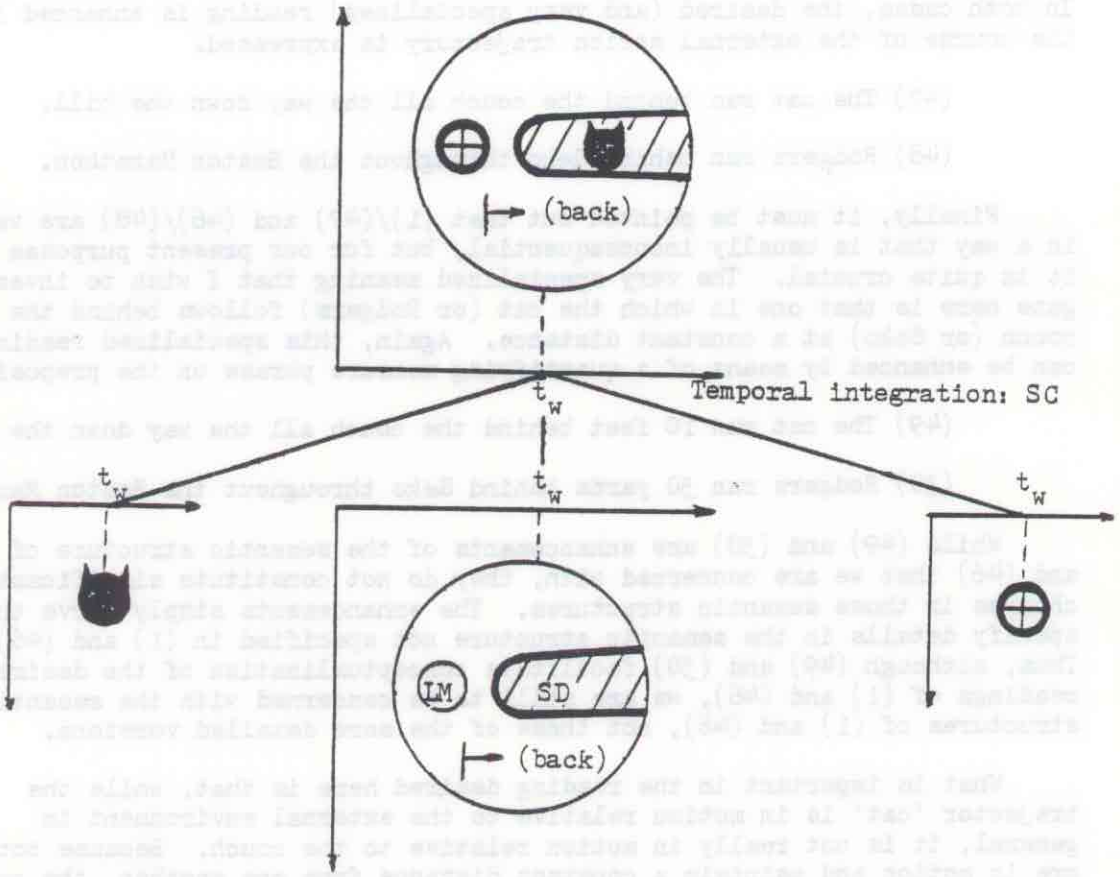
the temporal integration within the prepositional phrase can also be accounted for by SC.

(45) the cat_{t_w} $+^{i}$ $behind_{t_w}$ (TR, LM) $+^{ii}$ the $couch_{t_w}$ =

the cat behind the $couch_{t_w}$ i. SC
ii. SC

This same structure can be represented more explicitly in the configurational scheme adopted earlier. That representation is given in figure 7.

Figure 7. the cat behind the couch



2.1.2 Temporal integration in finite clauses

2.1.2.1 Maintenance principles

2.1.2.1.1 Maintenance I: configurational uniformity

The reading of (1) to be dealt with in this section is a very specialized version of that paraphrased in (1)a., both of which are repeated below.

(1) The cat ran behind the couch.
(1)a. The cat (running) was behind the couch (moving).

Although the typical conceptualization of a couch would probably be as a static, immobile piece of furniture, it is not really difficult to construct a context in which such an object would be in motion, followed by a cat in hot pursuit. Consider the case of a couch on rollers having escaped the grasp of moving men as they unloaded it from a moving van parked on a steep hill. As it rolls freely down the hill, the errant couch catches the eye of a playful cat, which immediately begins to pursue the couch. In such a case, (1), as paraphrased in (1)a., would capture the scene quite nicely. For those still having difficulty imagining the situation in (1)a., I offer in its place the directly comparable, and perhaps more pragmatically acceptable, structure in (46).

(46) Rodgers ran behind Seko.

In both cases, the desired (and very specialized) reading is enhanced if the course of the external motion trajectory is expressed.

(47) The cat ran behind the couch all the way down the hill.

(48) Rodgers ran behind Seko throughout the Boston Marathon.

Finally, it must be pointed out that (1)/(47) and (46)/(48) are vague in a way that is usually inconsequential, but for our present purposes it is quite crucial. The very specialized meaning that I wish to investigate here is that one in which the cat (or Rodgers) follows behind the couch (or Seko) at a constant distance. Again, this specialized reading can be enhanced by means of a quantifying measure phrase on the preposition.

(49) The cat ran 10 feet behind the couch all the way down the hill.

(50) Rodgers ran 50 yards behind Seko throughout the Boston Marathon.

