

On the prepositions which introduce an adjunct of duration

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Abstract

This paper deals with the prepositions which introduce an adjunct of duration, such as the English *for* and *in*. On the basis of both crosslingual and monolingual evidence these adjuncts are argued to be ambiguous between a floating and an anchored interpretation. To capture the distinction in formal terms I employ the framework of HEAD-DRIVEN PHRASE STRUCTURE GRAMMAR, enriched with a number of devices which are familiar from DISCOURSE REPRESENTATION THEORY. The resulting analysis is demonstrated to be relevant for machine translation, natural language generation and natural language understanding.

1 A typology of PP adjuncts of duration

In many languages the adjuncts of duration take different forms depending on the aspectual class of the VP which they modify. In English, for instance, they are introduced by *for* if the VP denotes a state or a process and by *in* if the VP denotes an accomplishment.

- (1) Maria played the piano for an hour.
- (2) Anna wrote that letter in half an hour.

Orthogonal to this distinction, there is another one, which can be made explicit by comparing (1) and (3) with (4).

- (3) Laura will stay in Ohio for two months.
- (4) Silvia has lived in Paris for three years.

The adjuncts in (1) and (3) unambiguously specify the duration of Maria's activity of playing the piano and of Laura's stay in Ohio. The adjunct in (4), however, triggers an ambiguity: it can denote any three-year period in the past in which the

state of Silvia's living in Paris held, but it can also denote a period which started three years ago and which includes the time of utterance (Kamp and Reyle, 1993, 567). The relevance of this distinction is clear from the fact that there are languages which use different prepositions for both interpretations. Italian, for instance, employs the preposition *per* in the translation of (1), (3) and the first interpretation of (4), whereas it employs *da* in the translation of the second interpretation of (4).

- (5) Maria suonò il pianoforte per un'ora.
- (6) Laura starà per due mesi nell'Ohio.
- (7) Silvia ha abitato per tre anni a Parigi.
- (8) Silvia abita a Parigi da tre anni.

For ease of reference I will call the adjuncts in (1), (3), (4a), (5), (6) and (7) **floating**: they denote a stretch of time whose position on the time line is not defined. The adjuncts in (4b) and (8), by contrast, will be called **anchored**, since their position on the time line is fixed: their right boundary is supplied by the time of utterance. As illustrated in (9-10), the right boundary can also be supplied by a temporal adjunct, such as a PP[*a*] or a subordinate S[*quando*].

- (9) A quel punto Silvia abitava da tre
at that point Silvia lived for three
anni a Parigi.
years in Paris
'By that time Silvia had lived in Paris for
three years.'
- (10) Laura sarà nell' Ohio da due mesi,
Laura will-be in Ohio for two months,
quando verrà raggiunta da Ivo.
when she-will-be joined by Ivo
'Laura will have been in Ohio for two
months when Ivo will join her.'

The distinction between floating and anchored adjuncts is also relevant for the PP[*in*] adjuncts. To show this let us compare (2) and (11) with (12).

(11) Pablo makes such a drawing in less than five minutes.

(12) Leo will tune your piano in an hour.

In (2) and (11) the PP[*in*] adjuncts are unambiguously floating, but (12) is ambiguous: it can either mean that it will take Leo one hour to tune your piano or that he will start the activity of tuning your piano in an hour from now. In the first interpretation, the adjunct is floating, as in (2) and (11), but in the second one it is anchored: the beginning of the hour which will pass before Leo starts tuning the piano is supplied by the time of utterance. The relevance of the distinction is, again, brought out by the Italian equivalents. While the floating PP adjuncts are introduced by *in*, as in the translation of (2), (11) and (12a), the anchored ones are introduced by *fra*, as in the translation of (12b).¹

(13) Anna ha scritto quella lettera in mezz'ora.

(14) Pablo fa un disegno come quello in meno di cinque minuti.

(15) Leo accorderà il tuo pianoforte in un'ora.

(16) Leo accorderà il tuo pianoforte fra un'ora.

