Interpretation of the Classical Greek Optative Mood

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Abstract

The Classical Greek optative mood appears in a variety of constructions, of which some are easily related and others only with difficulty. We present a unified analysis for nearly all usages of the optative—including the optative of secondary sequence, in which an embedded verb under a past tense matrix verb bears optative morphology without any change in truth conditions, but excluding the past general conditional—which characterizes the optative as an expression of a modal domain restrictor. Insofar as our analysis is successful, it provides support for the existence of a modal domain coordinate and for histories framework proposed by Klecha (2014).

1 Introduction

1.1 Optative of Secondary Sequence

Classical Greek verbs can select for indicative or subjunctive finite complements[1], whose tense must be interpreted relative to that of the matrix clause. This is illustrated by (1) and (2) below. (All data are excerpted from Rijksbaron (2002) unless otherwise indicated.)

(1)

kai	oupote	erei	odeis	ho:s	ego:...	te:n	to:n	barbaro:n
and	never	say.FUT	no-one	that	I	the.ACC	the.GEN	barbarians.GEN

filian	heilome:n.
friendship.ACC	chose.1SG.AOR[2]

'And no one will ever say that I chose the friendship of the barbarians.' (X. An. 1.3.5)

[1]Given restrictions on mood in environments beyond those under embedding predicates, it is doubtful that the mood selection of verbs is free; rather, it likely reflects semantic properties of the verb. See Iatridou (2000), Villalta (2008), Giannakidou and Mari (2015) for discussion.

[2]In the gloss above, AOR denotes aorist morphology, which in matrix clauses is interpreted as a past tense with aoristic aspect (discussed in §3.2). In certain environments where a past tense is illicit, AOR has only an aspectual interpretation.

(2) tines eipon hoti ne:es ekeinai epiplesousi.
some say.3pl.aor that ships them sail.3pl.pres
'Some said that those ships were sailing against them.' (Th. 1.51.2)

Optative morphology is standardly used in place of the indicative or the subjunctive under a past matrix verb, such as in (3) and (4) below.

(3) apekriname:n auto: hoti skeue:... ou laboimi
answer.1sg.aor.ind him that equipment not take.1sg.aor.opt
'I answered that I had taken no equipment.' (D. 50.36)

(4) elekhthe:... ho:s hoi pelopon:e:sioi farmaka esbeble:koien es ta freata.
say.3sg.prf.pass.ind that the Peloponnesians poison place.3pl.prf.opt in the cisterns
'It was said that the Peloponnesians had put poison in the cisterns.' (Th. 2.48.2)

This use of the optative (called the *optative of secondary sequence*) is strictly optional, meaning that *elabon* 'take.1s.aor.ind' could be substituted for *laboimi* 'take.1s.aor.opt' in (3) with no change in truth conditions (Rijksbaron 2002, §18.2). Rijksbaron notes that an embedded clause with an indicative or subjunctive verb is often more vivid. This paper is not concerned with the derivation of a vividness entailment, however, because this may well have an extralinguistic cause. For example, speakers might associate the optative with less vividness than the indicative since it appears in nonverdical environments, and this association could exist without any change in the denotational meaning of the optative.

Surprisingly, the optative of secondary sequence is illicit when not embedded under a past matrix verb, as the hypothetical (5) illustrates below. The other uses of the optative discussed above which result in changed truth conditions do remain available,

(5) * legetai/*lekhthe:setai... ho:s hoi pelopon:e:sioi farmaka esbeble:koien es ta freata.
say.3sg.pres.pass.ind/say.3sg.fut.pass.ind that the Peloponnesians poison place.3pl.perf.opt in the cisterns
Intended Meaning: 'It is said/will be said that the Peloponnesians have put poison in the cisterns.' (Modified from Th. 2.48.2)

Selection of indicative or subjunctive mood is clearly tied to the semantic properties of the matrix verb, and the optative of secondary sequence can replace a verb inflected for either. Therefore, we depart from traditional Greek grammars by not considering the optative to stand in complementary distribution with the subjunctive and indicative. Instead, we consider optative morphology to be ambiguous between the combination of an optative and an indicative morpheme and the combination of an optative and a subjunctive morpheme. (6) below illustrates the two possible combinations of morphemes which this analysis predicts to be spelled out as *laboimi* ‘I take.OPT’ using the notation of Distributed Morphology (Halle & Marantz 1993).