While (49) and (50) are enhancements of the semantic structure of (1) and (46) that we are concerned with, they do not constitute significant changes in those semantic structures. The enhancements simply serve to specify details in the semantic structure not specified in (1) and (46). Thus, although (49) and (50) facilitate conceptualization of the desired readings of (1) and (46), we are still to be concerned with the semantic structures of (1) and (46), not those of the more detailed versions.

What is important in the reading desired here is that, while the trajector 'cat' is in motion relative to the external environment in general, it is not really in motion relative to the couch. Because both are in motion and maintain a constant distance from one another, the cat actually occupies the exact same point (or region) within the SD of 'behind' (as determined relative to the couch) throughout the motion trajectory of the process 'run'.

The important features to be accounted for in our investigation of temporal integration in this semantic structure have all been introduced. First, we have a trajector, which is a nominal, and thus stative by definition.

(51) the cat_{t_u}

This nominal must integrate semantically with the process predicate 'run', which, by definition, must be instantiated over some period of time. We will assume that this temporal profile initiates at time t_1 and continues through time t_5.

(52) $\text{run}_{t_1 \ldots t_5}(\text{TR})$

In temporally integrating with this predicate, the cat is not instantiated at just a single point in time, but rather it exists throughout the temporal profile of the process. What is emerging here is a phenomenon in which a process predicate can lend its temporal profile to a stative predicate with which it integrates. As the process is the inherently temporal predicate, we can say that it maintains the stative predicate throughout its temporal profile. The result is a complex semantic structure with the same temporal profile as in (52).

(53) $\text{the cat}_{t_u} +^{i} \text{run}_{t_1 \ldots t_5}(\text{TR}) = \text{The cat ran}^{13}_{t_1 \ldots t_5}$

i. Maintenance

It is also the case that throughout the temporal profile $t_1 \ldots t_5$ the cat bears the 'behind' relation to the couch. This relation is also stative in nature. As before, we can propose that the stative configuration of 'behind the couch' is maintained by the process 'run' in the same way that the trajector 'cat' was.

Before giving a summary of the temporal integration involved in (1)a., it is necessary to point out that I am making an important assumption concerning the order of application of these temporal integration principles. I will assume that temporal integration proceeds according to the hierarchical structure of the clause rather that according to the linear structure of the surface string. It could be proposed, then, that temporal integration operates much like the cyclic transformation rules in TG, starting at the lower nodes and working upward. In this case, however, temporal integration would operate at every node, not just at cyclic S nodes, as is the case for the transformation rules. Given this assumption, (54) captures the temporal integration involved in (1)a.

(54) $\text{the cat}_{t_u} +^{iii} \text{run}_{t_1 \ldots t_5}(\text{TR}) +^{ii} \text{behind the couch}_{t_v}$

$\text{behind}_{t_v} +^{i} \text{the couch}_{t_v}$

i. SC
ii. Maintenance
iii. Maintenance

In rendering this temporal integration principle in a reasonably formal statement, it is necessary to note two crucial features of this particular integration process. First is the fact that a process predicate can lend its temporal profile to a stative predicate, thereby maintaining

it through that temporal profile. Second, the stative configuration is maintained uniformly throughout the temporal profile. That is, the same exact stative configuration that is instantiated at the initial point in the temporal profile is also instantiated at all other points in the temporal profile. This feature, identified here as configurational uniformity, must be specified primarily because of the distinction in the way 'behind' is maintained in (1)a. and (1)b. It refers to the fact, pointed out earlier, that the cat occupies the exact same point within the SD of 'behind' throughout the temporal profile of the complex structure. In this way, a uniform 'behind' relation between the cat and the couch is maintained. Given in (55), then, is a formal statement of this integration principle.

(55) Maintenance: configurational uniformity (MI)
  a. A process predicate can integrate with a stative predicate if the process predicate lends its temporal profile to the stative predicate.
  b. The stative configuration instantiated at any point within the temporal profile assumed from the process is the same as that instantiated at any other time in the temporal profile.

The necessity for this particular maintenance principle is not limited to this admittedly obscure reading for (1). Indeed, its application is quite widespread in English. Note that this same feature of configurational uniformity (in (55)b.) applies as well to nominals that are maintained by virtue of their integration with process predicates in the role of trajector (or subject). The configuration of the cat, for example, remains unchanged throughout its integration with the temporally instantiated process 'run'. In addition, this same pattern of integration arises constantly between prepositions and the class of verbs that can be identified semantically as posture verbs.

(56) John stood on the table (for three hours).

(57) Mary sat in the corner (during the entire dance).

(58) Ophelia kneeled at the altar (while her child was baptized).

The stative configuration of a preposition is also maintained in this same way, uniformly through time, when the process predicate is the copula 'be'.

(59) Zeno was in his office (all day long).

It should also be noted that this uniformed temporal maintenance of a stative predicate is not restricted to prepositions and nominals. True syntactic adjectives are similarly maintained when integrated with perception verbs as well as the copula 'be'.