The following table provides a summary of the data discussed so far.

	floating	anchored
EN	PP[<i>for</i>] (1,3,4a)	PP[<i>for</i>] (4b)
IT	PP[<i>per</i>] (5,6,7)	PP[<i>da</i>] (8,9,10)
EN	PP[<i>in</i>] (2,11,12a)	PP[<i>in</i>] (12b)
IT	PP[<i>in</i>] (13,14,15)	PP[<i>fra/tra</i>] (16)

The distinction between floating and anchored adjuncts is relevant for Machine Translation and for Natural Language Generation, since it conditions the choice of the preposition. At the same time, it is also relevant for Natural Language Understanding, since it bears on the issue of scope. More specifically, while the floating adjuncts can be in the scope of a VP quantifier, the anchored ones cannot.

¹Instead of *fra* one also finds *tra*. The choice is mainly conditioned by phonological factors. To avoid alliteration speakers tend to prefer *fra* when (one of) the surrounding words start with *t(r)*, and *tra* when (one of) the surrounding words start with *f(r)*.

(17) Spesso suonavo il flauto per un'ora.
often I-played the flute for an hour
'I often played the flute for an hour.'

(18) Lea abita sempre a Roma da tre anni.
Lea lives always in Rome for three years
'Lea has lived in Rome for three years.'

The PP[*per*] in (17) is in the scope of the quantifying *spesso* 'often': there are several one hour periods of my playing the flute. By contrast the PP[*da*] in (18) outscopes the quantifying *sempre* 'always', yielding an interpretation in which Lea's living in Rome is said to go on uninterruptedly for a period of three years. The same contrast can be observed in sentences with VP negation.

(19) Non suonò il flauto per un'ora.
not played the flute for an hour
'(S)he did not play the flute for an hour.'

(20) Non suona il pianoforte da un'ora.
not plays the piano for an hour
'(S)he has not been playing the piano for an hour now.'

The floating PP[*per*] in (19) is in the scope of the negation, yielding an interpretation which can be paraphrased as 'it is not the case that (s)he played the flute for an hour'. The anchored PP[*da*] in (20), by contrast, outscopes the negation, yielding an interpretation which can be paraphrased as 'for an hour it has not been the case that (s)he plays the piano'.

To capture the semantic properties of the four types of durational adjuncts we need a framework for the analysis and representation of temporal expressions. As a starting point, I will use the HPSG framework, as defined in (Pollard and Sag, 1994) and (Ginzburg and Sag, 2000). This suffices to spell out what the four types have in common (section 2), but in order to also model what differentiates them (section 4) we will need some extensions to the standard HPSG ontology and notation (section 3).

2 What the durational adjuncts have in common

Since the adjuncts of duration are modifiers rather than arguments, they are not selected by their head sister. Instead, it is the head which is selected by the adjunct. Phrased in terms of the HPSG notation, a PP adjunct has a SELECT feature whose

value spells out the syntactic and semantic properties of its head sister.²

$$(21) \left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \textit{prep} \\ \text{SELECT } \textit{synsem} \end{array} \right] \\ \text{COMPS } \langle \rangle \end{array} \right]$$

Since the SELECT feature is part of the HEAD value, it is shared between the PP and the preposition. From this it follows that prepositions which introduce an adjunct can impose constraints on the SYNSEM value of the phrase which the adjunct modifies. Exploiting this possibility we can capture the syntactic properties of the prepositions which introduce a durational adjunct in terms of the following AVM.³

$$(22) \left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \textit{prep} \\ \text{SELECT} \mid \text{CAT} \left[\begin{array}{l} \text{HEAD } \textit{verb} \\ \text{COMPS } \langle \rangle \end{array} \right] \end{array} \right] \\ \text{COMPS } \left\langle \begin{array}{l} \text{CAT} \left[\begin{array}{l} \text{HEAD } \textit{noun} \\ \text{COMPS } \langle \rangle \\ \text{MARK } \textit{indefinite} \end{array} \right] \\ \text{CONTENT } (23) \end{array} \right\rangle \end{array} \right]$$

