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Imperfect propositions

What this paper is about

The aim of this paper[1] is to provide a unified semantic analysis for three important readings of the Italian Imperfetto (and Presente): the PROGressive, the HABitual, and the FUTurate reading. To highlight the role of the *utterance context* in setting the relevant parameters of interpretation, explicit temporal adverbials are left out of the scene and prominence is given to the situations where the context provides the temporal information required to discriminate between alternative readings, by exploiting a single logical form.

The paper is organized as follows. After a short presentation of the data (sect. 1), in the second section I discuss some intuitive features of imperfectivity by focusing on the fact that the conclusion of an event or series of events is left open. This indeterminacy with respect to a given perspective point is formalized in the third section of the paper by resorting to a branching time model. In this section a unitary treatment (based on the derivation of a single logical form) is proposed for the three main readings of tenses such as the Presente and the Imperfetto and for an intriguing side effect that, in some particular circumstances, makes a "perfective" reading possible. Finally, since the context has a key role in this reconstruction of imperfectivity, the last section of the paper is devoted to the consideration of the temporal parameters to which the evaluation of an utterance is relativized.

1. The data

That the Imperfetto is a multi-purpose tense is proved by sentences like the following:

(1) Quando fu lodato da Miles Davis, Bill Evans suonava in un trio con Scott LaFaro e Paul Motian [When Bill Evans was praised by Miles Davis, he play (past, imp.) in a trio with Scott LaFaro and Paul Motian = ... he was playing... or ...he used to play...].

As suggested by the English translation, two different interpretations are available here. According to the PROG reading, (1) would be appropriate, for instance, to describe a situation in which Miles Davis expresses an extremely positive judgment about Bill Evans while listening to him playing with his trio at the Village Vanguard.

On the other hand, according to the HAB reading, (1) would be perfectly compatible with a situation in which *no* particular event of Bill Evans's playing in a trio is referred to and we are generically speaking of a period in which he used to play in a trio (just to say that it is in this period that Miles Davis expressed his flattering judgment).

In other cases only one reading sounds plausible, as shown by (2) and (3):

(2) Quando Miles Davis entrò al Village Vanguard, Bill Evans suonava in un trio con Scott LaFaro e Paul Motian [When Miles Davis entered the Village Vanguard, Bill Evans play (past, imp.) in a trio with Scott LaFaro and Paul Motian = ... he was playing...]

(3) Quando firmò il contratto con la Riverside, Bill Evans suonava in un trio con Scott LaFaro e Paul Motian [When Bill Evans sign (past, perf.) the contract with Riverside, he play (past, imp.) in a trio with Scott LaFaro and Paul Motian = ... he used to play...].

The natural interpretation of (2) involves a particular event of the pianist's playing in a trio: an event which was ongoing at the moment denoted by the when-clause (PROG reading). But no such involvement is required in the case of (3): it is quite plausible to think that at the very moment of signing the contract Bill Evans was not playing at all, even if that moment is part of a period in which he used to play in a trio (HAB reading). So, the obvious conclusion is that different utterance contexts (linguistic contexts, in these cases, due to the presence of an explicit when-clause) force different interpretations for the same sentence, i. e. the main clause in (2) an (3):

(4) Bill Evans suonava in un trio con Scott LaFaro e Paul Motian [Bill Evans play (past, imp.) in a trio with Scott LaFaro and Paul Motian].

Unfortunately, this is not the end of the story, for the Imperfetto (and, very frequently, the Presente) can be associated to a *further* type of interpretation, the so-called futurate reading[2], illustrated by (7):

(5) Ieri mattina Leo ha prenotato un posto in treno per le tre del pomeriggio [Yesterday morning Leo booked a seat for 3 p. m.]
(6) Era soddisfatto [He was satisfied].
(7) Il treno partiva dalla sua stazione preferita [The train leave (past, imp.) from his favorite station = ... would leave ...].

Clearly, in this context, neither the PROG reading nor the HAB reading can be the natural interpretation of (7), which is based on the intuition[3] that the single event we are speaking about (the train's leaving) is located in the future of the reference time (yesterday morning).
In some particular scenario, the relevant event can even be located in the future of the utterance time, witness (9):

Lea says:
(8) Ho appena comprato i biglietti per il concerto di domani. Bill Evans suona con Jim Hall. [I' ve just bought the tickets for the tomorrow concert. Bill Evans play (pres.) with Jim Hall = ... will play ...]

Leo (looking at the program of the tomorrow concert) objects:
(9) Ma *non suonava in un trio con Scott LaFaro e Paul Motian*? [But not (he) play (past, imp.) in a trio with Scott LaFaro and Paul Motian? = ... wasnt'he supposed to play ...]

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[2] The FUT reading of the Spanish Imperfecto is discussed in Cipria and Roberts (2000) (they speak of "intentional reading"). Roughly speaking, their idea is that intentional readings are subcases of the progressive interpretation: "If we include the period during which one holds intentions to perform some act as part of the preparatory phase of an extended event, then the extended event is in progress during the preparatory phase, during the period when one holds those intentions [...] Our preliminary evidence suggests that intentional readings of the *imperfecto* are most often encountered with achievement predicates. These simple telics have no inherent pre-culminative process, and hence the intentional reading, focusing on the preparatory (planning) process, is forced in order to make sense of the atelic interpretation." (329-332) The problem is that such a preference for achievement predicates does *not* characterize the FUT reading of the Italian Imperfetto (or, even more dramatically, of the Italian Presente), as shown by a number of cases discussed in the present paper, where the FUT reading occurs in the presence of accomplishments, activities or states. (For example, if in the context (5)-(7) (7) is replaced by *Il suo treno attraversava una regione incantevole* (His train cross [past, imp.] a charming region = ... would cross ...) the FUT reading is still present.)
[3] A similar intuition characterizes the FUT reading of the French Imparfait, as shown by examples like the following (Fleischman, 1992), taken from Flaubert's *Éducation sentimentale*:
Ensuite, Arnoux parla d'une cuisson importante que l'on devait finir aujourd'hui, à sa fabrique. Il voulait la voir. Le train *partait* dans une heure.
On this point see also Ducrot (1979).

Finally Lea clarifies:
(10) No, hanno cambiato programma! [No, the program has been changed!].

The problem of the existence of different interpretations is even more dramatic if the Presente is considered, for in this case the FUT reading is not severely constrained (as in the case of the Imperfetto), but represents a very common way to express future-oriented propositions, as shown by (8).

Consider this very simple example:

(11) Leo corre nel parco.
'Leo run (pres.) in the park'.

It is straightforward to recognize that, in different contexts, (11) can mean different things. Here are the suitable scenarios in which different readings of (11) are selected.

SC I. During a conversation in which you ask why Leo is not in his office right now, (11) would sound as an appropriate answer. In this case we would have an example of the PROG reading.

SC II. Another possible scenario for a plausible use of (11) is a conversation in which we are talking about the training program of the local soccer team. In this case we would have an instance of FUT reading of the Presente and (11) could be naturally used to answer the question: 'Domani Leo si allena?' ('Is Leo going to train tomorrow?').

SC III. Finally, we can imagine of an utterance of (11) during a chat on Leo's healthy habits. Sentence (11) could then be used to answer the question: 'Ma cosa fa quest'anno Leo per essere così in forma?' ('But what is Leo doing this year to be in such a great shape?').

These are the main empirical data I am concerned with. They are simple, intuitive, and intriguing at the same time, if we are interested in providing a *unitary* analysis[4].
Notice that in the first three examples it is an *explicit* when-clause, in the complex sentences, that picks out the time which is spoken about. But in the case of the last examples this task is achieved by the utterance context, for no when-clause or temporal adverb is present in (11), (9) or (7). Since this role of the context is the main topic of the present paper, from now on I will consider examples of this type, where an appropriate scenario, rather than an explicit adverbial[5], provides the temporal information we need for a correct interpretation of the utterance.

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[4] In Bonomi (1998) and Deo (2009) a unified semantics is presented for the other two readings of the Imperfetto, whilst the issue of the FUT reading is not addressed. In both cases no treatment is suggested for the Presente, in spite of the strong parallelism between these two tenses: in traditional grammar one often says that the imperfetto is "a present in the past". So, in the present paper I will try to sketch a *unified* semantics both in sense that the Imperfetto and the Presente are kept together as two faces of the same coin and in the sense that the FUT reading of these two tenses is taken into account in addition to the other two readings.

[5] Accordingly, the formal framework that will be sketched here will be neutral with respect to alternative theories of temporal adverbials, even if it is natural to think that the constraints imposed by the presence of explicit adverbials can be added to the information associated, respectively, to the variable playing the role of reference time and to the variable playing the role of target time.

2. A conceptual characterization of imperfectivity

2.1 The actual and the possible.

The idea that I will develop here is sketched in Bonomi (1998) and is based on the proposal to associate the imperfective morphology to universal quantification over courses of events compatible with a viewpoint located in time.

One might wonder why we should complicate the semantics of a tense apparently so simple as the Presente (or, for that matter, the Imperfetto[6]) by invoking a plurality of courses of events and by universally quantifying over them. The answer is simple: in all the readings under consideration (i. e. PROG, HAB, FUT) the Presente (or the Imperfetto) involves the dimension of the *future* (relative to a given point in time), so that the perspective from which the *possible* developments of a given situation are considered becomes relevant to semantics. In these cases, what is possible (in the light of a certain background of information, as we will see in the next section) is not less important than what is merely actual, and *this involvement of a future dimension is an essential feature of the core meaning of imperfectivity.*

Such an involvement is obvious in the case of the FUT reading, but it can be detected in the other two readings as well. As concerns the PROG reading, what remains undetermined is the continuation and the conclusion of a *single* event in the future. This is why one often talks of an internal perspective on the event, where the conclusive part of it is left *open*. According to Smith (1991: 259), the French Imparfait "presents situations without a final point", and this indeterminacy characterizes the PROG reading of Italian Imperfetto as well.

This point can be illustrated by examples like the following[7].

Suppose that in the course of logic there are three theorems for beginners and that Leo decides to prove one of them during the today lesson. Until to lemma X the proof is the same for all these theorems, but, starting from that point, proofs diverge and require different levels of competence. Thus, it is quite possible that Leo starts the proof without deciding *which* of these theorems will be proved at the end, leaving the choice to the students just after proving lemma X.

But suppose also that the proof is interrupted a little before this point. In such a scenario an utterance of:

(12) Leo dimostrava un teorema per principianti quando fu interrotto dal bidello [Leo prove (past, imp.) a theorem for beginners when he was interrupted by the janitor = ... was proving ...]

does *not* entail that there is a particular theorem for beginners he was proving. This indeterminacy is due to the fact that different continuations were still possible at that point of the proof and such a situation can be accounted for, in formal terms, if we assume that the intensional operator associated to the Imperfetto has scope over the existential quantifier.

A similar story can be told about the HAB reading: with the only difference that, this time, such an indeterminacy concerns a (regular) *series* of events rather than a single event[8]. This series (like the single event in the case of the PROG reading) is *expected* to continue with respect to a given reference time *t*, unless otherwise stated. But the way it will continue, after *t*, is an open issue.

This involvement of the future dimension (and the modal apparatus it requires) has a crucial role to play in the way the present analysis accounts for the "indeterminacy" which has often been associated with imperfectivity. The idea is that the dissymmetry[9] between the past, which is

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[6] See Bazzanella (1990) for a list of the modal uses of the Imperfetto in Italian.

[7] von Stechow (1997) mentions a similar example, suggested by A. Kratzer: *They were electing a president* does not entail that there is a particular person they were electing. Other examples can be found in Giorgi and Pianesi (1997). See Bonomi (1997b) for a general discussion about these issues, starting from the so-called Multiple Choice Paradox.

[8] This feature is extensively discussed in Bertinetto (1986:345-348), who explicitly speaks of "the indeterminate continuation of a process beyond the instant or interval under consideration".

[9] As outlined in Prior (1967), which is the locus classicus for the contemporary reflection on these issues.

"closed", and the future, which is "open", is to some extent responsible for the opposition between perfectivity and imperfectivity. In the former case it is possible to speak of determinacy, and external point of view, because the event or series of events has already reached its termination point, in the latter it is possible to speak of indeterminacy, and internal point of view, because the conclusion of the event or series of events is *still open*. The present reconstruction in terms of branching time[10] is a way of making such intuitions more precise as concerns the Presente (Pres) and the Imperfetto (Imp).