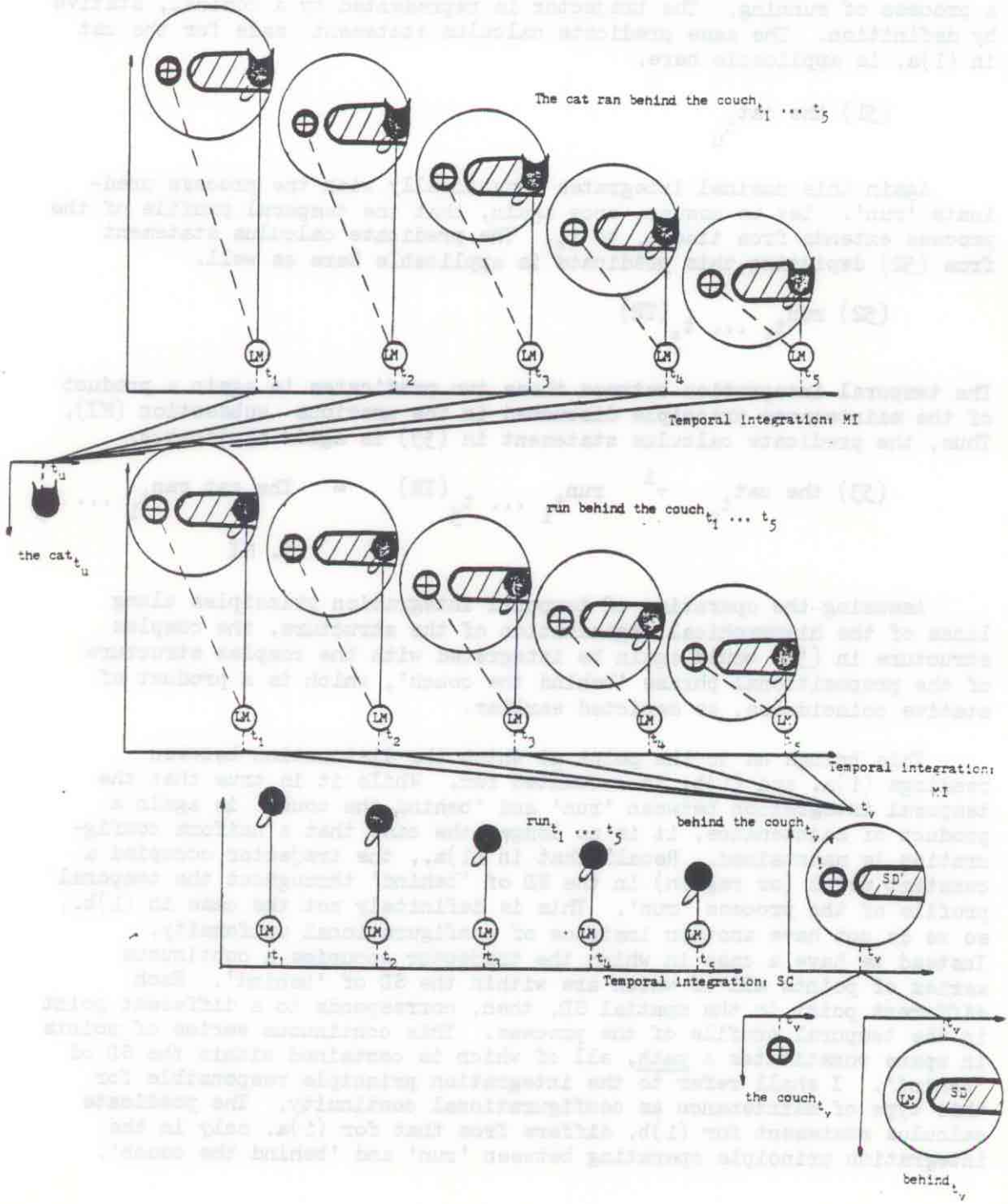
(60)a. The soup sure smells good. (*well)
  b. The soup sure is good. (*well)

(61)a. The plan sounds reasonable to me. (*reasonably)
  b. The plan is reasonable. (*reasonably)

(62)a. Howard certainly looks young for his age. (?*youngly)
b. Howard certainly is young. (?*youngly)

Assuming the hierarchical application of temporal integration principles discussed earlier, the structure of (1)a. can be given more explicitly with our configurational representation scheme.[14]

Figure 8. The cat (running) was behind the couch (moving).



2.1.2.1.2 Maintenance II: configurational continuity

In this subsection we are concerned with the reading of (1) paraphrased in (1)b.

(1) The cat ran behind the couch.
(1)b. The cat (running) was behind the couch (not moving).

As in the previous case, there is a trajector which is involved in a process of running. The trajector is represented by a nominal, stative by definition. The same predicate calculus statement made for the cat in (1)a. is applicable here.

(51) the cat_{t_u}

Again this nominal integrates semantically with the process predicate 'run'. Let us assume, once again, that the temporal profile of the process extends from time t_1 to t_5. The predicate calculus statement from (52) depicting this predicate is applicable here as well.

(52) $run_{t_1 \ldots t_5}(TR)$

The temporal integration between these two predicates is again a product of the maintenance principle discussed in the previous subsection (MI). Thus, the predicate calculus statement in (53) is again applicable.

(53) the cat_{t_u} $+^{i}$ $run_{t_1 \ldots t_5}(TR)$ = The cat $ran_{t_1 \ldots t_5}$

i. MI

Assuming the operation of temporal integration principles along lines of the hierarchical organization of the structure, the complex structure in (53) would again be integrated with the complex structure of the prepositional phrase 'behind the couch', which is a product of stative coincidence, as depicted earlier.

