

# Calculating the epistemic interpretation of past modals via K

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## 1. Introduction

In this paper we examine the epistemic interpretation of existential modals *potere* (Italian) and *pouvoir* (French) under two tense/aspect combinations: (i) present perfect (1-a) and (ii) imperfect (1-b), considering the present or past evaluation of the modal sentence. Moreover, along the lines of Mari (2010), in an original manner compared to previous approaches for Romance languages<sup>1</sup> we also take into account the distinction between the eventive and stative nature of the predicate embedded under the modal. The main claim of the paper is to show that the epistemic interpretation is not coded in the meaning of the modal, but rather is derived as an inference.

The examples that are generally discussed in the literature involve modals combined with an eventive predicate, as in (1-a) and (1-b). In French<sup>2</sup> these have both an abilitative and an epistemic interpretation. Here we will focus uniquely on the epistemic interpretation<sup>3</sup>.

- (1) a. Jean a pu<sub>present perfect</sub> déplacer la table  
*John could move the table / might have moved the table*  
b. Jean pouvait<sub>imperfect</sub> déplacer la table  
*John could move the table / might have moved the table*

Recent analyses of the epistemic interpretation of these sentences (Hacquard (2006) and Laca (2008)) hold that the modal moves above the aspect/tense. The claim of these theories has been that (i) the modal evaluation takes place in the present and (ii) the aspect on the modal determines the time of the event denoted by the infinitive under the modal. The paraphrases of (1-a) and (1-b) are respectively in (2-a) and (2-b):

- (2) a. It is possible that he has moved the table in the past  
b. It is possible that he was moving the table in the past

This view has been recently criticized by a variety of theorists (Homer (2009), Soare (2009), Mari (2010)), primarily on the grounds that the *epistemic evaluation takes place in the past*, that is, the analysis relies on an epistemic state of the agent that held in the past.

For the *imperfect*, Boogaart (2007) and Homer (2009) have argued that epistemic modals are base generated and interpreted below tense. In (3), Jack Bauer is reporting on a prior epistemic state.

- (3) *Scene*: Jack Bauer is testifying before a commission about his actions during a period when the president was kidnapped.  
Le président pouvait/devait<sub>imperfect</sub> être déjà mort, donc j'ai appelé le vice-président  
*The president could/must have already been dead, so I called the vice president*

For the *present perfect*, it has been argued that epistemic evaluation also takes place in the past. Hacquard's analysis predicts in fact that (1-a) be synonymous with (4)

<sup>1</sup>See Condoravdi (2002) for an analysis taking into account this distinction for English.

<sup>2</sup>In Italian, the epistemic interpretation is not available when the modal in the present perfect combines with eventive predicates (see Mari (2010) for a detailed discussion of the distinction between *ha potuto* + statives and *ha potuto* + eventives).

<sup>3</sup>See Hacquard (2006) and Mari (2010) for two different approaches to the systematic ambiguity of modals under these tense/aspect combinations.

- (4) Jean peut<sub>present</sub> avoir déplacé<sub>perfect</sub> la voiture  
*John may have moved the car*

However, it has been shown that (1-a) and (4) are not synonymous (Martin (2009) and Mari (2010)). Martin (*ibid.*) in particular argues that the epistemic evaluation takes place in the past also with the present perfect.

In the present paper we make three claims.

1. All heads are interpreted *in situ*, but
2. The epistemic evaluation also takes place at the utterance time<sup>4</sup>
3. The epistemic interpretation comes as an inference and is not coded in the meaning of the modal.

We present the data in section 2, the analysis in section 3, and some conclusions in section 4.

## 2. Data

In addition to the placement of tense and aspect with respect to the modal, we consider two other parameters: (i) the perspective (past versus present) and (ii) the eventive / stative nature of the embedded predicate (along the lines of Mari (2010)). In Italian, the present perfect does not have an epistemic interpretation, thus we shall consider here the French in the present perfect in order to illustrate our main claim, namely that the epistemic reading is derived as a pragmatic inference.