2.2 Aspects of quantification.

In Bonomi (1998), where both the PROG reading and the HAB reading of Imp are accounted for in a W×T framework, a sentence such as

(13) Leo giocava a golf [Leo play (past, imp.) golf]

is associated (ignoring tense) to a logical form like

(13a) $\forall i',w[w \in X \wedge Rel(i') \wedge i' \subseteq i \rightarrow \exists e[\text{Leo-play-golf}_w(e) \wedge e \circ i']]$

which means that (13) is true of a given interval i iff for every world w in a contextually determined set X and for every i' such that i' is a *relevant* subinterval of i there is an event of Leo's playing golf which occurs in w and whose temporal extension overlaps with i'.
While this formulation is adequate to deal with problems like the so-called Multiple Choice paradox, it is quite clear that at least two serious issues are left open, for two crucial ingredients in (13a), that is the set of worlds X and the set of *relevant* intervals included in i, are not further specified[11].
The former problem will be addressed when discussing the role of the perspective point in the analysis of the imperfective. As for the latter, an important suggestion is made in Deo (2009), where the vague notion of "relevant" subintervals of a given interval i is replaced by the notion of *regular partition* of i. Ignoring the technical details of the formal definition, the idea is that "intuitively, a regular partition of i is a set of non-overlapping chunks of time of equal length partitioning i, a set against which predicate-instantiation may be evaluated with respect to regular distribution in time ." (Deo 2009: 490.)
Under such assumptions, we get the following logical form for (13):

(13b) $\exists i[i < now \wedge \forall h[h \in H_{inert(i)} \rightarrow \exists j[i \subset_{nf} j \subset h \wedge \forall k[k \in R_{j,c} \rightarrow \exists e[\text{Leo-play-golf}(e) \wedge \tau(e) \subset h \wedge \tau(e) \circ k]]]]]$

where "$\subset_{nf}$" means that i is a non-final interval of j, $R_{j,c}$ is a contextually determined regular partition of j and $H_{inert(i)}$ is the set of "inertial" futures (in the sense of Dowty, 1979) stemming from the interval i. So, what (13b) means is that (13) is true of an interval i iff i is before *now* and every inertial future in $H_{inert(i)}$ contains a super interval j of i and for every subinterval k of j belonging to $R_{j,c}$ k overlaps with the run time of an event of Leo's playing golf. In other terms, (13) is true iff "there is an interval of Leo playing golf coinciding with every contextually given disjoint part of an interval extending to the future of the reference interval" (Deo, 2009: 491).
A clear advantage of this treatment is that the context determines the set of "relevant" subintervals in a principled way, by providing the partition-measure, i. e. "a measure of length which serves to draw a partition which constitutes the restriction set" (492).

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[10] See Belnap, Perloff and Xu (2001) for the logical and philosophical foundations of this approach.
[11] A refinement of the notion of contextual relevance can be find in Lenci and Bertinetto (2000). See Deo (2009) for the issues raised by their approach.

Among the issues that deserve further analysis there is the real adequacy of the set $H_{inert(i)}$ of inertial futures "as a means to access the set of worlds/histories that are indistinguishable from each other up until the reference interval and continue past this interval in ways that are compatible with and predictable from the normal course of events" (489). So, consider this sentence[12], adapted from Wulf (2009):

(14) Shannon faceva un dolce di zucca, ma qualcuno aveva già usato l'ultima scatola di zucca [Shannon make (past, imp.) a pumpkin pie, but someone had already used the last can of pumpkin = ... was making ...]

The problem is that the reference time i is later than the moment at which someone used the last can of pumpkin, so that there is no "inertial" future stemming from i in which the event of making the pumpkin cake is completed and (14) is predicted to be false on the analysis under discussion. This is not correct, for this sentence is perfectly acceptable to describe the above scenario. Thus, what is required here is a revision of the universe of possible course of events which is referred to in logical forms like (13b).

A second issue concerns what I call the perfective effect: a phenomenon which will be analyzed in sect. 3.4 and which consists in the fact that, when an achievement predicate is involved, the PROG reading of the imperfective form (unlike the perifrasi progressiva) entails the realization of the event at issue. So, for instance, a statement such as

(15) Ieri alle tre Leo raggiungeva la vetta della montagna [Yesterday at three o'clock Leo reach (past, imp.) the top of the mountain]

entails that Leo did reach the top of the mountain.

From an intuitive point of view, the idea is that, for achievement predicates, being in progress is tantamount to being realized. This means that, in our example, the reference time i (yesterday, 3 p. m.) *coincides* with the run time $\tau(e)$ of the event of reaching the top (which is an interval consisting, ideally, of a single instant[13]). On the other hand, the requirement imposed by a logical form like (13b) in the case of the PROG reading is that "the relation $i \subset_{nf} j \subseteq \tau(e)$ holds" (Deo, 2009: 506). As a consequence, the reference time i cannot coincide with $\tau(e)$ but must be a proper subpart of it: which is not compatible with the perfective effect of Imp when an achievement predicate is involved.

Finally, a similar problem arises with the FUT reading of the imperfective[14], where the temporal trace $\tau(e)$ is not a superinterval of the reference time i, but *follows* it.

In all these cases a better specification of the roles played, respectively, by the reference time and by the event time might be helpful. This is exactly what I will try to do in the next sections.

2.3 The modal setting

As we saw at the outset, there is a close relationship between Imp and Pres, for they share the three prominent readings considered here, and I will argue that this common feature depends on a fundamental aspect of imperfectivity in Italian (and possibly in other languages), i.e. the relevance of modal considerations involving the reference to a state of information which includes

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[12] Such examples, involving events whose realization is factually impossible at the reference time, will be discussed in sect. 5.2

[13] As we will see in sect. 3.4, in the grammar of Italian achievements are ideally represented as *punctual* changes of state.

[14] This problem is particularly dramatic in the case of the Presente, which is very often used on the FUT reading. In Deo's analysis of imperfectivity in Italian only the Imperfetto is considered, but not on its FUT reading.

expectations, presupposed intentions, plannings, and so on[15].

The role of this informational background is to determine the set of modal alternatives that are still *open* from a given viewpoint (VIEW, from now on) located in time, and the main difference between Pres and Imp is that in the former case VIEW is located at the utterance time, while in the latter it is located at a past time. The shift from the utterance moment to a past moment which takes place with Imp is due to the fact that Imp is a past tense. To account for this shift, the analysis I will develop will be based on a "modal" reinterpretation of Reichenbach's classical analysis of tenses in English, and both Pres and Imp are analyzed as involving a Reference Time (RT).

To grasp the role of RT in a particularly significant scenario, consider the intriguing use of Imp in (16), as uttered in the context described above (see (8)-(10)), and contrast it with the plain use of Pres in (17).

(16) (Domani) Bill Evans suonava in un trio con Scott LaFaro e Paul Motian [(Tomorrow) Bill Evans play (past, imp.) in a trio with Scott LaFaro and Paul Motian = ... was supposed to play ...]
(17) (Domani) Bill Evans suona in un trio con Scott LaFaro e Paul Motian [(Tomorrow) Bill Evans play (pres.) in a trio with Scott LaFaro and Paul Motian = ... will play ...].

Here the time *which is spoken about* is pointed out by the bracketed adverb (do not forget that this information is provided by the context, not by linguistic material in the sentence). And in both cases this time is located in the future of the utterance moment, so that speaking of FUT reading is perfectly justified.

(17) is an illustration of the FUT reading of Pres, which is very frequent[16] in Italian. No particular context is required to trigger this reading, as shown by the fact that (17) can be uttered "out of the blue": as a matter of fact, it would be perfectly appropriate to start a discourse by uttering (17) and then specify, in the subsequent discourse, that a detailed program of the concert is available.

On the contrary, (16) *cannot* be utterered ex abrupto but requires some particular *ad hoc* context (as in (8)-(10)), since a (possibly implicit) reference to a past scenario is necessary. Such a scenario can involve a program (like in our original example), a schedule, a planned sequence of actions, etc., justifying the reference to *future* events (namely, events that are future with respect to some point *in the past*), and the role of RT, here, is to specify *where* to locate such a viewpoint and the domain of possibilia associated with it. Not surprisingly, the main difference between (17) and (16) is that in the former case there is an involvement of *present* possibilia, in the latter of *past* possibilia (perhaps to insist that these possibilia are *still* live options).

In general, tenses are a device to anchor VIEW to a temporal location: to the utterance time (with Pres), to some past time (with Imp). Thus, what tenses do, here, is *not* to locate the events themselves, but to locate VIEW via RT. And another important difference between the two cases is that in a statement like (17) the temporal anchoring of VIEW is automatically guaranteed by identifying RT with the utterance time, while in a statement like (16) the location of VIEW is not that obvious, but requires an appropriate scenario: for example a (possibly) *tacit* reference to some promise made in the past, or to some sort of planning, and so on, i. e. a background which justifies the English translation " ... (he) was supposed to play ...". That is the reason why such occurrences of the FUT reading of Imp are severely constrained and not very frequent.

A short reflection on the above examples is in order at this point.

If we ask ourselves how time contributes to the process of interpretation of an utterance, we can isolate (inter alia) two distinct roles.

On the one hand, as we have just seen, time is relevant to fixing a particular *perspective point*, i. e. the moment (or interval) to which VIEW is associated: it is with respect to this background of information that the utterance is ideally evaluated. This is why, in the formal treatment I will propose, RT will play the role of *circumstance of evaluation*. In (16), for instance, the moment at

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[15] See Copley (2009) for similar remarks about the future tense.
[16] At least in my idiolect, in a sentence like (17) the Present tense sounds more natural than the Future tense.

issue is located in the past, when the program of the concert was still in force, and shifting to this moment allows us, from an intuitive point of view, to evaluate that statement as *true*[17].

On the other hand, if we look at the global context in which (16) (or (17)) is uttered (if we look at the previous discourse, in particular), it is easy to observe that there is a time *which is spoken about*, i. e. the time of the *tomorrow* concert. To use a suggestive term, one might speak in this case of *target time*[18] (TT), by resorting to a metaphorical distinction between an aiming device (represented by RT) and the target aimed at by that device (TT).

To conclude these preliminary remarks about (17) and (16), we can say that these statements have the same TT (the time of the tomorrow concert), but different reference times: respectively, the utterance moment for (17) and some point in the past for (16).

Even if it is not in the scope of the present paper to develop a syntactic analysis of the positions occupied, respectively, by RT and TT, some informal remarks are in order here. Bianchi, Squartini and Bertinetto (1995) make this important observation: when a temporal adverb serves to locate what they call the perspective point, it occupies an "external" position with respect to the sentence structure, in the sense that "it lies outside the predicative nucleus of the sentence" (310). On the contrary, when the temporal adverb has the role of "event localizer", it occupies an internal position within the predicative nucleus. So, at this point, it seems plausible to conjecture that these two positions correspond to the variables associated, respectively, to RT and TT, whose values can be determined by the constraints imposed by extralinguistic context, or by the presence of explicit temporal adverbs, or by the interaction of these two factors.

2.4 Propositions and temporal parameters.

In a sense that will be made explicit later on by introducing an appropriate formal framework, the role of TT can be assimilated to the role of topic situations in Barwise's "Austinian" propositions. Roughly speaking, the idea is that when a sentence ϕ is uttered in a context c, a key role played by c is to *pick out the situation s* the utterance is about (the topic situation). Since this reference to *s* is crucial in fixing the relevant truth conditions, an "Austinian" proposition must involve it as an essential part.

As an illustration of this idea, imagine the following scenario.

I'm looking for the last edition of *The Literary Cyclist*. So I visit the bookstore A, where the shop assistant, after checking several shelves, says:

(18) Sorry, it is out of stock.

I am likely to accept (18) as a true statement even I am perfectly aware that the book is available in other stores. The reason, of course, is that the assistant's assertion is about a *particular* state of affairs involving the bookstore A. So, in addition to the classical features of the context, what is relevant here is the situation which is spoken about, and the corresponding truth conditions must

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[17] Notice that, as shown by (8)-(10), the truth of (16) with respect to the relevant state of information is perfectly compatible with its falsity with respect to a different state of information. I will address this issue in sect. 4.

[18] At least to some extent, this notion overlaps with Klein's notion of *topic time*, that is the time span "to which the speaker's claim is confined" (Klein, 1994: 4) But since this notion is often seen as replacing Reichenbach's concept of reference time, using an alternative term is safer.

To see the difference with respect to Klein's notion, consider (16) once more. In this case the past tense determines a backward shift of the reference time, not of the topic time, if we mean by this term the time the speaker is talking about, as specified in Klein's quotation. Why this is so is clear from the given scenario, where what is located in the past is RT, not the topic time (which is the time of the *tomorrow* concert, i. e. a point in the future of the utterance time). So, Klein's general assumption that the object of the backward shift operated by a past tense is his "topic time" does not seem to hold here.