(6) *Example Spellout of Optative Morphology on Verb*
[1SG AOR OPT IND $\sqrt{take}$] $\leftrightarrow$ *laboimi* ‘I take.OPT’
[1SG AOR OPT SUBJ $\sqrt{take}$] $\leftrightarrow$ *laboimi* ’I take.OPT’

1.2 Overview

Accounting for the optative of secondary sequence in (3) and (4) is the primary goal of this paper. In particular, we attempt to answer these questions:

- What is the semantic contribution (if any) of the optative mood morpheme in this construction?
- Why is the optative of secondary sequence only licensed under a past matrix verb?

However, it is helpful to first examine other environments in which the optative is used in order to later formulate an analysis of the optative of secondary sequence. Therefore, this paper is organized as follows: in §2 we review other usages of the optative in Ancient Greek, and in §3 we develop a denotation of the optative which can account for these uses (excluding the past general conditional) within the histories framework of Klecha (2014). In §4 we extend our analysis to account for the optative of secondary sequence.

2 Optative in Other Environments

2.1 Future Less Vivid

2.1.1 Use of the Future Less Vivid

In the future less vivid (FLV) conditional, the verbs of the antecedent and consequent clauses are inflected for optative tense, as illustrated by (7). Both are evaluated with respect to a future time.

(7) ei d’ ho:s malist’ apekhoimeth’ hou su de: legeis, ho
if but as most abstain.1PL.PRES.OPT which.GEN you indeed say, which.NOM
me: genoito[3], mal:on an dia toutogi genoit’ an
not happen.3SG.AOR.OPT, rather AN through that happen.3SG.AOR.OPT AN

erei:ne:
peace
'But if we would abstain as much as possible from what you say, which I wish may not happen, would there be peace because of that?' (Ar. Lys. 146-48)

The future less vivid uncontroversially carries an implicature that the antecedent clause is unlikely to be fulfilled, but we follow Rijksbarson (2002, §24.4) in considering the possibility of fulfillment of the antecedent to be part of the meaning of the Classical Greek FLV, *contra* Smyth (1956, §2322/2329). A truly counterfactual condition would be expressed in Ancient Greek with the Present Contrary-to-Fact Condition, which like English counterfactuals discusses an unrealizable nonpast state but contains past morphology (Rijksbaron 2002, §24.5).

In a discussion of the modal *an* to which we will later refer, Beck et al. (2012) classify the Classical Greek FLV as a counterfactual based on the unlikeliness of the fulfillment of its antecedent, and they analyze the optative in this construction as in part an expression of counterfactuality. Following Iatridou (2000), the counterfactuality implicature is attributed to an EXCL morpheme that in English is expressed by past morphology. The next section argues that any analysis of the Classical Greek optative in which the optative expresses a EXCL feature ranging over worlds is unable to account for the optative of wish. Yet even in an analysis of the English FLV, the presence of an EXCL morpheme would yield a meaning which is too tightly restricted.

Iatridou cites (8) below as evidence for an unlikelihood implicature.

(8) a. If John comes to the party, and I think he will, we will have a great time.
b. # If John came to the party, and I think he will, we would have a great time. *(English FLV Conditional)*

However, it is clear that the English FLV is able to express conditions whose fulfillment is taken as a serious possibility by the speaker, as demonstrated by the acceptability of (9) below. Such antecedents would be ruled out by a counterfactual semantics.

(9) If John came to the party, and I think there's a good chance he will, we would have a great time.