### 2.1. Imperfect

Prior analyses of the imperfect (see, e.g. Hacquard (2006), Homer (2009)) fail to predict or explain the variety of potential interpretations as illustrated in Table 1. We distinguish between eventive-like predicates (including eventives (5-a) and temporary states (5-b)) and permanent states (3) repeated in (6-a) (Fr./It.) and (6-b) (Fr./It.).

- (5) a. Gianni poteva prendere il treno !  
*John could have taken the train!*  
 b. Poteva esserci una tigre !  
*There could have been a tiger!*
- (6) a. Le président pouvait/devait<sub>imperfect</sub> être déjà mort, donc j'ai appelé le vice-président  
 Il presidente poteva/doveva essere già morto, ... *The president could/must have already been dead, so I called the vice president*  
 b. Poteva essere basso !  
 Il pouvait être petit !  
*He could have been short* (uttered in a museum in front of a short bed)

	type of VP	perspective	reading	example number
1	eventive	present	counterfactual	(5-a)
2	eventive	past	circumstantial (epistemic secondary)	(5-b)
3	stative	present	epistemic	(6-b)
4	stative	past	epistemic	(6-a)

It has been claimed that the imperfect allows past epistemic perspective because it is a 'point of view' aspect (see Boogaart (2007)). One of the endeavors of the analysis in this paper is to provide a theoretical content to this claim, in a precise formal framework that explains the characteristics of the imperfect that allow it to be compatible with a past perspective.

Line 1 - (5-a): when the modal in the imperfect is interpreted in the present, with an eventive predicate, the only available reading is the counterfactual one. The speaker is aware that John did not take the train or, in the present, the speaker knows that a tiger was not there.

Line 2 - (5-b) : when the modal in the imperfect is interpreted in the past, the epistemic reading is unavailable with an eventive predicate(5-a) (a progressive form is needed cf. *infra*). With temporary

<sup>4</sup>More elaboration is needed for the imperfect, see *infra*.

states, both the circumstantial and the epistemic readings are available. We propose a unified explanation that relates these two readings.

Line 3 - (6-b) : when the modal is interpreted in the present with a stative predicate, the present perspective is possible. (6-b) can be uttered in a museum in front of the short bed of King Louis XIV.

Line 4 - (6-a): as illustrated in Homer’s example (3), the epistemic state can hold in the past. However, as we shall show, this is also secondary w.r.t. the circumstantial reading and comes as a pragmatic inference.

It has been argued that the imperfect is an anaphoric tense. However, as (6-b) shows, the imperfect is not anaphoric to the event itself (the king is dead at the time of utterance). One can arguably claim that it is anaphoric to the time of the availability of the evidence. This assumption cannot be derived on either Hacquard’s or Homer’s account, in which the choice must be made whether the epistemic evaluation takes place in the present or the past.

## 2.2. Perfect

When the modal is under the present perfect, regardless of whether the embedded predicate is eventive or stative, the epistemic evaluation takes place in the present. It has been shown that in order for the epistemic evaluation to go through, indirect evidence is needed. As Hacquard (2006):25 points out, when the present perfect is used, there is a mismatch between the time of the availability of the evidence and the time of the modal evaluation.

- (7) D’après ce que je sais (maintenant), il a pu prendre le train (dans le passé)  
*As far as I know now, he might have taken the train (in the past)*

This mismatch ultimately leads Hacquard to move the modal evaluation to the time where evidence is available<sup>5</sup>

Before getting to our analysis (which, for the present perfect, follows Mari (2010)), we spell out the interpretations of (8) and (9-a)-(9-b) as in table 2, where the present perfect modal is combined with, respectively, eventive and stative properties. Italian does not have an epistemic interpretation when combined with eventive predicates but does when combined with stative predicates. We illustrate with a French example the the case of the modal in the present perfect combined with eventives.<sup>6</sup>

- (8) Il a pu déplacer la table  
*He might have moved the table*
- (9) a. Ha potuto essere biondo !  
 b. Il a pu être blond !  
*He might have been blond*

	type of VP	perspective	reading	example number
1	eventive	present	epistemic	(8)
2	stative	present	epistemic	(9-a) and (9-b)

For the present perfect, not only is the perspective always present, but the event must, in both cases, be bounded. In (9-a) and (9-b) the utterance is only felicitous if the person under discussion is dead or has changed his hair color.