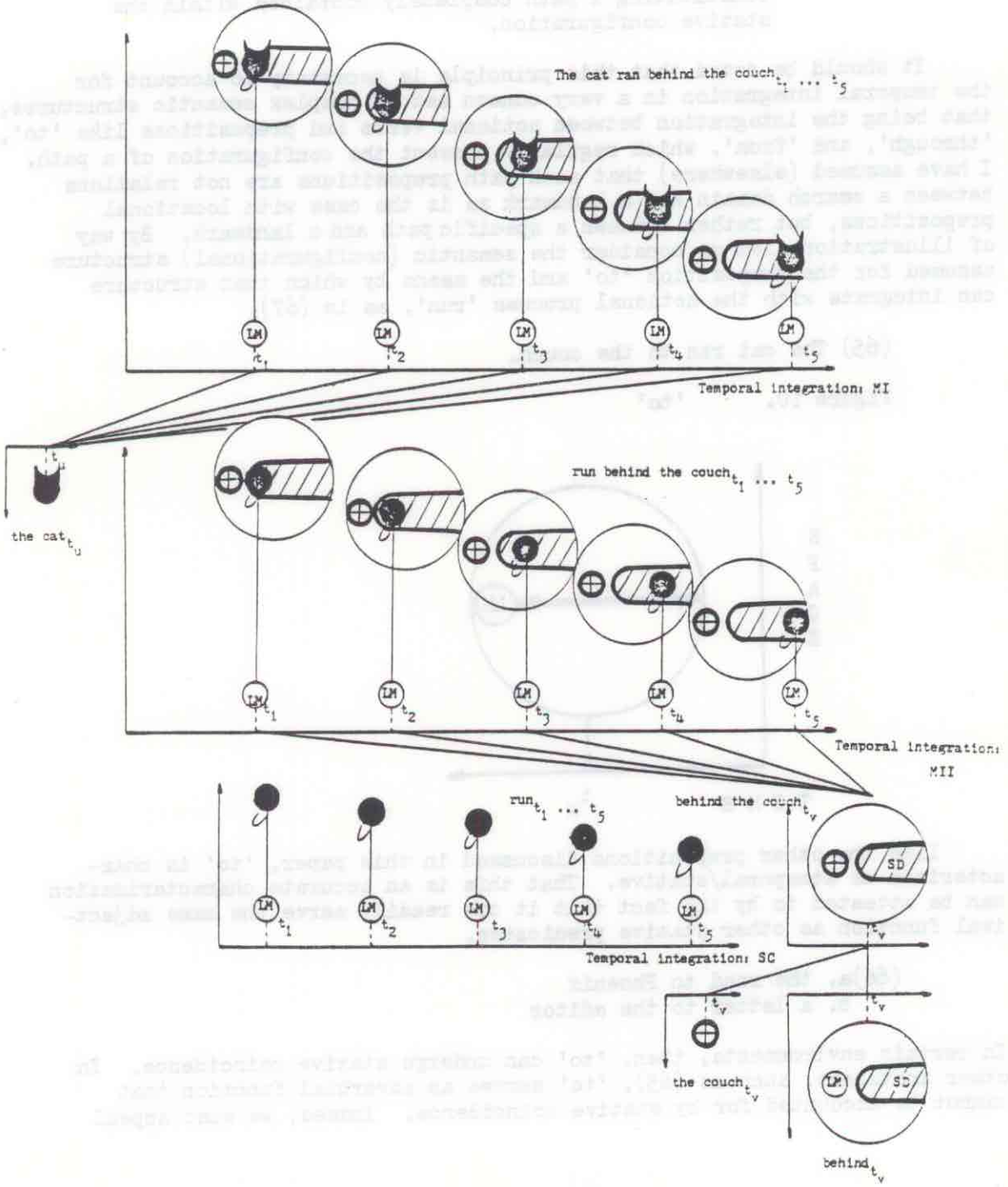
This brings us to the point at which the distinction between readings (1)a. and (1)b. is accounted for. While it is true that the temporal integration between 'run' and 'behind the couch' is again a product of maintenance, it is no longer the case that a uniform configuration is maintained. Recall that in (1)a., the trajector occupied a constant point (or region) in the SD of 'behind' throughout the temporal profile of the process 'run'. This is definitely not the case in (1)b., so we do not have another instance of configurational uniformity. Instead we have a case in which the trajector occupies a continuous series of points all of which are within the SD of 'behind'. Each different point in the spatial SD, then, corresponds to a different point in the temporal profile of the process. This continuous series of points in space constitutes a path, all of which is contained within the SD of 'behind'. I shall refer to the integration principle responsible for this type of maintenance as configurational continuity. The predicate calculus statement for (1)b. differs from that for (1)a. only in the integration principle operating between 'run' and 'behind the couch'.

(63) the cat_{t_u} $+^{iii}$ $\text{run}_{t_1 \ldots t_5}$ (TR) $+^{ii}$ behind the couch_{t_v}

behind_{t_v} $+^{i}$ the couch_{t_v}

i. SC
ii. MII
iii. MI

Figure 9. The cat (running) was behind the couch (not moving).



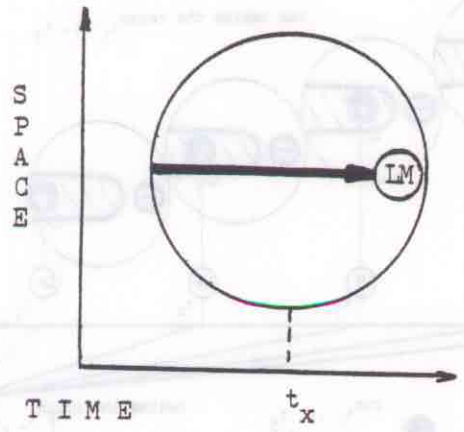
This second maintenance principle of temporal integration can be characterized as follows:

(64) Maintenance: configurational continuity (MII)
  a. A process predicate can integrate with a stative predicate if the process predicate lends its temporal profile to the stative predicate.
  b. Each successive point in the processual configuration integrates with a different point within the stative configuration. This series of points is continuous, constituting a path completely contained within the stative configuration.