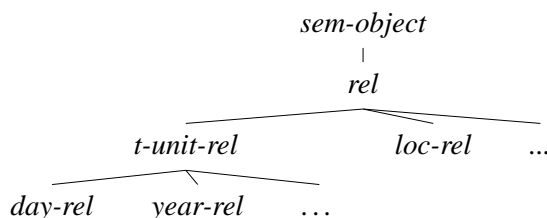
In words, the prepositions which introduce a durational adjunct take an NP complement and project a PP which modifies a VP. Besides these properties, which they share with many other types of PP adjuncts, there is the more specific requirement that the NP complement must denote an amount of time. This is modeled in terms of its MARK(ING) and its CONTENT values. Starting with the latter and employing the semantic ontology of (Ginzburg and Sag, 2000), in which the CONTENT value of a nominal is an object of type *scope-object*, the relevant constraint can be defined as follows:

²For reasons which are given in (Van Eynde, 2005), I do not employ separate selection features for the modifiers and the specifiers. The SELECT attribute, hence, generalizes over the MOD(IFIED) and SPEC(IFIED) attributes of (Pollard and Sag, 1994).

³I ignore the distinction between local and non-local properties. CAT is, hence, short for LOCAL|CATEGORY and CONTENT for LOCAL|CONTENT.

$$(23) \left[\begin{array}{l} \textit{scope-object} \\ \text{INDEX } \boxed{1} \textit{index} \\ \text{RESTR } \left\{ \begin{array}{l} \textit{t-unit-rel} \\ \text{INST } \boxed{1} \end{array} \right\} \end{array} \right]$$

In words, the index of the complement must be the argument of a predicate of type *t-unit-rel*. This is one of the intermediate types in the hierarchy of relations. Its subtypes are the predicates which express temporal units.



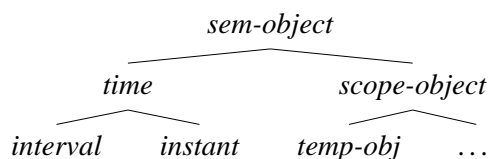
The defining property of temporal units is that they succeed one another without interruption. A day, for instance, is a temporal unit, since it is immediately followed by another day, but a Friday is not, since it is not immediately followed by another Friday. The relevance of this distinction is illustrated by the fact that *for a day* and *in ten minutes* can be adjuncts of duration, whereas *for Friday* and *in April* cannot. Whether a PP[*for/in*] can be used as an adjunct of duration is not only determined by the semantic class of the noun, but also by the prenominals: *for every day* and *in that month*, for instance, cannot be used as adjuncts of duration. This is captured by the constraint that the NP must be indefinite, rather than universal or determinate. Evidence for making this threefold distinction and for modeling it in terms of the MARKING values is provided in (Van Eynde, 2005).⁴

A crucial factor in the semantic analysis of the durational adjuncts is their contribution to the meaning of the VP: the amount of time which is denoted by their NP daughter must somehow be related to the semantic properties of the VPs which they modify. To spell this out we first need a format for the semantic analysis of verbal objects.

⁴If the NP is determinate, as in *for the last five years*, *for the whole morning* and *da lunedì* ‘since Monday’, it does not denote an amount of time, but an interval or an instant. Such PPs have meanings which resemble those of the durational adjuncts, but their contribution to the semantics of the VP is nonetheless different.

3 Times and temporal objects

To model the semantic properties of verbal projections I extend the semantic ontology of (Ginzburg and Sag, 2000) with times and temporal objects.



The temporal objects belong to a subtype of *scope-object* and, hence, have an index and a set of restrictions on that index. Besides, they have a TIMES attribute, which takes a list of times as its value.

$$(24) \left[\begin{array}{l} \text{temp-obj} \\ \text{TIMES } \text{list}(\text{time}) \end{array} \right]$$

The objects of type *time* denote temporal entities and come in two kinds: instants and intervals. This distinction does not concern any inherent properties of the temporal entities, but rather their mode of individuation. The objects of type *interval* have a beginning, an end and a duration.

$$(25) \left[\begin{array}{l} \text{interval} \\ \text{BEGIN } \text{instant} \\ \text{END } \text{instant} \\ \text{EXTENT } \text{scope-obj} \end{array} \right]$$

Since the value of the EXTENT feature is of type *scope-obj* it can be identified with the amount of time which is expressed in an adjunct of duration.