<sup>5</sup>It has also been argued, in a different perspective, that the present perfect denotes an eventuality (in this case a modal one), ‘seen’ from the present Martin (2009); i.e. the present perfect is also a ‘point of view’ aspect), and this is why it only allows present perspective. Since no formal analysis has been provided for this claim we cannot properly evaluate it here.

<sup>6</sup>Mari (2010) provides an explanation for the fact that the present perfect modal + eventive in Italian does not have an epistemic interpretation without assuming movement. The author shows that on this combination, the present perfect modal scopes over properties of events and not propositions. In the present paper we only consider cases in which the modal scopes over a proposition. Mari (*ibid.*) shows that when the modal in the present perfect in Italian combines with statives, it scopes over a proposition, thus establishing a new distinction between the contribution of statives and eventives, which has been entirely neglected in previous works.

### 3. Analysis

#### 3.1. The framework

We employ a  $W \times T$  forward branching structure following Thomason (1984). A three place relation  $\simeq$  on  $T \times W \times W$  is defined, s.t. (i) for all  $t \in T$ ,  $\simeq_t$  is an equivalence relation; (ii) for any  $w, w' \in W$  and  $t, t' \in T$ , if  $w' \simeq_t w$  and  $t' \prec t$  then  $w' \simeq_{t'} w$ . In words: any two worlds (which are maximal sets of times) overlap until they branch. We assume that  $\tau(e, w)$  returns the spatio/temporal trace of an event  $e$  in the world  $w$ .

We examine four types of past possibility of a proposition  $\phi$ . For each of the two cases, the event in  $\phi$  can be either eventive or stative, and can be scoped over by a modal that is either bounded or unbounded in aspect. The speaker can be in one of three epistemic states with respect to  $\phi$ : i) he believes it is true in the actual world, ii) he believes it is not true in the actual world, or iii) he has no view on the matter. We ignore the first possibility, as a speaker would conventionally express this as  $\phi$  (i.e. with no modal). We argue that the hearer can calculate which of the other two possibilities obtains as an implicature of the form of the modal the speaker elects to use. In order to formalize the epistemic dimension of ii) and iii), we introduce an operator  $K_j$  with the intended interpretation the speaker (j) believes that (see [5]), which is not part of the truth conditions (vs. [7]). We conventionally use  $\diamond$  to symbolize alethic and more specifically, nomological possibility<sup>7</sup> We note that  $K$  is a factive operator (i.e.  $K[\phi]$  entails  $\phi$  at  $w, t$ ; consequently,  $K[\diamond\phi]$  entails  $\diamond\phi$  at  $w, t$ ). We write as  $\phi_{\text{bounded/unbounded}}$  a proposition in which the eventuality is either bounded or unbounded. We also distinguish between a proposition  $\phi$  and the event  $\psi$  described in this proposition.

#### 3.2. Imperfect

The aspectuo-temporal clause with a modal in the imperfect is given in (10)

$$(10) \quad \text{PAST}(\text{UNBOUNDED}(\diamond(\text{PRES}^8(\phi_{\text{unbounded/bounded}}))))$$

When using the imperfect on the modal, the speaker utters  $\phi$ .

$$(11) \quad \phi = \lambda w \lambda t \lambda P \exists t' \exists w' (w' \simeq_{t'} w \wedge t' \prec t \wedge \text{now} \wedge \exists e (P(e, w') \wedge \tau(e, w') \supseteq t'))$$

*Paraphrase:* given world  $w$ , time  $t$  and property  $P$  there is a  $t'$  a world  $w'$  such that  $t$  before  $t'$   $w$  indistinguishable from  $w$  up to  $t$  there is a  $P$  event whose trace in  $w$  contains  $t$

$t$  is set to the time of the evaluation, namely the utterance time. Since, absent any evidence to the contrary, the imperfect denotes an **unbounded** interval along which the eventuality is spread, it follows that the spatio-temporal trace of the event is contained in the unbounded interval that also contains  $t'$ .

$$(12) \quad \text{Aveva un gelato in mano}$$

*He had an ice-cream in his hand*  $\rightarrow$  it is not excluded that he still has the ice cream in his hand

The composition can be seen here below (where  $R$  is a relation of alethic accessibility)

$$(13) \quad \text{Poteva piovere}$$

*It could rain*

<sup>7</sup>Under 'alethic' we comprise a variety of modal bases (notably nomological and metaphysical), excluding the epistemic and deontic.