Unfortunately, the terminology, in this area, is rather confusing. But I hope that the formal framework I will sketch in the next section will contribute to make things clearer.

take into account the fact that *this* situation is the target aimed at by the utterance. (See, for instance, Barwise and Etchemendy, 1987; Récanati, 2007; Kratzer, 2010)

In order to preserve the familiar theoretical background of the analysis about tense and aspect, in what follows I will take advantage of Barwise's suggestion by concentrating on an essential component of situations, that is time. In particular, I will be concerned with "topic" times, i. e. what I called target times, rather than topic situations. (But we should not forget that, in the formal framework that will be adopted here, the moments in the branching structures might easily be assimilated to (partial) worlds, i. e. situations).

Perhaps, a more radical departure from Barwise's formalization is that, formally, the time which is spoken about will be treated here as a contextual coordinate in the Kaplanian sense.

To illustrate the role of the target time TT, let us consider two different utterances of the same sentence:

Scenario 1. A says:
(19) L'anno scorso, quando entrammo al Village Vanguard, tutti stavano ascoltando la musica in religioso silenzio. [Last year, when we entered the Village Vanguard, everybody was listening to the music in an absolute silence].
B's comments is:
(20) Sì, ricordo, Bill Evans suonava con il suo famoso trio [Yes, I remember, Bill Evans play (past, imp.) with his famous trio = ... he was playing ...].

Scenario 2. Looking at the last issue of *DownBeat*, A says:
(21) L'anno scorso Bill Evans ha dato una quantità di concerti [Last year Bill Evans gave a lot of concerts].
Once more, B's comment is:
(22) Sì, ricordo, Bill Evans suonava con il suo famoso trio [Yes, I remember, Bill Evans play (past, imp.) with his famous trio = ... he used to play ...].

As shown by the relevant scenarios, the reference to the last year contributes to narrow down the intended TT in both cases, but the difference is that, in the former context, only a single time span is picked out (it is a particular moment during the trio's performance at the Village Vanguard), while in the latter several[19] time spans are involved: the time spans made *contextually relevant* by the reference to a series of concerts.

In the second scenario the number of the relevant subintervals of a given time span (last year) is left *indefinite*, but in other cases the context can help to make it definite. Here is an example with a definite, but "plural", TT.

Scenario 3. Looking at the last issue of *DownBeat*, A says:
(23) L'anno scorso Bill Evans ha dato tre memorabili concerti alla Carnegie Hall [Last year, Bill Evans gave three terrific concerts at the Carnegie Hall].
As before, B's comment is:
(24) Sì, ricordo, il pubblico ascoltava la musica in religioso silenzio [Yes, I remember, the audience listen (past, imp.) to the music in an absolute silence].

It is quite clear that the TT this utterance of (24) is about involves *three* time spans (made relevant by the reference to the three concerts in (23)). And what is entailed here, once more, is that an event of the relevant type takes place in *all* those occasions.

The idea is that the universal quantification associated with the imperfective allows us to characterize a *whole* interval i in terms of what happens in the subintervals of i made relevant by the context. This is why the imperfective is often used to describe the *temporal frame* in which the particular event denoted by a perfective clause or the particular time denoted by a temporal

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[19] This point is clearly stated in Klein (1994: 47): "A speaker may choose to speak about a *series* of topic times, rather than about a single one." (Italics mine.)

adverbial is located[20].

To sum up, *two* essential ingredients have been individuated in the present analysis of imperfectivity: the time of the situation an utterance is *about* (the target time TT) and the time *from* which that situation is considered (the reference time RT), i. e. the time to which VIEW is anchored. In some cases they coincide, in others they don't.

As for the former ingredient, we have just observed that TT is characterized as a whole in terms of a universal quantification over its relevant subintervals. This is what I call the *temporal impact* of imperfectivity.

As concerns the latter ingredient, the backward shift determined by the fact that Imp is a past tense is always associated with a backward shift of VIEW, while this perspective point sticks to the utterance time in the case of Pres. In both cases, the reference to a (past or present) state of information X is realized as a universal quantification over the courses events compatible with X. This is what I call the *modal impact* of imperfectivity.

This feature of the present analysis can be illustrated through the diagrams in Fig. 1 and Fig. 2. (Here time is represented as a branching structure: the formal apparatus will be defined in the next section.)

**Fig. 1** (VIEW is located at the utterance moment u)

Pres

u
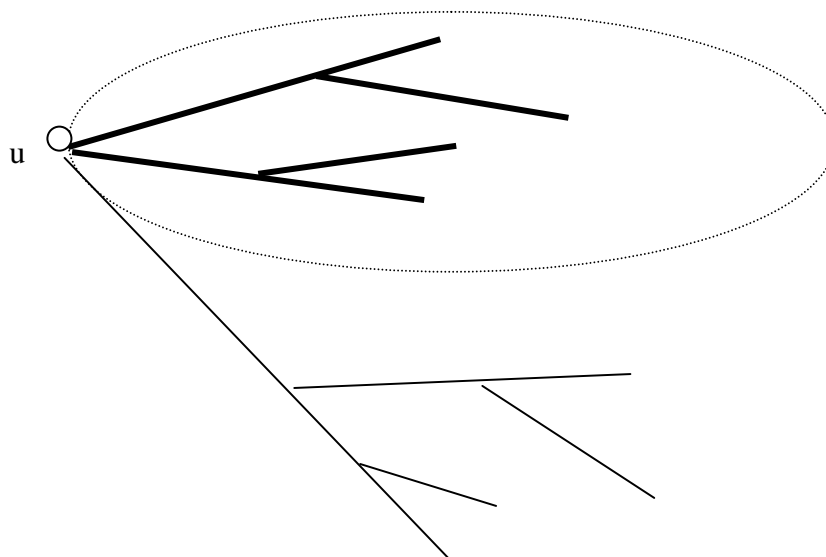
The ellipsis in Fig. 1 represents the VIEW located at the utterance moment u, in which some courses of events (the thicker lines) are selected as live options by the state of information holding at u, whilst others (outside the ellipsis) are ruled out.

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[20] This is the the "framing effect" described by Jespersen (1931). A similar idea can be found in Ducrot (1979): according to him the French Imparfait involves a contextually given time span i (named *thème temporel*), which is characterized as a *whole* in terms of the occurrence of a certain type of event in *all* the (relevant) subparts of i.

Fig. 2 (VIEW is located in the past of u)

Imp

VIEW is no longer located
at the utterance moment u
but at some moment m in the
past of u
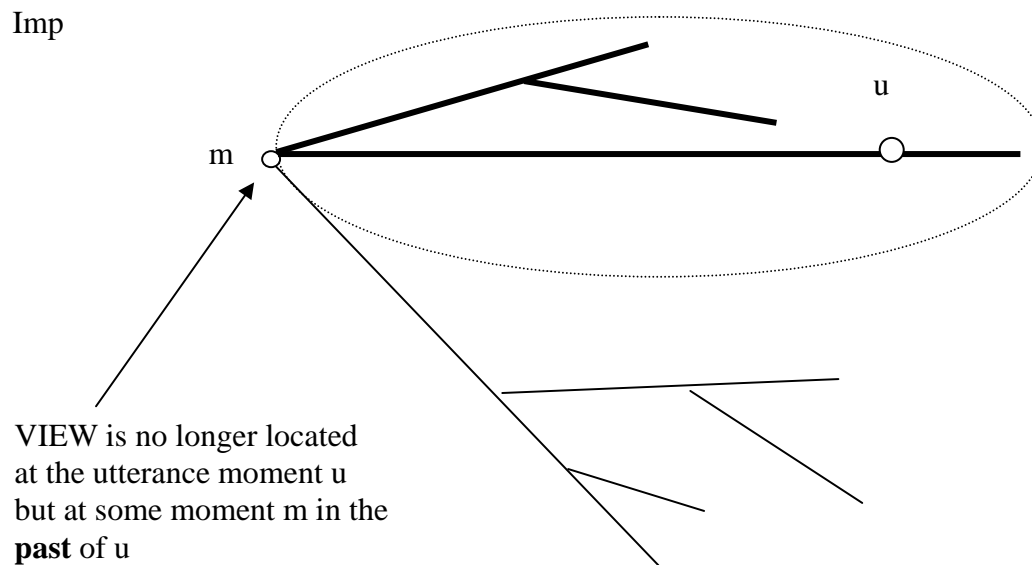
Thanks to the backward shift due to the past tense the perspective (represented by the ellipsis) is associated with a VIEW which precedes the utterance moment; it is from this standpoint located in the *past* that some courses of events are selected as live options.

Of course, associating imperfectivity with a point of view is no new idea (see, for instance, Bennett and Partee, 1978; Kamp and Rohrer, 1983; Smith 1991; and, for Italian: Bertinetto, 1986; Giorgi and Pianesi, 1997; Bonomi, 1997a). Indeed, in the literature on aspect imperfectivity has often been associated with an *internal* perspective on the event, and perfectivity with an external one.

However, this idea has been traditionally interpreted in terms of a linear representation of time, as a relation of inclusion between the interval corresponding to the reference time and the interval corresponding to the event time. This topological interpretation is illustrated in Fig. 3.

Fig. 3 (the classical representation)

Reference time

Event time
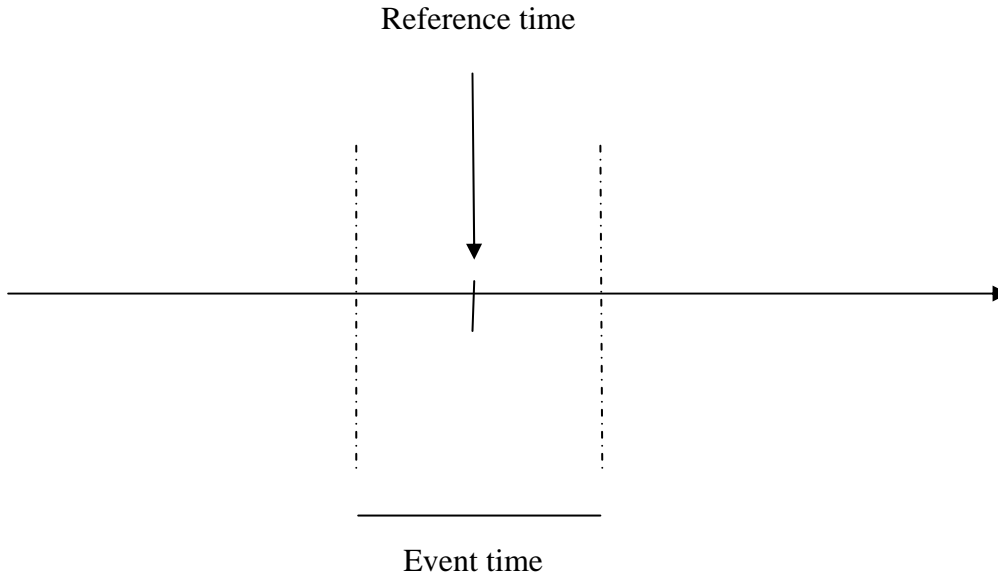
As we saw with Fig. 1 and Fig. 2 above, on the present proposal VIEW involves a *plurality* of courses of events in a branching structure, rather than a single course of events. Such a collection is the domain of the universal quantifier associated with imperfectivity and will be the topic of the next section, in which the formal framework will be presented.

3. A Branching Time framework

3.1 The basic notions.

Coming to the formal definitions, a model is a structure $S = \langle U, \leq, D, E \rangle$ where:

(i) U is a non empty set, the domain of moments;

(ii) $\leq$ is a partial order over U (i.e., it is a reflexive, transitive, and anti-symmetrical relation over U); $\leq$ is forward branching but not backward branching (i.e., it is branching towards the future but not towards the past), as required by the following postulate:

$\forall m_0, m_1 m_2 [[m_0 \leq m_2 \wedge m_1 \leq m_2] \rightarrow [m_0 \leq m_1 \vee m_1 \leq m_0]]$;

(iii) D is a domain of individuals;

(iv) E is a domain of sorted eventualities.

A course of events (coe) is a maximal $\leq$-chain on U. This mean that a set $X \subseteq U$ is a coe in U if X satisfies the following conditions:

(i) $\forall m_0, m_1 \in X [m_0 \leq m_1 \vee m_1 \leq m_0]$
(ii) $\forall Y \subseteq U \forall m_0, m_1 \in Y [[m_0 \leq m_1 \vee m_1 \leq m_0] \wedge X \subseteq Y \rightarrow X = Y]$.