The definition of EXCL in Iatridou (2000) when interpreted as a restrictor of some modal domain M is given by (10), where $\mathcal{M}(i)$ denotes the context worlds of the nearest intensional

[3] This use of *genoito* is an optative of wish: refer to §2.2 for a description.

context. In a matrix context, $\mathcal{M}(i)$ is the set of "worlds that for all we know are the worlds of the speaker" (Iatridou 2000:247).[4]

(10) $[\![\text{EXCL}]\!]^{i,c,g} = \lambda M : M$ excludes $\mathcal{M}(i)[M]$

There are two apparent methods by which one could maintain the existence of a modal EXCL in (9): the first is to say that no worlds in which John comes to the party are elements of the set of context worlds $\mathcal{M}(i)$, and the second is to claim that rather than introducing a presupposition of counterfactuality EXCL only introduces a cancellable implicature. Both of these are implausible. If the speaker expressly states that there is a sizeable chance that a world in which John will come to the party is the actual world, then by definition that world must be an element of the set of context worlds $\mathcal{M}(i)$. On the other hand, if we take EXCL to introduce a cancellable implicature, then why is this implicature not cancellable when EXCL ranges over tenses?

We therefore consider the primary features of the FLV to be its future orientation[5] and the (mere) possibility of its antecedent clause.

2.1.2 Comparison with the Future More Vivid

One could argue that the optative is not the contributor of future-orientation to the conditional on the basis of the Future-More-Vivid (FMV) conditional. The FMV contains the particle *an* (glossed as AN) and subjunctive inflection in the antecedent clause and a future indicative verb in the consequent clause, as illustrated in (11) below.

(11) e:n krate:so:men, ou me: tis he:mi:n al:os stratos
if AN win.1PL.PRES.SUBJ, certainly-not some.NOM us.DAT other.NOM army.NOM
antiste:
resist.3SG.FUT.IND
'If we are victorious, it is certain that no other army will resist us.' (Hdt. 7.53.2)

An FMV conditional has the roughly same meaning as its FLV form, except that the FMV conditional carries an implicature that its antecedent clause is likely to be fulfilled. If the

[4] In Iatridou (2000), EXCL (*ExclF*) relates two sets $T(x)$ and $C(x)$, where $T(x)$ is "'the x that we are talking about'" and $C(x)$ is "'the x that for all we know is the x of the speaker'" (2000:246). We have reformulated Iatridou's proposal so that EXCL represents a partial identity function on some x which relates it to the x of the local intensional context, in order to grant the denotation more specificity and foreshadow analyses proposed later in this paper. The intensional index i is used in the sense of Anand and Nevins (2004); the evaluation function is also relativized to a contextual index c and an assignment function g.

[5] We use *future orientation* here to mean that a clause under a future-oriented modal cannot have a state of affairs associated with the embedded verb in a non-future time, and that a present (nonpast) tense under a future-oriented modal receives a future interpretation. These notions are further formalized in §3.2 once the framework of Klecha (2014) has been introduced.

FMV and FLV constructions truly differed minimally in the likelihood of their argument, the account of the FLV should reflect this minimal difference. However, the future tense in the consequent clause indicates that the temporal orientation of the FMV is significantly more complex.

One clue as to the proper analysis of the FMV is that a present tense in the antecedent clause must denote a time simultaneous to the time of the consequent clause, and an aorist (past) tense in the antecedent clause must denote a time prior to the time of the consequent clause. While a full analysis of the FMV is outside the scope of this paper, we propose as a general rule that antecedents of conditionals must be evaluated at the time of the event of their consequent clauses. If this is indeed the case, then the FMV could be analyzed such that the future interpretation results solely from the future tense in the consequent clause and not from the modal quantification introduced by *an*, which means an account must then be given of why modal quantification is restricted to future orientation under the optative.