<sup>8</sup>For lack of space, we do not consider here cases in which the infinitive is in PERF aspect.



(15) PAST(UNBOUNDED( $\diamond$ (PRES( $\phi_{bounded}$ ))))

We first consider the case where the imperfect on the modal combines with eventives or temporary states and repeat examples (5-a) and (5-b) in (16-a) and (16-b). As given in Table 1, we consider present and past evaluation in turn.

- (16) a. Poteva prendere il treno !  
*He could have taken the train!*  
 b. Poteva esserci una tigre !  
*There could have been a tiger*

**Present evaluation and counterfactual interpretation** By his use of the imperfect aspect, the speaker fails to state that the possibility (of  $\psi$ ) has a definite endpoint (see 2). He thereby conveys that an event in the past, which no longer has the possibility of occurring in the actual world  $w$  at the current time  $t$  (e.g. a train's departure at a certain time), is still possible. The hearer can calculate as follows : if the event under consideration had occurred, it would have been at a past time  $t'$  which is prior to the current time (i.e.  $t' \prec t$ ). But the possibility of this past event is left unbounded by the speaker, and thus the possibility remains, in some sense, 'open'. As it is clear that the event is not possible at the current world-time pair, the only option available to the hearer is to assume that the speaker is referring to a non-actual world (e.g.  $w'$ ) where this possibility is still open. If the only way to make  $\diamond\phi$  true is to consider a non-actual world, then, assuming truth entails possibility, the speaker must believe that  $\phi$  is not true in the actual world  $K_j \models_{w,t} \neg\phi$

**Past evaluation and epistemic inference** With a past perspective, the epistemic reading is not available with the unbounded aspect and an eventive predicate. When this occasion arises, the overwhelming preference of both Italian and French speakers is to put the eventive verb in the progressive (which denotes an unbounded interval, effectively transforming the predicate into a stative one).

- (17) a. Poteva star prendendo il treno  
 b. Il pouvait être en train de prendre le train  
*He might have been taking the train*

With temporary states the epistemic interpretation is easier. (16-b) is more likely than (16-a) to have an epistemic reading. For the explanation of this case, see discussion in section 3.2.2. In section 3.2.2, we also discuss why the epistemic interpretation is unavailable, after explaining under what conditions the epistemic inference arises.

### 3.2.2. Imperfect modal embedding a stative

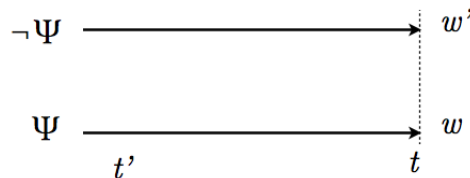
(18) PAST(UNBOUNDED( $\diamond$ (PRES( $\phi_{unbounded}$ ))))

We explain the conditions that allow the epistemic interpretation of the sentences when the embedded predicate is stative. We once again distinguish between the present and the past evaluation.

**Present evaluation** The example under discussion here is (6-b), repeated here in (19). Recall that the sentence is uttered in a museum, in front of the bed of Louis XIV.

- (19) Poteva essere basso ! (It.) / Il pouvait tre petit ! (Fr.)  
*He could be short* (uttered in a museum in front of a short bed)

**Figure 2:** Imperfect + stative (present evaluation)



The speaker's utterance demonstrates that he believes it is still a possibility that the state obtained, and in fact might still be ongoing. Statives, being unbounded, can hold on the whole path from  $\langle w/w', t \rangle$  to infinity, hence the epistemic possibility is open at the reference time (which is the utterance time  $t$ ). The calculation of the implicature by the hearer is straightforward: he knows that since the unbounded aspect has been chosen, the speaker ( $j$ ) considers that it is still an open possibility that the king was short. He thus infers that the speaker does not have an opinion as to whether the actual world is identical to a  $\psi$  world or a  $\neg\psi$  world. This is to say that both  $\psi$  and  $\neg\psi$  worlds are possible candidates for being the actual world. It immediately follows from this that at  $w, t$ :  $\neg K_j \phi$  and  $\neg K_j \neg\phi$