Of the various times which figure in the list of a temporal object, the rightmost one has a special role, since it is the one which is linked to the index of the verb. For ease of reference I will call it the V-time.

$$(26) \left[\begin{array}{l} \text{temp-obj} \\ \text{INDEX } \boxed{1} \text{index} \\ \text{RESTR } \left\{ \left[\begin{array}{l} \text{loc-rel} \\ \text{INST } \boxed{1} \\ \text{TIME } \boxed{2} \end{array} \right] \right\} \\ \text{TIMES } \text{list}(\text{time}) \oplus \langle \boxed{2} \text{time} \rangle \end{array} \right]$$

The verb's index ($\boxed{1}$) is comparable to a Davidsonian event variable, but has a slightly different role. It is, for instance, not only assigned to verbs and VPs which denote an event, but to all verbal

projections, including the stative ones. The index is invariably the first argument of the relation which the verb denotes, as in *greet-rel* (i, x, y), and is linked to the V-time by means of the *loc-rel* relation. The function of this relation is to link the denotation of the V(P) to the time at which it holds. It is comparable to the overlap relation, familiar from Discourse Representation Theory: $\boxed{1} \circ t$.

Since the temporal objects belong to a subtype of *scope-obj*, it follows that their indices are of the same type as those of the nominal objects. Given the ontology of (Ginzburg and Sag, 2000), this implies that they contain features for person, number and gender.⁵

$$(27) \left[\begin{array}{l} \text{index} \\ \text{PERSON } \text{person} \\ \text{NUMBER } \text{number} \\ \text{GENDER } \text{gender} \end{array} \right]$$

The presence of these features in the CONTENT values of verbs may, at first, seem awkward, since they model properties which are typical of N(P)s. A form like *greet*s, for instance, requires its NP subject to have a third person singular index, but does not have a third person singular index of its own, as argued in (Pollard and Sag, 1994, 82). Looking closer, though, the assignment of these features to verbs does have a number of advantages. One is that it accounts for the agreement in clauses with a verbal subject.

(28) Forging banknotes is/*are/*am not easy.

(29) To make mistakes is/*are/*am human.

Since the form *is* requires a subject with a third person singular index, it follows that the nonfinite VPs in (28) and (29) have a third person singular index, and since phrases share their index with their head daughter, this implies in turn that the verbs *forging* and *make* have a third person singular index.⁶ To avoid misunderstanding, it is worth stressing that this does not mean that they require a third person singular subject, but rather that they

⁵The values of these features concern the mode of individuation of a nominal's referent and should not be confused with properties of the referent itself. A person, for instance, can be individuated by means of a second person pronoun, but this does not mean that (s)he has the property of being a second person.

⁶That *forging* and *make* are verbs is clear from the fact that they take NP complements; if they were nouns, they would take PP[*of*] complements.

themselves are third person singular. This distinction is especially relevant for the finite verbs, as illustrated by (30) and (31).

(30) That he/she snores is/*are/*am annoying.

(31) That I/they snore is/*are/*am annoying.

Also here the subjects are required to have a third person singular index, and since they are clauses which are headed by a finite verb, it follows that the finite verbs have a third person singular index. Moreover, this index is different from the one of their subject. *Snore* in (31), for instance, has a third person singular index, but requires its subject to have an index which is plural or non-third person. In sum, one advantage of the assignment of a third person singular index to verbs is that it accounts in a straightforward manner for the agreement data in (28-31).