Intuitively speaking, coes are temporally complete linear paths, each of which can be seen as a deterministic world.

H is the set of all coes in S.

Intervals in U are *linear convex sets* of moments in U. That is, a set X of moments in U is an interval in U if:

(i) X is a proper subset of some coe h in H;
(ii) $\forall m_0, m_1, m_2 \ [m_0, m_2 \in X \wedge m_0 < m_1 < m_2 \rightarrow m_1 \in X]$.

Zero measure intervals are intervals containing only one moment.

For any moment $m \in U$, H_m is the set of coes containing m. Similarly, for any interval of moments v, H_v is the set of coes including v.

As specified at the outset, in order to focus on the essential features of the present proposal, I will concentrate on the temporal constraints provided by the context, leaving temporal adverbials out of the scene. A further simplification concerns contexts, for I will ignore the features that are not relevant here by reducing a context c to the triple $<u_c, TT_c, F_c>$, where:

u_c is the *utterance moment*;

TT_c is the *target time*, i. e. an interval which is contextually determined: this mean that it can be narrowed down by information retrievable from previous discourse, world knowledge and so on[21] (this kind of information must be considered as an essential part of context c); formally speaking, it is like a free variable whose value is contextually fixed; for any coe h, h_{TT_c} is the segment of h individuated by TT_c;

F_c is the *reference time function*, which maps intervals to states of information. Intuitively, the role of F_c is to associate, to any interval v, the VIEW holding at v.

I will make this notion more precise by referring to Kratzer's treatment of modals in terms of a modal base and an ordering source[22]. Thus we have $F_c(v) = <B_{c,v}, \leq_{c,v}>$, where $B_{c,v}$ is a set of coes compatible with a contextually given conversational background (the modal base at v), and $\leq_{c,v}$ is an ordering on $B_{c,v}$ determined by a second, contextually given, conversational background (the ordering source at v).

To illustrate this point take for instance any moment m. In most cases, we have $B_{c,m} \subseteq H_m$. This means that, in standard situations, if m is the moment of evaluation, the modal base $B_{c,m}$ coincides with H_m (the set of coes which are metaphysically possible at m) or with a subset of it. But in sect. 5.2 we will also discuss possible scenarios in which the modal base does *not* coincide with (any subset of) H_m.

If $F_c(v) = <B_{c,v}, \leq_{c,v}>$, $MAX(F_c(v))$ is the set of coes, in $B_{c,v}$, which come closest to the ideal determined by the ordering source which determines $\leq_{c,v}$[23]. (More exactly, $MAX(F_c(v))$ is the set of coes h, in $B_{c,v}$, such that for no h', in $B_{c,v}$, $h <_{c,v} h'$.)

Intuitively speaking, $MAX(F_c(v))$ is a way of formalizing the perspective point (what we called VIEW), which the context c associates to a given moment m or interval v.

So, on this proposal, contextual dependency manifests itself in a twofold way:

(i) by narrowing down the location of the time span which *we are talking about* (the target time) and whose *relevant* subintervals will be quantified over (this is what I called the *temporal impact* of imperfectivity);

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[21] Such a "familiarity condition" is a feature of context which is not adequately dealt with in the formal framework under discussion and which deserves a separate analysis.
[22] See Kratzer (1981, 1991).
[23] The above definition presupposes the acceptance of the so-called "limit assumption", that is the assumption that there is a unique best set of worlds. This endorsement allows for a simpler presentation of the strategy at issue with respect to Kratzer's original formulation. See Portner (1998) for a similar approach.

(ii) by narrowing down the temporal location of the reference time to which a suitable VIEW is anchored; the coes compatible with this perspective point will be the domain of another kind of quantification (this is the *modal impact* of imperfectivity).

It should be noticed that, due to the presence of the reference time *function* F_c, an utterance context c has an inherently *dynamic* character. The idea is that, for any context $c = <u_c, TT_c, F_c>$, the utterance time is fixed once and for all, and is represented by u_c, which is the time of the utterance event. And the same can be said about the target time TT_c, which corresponds, once and for all, to a contextually *given* time span (perhaps associated with a set of subintervals).
But what about the parameter F_c, fixing the relevant VIEW? Surely, the moment u_c itself can play the role of evaluation moment to which F_c applies. This means that $F_c(u_c)$ is associated to a particular VIEW, i. e. the set of coes compatible with the modal base and the ordering source holding at the utterance time u_c. Yet, as time goes by, *other* moments (or intervals) become available as evaluation moments which feed the reference time function F_c: for example moment w, or, alternatively, moment v, and so on, so that *other informational backgrounds can become relevant in the same utterance context*. The intuition, here, is that, once an utterance event has taken place, the effects of this event extend over the temporal paths stemming from the utterance time, as pictured in fig. 4, where u, w, z, ..., are ideally associated to different evaluation times and, as a consequence, to possibly different perspective points. (This point will be illustrated sect. 4, when discussing the "no longer" clauses.)

Fig. 4 (the utterance time is definitely fixed at u, but, as time goes by, VIEW can be located at different moments, starting from the utterance time u itself)
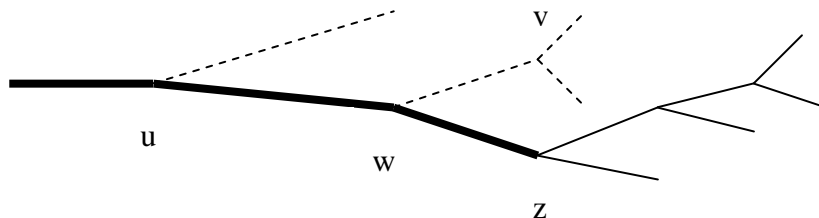
Notice that, thanks to function F_c, the location of the perspective point is seen as a coordinate of the context rather than a simple component of the circumstance of evaluation. Such a choice is motivated by the fact that, as shown by the examples discussed so far, the location of VIEW depends on *contextual* factors and these factors can change as time goes by. This is a natural outcome if imperfectivity is seen as a *modal* notion involving a *temporal* component.

To sum up, as concerns contextual dependency, the main features characterizing the present proposal are the following:

(i)   A context c is represented as a sequence of parameters**,** including the utterance time, the target time and the reference time *function*;
(ii)   the utterance time is fixed once and for all as the moment at which the utterance takes place;
(iii)   the target time (the time which is talked about) is fixed once and for all by contextual factors (where the speaker's intentions play a special role);
(iv)   the same utterance can be associated to different reference times (and, as a consequence, to different informational backgrounds) in function of the time flow.

For any expression α, $[\![α]\!]^{c,g}$ stands for the content of α in context c (with respect to the assignment g). If α is a sentence, this content is a proposition, i. e. a set of intervals of moments, and since the temporal parameters in any context c are the target time and the reference time function, this means that propositions (and in general contents) are defined *relative to these parameters*.

We will say that sentence ϕ is true of the interval v with respect to context c (and assignment g) if and only if $[\![ϕ]\!]^{c,g}(v) = 1$. Here v is the evaluation time, that is the interval that the reference time function maps to a set of coes. For brevity, I will refer to it as the reference time.

3.2 The semantics of Imp.

In view of the parallelism between Pres and Imp, the account proposed for one of them can be generalized to the other, with an important difference. As we saw in the previous section, in the case of Pres the VIEW which determines the relevant domain of coes must be located at the utterance time. On the contrary, Imp (which is a past tense) determines a backward shifting of VIEW. This point is expressed by the following general principle concerning Imp:

(PastImp) The reference time at which VIEW is located is in the *past* of the utterance time.

Once this peculiarity has been made clear, it is possible to start our analysis.

As for the temporal impact of Imp, the key idea is that the target time TT, which is an interval v, is characterized as a *whole* in terms of the occurrence of a certain type of event in *all* the "relevant" subparts of v. Intuitively speaking, this means that the event at issue "covers" the entire interval v, as required by the framing effect described, among others, by Jespersen and Ducrot.

In what follows, to account for this characteristic of Imp, I will assume that the set of "relevant" subintervals of the target time TT_c is contextually determined and that the term "relevant" is just a placeholder which allows us to refer to our favourite theory in this connection. As I explained in sect. 2.2, Deo's notion of *regular partition* of the relevant interval is the best candidate to play this role. But I will leave this issue open.

I will also assume that, if i is a zero measure interval, the set of its relevant subinterval is the singleton of i itself.

"$v \subseteq_R h_{TTc}$" means that v is a subinterval of h belonging to the contextually given set of the relevant subintervals of TT_c (possibly a regular partition of TT_c in the sense of Deo (2009), as I have just said).

So let us turn to the unified treatment of imperfectivity which accounts for the three readings at issue. The key definition is the following[24]:

$$[\![IMPF]\!]^{c,g} = λEλv∀h,v'[h ∈ MAX(F_c(v)) ∧ v' \subseteq_R h_{TTc} → ∃e[E(e) ∧ τ(e) ⊆ h ∧ v' ⊆ τ(e)]].$$

---

[24] E ranges over "radicals", that is predicates of events, and τ(e) is the temporal trace of an event e.

More restrictive temporal relations between the target time and the temporal trace of e might be considered, for example by imposing that $v' \subseteq_{nf} τ(e)$ (where "$x \subseteq_{nf} y$" means that x is a non-final subinterval of y, as specified in Deo 2009). One of the advantages of the more flexible solution I have opted for is that *it is compatible with the "perfective" effect of Imp which will be discussed below*.

Intuition is far from being clear on these issues. For example, according to the semantic rule for Imp adopted here, if at a moment m I say "Leo ripara la bici" ("Leo repair (pres) his bike") and Leo finishes repairing his bike at that very moment, such an utterance would be evaluated as true according to the "liberal" rule under discussion. My intuition agrees with this outcome (that is why I chose the most "liberal" option), but objections might be raised.

The feeble reliability of intuitions in this area is pointed out, among others, by Parsons (202: 684): "If Maria wins a race exactly when I begin uttering *Maria won the race* should my utterance be true? What if John shuts the door by kicking it, and because of the way it is mounted, it takes three seconds to fully close? If I say *John closed the door* after he kicked it but while it is still swinging, is my utterance true? Or *Maria thinks the cat is sick* if she starts to think that just as I pronounce the last word? These uncertainties are reflected in our usage – that is, native speakers vacillate about close cases."

As concerns tense, a referential approach will be adopted here (Partee 1973, Heim 1994). The relevant definition is as follows:

$[\![PAST_v]\!]^{c,g}$ is defined only if $g(v)$ precedes the utterance time i_u and coincides with the reference time. If defined, $[\![PAST_v]\!]^{c,g} = g(v)$.

(Importantly, the constraints concerning the value of v are determined *not only* by the presupposition that its value must be a past time, *but also* by other presuppositions retrievable from the context. For example, if I am reading a report describing something that happened in my office yesterday at 3 p. m. and my comment is: "I wasn't in my office", it is clear that the relevant presupposition, here, is not only that the value of variable v must be located in the past, but also that it must be identified with a particular moment (the reference time: yesterday, 3 p. m.), in the spirit of Partee's original remarks. How to formalize such familiarity conditions is a general issue concerning anaphora resolution which cannot be addressed here; so, in what follows I will content myself with generically speaking of "other" contextual constraints in addition to the classical one concerning the property of being past.)
To sum up, the reference time and the target time are associated with presuppositional constraints that narrow down their respective temporal locations.

To start with a concrete example, consider the PROG reading of the sentence

(25) Leo dimostrava un teorema [Leo prove (past, imp.) a theorem = ... was proving ...]

uttered to answer a question like "What was Leo doing yesterday afternoon at three o' clock?"

The relevant constraint provided by the context is that the reference time is to be located at 3 p. m. (yesterday) and the target time coincides with this moment. Thus, the truth conditions of (25) in the utterance context c (with respect to an assignment g) are derived in the following way:

$[\![Leo\text{-}prove\text{-}a\text{-}theorem]\!]^{c,g} = \lambda e[Leo\text{-}prove\text{-}a\text{-}theorem(e)]$

$[\![IMPF]\!]^{c,g}(\lambda e[Leo\text{-}prove\text{-}a\text{-}theorem(e)])$

$\lambda E \lambda v \forall h, v'[h \in MAX(F_c(v)) \wedge v' \subseteq_R h_{TTc} \rightarrow \exists e[E(e) \wedge \tau(e) \subseteq h \wedge v' \subseteq \tau(e)]](\lambda e[Leo\text{-}prove\text{-}a\text{-}theorem(e)])$

$\lambda v \forall h, v'[h \in MAX(F_c(v)) \wedge v' \subseteq_R h_{TTc} \rightarrow \exists e[Leo\text{-}prove\text{-}a\text{-}theorem(e) \wedge \tau(e) \subseteq h \wedge v' \subseteq \tau(e)]]$

The last line gives us the proposition expressed by the sentence at issue in the given context.