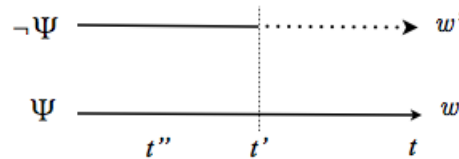
A potential objection is that the state of being short is bounded to the duration of the life of the king. However, much work on statives (and permanent properties in particular) has shown that they are abstract objects which share many features with facts (Asher (1993), Jayez & Godard (1999), Katz (2000), Maienborn (2007)) and propositions (Copley (2006), Mari (2010)) and in this sense they hold permanently. Also, simply note that the following is not acceptable:

(20) #Il re era basso durante la sua vita / *The king was short during his life*

### Past evaluation

(21) Le président pouvait/devait imparfait être déjà mort, donc j'ai appelé le vice-président (Fr.) (= (6-a))  
 Il presidente poteva/doveva essere già morto, ... (It.)  
*The president could/must have already been dead, so I called the vice president*

**Figure 3:** Imperfect + stative (past evaluation)



Let  $\phi$  symbolize the proposition *The president is dead* and suppose (21) is uttered in a context where the speaker knows at the time  $t$  of utterance both i) that president is now alive and ii) that at the relevant time  $t'' < t$  in the past he had been kidnapped. At time  $t'$ , the president is released and it becomes known that he is not dead. This world knowledge is thus available at the time  $t$  of utterance. In such a case,  $\phi$  was not only alethically possible at  $t''$ , but the speaker might have concluded that it was alethically likely on the basis of ii) (one can die in a kidnapping situation).

A speaker uttering this sentence can reasonably expect to be understood as communicating something about his epistemic state at  $t''$  (i.e. that he regarded  $\psi$  as epistemically possible at  $t''$ ). This additional information about his epistemic state is derived as an inference from the semantic content of the modal, which means alethic possibility, together with the fact of utterance. For not only would the claim  $\psi$  was possible at  $t''$  typically be uninformative (since it is always alethically possible that someone is dead), but it is presumably the speaker's epistemic state which is at issue with respect to explaining his actions (e.g. why he called the vice president). Thus the context of utterance at time  $t$  requires that the proposition uttered be informative. The only way for the hearer to interpret the speaker as failing to violate the maxim of relevance is to assume that the utterance serves to convey epistemic possibility in addition to alethic possibility.

This explains why the epistemic evaluation is rarely available with eventive predicates. The epistemic evaluation is derived by the alethic possibility of the event, at the time of the evaluation. However, with the evaluation concomitant to the event, the epistemic reading is blocked (22). As events are not homogeneous, one cannot know at the time of the event whether it is taking place or not (since one cannot know that an event has taken place until is completed). It is impossible to know whether the event actually occurs, as, while it is occurring, only a part of the event denoted by the predicate has been realized (see also discussion in Copley (2006))<sup>10</sup>

<sup>10</sup>For lack of space we cannot discuss these examples for both Italian and French. The French version of (22) is slightly easier for some speakers.

This is independent of whether the modal is in the imperfect or in the present: (22) cannot have an epistemic interpretation.

- (22) ??Gianni può mangiare un panino in questo preciso momento  
*John can eat a sandwich in this precise moment*

In this case the progressive form is preferred:

- (23) Gianni può star mangiando un panino in questo preciso momento  
*John can be eating a sandwich in this precise moment*

### 3.3. Perfect

The aspectuo-temporal structure of a clause with the modal in the present perfect is given in (24)

- (24) PRES(PAST(BOUNDED( $\diamond$ (PRES( $\phi_{unbounded/bounded}$ ))))))

We analyze here the present perfect as a present + perfect, along the lines of Kamp & Reyle (1993) and de Swart (2007). Following these authors, we assume that the perfect provides a bounded event (topic event) that is in an 'abut' relation with its consequent state (the topic event is anterior to its consequent state, but touches it). Since the present component sets the consequent state at the utterance time, the topic event is set in the past (contra Hacquard (2006) who analyzes it as a perfective).