Another possible analysis could say that the consequent clause is in fact interpreted with respect to the matrix history in addition to the histories quantified over by *an*. The meaning of such a conditional could be paraphrased by, "It will be the case that X, provided that indeed Y (which I expect is the case)." Regardless, it seems plausible that the likeliness of fulfillment associated with the FMV results from the interpretation of the consequent, which is inflected with future indicative morphology. We therefore maintain that the unlikeliness implicature attached to the FLV arises from competition with an FMV construction which presumes the likeliness of its antecedent, and that the optative contributes a meaning to the FLV which presumes that the realization of its antecedent is possible.

2.2 Optative of Wish

The optative of wish expresses an attainable desire of the speaker and can only be evaluated at a future time (Rijksbaron 2002, §14.1). In (12) below, the aorist morphology only denotes aoristic aspect and is not interpreted as a past tense.

(12) genoio eutukhe:s:
become.AOR.OPT happy
'May you become happy.'

Smyth (1956, §1815) observes that the optative of wish is often introduced by *ei gar* 'if only' or *eithe* 'would that'. We consider the semantics of *ei gar* to be present in all optatives of wish, meaning that this usage is essentially a special case of the future less vivid conditional. See Biezma (2011) for a possible derivation of desirability semantics from 'if only' antecedent clauses (unfortunately termed *optatives* by the literature).

The attainability presupposition on optatives of wish provides strong evidence against the analysis of the optative in Beck et al. (2012) as expressing a counterfactual EXCL morpheme. In fact, unattainable wishes must be expressed by a (fake) past tense (Rijksbaron 2002, §8.2) which could more readily be analyzed as an EXCL feature in the framework of Iatridou (2000).

Interestingly, in Homeric (pre-Classical) Greek the optative of wish can refer to unattainable desires and is sometimes evaluated with respect to the present tense (Smyth 1956, §1817-1818). A diachronic analysis of the optative is nevertheless outside the scope of this paper.

2.3 Potential Optative

The clause of a potential optative holds of some future possibility (Smyth 1956, §1824), as in (13) below.[6]

(13) eipoi an tis...
say.3SG.AOR.OPT AN someone
'Someone might say...'

Beck et al. (2012) ascribes the meaning of modal quantification over possible worlds to *an* in conditional contexts, but here posits a different unpronounced modal. In §3.2 we give an explicit semantics for *an*, but for now it is enough to note that we analyze the optative as a restrictor on the domain of quantification introduced by *an*, and follow Beck et al. in assuming that the optative never itself introduces modal quantification.

The potential optative patterns with the future less vivid in its future orientation and possibility presupposition (though in this case, the possibility presupposition is trivially fulfilled if *an* is acting as a possibility modal).

2.4 Past General

The *past general* conditional has optative mood in the antecedent clause and indicative mood with an imperfect (past) tense in the consequent. It is interpreted as regarding a habitual

[6] Rijksbaron (2002, §4) provides the following constructed example of a potential optative, which appears to be able to be evaluated at a present time:

(1) he: hre:torike: de:miorgia an eie:
the rhetoric popular oratory AN is.3SG.PRES.OPT
'Rhetoric is possibly (just) popular oratory.'

Since Rijksbaron does not directly address the temporal orientation of the potential optative, and (1) does not refer to an actual sentence in the Classical Greek corpus, we follow Smyth in considering the environments of the potential optative to be strictly future-oriented.

past state of affairs, and seems to carry a presupposition that the conditional has been fulfilled more than once.

(14)

ei	men	epioien	hoi athe:naioi,	hupekho:roun,	ei d'
if	MEN	attack.3PL.PRES.OPT	the Athenians	retreat.3PL.IMP.IND,	if but

anakho:roien,	epekeinto
retreat.3PL.PRES.OPT	charge.3PL.IMP.IND

'If the Athenians attacked they retreated, but if they retreated they charged.' (Th. 7.79.5)

The previous three uses of the optative appear obviously related in that they imply future-orientation and possibility in modal quantification. The past general seems less easily unified, in part because it involves quantification over situations instead of possible worlds. We therefore leave to future research an extension of our analysis to this construction.