Another advantage is that the indices provide a way to capture the distinction between the aspectual classes (Aktionsarten). To see this, let us first revisit the role of the indices in nominal objects. As argued in (Pollard and Sag, 1994), the indices are not only useful to model agreement between a finite verb and its subject, or between an anaphoric pronoun and its antecedent, but also between a determiner and its nominal head. The demonstrative *these*, for instance, requires a nominal with a plural index, whereas *this* requires a nominal with a singular index. A similar constraint holds for the combination of a quantifying determiner and its head. While *every* and *a* require their nominal head to be singular and count, *much* requires it to be singular and mass: *every/a/*much table* vs. *much/*every/*a traffic*. Despite the obvious similarity with the constraints for the demonstrative determiners, they cannot be modeled in terms of the indices of (Pollard and Sag, 1994), since their indices do not contain any information about the mass/count distinction. A natural move, therefore, is to redefine the indices in such a way that this distinction can be integrated. Independent evidence for this move is provided by the fact that the mass/count distinction concerns the mode of individuation of the referent(s) of the nominal, rather than an inherent property of the referent(s), see footnote 5. Another piece of evidence is the fact that the mass/count distinction closely interacts with the NUMBER distinction: most of the relevant constraints simultaneously concern a number and a mass/count value. To model this I add a COUNT-

ABILITY feature to the objects of type *number*, adopting a proposal of (Van Eynde, 2005).

(32)
$$\left[\begin{array}{l} \textit{number} \\ \text{COUNTABILITY } \textit{countability} \end{array} \right]$$

Its values are:

countability
 $\underbrace{\hspace{10em}}$
bounded *unbounded*

In terms of this dichotomy the count nouns have bounded indices, whereas the mass nouns have unbounded indices. Nouns which are used either way, such as *glass*, have the underspecified value in their lexical entry; this can be resolved by the addition of a determiner, as in *a glass* or *much glass*.

Returning now to the verbs, it automatically follows from the presence of an index in their CONTENT values that they also have a COUNTABILITY feature. This is an advantage, since it provides us with the means to spell out the similarities between the count/mass distinction for nominals and the Aktionsart distinction for verbal projections. The states and processes, for instance, share the property of the mass nouns that their denotation is unbounded, whereas the accomplishments and the achievements share the property of the count nouns that their denotation is bounded (Bach, 1986). Exploiting the potential of this extended role of the indices I introduce a distinction between two types of temporal objects. The bounded ones have an index of type *bounded* and are subsumed by the following constraint:

(33)
$$\left[\begin{array}{l} \textit{bd-temp-obj} \\ \text{INDEX } \boxed{1} \left[\begin{array}{l} \textit{index} \\ \text{NUM} \mid \text{C } \textit{bounded} \end{array} \right] \\ \text{RESTR } \left\{ \left[\begin{array}{l} \textit{in-rel} \\ \text{INST } \boxed{1} \\ \text{TIME } \boxed{2} \end{array} \right] \right\} \\ \text{TIMES } \textit{list}(\textit{time}) \oplus \langle \boxed{2} \textit{time} \rangle \end{array} \right]$$

In words, the index of a bounded temporal object is temporally included in the V-time. Since inclusion is a special type of overlap, this is a more constrained version of (26). It corresponds to DRT's 'e \subseteq t'.

The unbounded temporal objects obviously have an index of type *unbounded*, but the relation

of this index to the corresponding time is not subject to any further constraints; it is subsumed by the generic *loc-rel*.

With the introduction of times, temporal objects and the boundedness distinction we have paved the way for a more detailed analysis of the various types of durational adjuncts.

4 What differentiates the four types of durational adjuncts

I first discuss the adjuncts which combine with an unbounded temporal object, and then the adjuncts which combine with a bounded temporal object. In the last paragraph I return to the issue of scope.

4.1 The PP[for/per/da] adjuncts

The PP[for/per/da] adjuncts select a VP which denotes an unbounded temporal object and specify the duration of the V-time.⁷

$$(34) \left[\begin{array}{c} \text{unbd-temp-obj} \\ \text{INDEX } \boxed{1} \text{ index} \\ \text{H | S | C} \text{ RESTR } \left\{ \begin{array}{l} \text{incl-rel} \\ \text{INST } \boxed{1} \\ \text{TIME } \boxed{2} \end{array} \right\} \\ \text{TIMES } \langle \dots, \boxed{2} [\text{EXTENT } \boxed{3}] \rangle \\ \text{COMPS } \langle [\text{CONTENT } \boxed{3}] \rangle \end{array} \right]$$

The restriction to unbounded temporal objects accounts for the fact that these adjuncts combine with states and processes, but not with accomplishments or achievements. Notice, though, that this restriction does not exclude the combination with VPs whose CONTENT value is the underspecified *temp(oral)-obj(ect)*. This is important, since few V(P)s are inherently bounded or unbounded. It is usually by the addition of an adjunct that the underspecification gets resolved.