As repeatedly stated, the time of the evaluation of the present perfect is set in the present, in virtue of the present component. Our claim, however, is that the modal does not have a primary epistemic meaning (being evaluated in the past). We claim that the sentence has an epistemic interpretation which is derived by calculation at the utterance time. The modal keeps its primary *alethic and more specifically nomological interpretation*. The analysis we propose here reiterates that of Mari (2010), which provides details concerning the differences between Italian and French. But crucially, that analysis supports the thesis of this paper, namely that the epistemic interpretation pertains to the sentences and is not part of the meaning of the modal<sup>11</sup>

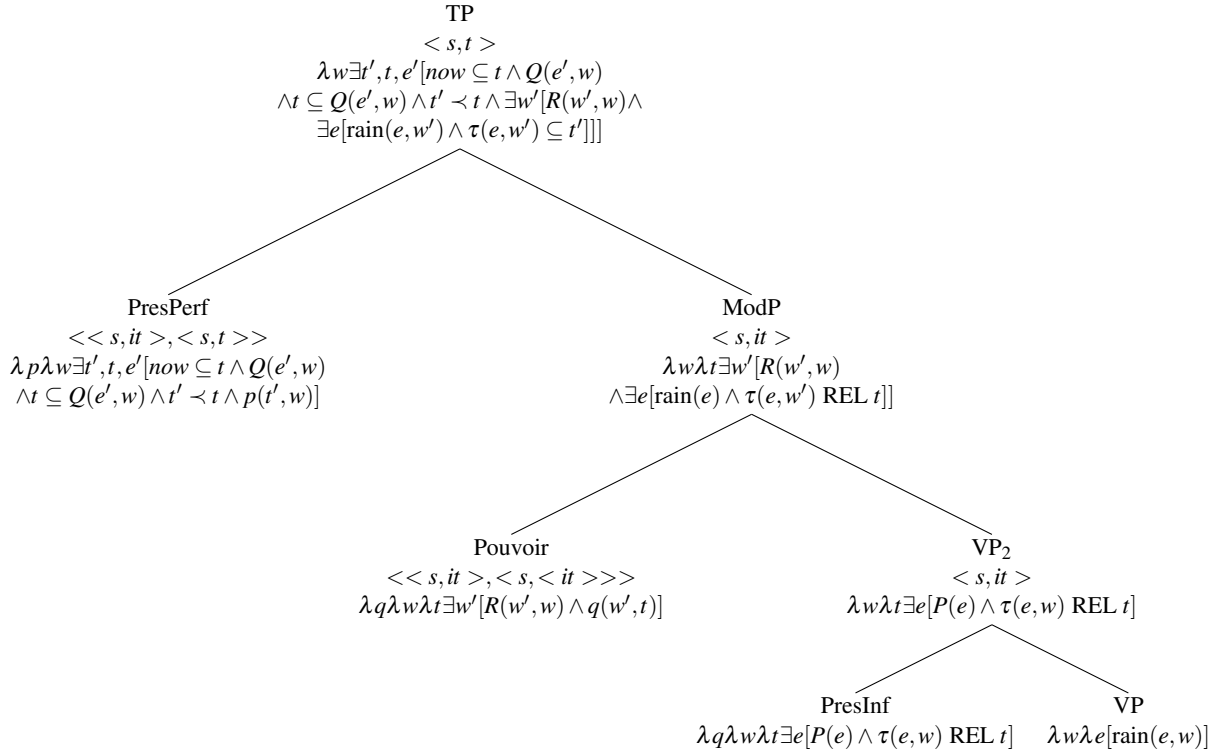
When using the perfect on the modal, the speaker utters  $\phi$ .

- (25)  $\phi = \lambda w \lambda t \lambda P \exists t' \exists w' (w' \simeq_t' \wedge t' \prec now \wedge \exists e (P(e, w') \wedge \tau(e, w') \subseteq t'))$

The compositional analysis is illustrated here below (see Mari (2010) for details).