3 Optative as Modal Domain Restrictor

The approach pursued in this paper is to treat the optative as a restrictor on modal domains, which allows us to account for the meaning of being an (unlikely) possibility with which the optative is associated in the FLV, optative of wish, and potential optative. In order to also account for the future-orientation with which the optative is associated with in these structures, we adopt the framework of Klecha (2014), which associates modal domains with particular temporal orientations.

3.1 Review of Klecha (2014) and Formalism

Klecha (2014) analyzes propositions as type $\langle i, st\rangle$ properties of times and histories instead of $\langle i, wt\rangle$ properties of times and worlds, where i is the type of time intervals, w is the type of worlds, and s is the type of histories (world-time tuples). This formalism is motivated by an association between the modal base of a predicate and the temporal orientation of its complement clause.

We list some relevant definitions excerpted from Klecha (2014) below.

(15) *Definitions Regarding Histories* (adapted from Klecha 2014:11)

a. If $h = (w, t)$ then $\omega(h) := w$.

b. If $h = (w, t)$ then $\tau(h) := t$.

c. The actual history of a world w at time t is $act(w, t) := (w, (-\infty, t])$.

d. The past history of a world w at time t is $pst(w,t) := (w, (-\infty, t))$.
e. The future history of a world w at time t is $fut(w,t) := (w, (t, \infty))$.
f. The prospective history of a world w at time t is $pro(w,t) := (w, [t, \infty))$.
g. The set of actual histories of a time t is $\mathcal{A}_t := \{h | \tau(h) = (-\infty, t]\}$.
h. The set of future histories of a time t is $\mathcal{F}_t := \{h | \tau(h) = (t, \infty]\}$.

Importantly, the event time of any clause can only receive an interpretation within the temporal range of the history under which it is evaluated. This is achieved in Klecha (2014) by a presupposition on the aspect of the verb.[7]

We present denotations of the Classical Greek aspects below modeled after those given for the English aspects in Klecha (2014). Note that Classical Greek has two aspects corresponding to the English perfective: the true perfective aspect which assumes the existence of a contextually salient result state, and aoristic aspect which assumes that such a state does not exist. We use $R(e,h)$ to denote the property of events of having a result state: specifically, $[\![\text{R(e, h)}]\!]^{i,c,g} = 1$ iff e has a result state e' such that $\tau(e') \in h$. $\tau(e)$ gives the time interval associated with the event e.

(16) *Classical Greek Aspects*
a. $[\![\text{PROG}]\!]^{i,c,g} = \lambda P_{\langle \varepsilon, wt \rangle} \lambda t_i \lambda h_s : t \in \tau(h)\ .\ \exists e\ [\ P(e, \omega(h)) \wedge t \subseteq \tau(e)\ ]$
b. $[\![\text{PRF}]\!]^{i,c,g} = \lambda P_{\langle \varepsilon, wt \rangle} \lambda t_i \lambda h_s : t \in \tau(h)\ .\ \exists e\ [\ P(e, \omega(h)) \quad \wedge t = \tau(e) \wedge R(e,h)\ ]$
c. $[\![\text{AOR}]\!]^{i,c,g} = \lambda P_{\langle \varepsilon, wt \rangle} \lambda t_i \lambda h_s : t \in \tau(h)\ .\ \exists e\ [\ P(e, \omega(h)) \wedge t = \tau(e) \wedge \neg R(e,h)\ ]$

Implicit in the discussion of Klecha (2014) is the notion that modals quantify over histories consistently with respect to temporal orientation, which we formalize in (17) below.

(17) *Hypothesis of Uniform Temporal Orientation*
Given any domain of histories M, it must be the case that all histories of M have the same time coordinate, i.e. $\tau(h) = \tau(h')$ for all $h, h' \in M$.