It should be noted that this principle is necessary to account for the temporal integration in a very common set of complex semantic structures, that being the integration between motional verbs and prepositions like 'to', 'through', and 'from', which regularly present the configuration of a path. I have assumed (elsewhere) that such path prepositions are not relations between a search domain and a landmark as is the case with locational prepositions, but rather between a specific path and a landmark. By way of illustration, let us consider the semantic (configurational) structure assumed for the preposition 'to' and the means by which that structure can integrate with the motional process 'run', as in (67).

(65) The cat ran to the couch.

Figure 10. 'to'



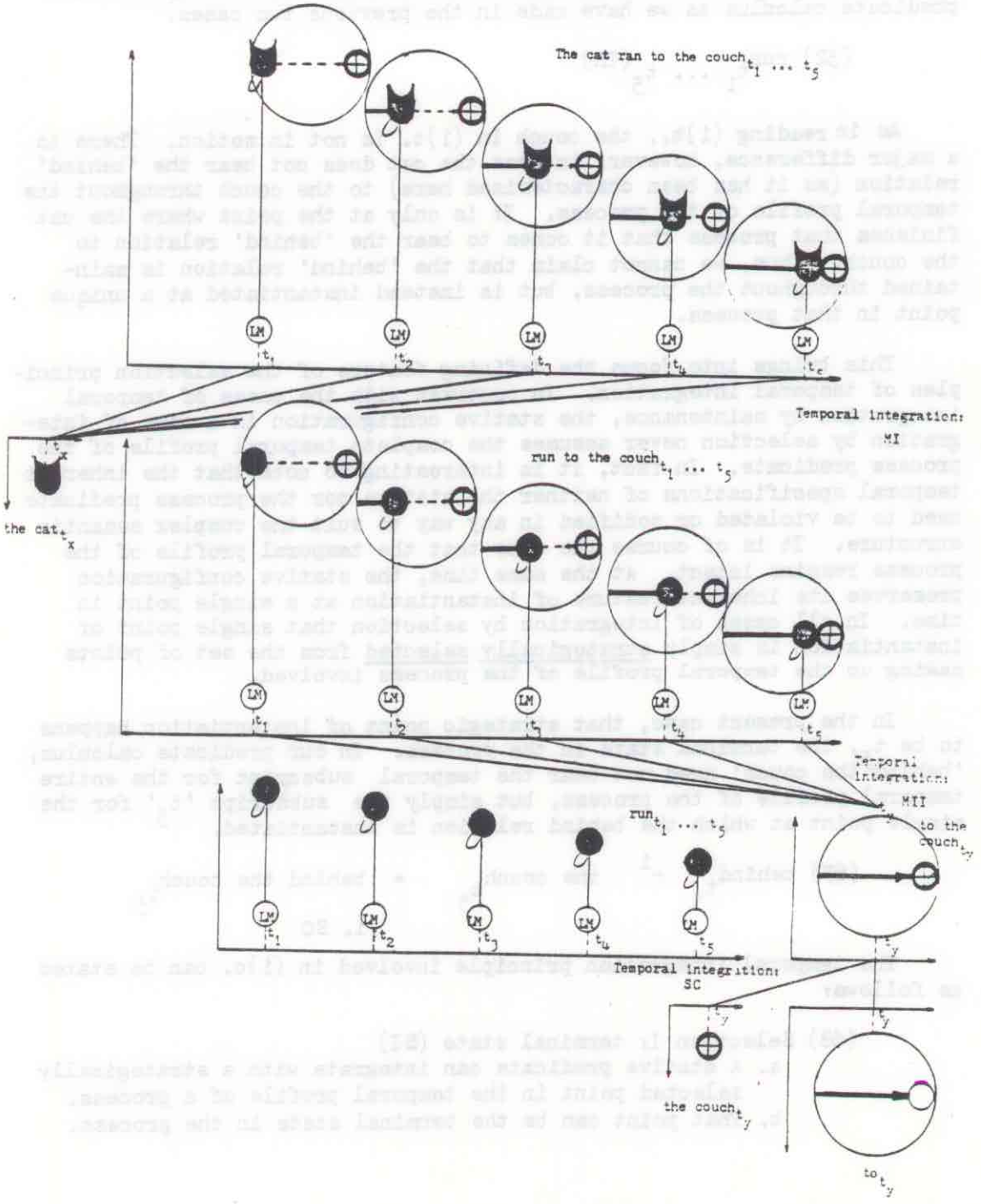
Like the other prepositions discussed in this paper, 'to' is characterized as atemporal/stative. That this is an accurate characterization can be attested to by the fact that it can readily serve the same adjectival function as other stative predicates.

(66)a. the road to Phoenix
  b. a letter to the editor

In certain environments, then, 'to' can undergo stative coincidence. In other instances, such as (65), 'to' serves an adverbial function that cannot be accounted for by stative coincidence. Indeed, we must appeal

to the maintenance principle of configurational continuity to account for the temporal integration in (65). That is, there is no single point in the temporal profile of the process 'run' when the complete path configuration of 'to' integrates with a state in the process. Thus, we definitely do not have a case of configurational uniformity. Instead, at each successive point in the temporal profile of the process, the cat occupies a different point in the path. Characteristic of configurational continuity, that series of points is continuous, and, as a set, the points constitute the 'to' path. Figure 11 captures the temporal integration involved in (65).