That the adjunct specifies the duration of the V-time is illustrated by the examples of the first section. In (1), for instance, it is the time of playing the piano which is said to take an hour, and in (3) it is the time of Laura's stay in Ohio which is said to have a length of two months. The relation between this time and the index of the V(P) is required to be the one of inclusion ($s \supseteq t$). This accounts for the fact that (1) is only true if the playing of the

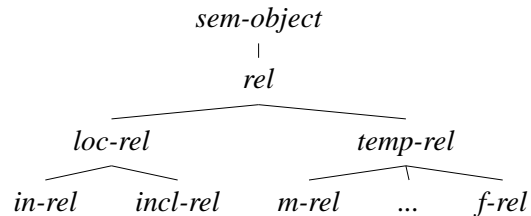
⁷H|S|C is short for HEAD|SELECT|CONTENT. The same abbreviation is used in (36) and (38).

piano went on for at least an hour. The generic *loc-rel* is not sufficient for this purpose, since it only requires overlap: it would make (1) true if the playing went on for five minutes.

For the floating PP[for] and PP[per] adjuncts there is nothing which need be added to (34). Their anchored counterparts, however, are subsumed by one further constraint.⁸

$$(35) \left[\begin{array}{c} \text{SS | ... | C} \text{ RESTR } \left\{ \begin{array}{l} \text{temp-rel} \\ \text{TIME } \boxed{1} \\ \text{TIME } \boxed{2} \end{array} \right\} \\ \text{TIMES } \langle \dots, [\text{END } \boxed{1}] \rangle \\ \text{CONX | C-IND | UTT-TIME } \boxed{2} \text{ instant} \end{array} \right]$$

In words, the interval whose duration is specified has a right boundary ($\boxed{1}$) which is related to the time of utterance. This relation can be the one of identity, as in (5b) and (8), or it can be mediated by a temporal adjunct. In (9), for instance, the right boundary is specified by the PP *a quel punto*, which precedes the time of utterance, and in (10) it is specified by the clause *quando verrà raggiunta da Ivo*, which follows the time of utterance. To capture this variation I use the relation *temp-rel*. This stands for any binary relation between times.⁹



As demonstrated in (Allen, 1984), the number of distinct binary relations between times is limited. He distinguishes seven basic relations: equal ($=$), before ($<$), during (d), meets (m), overlaps (o), starts (s) and finishes (f). Each of these relations has an inverse: the one of before, for instance, is after ($>$). This yields fourteen possible relations, but since equality is indistinguishable from its inverse, the number of distinct relations is 13. Of these 13 relations, only three are

⁸CONX|C-IND is short for CONTEXT|CONTEXTUAL-INDICES and SS|...|C for SYNSEM|CATEGORY|HEAD|SELECT|CONTENT.

⁹In this respect, *temp-rel* and its subtypes contrast with *loc-rel* and its subtypes, which are relations between an index and a time.

exemplified by (8-10), but most of the remaining ones are excluded by the constraint in (35) that the related times must be instants. This automatically excludes the relations in which at least one of the times must be an interval, such as overlap, during, start, finish and their respective inverses.

4.2 The PP[*in/fra/tra*] adjuncts of duration

The floating PP[*in*] adjuncts select a VP which denotes a bounded temporal object and specify the duration of the V-time.

$$(36) \left[\begin{array}{l} \text{H | S | C} \left[\begin{array}{l} \text{bd-temp-obj} \\ \text{TIMES} \langle \dots, [\text{EXTENT } \boxed{1}] \rangle \end{array} \right] \\ \text{COMPS} \langle [\text{CONTENT } \boxed{1}] \rangle \end{array} \right]$$