Recall from §2.1 that $\mathcal{M}(i)$ gives the modal domain coordinate of the intensional index i, formalizing the notion of a set of context worlds used in Iatridou (2000). Under the histories framework, this domain must be associated with a temporal orientation. Klecha (2014) states that matrix sentences are evaluated with respect to the maximal history associated with a world w and time t of evaluation $max(w,t) = (w, (-\infty, \infty))$. We consider the history of evaluation to instead be an actual history, which accounts for the inability of the nonpast to receive future interpretation in the matrix clause in the absence of a prosepctive- or future-oriented modal such as *will*. Therefore, if the history of evaluation is an actual history then

[7]In Klecha (2014) this presupposition was introduced by a different formalism, in which the time of the event[8] is compared by aspect to $\tau h|t = t$ but $\tau h|t$ evaluates to t iff $t \in \tau(h)$, and is otherwise undefined.

by (17) it must be the case that $\mathcal{M}(c) \subset \mathcal{A}_{\tau(c)}$, where c is the intensional index of the matrix clause and $\tau(c)$ is its time coordinate (the time of evaluation).

For convenience, we also define the two notations below: note that the uniqueness of $\tau(M)$ is guaranteed by (17).

(18) $\omega(M) := \{w : \exists h \in M \; [w = \omega(h)]\}$

(19) $\tau(M)$ is the unique time interval t such that $t = \tau(h)$ for some $h \in M$

3.2 Analysis of Optative in Future-Oriented Environments

We will now formulate a denotation of the optative which accounts for its use in the FLV, the optative of wish, and the potential optative constructions. First, we must define an oriented extension of a history or a modal domains.

(20) *Oriented Extensions of an Actual History*
A history $h \lhd_f k$ is an f-oriented extension of an actual history k with $\tau(k) = (-\infty, t]$ iff $h = f(\omega(k), t)$, where $f \in \{act, pst, fut, pro\}$ is a function from histories to histories. For example, a history $h \lhd_{fut} k$ is an future-oriented extension of k with $\tau(k) = (-\infty, t]$ iff $h = fut(\omega(h), t)$.

(21) *Oriented Extensions of a Modal Domain*
A domain of histories $L \lhd_f M$ is an f-oriented extension of M iff for every history $h \in L$, h is an f-oriented extension of a history $k \in M$. In other words, $L \lhd_f M$ iff $\forall h \in L \; \exists k \in M \; [h \lhd_f k]$.

The denotation in (22) below asserts that some (but not necessarily all) histories in the domain of quantification are future-oriented extensions of histories in the modal domain associated with the nearest intensional context. This derives future-orientation and a possibility presupposition on conditional antecedents with optative inflection (the FLV antecedent and the optative of wish), and also derives the future-orientation of the potential optative.

(22) *Denotation of Optative (Version 1)*
$[\![\text{OPT}]\!]^{i,c,g} = \lambda M : \omega(\mathcal{M}(i)) \not\subseteq \omega(M) \wedge \exists M' \subset M \; [\, M' \lhd_{fut} \mathcal{M}(i) \,] \; . \; M$

Note that if the future-oriented extension relation were said to hold between M and $\mathcal{M}$(i) directly rather than between a subset of M and $\mathcal{M}$(i), as a consequence the optative would assert that all worlds over which the modal it appears under quantifies are worlds of $\mathcal{M}$(i). This would predict that in a matrix clause the optative asserts the factuality of the condition instead of its possibility, which is clearly not the case.

We include the clause $\omega(\mathcal{M}(i)) \not\subset \omega(M)$ since although the (un)likelihood of the FLV antecedent varies, it very clearly cannot denote something which is known by the speaker to be true. Thus, (22) specifies that there are worlds which could be the actual world which do not belong to the domain of modal quantification.