Figure 11. The cat ran to the couch.



2.1.2.2 Selection principles

2.1.2.2.1 Selection I: terminal state

We now turn to the reading of (1) that is paraphrased in (1)c.

(1) The cat ran behind the couch.
(1)c. The cat ran to behind the couch.

As in the previous cases, we can assume that the process of running in which the cat is participating has begun by time t_1 and continues through time t_5. Thus, we can make the same statement in our modified predicate calculus as we have made in the previous two cases.

(52) $run_{t_1 \ldots t_5}(TR)$

As in reading (1)b., the couch in (1)c. is not in motion. There is a major difference, however, in that the cat does not bear the 'behind' relation (as it has been characterized here) to the couch throughout the temporal profile of the process. It is only at the point where the cat finishes that process that it comes to bear the 'behind' relation to the couch. Thus, we cannot claim that the 'behind' relation is maintained throughout the process, but is instead instantiated at a unique point in that process.

This brings into focus the defining feature of the selection principles of temporal integration. In contrast with the cases of temporal integration by maintenance, the stative configuration in a case of integration by selection never assumes the complete temporal profile of the process predicate. In fact, it is interesting to note that the inherent temporal specifications of neither the stative nor the process predicate need to be violated or modified in any way to suit the complex semantic structure. It is of course the case that the temporal profile of the process remains intact. At the same time, the stative configuration preserves its inherent feature of instantiation at a single point in time. In all cases of integration by selection that single point of instantiation is simply strategically selected from the set of points making up the temporal profile of the process involved.

In the present case, that strategic point of instantiation happens to be t_5, the terminal state in the process. In our predicate calculus, 'behind the couch' need not bear the temporal subscript for the entire temporal profile of the process, but simply the subscript 't_5' for the single point at which the behind relation is instantiated.

(67) $\text{behind}_{t_5} +^{i} \text{the couch}_{t_5} = \text{behind the couch}_{t_5}$

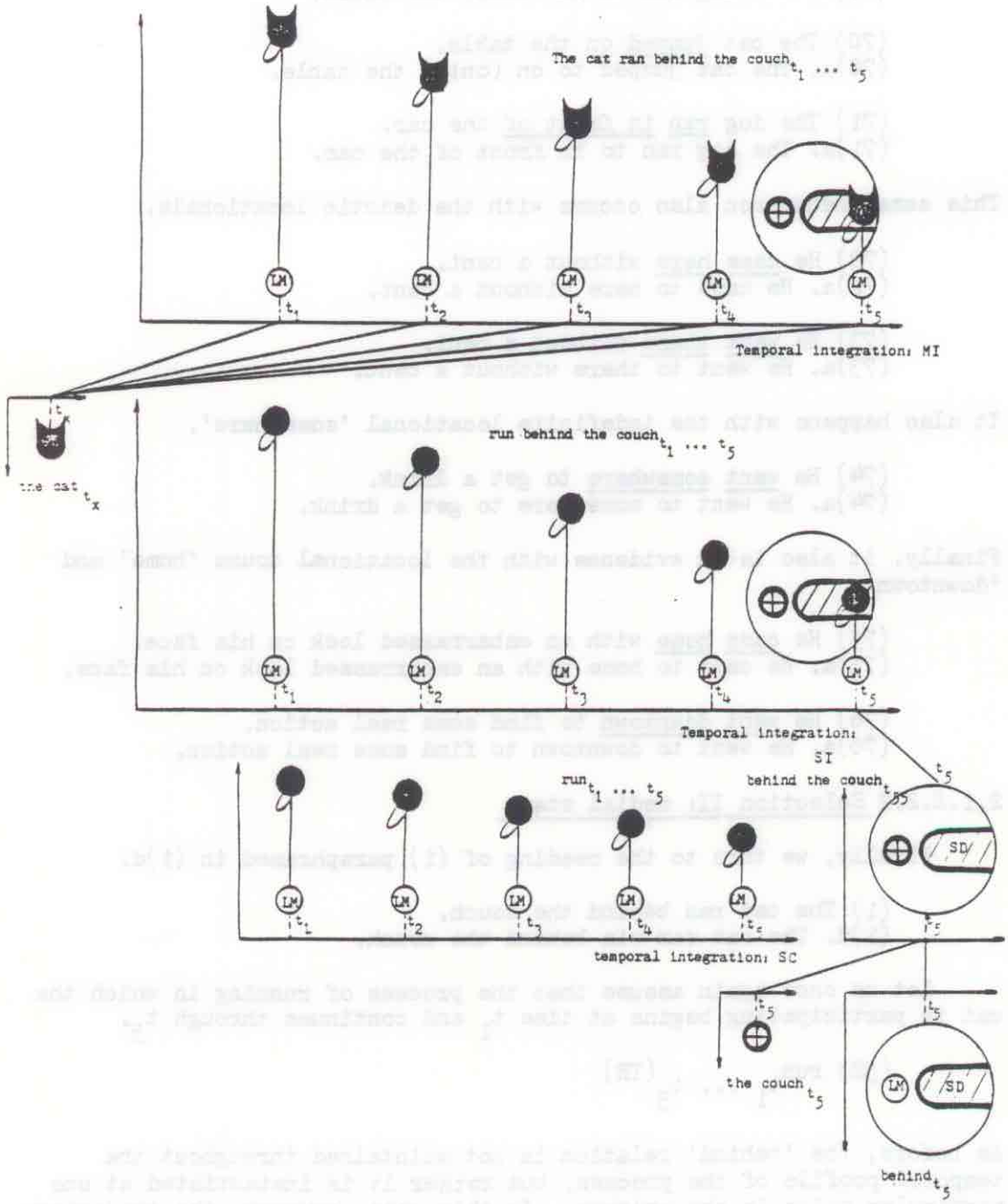
i. SC

The temporal integration principle involved in (1)c. can be stated as follows:

(68) Selection I: terminal state (SI)
a. A stative predicate can integrate with a strategically selected point in the temporal profile of a process.
b. That point can be the terminal state in the process.

The configurational representation for the complex semantic structure in (1)c. is given in figure 12.

Figure 12. The cat ran to behind the couch.



It is once again important to note that this integration principle is applicable to cases other than (1)c., but all (that I have been able to discover so far) involve the integration of motional verbs with some other semantic structure designating a location. Indeed, we find other locational prepositions exhibiting this same phenomenon.

(69) The dog ran in the house.
(69)a. The dog ran to in (into) the house.

(70) The cat jumped on the table.
(70)a. The cat jumped to on (onto) the table.

(71) The dog ran in front of the car.
(71)a. The dog ran to in front of the car.

This same phenomenon also occurs with the deictic locationals.

(72) He came here without a cent.
(72)a. He came to here without a cent.

(73) He went there without a cent.
(73)a. He went to there without a cent.

It also happens with the indefinite locational 'somewhere'.

(74) He went somewhere to get a drink.
(74)a. He went to somewhere to get a drink.

Finally, it also is in evidence with the locational nouns 'home' and 'downtown'.

(75) He came home with an embarrassed look on his face.
(75)a. He came to home with an embarrassed look on his face.

(76) He went downtown to find some real action.
(76)a. He went to downtown to find some real action.

2.1.2.2.2 Selection II: medial state

Finally, we turn to the reading of (1) paraphrased in (1)d.

(1) The cat ran behind the couch.
(1)d. The cat ran via behind the couch.

Let us once again assume that the process of running in which the cat is participating begins at time t_1 and continues through t_5.

(52) $run_{t_1 \ldots t_5}(TR)$

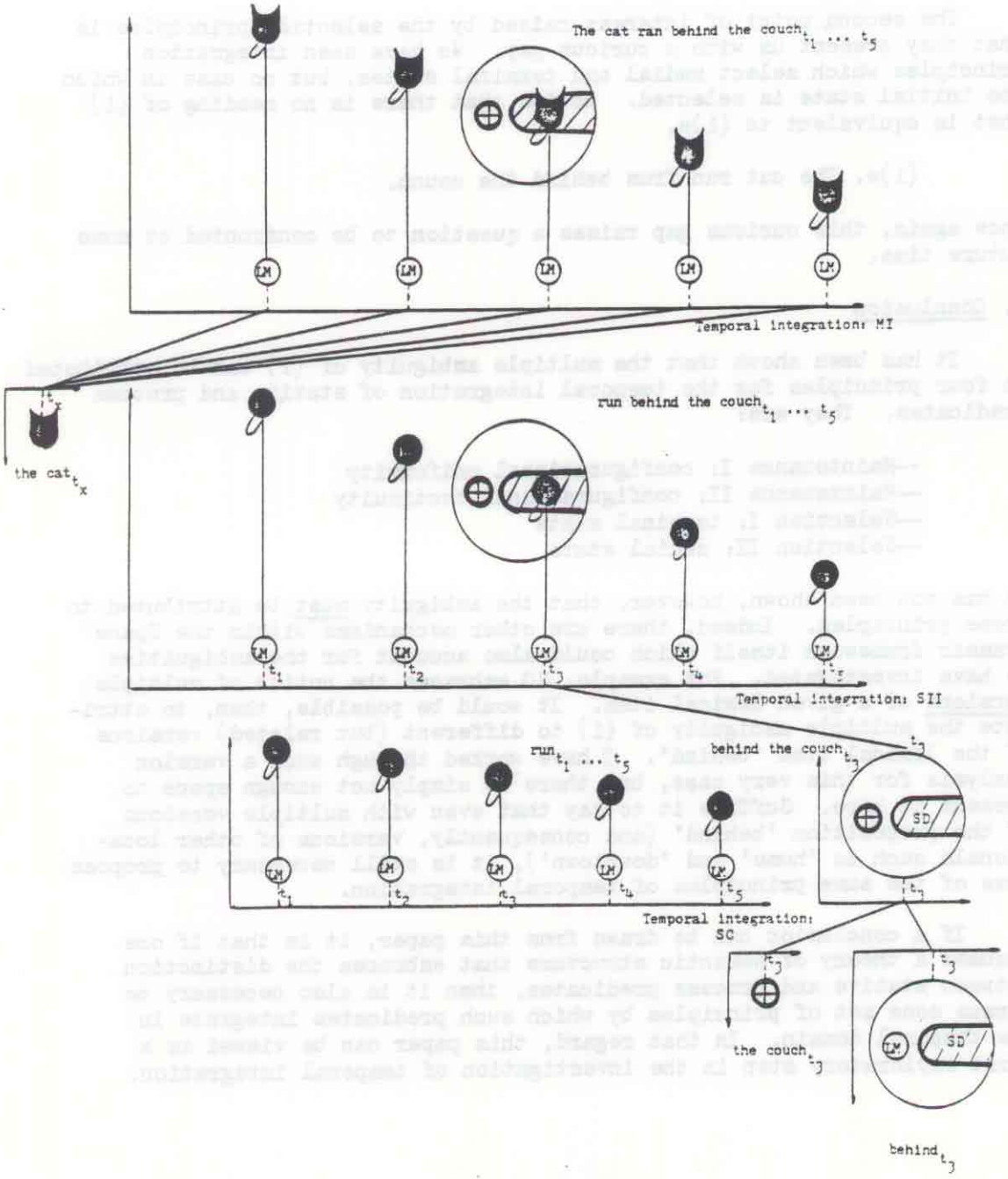
As before, the 'behind' relation is not maintained throughout the temporal profile of the process, but rather it is instantiated at one particular point in the process. In this case, however, the trajectory of the cat does not terminate behind the couch, but continues on so that the cat re-emerges on the other side of the couch. Thus, the cat bears