The final step, ruled by tense, is to introduce a contextually selected time:

$\lambda v \forall h, v'[h \in MAX(F_c(v)) \wedge v' \subseteq_R h_{TTc} \rightarrow \exists e[Leo\text{-}prove\text{-}a\text{-}theorem(e) \wedge \tau(e) \subseteq h \wedge v' \subseteq \tau(e)]]([\![PAST_v]\!]^{c,g})$.

So, what we get is the following truth conditions:

(25a)

$\forall h,v'[h \in MAX(F_c(v)) \land v' \subseteq_R h_{TTc} \rightarrow \exists e[\text{Leo-prove-a-theorem}(e) \land \tau(e) \subseteq h \land v' \subseteq \tau(e)]]$

Here, as required by the contextual constraints, the reference time $g(v)$ is a zero measure interval which precedes the utterance time and which corresponds to yesterday, 3 p.m. The target time TT_c coincides with the reference time. (Do not forget that the set of relevant subintervals of a zero measure interval is assumed to be the singleton of that interval.)

$F_c(v) = <B_{c,v}, \leq_{c,v}>$, where $B_{c,v}$ is a set of coes compatible with a contextually given conversational background (the modal base at v), and $\leq_{c,v}$ is an ordering on $B_{c,v}$ determined by another conversational background (the ordering source at v). Thus, in our example, suppose that $B_{c,v}$ is determined by a *circumstantial* modal base, where the relevant *facts* holding at v are are taken into consideration and that $\leq_{c,v}$ is determined by a *teleological* ordering source, which selects the coes, in $B_{c,v}$, where the goal at issue is reached with minimal difficulty.

Under these assumptions, we can say that (25) is true in the utterance context c if and only if there is a past moment m such that:

m is in the past of the utterance moment and coincides with yesterday, 3 p. m.;

in every coe h passing through m which is compatible with the VIEW holding at m (associated, in this case, to a circumstantial modal base and a teleological ordering source), there is an event of Leo's proving a theorem which is going on at m and whose temporal trace, including the culmination point, is a segment of h. The following picture can help:

Fig. 5
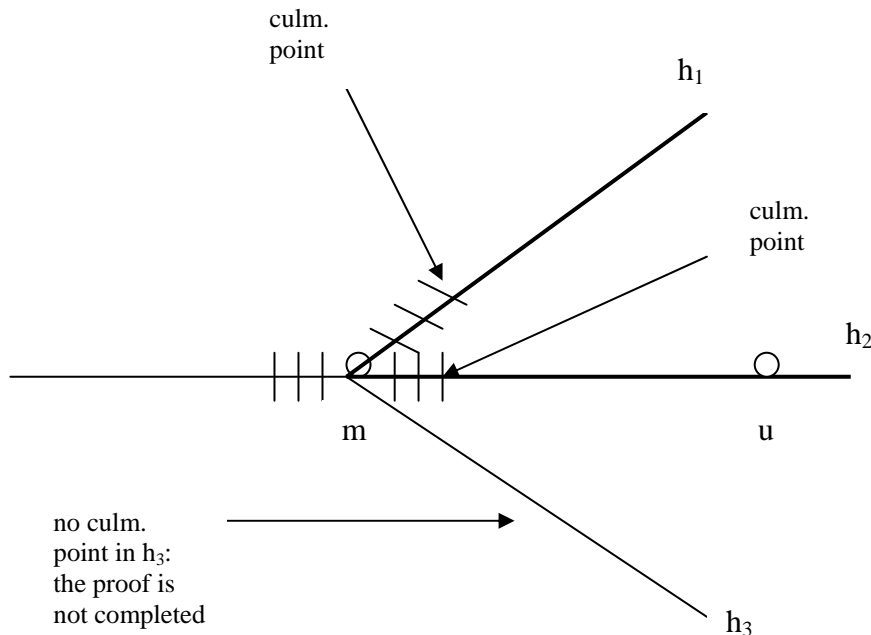
Here, u is the utterance time.

Constraints: $m < u$ (constraint imposed by tense); m coincides with yesterday, 3 p. m. (constraint imposed by the context).

h_1 and h_2 (the thicker lines) instantiate the coes compatible with VIEW at moment m, that is the coes which come closest to the ideal fixed by the teleological ordering source. In such coes an event of Leo's proving a theorem is going on at m and culminates at some moment following m. Notice that different events (in different coes) can share the same temporal trace up to the branching point m and that the event which is in progress at m aborts in h_3, where there is no culmination point. For example, h_3 might be a coe where the proof is definitely interrupted, at ten past three, because one of the students has just destroyed Leo's notes, which are essential to complete the proof. But the existence of h_3 as one of the possible courses of events still open at moment m does not interfere with the truth of (25), for the simple reason that h_3 is not among the "best" coes with respect to the teleological ordering source. I will discuss such issues in sect. 5.2.

Let us turn to the HAB reading. The important difference, with respect to the progressive reading, is

that the target time TT_c is no longer a "small" interval, but an interval whose extension exceeds the reasonable running time of any singular event of the type at issue. In this case a series of events of that type is associated to a series time spans made *relevant* by the context (e. g. by a regular partition in Deo's sense). For example, consider a situation in which a sentence like (22), repeated here as (26), is used in the scenario described in (21)-(22).

(26) Bill Evans suonava con il suo famoso trio [Bill Evans play (past, imp.) with his famous trio = ... he used to play ...].

It is clear, from the context, that the target time is an interval corresponding to the last year and that the relevant subintervals quantified over are picked out by referring to a series of concerts.

Applying the same kind of derivation developed for (25) we get the following truth conditions:

(26a) $\forall h,v'[h \in MAX(F_c(v)) \wedge v' \subseteq_R h_{TTc} \rightarrow \exists e[\text{B.E.-play-with-his-trio}(e) \wedge \tau(e) \subseteq h \wedge v' \subseteq \tau(e)]]$
contextual constraints: the target time corresponds to the last year and its relevant subintervals are determined by the reference to the concerts at issue. The reference time coincides with the target time.

VIEW is $F_c(v) = <B_{c,v}, \leq_{c,v}>$. But in this case $B_{c,v}$ is determined by a circumstantial modal base and $\leq_{c,v}$ is determined by a stereotypical ordering source (which selects the "normal" courses of events stemming from v)
So, according (26a), (26) is true in the utterance context c if for every time span v' corresponding to the last year concerts and for every coe h compatible with VIEW there is an event of B. E.'s playing with his trio occurring in h at v'.

Finally let us consider the FUT reading, illustrated by (29).

(27) Ieri mattina Leo ha prenotato un posto in treno per le tre del pomeriggio [Yesterday morning Leo booked a seat for 3 p. m.]
(28) Era soddisfatto [He was satisfied].
(29) Il treno partiva dalla sua stazione preferita [The train leave (past, imp.) from his favourite station = ... would leave ...].

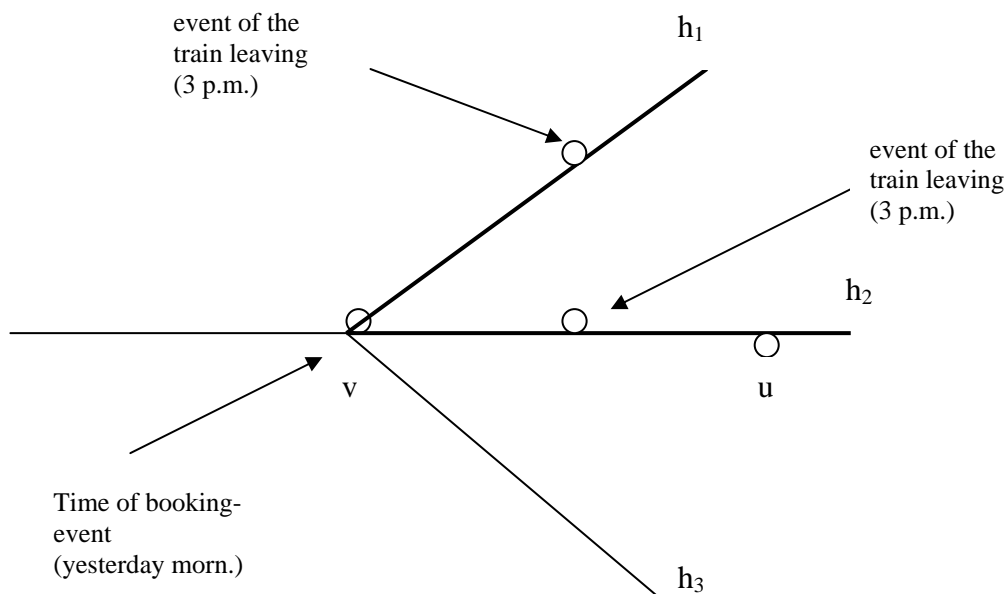This time the usual derivation yields the following result:

(29a) $\forall h,v'[h \in MAX(F_c(v)) \wedge v' \subseteq_R h_{TTc} \rightarrow \exists e[\text{the-train-leave-from-his-favourite-station}(e) \wedge \tau(e) \subseteq h \wedge v' \subseteq \tau(e)$
contextual constraints: the reference time v is a past interval (included in the interval corresponding to yesterday morning) and the target time is the zero measure interval corresponding to yesterday, 3 p.m.

In the above scenario, the VIEW holding at the reference time v is $F_c(v) = <B_{c,v}, \leq_{c,v}>$, where $B_{c,v}$ is a circumstantial modal base and $\leq_{c,v}$ is a *planning*-oriented ordering source which selects the coes in $B_{c,v}$ that are compatible with a given railway schedule.
The following picture can be useful to grasp the content expressed by (29a).

Fig. 6

event of the
train leaving
(3 p.m.)

h_1

event of the
train leaving
(3 p.m.)

h_2

v

u

Time of booking-
event
(yesterday morn.)

h_3

Here, u is the utterance moment
Thanks to the constraints concerning RT, VIEW is located at v (time of booking-event) and is determined by a circumstantial modal base and a planning-oriented ordering source.
TT is yesterday 3 p.m.
RT < TT < u
h_1 e h_2 instantiate the coes compatible with VIEW at m. In such coes, which belong to $MAX(F_c(v)$ as described above, an event of the train's leaving occurs at the target time.

3.3 Extending the analysis: *the semantics of Pres*.

As pointed out at the outset, given the parallelism between Pres and Imp the main goal of this paper is to provide a unitary account for the prominent readings we are considering, and one possible way to achieve this task is to extend the logical form in (25a) to all these readings, letting the tense rules and the context make the difference.
Let us start from the PROG reading of Pres by considering an example which is quite similar to (25) (the only difference is that RT does not precede the utterance moment but coincides with it). So, suppose that someone asks me what Leo is doing (right now) and that my answer is:

(30) Ripara la bici in giardino [(He) repair (pres.) the bike in the garden = ... is repairing ...].

It is clear from the context that we are speaking about what Leo is doing right now, i. e. at the *utterance time* u_c; this means that, in this case, TT is nothing but u_c itself. On the other hand, u_c coincides with RT as well, for it is at the utterance time that VIEW is located.
VIEW is characterized as in example (25), in terms of a circumstantial modal base and a teleological ordering source. What changes is its location.

To get the right derivation, we need a tense rule for Pres, which might be something like that[25]:

$[\![PRES_v]\!]^{c,g}$ is defined only if g(v) is the utterance time. If defined, $[\![PRES_v]\!]^{c,g} = g(v)$.

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[25] Under the assumption, which is often endorsed in the semantics of tense and aspect, that the utterance time is idealized as an instantaneous temporal unit. Such an idealization allows for a simpler version of the truth conditions, but the analysis under discussion does not depend on it in any significant way.

So, thanks to a derivation parallel to the one illustrated in the case of (25), what we obtain this time is the same kind of formula we obtained for Imp, but with different contextual constraints on TT and RT.

(30a) $\forall h,v'[h \in MAX(F_c(v)) \land v' \subseteq_R h_{TTc} \rightarrow \exists e[\text{Leo-repair-the-bike}(e) \land \tau(e) \subseteq h \land v' \subseteq \tau(e)]]$
contextual constraints: reference time = target time = the utterance time. More exactly, TT_c is a zero measure interval which coincides with u_c.