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<sup>11</sup>However the analysis in Mari (2010) is not cast in a branching time framework.

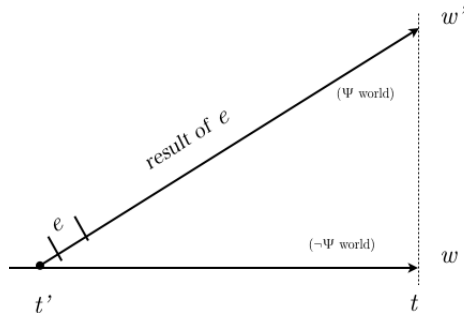


As above, after the VP combines with the PresInf it receives a spatio-temporal trace. However, this remains unspecified until the modal and tense/aspect are met in the composition. In particular, since  $t' \prec t$ , the consequent state overlaps with the present and the topic event is in some relation with the past time  $t'$ . Since the consequent state and the causal event are in an abut relation, REL can only be specified to  $\subseteq$ . Hence:

(26) If under Perfect, REL :=  $\subseteq$

Since the evaluation always takes place in the present and the present perfect has the same effect on eventive and stative properties (see de Swart (2007) : the present perfect provides a past bounded interval in which the state holds), one configuration is obtained, as seen in Figure 4:

**Figure 4:** Imperfect + eventive/stative



### 3.3.1. Modal perfect embedding an eventive/stative predicate

As for eventives, as mentioned above, since Italian does not have an epistemic interpretation with eventive predicates<sup>12</sup>, we employ French<sup>13</sup> examples to illustrate our claim that the epistemic interpretation is not part of the meaning of the modal, but is a feature of the sentence.

- (27) Il a pu déplacer la table (= (8))  
*He might have moved the table*

When the stative verb is under the scope of a modal with bounded aspect, the perfect forces the state to be bounded (we agree with Hacquard (2006) and Laca (2008); see also Mari (2010), although we do not admit that the modal outscopes tense). For example, in (28-a) and (28-b), the only felicitous reading of this sentence is if the speaker considers Mario to be dead.

- (28) a. Ha potuto essere biondo !  
b. Il a pu être blond !  
*He might have been blond*

In these cases the speaker knows that the event is no longer possible in the current world and thus puts a bounded aspect on the modal of possibility<sup>14</sup>. No implicature can be calculated about the speaker's belief that  $\neg\psi$ , and as  $\psi$  is also not implicated (see above), the hearer may thus conclude that the speaker's epistemic state is impoverished, i.e. he has no belief that either  $\phi$  or  $\neg\phi$ . In this scenario, the speaker holds both  $\psi$  worlds and  $\neg\psi$  worlds as candidates for the actual world. The inability to distinguish these worlds characterizes the speaker's epistemic state at  $t_u$ , and the hearer can derive  $\neg K_j\phi$  and  $\neg K_j\neg\phi$ .

In more formal terms,  $\lambda w$  in Figure 4 is instantiated to a possible world  $w''$  which cannot be excluded to be equal to  $w$ . The epistemic interpretation derives from the inability to equate  $w''$  with the actual world<sup>15</sup>

On this view, the world of evaluation is not the actual world, and the proposition is true in 'a world' which is not necessarily the actual one (see Cappelen & Lepore (2005)).

## 4. Conclusion

The epistemic reading of a sentence containing *potere/pouvoir* with a past modal is an inference which is not part of the semantic meaning of the modal. The epistemic reading can be calculated only if (plausible) alethic alternatives are available. The speaker considers worlds which are contextually similar, e.g metaphysical alternatives for example (6-a) are determined by the kidnapping scenario. Our analysis differs from alternate proposals; from Kratzer (1991) who claims the ambiguity of the interpretation of modals derives from the type of background and from Hacquard (2006) who argues that the interpretation of modals depends on the type of event, either epistemic (as a speech event) or circumstantial (as an actual event). It is somehow close in spirit to Condoravdi (2002) (who exploits a relation between metaphysical alternatives and epistemic alternatives), although we do not make a number of assumptions that the author makes, namely requiring a diversity condition or assuming that eventives and statives have intrinsically different behaviors. Moreover, we exploit the relation for both stative and eventive embedded predicates, providing the calculation of the implicatures from the alethic to epistemic interpretation for various aspect/tense/modal combinations. We have thus explained in a principled way a set of previously uncovered data in Italian and French, without assuming movement.