the 'behind' relation to the couch at some medial state within the process of motion. The temporal integration principle can be stated as follows:

(77) Selection II: medial state (SII)
  a. A stative predicate can integrate with a strategically selected point in the temporal profile of a process.
  b. That point can be a medial state in the process.

The configurational representation for (1)d. is given in figure 13.

Figure 13. The cat ran via behind the couch.



Before closing, two interesting points should be made with respect to the selection principles. First, I have been able to find but one other case in which the medial state selection principle operates, and that example is not all that different from (1)d. It involves the complex preposition 'in front of', which is closely related to 'behind'.

(78) The cat ran in front of the couch.
(78)a. The cat ran via in front of the couch.

Any attempt to account for this limited application of the medial state principle would be pure speculation at this point. It will, thus, stand as a question to be confronted.

The second point of interest raised by the selection principles is that they present us with a curious gap. We have seen integration principles which select medial and terminal states, but no case in which the initial state is selected. Notice that there is no reading of (1) that is equivalent to (1)e.

(1)e. The cat ran from behind the couch.

Once again, this curious gap raises a question to be confronted at some future time.

3. Conclusion

It has been shown that the multiple ambiguity of (1) can be attributed to four principles for the temporal integration of stative and process predicates. They are:

--Maintenance I: configurational uniformity
--Maintenance II: configurational continuity
--Selection I: terminal state
--Selection II: medial state

It has not been shown, however, that the ambiguity must be attributed to these principles. Indeed, there are other mechanisms within the Space Grammar framework itself which could also account for the ambiguities we have investigated. For example, SG embraces the notion of multiple versions of a given lexical item. It would be possible, then, to attribute the multiple ambiguity of (1) to different (but related) versions of the lexical item 'behind'. I have worked through such a version analysis for this very case, but there is simply not enough space to present it here. Suffice it to say that even with multiple versions of the preposition 'behind' (and consequently, versions of other locationals such as 'home' and 'downtown'), it is still necessary to propose some of the same principles of temporal integration.

If a conclusion can be drawn from this paper, it is that if one assumes a theory of semantic structure that embraces the distinction between stative and process predicates, then it is also necessary to pursue some set of principles by which such predicates integrate in the temporal domain. In that regard, this paper can be viewed as a first exploratory step in the investigation of temporal integration.

Footnotes

[1]Langacker 1979 divides this class further into predicates which designate a configuration as constant through time and those which designate a configuration as changing through time. The former are identified in SG as imperfective processes, the latter as perfective. This dichotomy, however valid it may be, is not relevant to the present discussion.

[2]cf. Langacker 1975, 1978, and 1979.

[3]Langacker (1981: 6)

[4]Langacker (1981: 6)

[5]The term 'landmark' is ultimately attributable to Lynch (1960), but came into SG by way of Miller and Johnson-Laird (1976).

[6]The term 'search domain' is also attributable to Miller and Johnson-Laird (1976). It has, however, been slightly modified (or specialized) for the present research program.

[7]cf. Langacker 1979

[8]There is a factor of rate that distinguishes 'run' from 'walk' which is not captured in the representation given here. Although it is of definite significance semantically, that distinction has no relevance to the present discussion.

[9]Proximity is a basic topological relation which Piaget and Inhelder (1948) have claimed emerges in the earliest stages of the child's adaptation to physical space, in the first four months of life. The same notion is of central importance in the Gestalt school of psychology. For further background, cf. Koffka (1963)

[10]The determiner 'the' is virtually ignored in this discussion for sake of simplicity. Because the semantic content of all determiners is quite abstract, discussion of semantic integration between nominals and determiners can become confusing in ways that we need not be concerned with here.

[11]In all future representations of temporal integration in higher order semantic structures, the representation will be annotated with the abbreviation for the principles applicable in that structure.

[12]Actually participials are not individual predicates, but complex semantic structures as well. For our present purposes, however, we need not elaborate upon their semantic complexity. We can assume, again for the sake of simplicity, that they are simple predicates.

[13]As in the case of the determiner, the role of tense marking within the complex semantic structures of all readings of (1) will be ignored throughout this discussion.

[14]The dotted line from the couch to the unspecified landmark of the 'run' trajectory is meant to indicate that the couch is also participating in a motion trajectory and that that trajectory is not expressed explicitly. In none of the other readings of (1) is this implicit trajectory involved.

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