$F_c(v) = <B_{c,v}, \leq_{c,v}>$, where, as in the case of (25), $B_{c,v}$ is determined by a *circumstantial* modal base and $\leq_{c,v}$ is determined by a *teleological* ordering source.
This means that (30) is true in the given scenario if and only if VIEW is located at the reference time v, which coincides with the utterance moment u_c, and in every coe containing u_c and belonging to $MAX(F_c(v))$ there is an event of Leo's repairing the bike going on at u_c.
To sum up, the PROG reading of (30) might be pictured in a figure quite similar to the one used for the imperfetto (fig. 5), with the only difference that this time RT does not precede the utterance time but coincides with it.

As concerns the FUT reading, let us consider an example which is similar to (27)-(29), with the difference that the Imperfetto is replaced by the Presente:

(31) Leo ha appena prenotato un posto in treno per le tre del pomeriggio [Leo has just booked a seat for 3 p. m.]
(32) È soddisfatto [He is satisfied].
(33) Il treno parte dalla sua stazione preferita [The train leave (pres.) from his favourite station = ... will leave ...]

Clearly, in such a scenario the intended TT for (33) is 3 p. m., whilst, as required by the present tense, RT (i. e. the time at which a certain kind of information - such as a schedule, a program, etc. - is available) coincides with the *utterance time*. As a consequence, we get the same logical form as before, but with different presuppositions, as pointed out by the following truth conditions:

(33a) $\forall h,v'[h \in MAX(F_c(v)) \land v' \subseteq_R h_{TTc} \rightarrow \exists e[\text{the-train-leave-from-his-favourite-station}(e) \land \tau(e) \subseteq h \land v' \subseteq \tau(e)]]$
contextual constraints: the reference time g(v) is the utterance time and the target time is the zero measure interval following the utterance time and corresponding to 3 p. m.

In this case, the VIEW holding at the reference time v (which coincides with the utterance moment) is $F_c(v) = <B_{c,v}, \leq_{c,v}>$, where $B_{c,v}$ is a circumstantial modal base and $\leq_{c,v}$ is determined by the *planning*-oriented ordering source associated to a railway schedule.
So, (33) is true in the given scenario if and only if the moment at which VIEW is located is the utterance time u_c and for every coe containing u_c, and compatible with the VIEW holding at u_c, there is an event of the train's occurring (which is the intended target time).

Finally, let us turn to HAB. To illustrate this reading, imagine a situation in which A is speaking of the great performances achieved this year by Bill Evans and consider this comment, made by B:

(34) (Sì, lo so) suona in un trio fantastico [(Yes, I know), he play (pres) in a terrific trio].

In this case VIEW is characterized as in example (26), in terms of a circumstantial modal base and a stereotypical ordering source. What changes is its location, because the reference time is not in the past of the utterance moment but coincides with it.

The target time TT is the current year, and the set of relevant subintervals of TT is contextually determined by the concerts at issue.

Thus, we get the following truth conditions:

(34a) $\forall h, v'[h \in MAX(F_c(v)) \wedge v' \subseteq_R h_{TTc} \rightarrow \exists e[\text{He-play-in-a-terrific-trio}(e) \wedge \tau(e) \subseteq h \wedge v' \subseteq \tau(e)]]$

contextual constraints: the target time TT_c is the interval corresponding to the current year and the reference time is the utterance time.

Here VIEW, determined by a circumstantial modal base and a stereotypical ordering source, is located at the utterance time u_c, TT is the current year and the set of its relevant subintervals is contextually determined by the reference to the pianist's performances. Thus, (34) is true in the utterance context c if and only for every coe h compatible with VIEW and for every subinterval v' of the current year associated to a great performance there is an event of Bill Evans's playing in a trio occurring in h at v'.

As explained at the outset the idea is that the habit at issue involves a series of regular events in the current year and that this series is expected to continue beyond the utterance moment, unless otherwise stated.

3.4 The perfective effect.

For the sake of generality, I have tried to keep the current analysis independent of the actional properties of the verb phrases. But there is an intriguing phenomenon, in this connection, that cannot be ignored.

As is well-known, the imperfetto of an achievement VP, on its PROG reading, has a sort of "perfective" effect[26], as shown by the following contrast:

(35) Alle tre Leo riparava la bicicletta (ma poco dopo ha dovuto rinunciare perché non aveva tutti i pezzi di ricambio necessari) [At three o' clock Leo fix (past, imp) his bicycle (but a little later he had to give up because he did not have all the necessary spare parts)]
(36) Alle tre Leo raggiungeva la vetta della montagna (??? ma poco dopo ha dovuto rinunciare a causa di un temporale) [At three o'clock Leo reach (past, imp) the top of the mountain (??? but a little later he had to give up because of a storm].

The intuition, here, is very clear. The imperfetto of an accomplishment VP like *riparare la bicicletta* (*fix the bicycle*) does *not* entail that the event at issue reaches its natural conclusion (as shown by the parenthetical remark in (35)). Indeed, this is one of the characterizing features of the PROG reading of the imperfetto for accomplishment VPs. On the contrary, the PROG reading of the imperfetto of an achievement VP like *raggiungere la vetta della montagna* (*reach the top of the mountain*) does entail the conclusion of the relevant event (this is why the parenthetical remark in (36) is not acceptable). Thus, a further task to pursue is to account for this "perfective" effect of Imp when it occurs with an achievement predicate.

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[26] The idea is that, when it co-occurs with some particular event predicates, the imperfective has a semantical effect which might be expressed by a perfective form. In the literature, this effect is usually associated with achievements (see the examples I discuss in the text). As shown by (46) below and other similar examples, this "narrative" reading of the imperfective is possible not only with achievements, but also with accomplishments (although in this case it is not the only interpretation available and a particular context is required). To explain why this phenomenon is in general possible is precisely one of the goals of the theoretical framework under discussion.

Before proposing an explanation, it should be noticed that, in some particular contexts, the imperfetto of an accomplishment VP can have this perfective effect, too. This is the so-called *imperfetto narrativo* (narrative imperfect: see, for instance, Bertinetto, 1986: 381 - 389). I will not address this issue for the moment and I will concentrate on achievements because, *unlike accomplishments*, they show a *uniform* behaviour in the presence of the imperfetto (in the sense that, unlike accomplishments, they *always* determine the perfective effect when TT and RT coincide[27]). Some more examples:

(37) Dopo una lunga fuga, Leo tagliava il traguardo da solo [After a long sprint, Leo cross (past, imp.) the finishing line by himself = ... crossed ...]
(38) Alle cinque in punto l'aereo del presidente atterrava all'aeroporto di Linate [The president's plane land (past, imp) at Linate airport exactly a 5 p. m. = ... landed ...]

The important thing to observe is that the truth of a sentence such as (37), for instance, does entail that Leo crossed the finishing line and, from this point of view, it can be assimilated to a perfective sentence like the following:

(39) Leo tagliò il traguardo.[Leo cross (past, perf.) the finishing line = ... crossed ...].

And the same can be said of the other examples. Thus, we are in the presence of a general phenomenon which needs an explanation.
It should also be noticed that the entailment at issue, determined by the "perfective" effect, does *not* characterize the perifrasi progressiva of an achievement VP, as shown by the fact that, unlike (36), a statement such as:

(40) Ieri alle tre Leo stava raggiungendo la vetta della montagna ... [Yesterday at three o' clock Leo reach (past, per. prog.) the top of the mountain ... = ... was reaching ...]

is perfectly compatible with a continuation such as

(41) ... quando un improvviso temporale lo costrinse a rinunciare [... when a sudden storm forced him to give up].

As a consequence, we must conclude that there must be something *inherent* to the semantics of the PROG reading of Imp, and not to the semantics of the perifrasi progressiva[28], which explains the perfective effect when an achievement VP is involved.
Such an explanation is easily found if we consider a further example and its logical form.

(42) Judge: Si ricorda esattamente cosa vide quando entrò nella stanza? (Do you exactly remember what you saw when you entered the room?)
(43) Witness: (Sì) proprio in quel momento l'accusato colpiva alla testa il prigioniero [(Yes) exactly at that moment the defendant hit (past, imp.) the prisoner on the head].

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[27] This is a necessary condition for the PROG reading of the imperfetto, which entails the perfective effect when an achievement predicate is involved. As predicted by the analysis under discussion, this effect does not occur when RT and TT do *not* coincide, i. e. in the case of the FUT reading. Too see this, consider the following example:
(A) Leo arrivò alla stazione alle tre. (Leo arrived at the station at 3 p. m.)
(B) Il suo treno partiva due ore dopo. (His train leave [past, imp] two hours later = ...would leave...)
(C) Sfortunatamente, a causa di uno sciopero improvviso, tutte le corse del pomeriggio furono cancellate. (Unfortunately, because of a sudden strike, all the afternoon departures were cancelled.)
Witness (C), the imperfetto of the achievement predicate in (B) does *not* entail that the train left, and this outcome is compatible with the FUT reading.
[28] See Higginbotham (2009) for an extended semantic analysis of the progressive.

Since the reference time is the moment at which the witness entered the room, for (36) we can derive the following (simplified) truth conditions:

(43a) $\forall h, v'[h \in MAX(F_c(v)) \wedge v' \subseteq_R h_{TTc} \rightarrow \exists e[\text{The-defendant-hit-the-prisoner}(e) \wedge \tau(e) \subseteq h \wedge v' \subseteq \tau(e)]]$

Contextual constraints: the reference time $g(v)$ is the moment at which the witness entered the room and $F_c(v)$ is determined by a circumstantial modal base and an empty ordering source. The target time is a zero measure interval which coincides with the reference time.

Intuitively speaking, all this is tantamount to saying that:
(i) m coincides with the moment at which the witness entered the room;
(ii) in *every* coe compatible with the facts at m, there is an event of the defendant's hitting the prisoner whose temporal trace includes or coincides with m.
In the present framework, this means that an event of the type at issue was ongoing at m.
Now, under the assumption that "achievements are simple changes of state, which are treated by the grammar as punctual and (near) instantaneous" (Rothstein, 1998), a consequence of (ii) is that, due to this peculiarity of achievements, the *whole* event of the defendant's hitting the prisoner (and not only a part of it) occurs at m (whatever coe you consider): which is exactly the "perfective" effect we are discussing. As (ideally) punctual or instantaneous events, achievements, we might say, have no future ... If an achievement occurs at a moment m, there is no way to stretch its temporal extension up to a moment m' later than m.
But what about accomplishments? To answer this question, take the following example:

A asks:
(44) Cosa faceva l'insegnante quando sei entrato in aula? (What was the teacher doing when you entered the room?)
B answers:
(45) Dimostrava un teorema alla lavagna ((She) prove [past, imp.] a theorem on the blackboard]).

Truh conditions for (45):
(45a) $\forall h, v'[h \in MAX(F_c(v)) \wedge v' \subseteq_R h_{TTc} \rightarrow \exists e[\text{She-prove-a-theorem}(e) \wedge \tau(e) \subseteq h \wedge v' \subseteq \tau(e)]]$
Contextual constraints: the reference time $g(v)$ is the past moment (a zero measure interval) at which I entered the room and the target time coincides with the reference time. $F_c(v)$ is determined by a circumstantial modal base and a teleological ordering source.

If a coe h contains a moment m included in the temporal trace of an accomplishment e, this does not entails that h will also contain the moment at which e reaches its natural conclusion (its culmination point). Indeed, whilst the temporal trace of an achievement coincides with its culmination point, this is not true of an accomplishment. As a consequence, the fact that an event e of the relevant type is going on at m in a coe h does not guarantee that e will reach its culmination point in h.
It should be noticed, however, that the perfective effect is allowed, with an accomplishment, in special circumstances. This happens when the reference time coincides with the culmination point of the event at issue. Since this is not the default case, a particular context is required to force such an interpretation. In other words, whilst the perfective effect of an achievement is *entailed* by the semantics of Imp on the PROG reading, such an effect, with accomplishments, can only be produced in particular, ad hoc scenarios[29]. This is the case of the so-called "narrative" reading, as shown by an example like:

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[29] The narrative reading is made possible only by a quite "peculiar" use of the imperfetto according to Bertinetto (1986: 381).

(46) Ieri pomeriggio alle tre, dopo molti tentativi, finalmente Leo dimostrava il teorema [Yesterday at 3 p. m., after many attempts, finally Leo prove [past, imp.] the theorem]

where it is *possible* to interpret such an utterance as saying that, yesterday at 3 p. m. Leo managed to complete his proof[30].