Since only intervals can have duration this constraint accounts for the fact that these adjuncts are not compatible with VPs which denote instantaneous events, as in:

$$(37) \quad ? \text{ The bomb exploded in two minutes.}$$

In contrast to their floating counterparts, the anchored PP[*in*] and PP[*tra/fra*] adjuncts do not specify the duration of the V-time, but rather of the interval which elapses between the time of utterance and the beginning of the V-time. In terms of Allen's ontology, this can be characterized as an instance of *m(eets)-rel*: $m(x, y)$ is true if and only if x immediately precedes y .¹⁰

$$(38) \left[\begin{array}{l} \text{SS | CAT} \left[\begin{array}{l} \text{H | S | C} \left[\begin{array}{l} \text{R} \left\{ \begin{array}{l} [m\text{-rel}] \\ \text{TIME } \boxed{1} \\ \text{TIME } \boxed{2} \end{array} \right\} \\ \text{T} \langle [\boxed{1} [\text{BG } \boxed{u}], \boxed{2}] \rangle \\ \text{COMPS} \langle [\text{CONTENT } \boxed{3}] \rangle \end{array} \right] \\ \text{CONX | C-IND | UTT-TIME } \boxed{u} \text{ instant} \end{array} \right] \end{array} \right]$$

The leftmost interval is the one whose duration is specified. The rightmost time can be an instant or an interval. In (16) it is most likely an interval, since the tuning of a piano is bound to take some time, but it can also be an instant, as in the most plausible interpretation of (39).

$$(39) \quad \text{The bomb will explode in two minutes.}$$

Since the beginning of an interval necessarily precedes its end, the V-time (2) must follow the time of utterance. This accounts for the fact that the English PP[*in*] can have the anchored interpretation in a clause with a future auxiliary, such as (12) and (39), or in a clause with a futurate present tense, such as *we are leaving in a minute*, but not in a clause with a past tense verb, such as (2), or in a clause with a non-futurate present tense, such as (11).

4.3 Scope

Having spelled out the properties of the anchored adjuncts we can now account for the fact that they cannot be outscoped by a VP quantifier. What makes this impossible is the fact that the interval whose duration they specify is linked to the time of utterance. The link can be more or less direct, but it does not allow for the intrusion of other intervening intervals. The floating adjuncts, by contrast, apply to intervals which are not linked to the time of utterance and, therefore, allow the intrusion of intervening times, as in (17), where *spesso* 'often' outscopes *per un' ora* 'for an hour'.

Of course, the fact that the floating adjuncts can be outscoped by a VP quantifier does not imply that they must be outscoped whenever there is such a quantifier. To show this let us have a look at (40).

$$(40) \quad \text{We will train two hours a day for at least six months.}$$

While the adjunct *two hours a day* specifies the duration and the frequency of the V-time, i.e. the time of the individual training sessions, the PP[*for*] adjunct specifies the duration of the period in which the daily training sessions will take place.¹¹ It, hence, outscopes the VP quantifier. This use of the adjunct is not covered by the analysis in section 4.1, since the latter only deals with those adjuncts which specify the duration of the V-time. To deal with the adjunct in (40) we would have to extend the hierarchy of temporal objects with a special subtype for the quantified temporal objects and add a constraint which captures the

¹⁰R is short for RESTRICTIONS, T for TIMES, BG for BEGINNING and EX for EXTENT.

¹¹The floating nature of the PP[*for*] adjunct is clear from the absence of a specification (implicit or explicit) of its right boundary and from the fact that its Italian equivalent is *per almeno sei mesi* rather than *da almeno sei mesi*.

properties of the durational adjuncts which combine with such objects. Spelling this out is left for future work.

5 Conclusion

The adjuncts of duration require an analysis in terms of two mutually independent distinctions. One concerns the aspectual class of the modified VP and is widely acknowledged as relevant. The other concerns the distinction between floating and anchored interpretations and is often ignored; its relevance, though, is clear from both crosslingual and monolingual data. For the analysis of the four types of durational adjuncts I have employed an extended version of HPSG. The extensions mainly concern the addition of times and temporal objects to the semantic ontology and the notation. The resulting analysis captures both the similarities and the differences between the four types of adjuncts, and provides an account for the fact that the floating adjuncts can be outscoped by a VP quantifier, whereas the anchored ones cannot.

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