## References

- Asher, N. (1993). *Reference to abstract objects in discourse*. Springer.  
Boogaart, Ronny (2007). The past and perfect of epistemic modals. Bisang, Walter, Hans Henrich Hock & Werner Winter (eds.), *Recent Advances in the Syntax and Semantics of Tense, Aspect and Modality*, Mouton de Gruyter, 47–70.  
Cappelen, H. & E. Lepore (2005). *Insensitive semantics: a defense of semantic minimalism and speech act pluralism*. Wiley-Blackwell.

<sup>12</sup>See Mari (2010), who, in virtue of syntactic evidence, argues that in Italian, the modal in the present perfect when combined with eventive predicates does not scope only over a proposition, but over properties of events.

<sup>13</sup>Mari (ibid.) argues that in French the modal in the present perfect scopes over a proposition even when combined with eventive predicates

<sup>14</sup>Our analysis can be easily extended to the simple past. As for the reasons why some but not all Romance languages have an epistemic interpretation with the simple past, see Mari (2010)

<sup>15</sup>For a detailed discussion of this point in relation with the present perfect, see Mari (2010).

- Condoravdi, C. (2002). Temporal interpretation of modals: Modals for the present and for the past. Beaver, David, Stefan Kaufmann, Brady Clark & Luis Casillas (eds.), *The Construction of Meaning*, CSLI Publications.
- Copley, Bridget (2006). Temporal orientation in conditionals. Guéron, Jacqueline & Jacqueline Lecarme (eds.), *Proceedings of the Time and Modality International Roundtable*.
- Hacquard, Valentine (2006). *Aspects of Modality*. Ph.D. thesis, Massachusetts Institute of Technology.
- Homer, Vincent (ed.) (2009). *Epistemic modality and indexicality*, North East Linguistic Society.
- Jayez, J. (2004). Le problème de Mittwoch. Handout for Journée sur l'imparfait, EHESS, Paris.
- Jayez, J. & D. Godard (1999). True to fact (s). Dekker, P. (ed.), *Proceedings of the 12th Amsterdam Colloquium*.
- Kamp, Hans & Uwe Reyle (1993). *From discourse to logic: Introduction to modeltheoretic semantics of natural language, formal logic and discourse representation theory*. Kluwer.
- Katz, G. (2000). Anti Neo-Davidsonianism: Against a Davidsonian Semantics for State Sentences. Tenny, C. & J. Pustejovsky (eds.), *Events as Grammatical Objects*, CSLI Publications, 393–416.
- Kratzer, A. (1991). The notional category of modality. Eikmeyer, Hans-Jürgen & Hannes Rieser (eds.), *Words, worlds, and contexts. New approaches in word semantics*, Walter de Gruyter, 38–74.
- Laca, B. (2008). On modal tenses and tensed modals. Invited talk at Chronos 2008.
- Maienborn, C. (2007). On Davidsonian and Kimian states. *Existence: Semantics and Syntax*, Springer, 107–130.
- Mari, Alda (2010). Temporal reasoning and modality. Handout for workshop: "Temporality: Typology and Acquisition" <http://www.semanticsarchive.net/Archive/DYyYTkzZ>.
- Martin, Fabienne (2009). Epistemic modals in the past. Handout for workshop Going Romance, Université de Nice.
- Soare, Elena (2009). Epistemic Modality in Romanian: the role of BE. *Proceedings XXXV Incontro di Grammatica Generativa*.
- de Swart, H. (2007). A cross-linguistic discourse analysis of the Perfect. *Journal of Pragmatics* 39:12, 2273–2307.
- Thomason, Richmond H. (1984). Combinations of tense and modality. D. Gabbay, F. Guenther (ed.), *Handbook of Philosophical Logic*, D. Reidel, vol. 2, 135–165.