4. Propositions and contextual dependency

Looking at the formal framework sketched above, there is an interesting issue which deserves a closer investigation: how does the evaluation of an *utterance* (not of a simple sentence) depend on the relevant parameters in the utterance context $c = <u_c, TT_c, F_c>$?
Let us begin from the target time TT_c. When discussing the relationship between propositions and temporal locations we saw that there is a sense in which the reference to a given time or situation is crucial in determining the content (the proposition) expressed by an utterance. This is a general phenomenon which deserves special attention, and the following example[31], taken from a different domain, is particularly useful to illustrate this point.
Consider a scenario in which Leo's five dogs are in different towns, for they are taking part in different dog shows. After some phone calls made to check whether they are in good health, Leo's wife says:

(47) All the dogs are fine.

Intuitively, this utterance is true if and only if all the five dogs at issue (the dogs that are *tacitly* assumed to be the topic of the utterance) are fine. Now, what keeps these dogs "together" (as a partial but unitary domain of quantification) is the implicit reference to a given situation, *which is not reducible to a mere spatio-temporal region*, because it is plausible to think that in a region big enough to include five different towns there are dogs that are *not* fine.
No, the relevant situation, in this case, has to be something more abstract, circumscribed by pragmatic considerations, something like a local state of affairs, or a property, which might be roughly described as "owning such and such dogs".
That this kind of (tacit) reference to abstract situations is *essential to determining the proposition expressed by the utterance* is proved by the fact that if, having in mind a different situation (for example a situation involving the dogs in his farm), Theo should object:

(48) No, not all the dogs are fine

we would say that this is a case of misunderstanding and that the disagreement expressed by negation in (48) does not involve what Leo's wife really said, but is simply due to Theo's inability to grasp it.
This is typical of "topic" situations in Barwise's sense. And something similar happens with *time*, witness a modified version of an example discussed in a previous section.
Imagine that tomorrow Bill Evans will give two concerts: one in the afternoon, with his famous trio, and the other by night, in a duo with Jim Hall. Referring to the time of the first concert, Leo utters the following sentence:

(49) Bill Evans suona in un trio [Bill Evans play (pres.) in a trio = ... will play ...].

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[30] Not surprisingly, a more natural way of expressing this content would involve an achievement VP:
(46') Ieri pomeriggio alle tre, dopo molti tentativi, finalmente Leo concludeva la dimostrazione del teorema [Yesterday at 3 p. m., after many attempts, finally Leo conclude [past, imp.] the proof of the theorem].
[31] Discussed in Bonomi (1998).

This example illustrates the FUT reading of Pres and we all agree that, given the intended target time (the time span corresponding to the tomorrow concert), such an utterance should be evaluated as true.

Now suppose that Lea ignores the existence of the afternoon concert, while she is perfectly aware of the program concerning the second concert. So, she objects:

(50) No, suona in un duo con Jim Hall [No, (he) play (pres.) in a duo with Jim Hall = ... will play ...].

Once more, the natural way to analyze (50) is to say that there is no real disagreement here and that, quite simply, Lea did not grasp what the speaker meant, i. e. the proposition expressed by his utterance. Accordingly, should Leo conclude

(51) Mi spiace, un'altra volta mi informerò meglio [Sorry, next time I'll try to get more information].

such a comment would sound completely inappropriate.

The moral we can draw is that the target time is not *negotiable*: different target times give us different propositions. Hence the idea to represent this feature as the "fixed" coordinate TT_c in an utterance context c.

What about the reference time?

The situation seems to be more intriguing in this case. Let us see why.

In the formal treatment adopted here, the reference time of a given context c is represented as a *function* F_c from moments (or intervals, for that matter) to states of information (consisting in a modal base and an ordering source). This is a necessary step, for different times can be associated to different states of information. To see that, let us consider the following story.

According to the program of the tomorrow concert, Bill Evans will play with Jim Hall. Theo, who has heard some vague rumours, asks:

(52) Che ne sai del concerto di domani? E' vero che Bill Evans suona con Jim Hall? [What about the tomorrow concert? Is it true that Bill Evans play (pres.) with Jim Hall? = ... will play ...]

Since Lea is well informed, she promptly answers:

(53)
(a) Sì, è vero [Yes, it is true]
(b) Bill Evans suona con Jim Hall [Yes, it is true. Bill Evans play (pres.) with Jim Hall = ... will play ...].

There is no doubt that such an answer testifies a quite intuitive use of the predicate "true" and that it would be unnatural to object that, since the event at issue has not yet occurred, such a predicate is misplaced here. Indeed, using this predicate in relation with a future-oriented sentence is a fact that seems to mirror the speaker's intuitions, *independently of philosophical speculations about the future*.

But suppose that tomorrow the program is modified because of some unexpected event. According the new program, Bill Evans will play with his usual trio. So, at this point Theo (who has been informed by a friend) can call Lea before the concert and say:

(54) Bill Evans *non suona più* con Jim Hall [Bill Evans *no longer play* (pres.) with Jim Hall].

It should be noticed that there is an interesting relationship between (53b) and (54). Indeed, (54) can be analysed as follows:

(i) *presupposition* (triggered by "no longer"): the proposition expressed by Lea's utterance of (53b) *was* true until some moment in the past; it was true, in particular, at the moment of Lea's utterance (in the light of the original program);

(ii) *assertion*: this proposition is *not* true at the present moment (considering the new program).

On the proposal under discussion, we would say that there is a *change* of VIEW when passing from (53b) to (54), and such a change is formally accounted for by the fact that the function F_c can associate different states of information to different times. In other words, to account for the change of evaluation expressed by (54) we can simply say that the proposition expressed by (53b) *in the given utterance context c*, that is the proposition $[\![(53b)]\!]^{c,g}$, is such that:

(55) $[\![(53b)]\!]^{c,g}(v) = 1$
        $[\![(53b)]\!]^{c,g}(v') = 0$

where v and v' are time spans included by the intervals corresponding, respectively, to today and tomorrow.

We can have different truth values because the intended proposition is evaluated with respect to different times (v and v', respectively), which in turn correspond to different states of information. As I have just recalled, in the formal framework under discussion this peculiarity is accounted for by associating the reference time with a *function*, which picks out different informational backgrounds depending on the time flow. More exactly, given a context c, this task is achieved by one of its coordinates, the function F_c, and the change of VIEW justifying the contrast between (53b) and (54) described in (55) is explained as follows:

(56) $F_c(v) \neq F_c(v')$.

In other terms, different backgrounds of information are associated, respectively, to v and v', and this is the reason why what Lea says is true at v but not at v'.

Thus, we have detected an important source of contextual dependency, for the truth of an *utterance* (and not only of a simple sentence) is relative to the background of information selected by the reference time function. The idea is that what is asserted by an *utterance* of a given sentence can be evaluated not only at the utterance moment itself, but at different moments, in function of the time flow.

5. Conclusions and open issues

5.1 The progressive and the PROG reading of the imperfective.

An interesting problem faced by the present analysis is the following.
We have seen that, in many cases, Imp, on its PROG reading, can be replaced, without any appreciable change in meaning, by the perifrasi progressiva (which is the specialized form used in Italian to express the progressive meaning). To see this, let us go back to one of the examples discussed at outset, namely sentence (2), repeated here as (57):

(57) Quando Miles Davis entrò al Village Vanguard, Bill Evans suonava in un trio con Scott LaFaro e Paul Motian [When Miles Davis entered the Village Vanguard, Bill Evans play (past, imp.) in a trio with Scott LaFaro and Paul Motian = ... he was playing...].

As we saw, the most natural interpretation of (57) is based on the PROG reading, and in this sense (57) is *roughly synonymous* with :

(58) Quando Miles Davis entrò al Village Vanguard, Bill Evans stava suonando in un trio con Scott La Faro e Paul Motian [When Miles Davis enter (past, perf.) the Village Vanguard, Bill Evans play (past, per. prog.) in a trio with Scott La Faro and Paul Motian = ... he was playing...]

where Imp is replaced by the *perifrasi progressiva*, which is the specialized form used in Italian to express the progressive meaning.
But we have also seen, that in other cases, Imp is *not* interchangeable with the perifrasi progressiva. For example, we saw that, because of the perfective effect, a sentence like (36), repeated here as (59), does entail that Leo reached the top of the mountain

(59) Ieri alle tre Leo raggiungeva la vetta della montagna [Yesterday at three o'clock Leo reach (past, imp) the top of the mountain = ... reached ...].

On the contrary, its progressive counterpart does *not* entail the conclusion of the event at issue, as shown by the fact that the following sequence is perfectly acceptable:

(60)
(a) Ieri alle tre Leo stava raggiungendo la vetta della montagna ... [Yesterday at three o' clock Leo reach (past, per. prog.) the top of the mountain ... = ... was reaching ...]
(b) ... quando un improvviso temporale lo costrinse a rinunciare [... when a sudden storm forced him to give up].

This is a familiar phenomenon, because what we have just observed in the case of the perifrasi progressiva can be repeated for the English progressive.
So the question is: how to explain this difference in meaning between the PROG reading of Imp and the perifrasi progressiva (or the progressive in general)?
We saw that, unlike accomplishment predicates, achievement predicates such as "raggiungere la vetta della montagna" [reaching the top of the mountain] are ideally represented, in the grammar of Italian, as punctual changes of state. The idea is that accomplishments, but not achievements[32], are associated with an *inherent* activity which provides the former type of events, but not the latter, with a temporal extension.
It should be noticed that achievements can obviously be associated with activities leading to the relevant change of state: for example, everybody knows what Leo has to do, in ordinary conditions, to reach the top of the mountain. The point is that such an activity is not considered, by the grammar of Italian, as an inherent part of the events denoted by the achievement predicate "raggiungere la vetta della montagna" [reach the top of the mountain], whilst it is considered as an inherent part in the case of an accomplishment predicate like "scalare la montagna" [climb the mountain].
In the light of these grammatical facts, it is plausible to conjecture that the main difference, for instance, between the PROG reading of Imp and the progressive proper resides in the way they deal with the structure of events.

(i) In order to express the idea that a given event e is going on, Imp can only refer to the subevents of e which are "inherent" parts of e, where this inherence is a grammatical (or, more exactly, a lexical) fact. Thus, if, as in the case of achievements, e has no subparts associated with it, then the only available subevent whose occurrence can be stated is the culminating event e itself, and the

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[32] See Dowty (1979) and Rothstein (1998) for this difference in structure between accomplishments and achievements.

imperfective turns out to be trivially equivalent to the perfective. Which means that the truth of (59) entails the truth of the statement that Leo has reached the top of the mountain (perfective effect).
(ii) This restriction does not hold for the perifrasi progressiva, that, in order to express the idea that an achievement e is going on, can focus on the non-inherent activity associated to e, where this activity is seen as a preparatory phase of e. This is why (60a) does *not* entail (60b): no perfective effect! (Interestingly enough, the same can be said of the English progressive, which can also focus on an "external" phase with respect to the culminating event proper. The statement that Leo was reaching the top does not entail that he has reached the top: once more, no perfective effect!)
So, a natural conclusion is that the progressive reading of the imperfective and the perifrasi progressiva have different semantical sources, witness the above contrast.
While a semantical analysis of the progressive proper, which is required for a full explanation of point (i), is beyond the scope of the present paper, point (ii) is accounted for by the treatment of the imperfective proposed in the present paper (as shown by the analysis of the perfective effect developed in sect. 4).

5.2 The imperfective paradox and the universe of possibilia.

In the literature on imperfectivity the so-called imperfective paradox has been associated with the progressive, but it is easy to see that it characterizes the PROG reading of Imp as well.
As is well-known, the imperfective paradox is based on the following remark, made first in Kenny (1963). When an activity predicate (or, in general, an "atelic" predicate) is involved, the progressive form of a sentence entails its perfect counterpart, while this is not true in the case of accomplishment predicates. The idea is that, if the time interval taken into consideration is not too small, the truth of a sentence like

(61) Leo is smiling

entails the truth of the sentence

(62) Leo has smiled

whilst the truth of

(63) Leo is proving a theorem

does not entail the truth of

(64) Leo has proved a theorem.

To turn to the main topic of the present paper, it is immediate to see that, for example, the same holds of Imp, for the truth of a statement like (25), repeated here as (65), does not entail that Leo has proved the theorem.

(65) Leo dimostrava un teorema [Leo prove (past, imp.) a theorem = ... was proving ...].