We now give a denotation of *an* loosely based on that of Beck et al. (2012). For simplicity, this denotation is written with modal quantification rather than with quantification over maximal situations. Moreover, although in Beck et al. *an* directly composes with the antecedent clause of conditionals, we consider this to be part of the meaning of *ei* 'if', which modifies the modal domain of quantification to satisfy the antecedent. In conditional clauses this will not change the meaning of *ei an*, but non-conditional uses of *an* can now be accommodated.

In (23a) below, $g(n)$ refers to a modal domain whose base and ordering are contextually determined which corresponds to an index n on *an*: a full account of the possible meanings of *an* is beyond the scope of this study, but it appears as though the only permissible ordering source is the stereotypical ordering ST. The compositional relation between *an* and *ei* which allows for *ei* to take as its complement the domain of quantification of *an* is left for future research.

(23) *Denotation of* an *and* ei

a. $[\![\text{an}_n]\!]^{i,c,g} = \lambda q_{\langle i,st\rangle} \lambda t_i \lambda h_s : t \in h_s \left[\forall k \in g(n),\, q(k,t)\right]$

b. $[\![\text{ei}]\!]^{i,c,g} = \lambda p.\lambda M.\textsc{best}(\{h \in M : p(h, \tau(i))\})$[9]

c. $[\![\text{ei } p \text{ an}_n\ q]\!]^{i,c,g} = \lambda t_i \lambda h_s : t \in \tau(h)\ .\ \forall k \in \textsc{best}(\{h \in g(n) : p(\tau(i), h)\})\ \left[q(k,t)\right]$

Below is a sample semantic derivation of a shortened version of (7).[10] We analyze the present inflection on *apekhoimetha* as a nonpast tense with aoristic aspect.[11]

(24) *Derivation of FLV Conditional (Version 1)*

ei	d'	apekhoimetha,	genoit'	an	eire:ne:
if	but	abstain.1PL.PRES.OPT...	happen.3SG.AOR.OPT	AN	peace

'But if we would abstain as much as possible, would there be peace?' (Adapted from Ar. Lys. 146-48)

a. $[\![\text{happen peace}]\!]^{i,c,g} = \lambda e \lambda w.$ e is a state of peace in w

[9]The antecedent clause can have more subtle effects on the modal domain of the conditional that here are included in the contextually sensitive nature of the domain of *an*, $g(n)$. Refer to Villalta (2008) for discussion.

[10]tro_n denotes an unpronounced temporal pronoun whose value is determined by the assignment function as $g(n)$.

[11]The present indicative in matrix clauses is ambiguous between progressive and aoristic aspect.

b. $[\![\textsc{aor} \text{ happen peace}]\!]^{i,c,g} =$
$\lambda t \lambda h : t \in \tau(h)\ .\ \exists e\ [\ t = \tau(e) \wedge e \text{ is a state of peace in} w\ ]$

c. $[\![\textit{tro}_8 \text{ NPST } \textsc{aor} \text{ happen peace}]\!]^{i,c,g} =$
$\lambda t \lambda h : g(8) \in \tau(h)\ .\ t \leq g(8) \wedge \exists e\ [\ g(8) = \tau(e) \wedge e \text{ is a state of peace in } w\ ]$

d. $[\![\text{an}_n]\!]^{i,c,g} = \lambda q \lambda t \lambda h : t \in h\ .\ \forall k \in g(n),\ q(k,t)$

e. $[\![\text{an}_n\ \textit{tro}_8 \text{ NPST } \textsc{aor} \text{ happen peace}]\!]^{i,c,g} =$
$\lambda t \lambda h : t \in h\ .\ t \leq g(8) \wedge \forall k \in g(n),\ \exists e\ [\ g(8) = \tau(e) \wedge e \text{ is a state of peace in } w\ ]$

f. $[\![\text{1PL abstain}]\!]^{i,c,g} =$
$\lambda x : (\textsc{auth}(c) \leq x \wedge |x| > 1)\ \lambda e \lambda w\ .\ e \text{ is an event in } w \text{ and } x \text{ abstains in } e$