To account for this fact in the theoretical framework under discussion, replace the scenario depicted in fig. 5 with a slightly different one, like the following:

Fig. 6
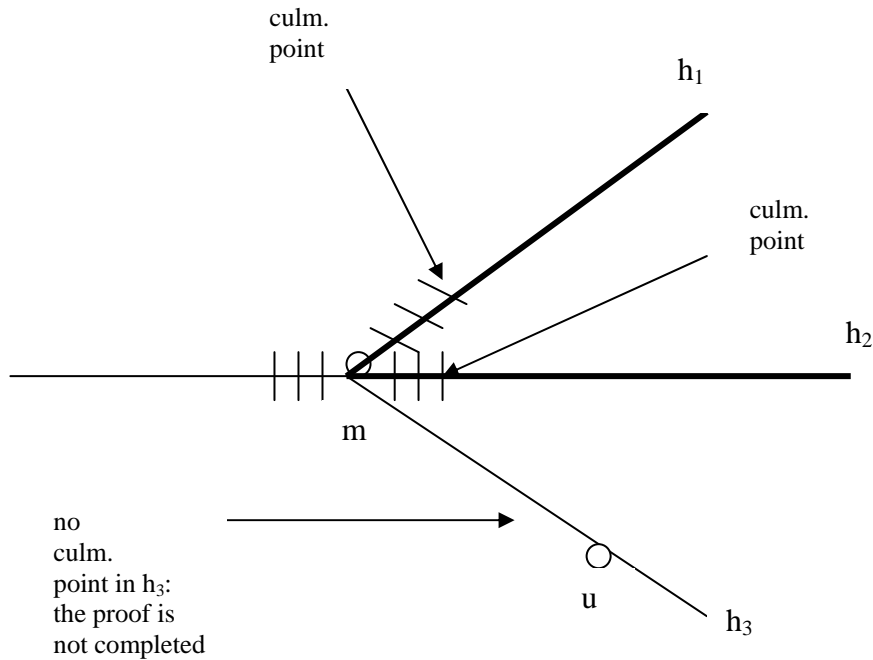
Here u is the utterance time.
Constraints: m < u (constraint imposed by tense); m coincides with yesterday, 3 p. m. (constraint imposed by the context).
h_1 and h_2 (the thicker lines) instantiate the coes compatible with VIEW at moment m, that is the coes which come closest to the ideal fixed by the teleological ordering source. In such coes an event of Leo's proving a theorem is going on at m and culminates at some moment following m.

In this case h_3 represents the way the world evolved up to and including the utterance moment u. In other terms, this is the coe where the utterance event is located (the world as it *actualized* at u, so to speak), and in this coe the proof is not completed, because a student destroyed the teacher's notes. So, as desired, at the evaluation time u it is false that Leo has proved a theorem.

But suppose also that the VIEW associated to moment m is specified as follows:

$F_c(m) = <B_{c,m}, \leq_{c,m}>$, where $B_{c,v}$, as in the original example, is determined by a *circumstantial* modal base, characterized by the presence of some relevant *facts* holding at m, and that $\leq_{c,v}$ is determined by a *teleological* ordering source, which selects the set of coes, in $B_{c,m}$, where the goal at issue is reached with minimal difficulty, that is the set $MAX(F_c(m))$. Now, a course of events like h_3 in which the teacher's notes are destroyed cannot belong to $MAX(F_c(m))$, so the fact that in *this* course of events the proof is not completed is perfectly compatible with the truth of (65) at u, based on the fact that in all the coes in $MAX(F_c(m))$ the proof is completed.

To sum up, in this scenario (65) turns out to be true at the evaluation time u, whilst its perfective counterpart turns out to be false at u: which is exactly the result we wanted to get.

An essential requirement of this reconstruction of the imperfective paradox is that, at moment m, the set $B_{c,m}$ determined by the modal base contains at least *some* coes in which the proof is completed: which means that this completion is still a *live option* at m. This is no problem in the situation I have just described, but in other cases such an assumption might be questionable.

For example Wulf (2009) discusses as a "new challenge" for the modal treatment of the progressive (and, I would add, for the modal treatment of the PROG reading of the imperfective), due to the existence of situations where "a progressive clause exhibiting the imperfective paradox can occur felicitously even when the described outcome is not possible". More explicitly, the problem, with a modal treatment of the progressive, would be represented by those scenarios in which an event is

presented as in progress even if the realization of the event at issue turns out to be impossible. After presenting the following example

(66) Shannon was making a pumpkin pie, but someone had already used the last can of pumpkin.

Wulf concludes: "Possibility accounts are founded on an incorrect assumption. We cannot assume from a felicitous assertion of *Shannon was making a pumpkin pie* (exhibiting the imperfective paradox) that a pumpkin pie was or will be a possible outcome of Shannon's activity. We cannot assume from a felicitous assertion of *John was drawing a circle* (exhibiting the imperfective paradox) that a circle was or will be a possible outcome of John's activity. As far as I can tell, this central assumption of modal accounts has not been challenged in the semantics literature." [33] (Wulf, 2009: 211.)

The problem raised by Wulf can also be reformulated as follows: is any modal account of the progressive (or the PROG reading of the imperfective) committed to the assumption that the natural conclusion of the action at issue is a "live option" at the relevant time?

In the branching time framework adopted here, such an assumption would entail that if the perspective point is located at moment m, there must be some future paths stemming from m in which, for example, Shannon succeeds in making the pumpkin pie.

The correct answer, of course, is that there is no reason to endorse this assumption. The point is that, besides the circumstantial modal base (which turns out to be problematic here), alternative modal bases are available to deal with examples like (66). This is an old problem, which was addressed, for example, by Thomason and Gupta (1980: 73) in their analysis of counterfactuals in a branching time framework: "Do not assume that all moments [in a Branching Time structure] have a past moment in common. We explicitly want to allow 'disconnected' moments that can be reached by a counterfactual, to provide for epistemic uses of conditionals." Technicalities apart, in our case this means that the universe of possibilia we are quantifying over is not necessarily determined by the facts occurring at the relevant moment m or before m. As we saw in sect. 3.1, the modal base and the ordering source are *contextually determined*: while a circumstantial modal base is the default solution in many situations, there are contexts in which a different choice sounds natural. For example, in the case of (66), an important requirement for this utterance to be felicitous is that Shannon (the main actor in this story) does not know that someone has already used the last can of pumpkin. (Otherwise he would only pretend to make a pumpkin pie.) And this fact makes an epistemic modal base[34] (together with a teleological ordering source) more appropriate in such a scenario. In this case the interpretation of the modal at issue would depend on implicit assumptions like: in view of the evidence available to the agent ... As an alternative, one might think of a circumstantial modal base which is based not only on present and past facts, but also on the intentions of the agents, their plans, schedules, and so on.

This kind of contextual dependency is a well-known feature of modals in general, so it comes as no surprise that the PROG reading of the imperfective (or the progressive itself[35]) hinges on a variety of pragmatic considerations concerning the agents and the contexts in which they operate[36].

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[33] Actually, the last remark is not correct, for the existence of progressive sentences describing "unrealizable" events was not ignored by the advocates of the modal approach. So the "new challenge" for this approach considered by Wulf is not really new.
For example, Bonomi(1997b) discusses the following example, which is very similar to (66):
(A) Leo is making the Christmas cake. When he finds out that the stove has just broken drown he will give up.
In the appropriate scenario described in that paper, the cake at issue is no possible outcome. In general, "it is not so unusual to find sentences in the progressive form which do refer to events whose realization is presented as *already* impossible at the utterance time" (Bonomi, 1997b: 177).
[34] An epistemic modal base selects the coes compatible with *what is known* by the relevant agent(s).
[35] See Condoravdi (2009) on this point.
[36] As remarked in Portner (1998), in some situations the modal base and the ordering source at issue may be fairly clear. "But in other situations, one may have to make do with a certain amount of vagueness or difficulty in determining

5.3 Complex events.

On the approach under discussion a target time TT is essentially a complex entity (for it involves a set of time spans: the universe of relevant subintervals in TT which are quantified over), whereas an event is something simple (in the sense that it cannot be analysed as a plurality of entities of the *same* type). But a symmetrical option, within the same theoretical framework, is available, by adopting a strategy based on complex events and simple target times. In this case no quantification over TT's subintervals is necessary to account for the intuition, discussed by Jespersen and Ducrot among others, that the interval at issue is characterized as a *whole* in terms of the occurrence of a certain type of event
The intuitive idea, in this case, is that a plurality of events is seen as an *extended event* whose temporal trace is the *least interval which* includes the temporal traces of those events.
Formally, this can be done by assuming that every coe h is a join-semilattice structure of intervals of moments $(I, \subseteq_I)$, and that, for every h, the set of events whose temporal trace[37] is located in h is a join-semilattice structure of events $(E, \subseteq_E)$ such that:

$$e_1 \subseteq_E e_2 \rightarrow \tau(e_1) \subseteq_I \tau(e_2)$$

$$\tau(e_1 \oplus e_2) = \tau(e_1) \oplus \tau(e_2).$$

In such a framework, the logical form associated to the HAB and PROG readings of a sentence like

(67) Leo correva nel parco [Leo run (imp.) in the park]

might be considerably simplified, for, after introducing the necessary modifications, we would have something like that:

(67a) $\forall h[h \in \text{MAX}(F_c(v)) \rightarrow \exists e[\text{Leo-run-in-the-park}(e) \wedge \tau(e) \subseteq h \wedge v' \subseteq \tau(e)]]$
contextual constraints: $g(v) = g(v') < u_c$.

On this view, the PROG reading and the HAB reading say exactly the same thing: namely, that RT coincides with TT (and precedes the utterance time) and that this interval is included by the temporal trace of an event of the relevant type. The only difference is that this event is "simple" (or singular) in the case of PROG, and "complex" (or "plural") in the case of HAB.
Needless to say, the size of the interval corresponding to TT (and RT) is crucial in determining which reading is to be picked out. For example, since the temporal trace of a simple (singular) running event cannot cover the interval corresponding to a whole year, it is quite obvious that if such an interval is the intended TT, then HAB, which involves a "plural" running event, is the natural reading of an utterance of (69) in the following scenario:

(68) Ma cosa faceva Leo (l'anno scorso) per tenersi in forma? [But what do (imp.) Leo do (last year) to stay in shape?]

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what is relevant. Of course modal sentences are vague, and discussions over their truth or falsity may be quite labored as the participants seek to reach an understanding about what background facts are relevant. And even once the relevant facts are determined, they may be so numerous (even infinite in number) or may interact in such complex ways that it is difficult as a practical matter to decide whether the modal sentence is true. This theory of modality predicts that a modal sentence's truth will be vague or difficult to ascertain exactly to the extent that its modal base and ordering source are difficult to determine or work with."
[37] See Krifka (1989) for the formal definition of temporal trace.

(69) Correva nel parco. [(He) run (imp.) in the park = ... he used to run ...].

One of the advantages of this possible refinement[38] of the analysis under discussion is that it allows for a very simple treatment of the *progressive form of habituals*, because there is no difference, in principle, between this kind of progressive and the more familiar situations, where the progressive involves a simple (singular) event. In both cases there is an event going on at the relevant time: an event which can be simple or complex.
Consider for example these statements:

(70) A Leo hanno ritirato la patente già da qualche tempo. Ecco perché sta andando a scuola in bicicletta [Leo's driving licence has been seized for some time. This is why he is biking to school]

(71) Stamattina Leo ha prestato l'auto a Lea. Ecco perché sta andando a scuola in bicicletta [This morning Leo lent his car to Lea. This is why he is biking to school].

If the domain of events of a given type contains not only simple events but also complex events, then, as desired, the progressive form in (70), which involves a habitual, is in principle indistinguishable from the one occurring in (71), which concerns a particular circumstance: after all, when uttering (70) we mean that there is a complex event of Leo's biking to school *going on at the utterance moment*, exactly as, when uttering (71), we mean that a simple event of that type is going on at that time. This invariance in logical form[39], made possible by assuming complex events, would be a further step towards a unified treatment of imperfectivity.

5.4 Synopsis.

(i) There is a temporal situation which is spoken *about*: this is the target time (TT) (which can be a very specific location or, for instance, the whole past, in a question like: Have you ever visited Illiers?)

(ii) TT is *stable* and not negotiable (there must be agreement about what is talked about).

(iii) There is a standpoint *from* which TT is considered (VIEW).

(iv) This standpoint is determined by the reference time function, which associates (possibly different) backgrounds of information to different times.

(v) Anyway, VIEW, located at some time t by the reference time function, involves a *plurality* of future courses of events stemming from t. The ensuing indeterminacy is the main source of imperfectivity.

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[38] For a similar approach in a different theoretical framework, see Ferreira (2005), where a full analysis of the distinction between singular and plural events is developed. Addressing such issues in detail is not possible in the present paper, which is mainly concerned with the role of context in setting the temporal parameters involved in the semantics of imperfectivity.

[39] This invariance extends to the FUT reading. As before, what changes is not the logical form, but the contextual constraints: in this case RT must precede TT.

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