g. $[\![\textit{pro}_6 \text{ 1PL abstain}]\!]^{i,c,g} =$
$\lambda e \lambda w\ .\ e \text{ is an event in } w \text{ and we}_6 \text{ abstain in } e$

h. $[\![\textsc{aor}\ \textit{pro}_9 \text{ 1PL abstain}]\!]^{i,c,g} =$
$\lambda t \lambda h : t \in \tau(h)\ .\ \exists e\ [\ t = \tau(e) \wedge e \text{ is an event in } w \text{ and we}_6 \text{ abstain in } e\ ]$

i. $[\![\textit{tro}_9 \text{ NPST } \textsc{aor}\ \textit{pro}_6 \text{ 1PL abstain}]\!]^{i,c,g} = \lambda t \lambda h : g(9) \in \tau(h).$
$t \leq g(9) \wedge \exists e\ [\ g(9) = \tau(e) \wedge e \text{ is an event in } w \wedge \text{we}_6 \text{ abstain in } e\ ]$

j. $[\![\text{ei}]\!]^{i,c,g} = \lambda p \lambda M\ .\ \textsc{best}(\{h \in M : p(h, \tau(i))\})$

k. $[\![\text{ei}\ \textit{tro}_9 \text{ NPST } \textsc{aor}\ \textit{pro}_6 \text{ 1PL abstain}]\!]^{i,c,g} = \lambda M\ .\ \textsc{best}(\{h \in M : \tau(i) \leq g(9)$
$\wedge \exists e\ [\ g(9) = \tau(e) \wedge e \text{ is an event in } \omega(h) \wedge \text{ we}_6 \text{ abstain in } e\ ]\})$

l. $[\![\text{ei}\ \textit{tro}_9 \text{ NPST } \textsc{aor}\ \textit{pro}_6 \text{ 1PL abstain an}_n\ \textit{tro}_8 \text{ NPST } \textsc{aor} \text{ happen peace}]\!]^{i,c,g} =$
$\lambda t \lambda h : t \in \tau(h)\ .\ \forall k \in \textsc{best}(\{h \in g(n) : [\![(24\text{c})]\!]^{i,c,g}(\tau(i), h)\})\ \big[[\![(24\text{i})]\!]^{i,c,g}(t,k)\big]$

m. $[\![\textsc{opt}]\!]^{i,c,g} = \lambda M : \omega(\mathcal{M}(i)) \not\subseteq \omega(M) \wedge \exists M' \subset M\ [\ M' \lhd_{fut} \mathcal{M}(i)\ ]\ .\ M$

n. $[\![\textsc{opt} \text{ ei}\ \textit{tro}_9 \text{ NPST } \textsc{aor}\ \textit{pro}_6 \text{ 1PL abstain an}_n\ \textit{tro}_8 \text{ NPST } \textsc{aor} \text{ happen peace}]\!]^{i,c,g} =$
$\lambda t \lambda h\ .\ \forall k \in \textsc{best}\big(\{h \in g(n) : [\![(24\text{c})]\!]^{i,c,g}(\tau(i), h)\}\big)\ \big[[\![(24\text{i})]\!]^{i,c,g}(t,k)\big]$
presupposed: $t \in \tau(h) \wedge \omega(\mathcal{M}(i)) \not\subseteq \omega(\textsc{best}(\{h \in g(n) : [\![(24\text{c})]\!]^{i,c,g}(\tau(i), h)\}))$
$\wedge \exists M' \subset \textsc{best}(\{h \in g(n) : [\![(24\text{c})]\!]^{i,c,g}(\tau(i), h)\})\ [\ M' \lhd_{fut} \mathcal{M}(i)\ ]$

The crucial part of the above derivation is that the optative in (24n) (i) forces the conditional to be interpreted with future orientation, by mandating that a subset of the histories being quantified over—so by the uniform temporal orientation of the domain, all histories being quantified over—are future extensions of histories in $\mathcal{M}$(i), and (ii) asserts that some of the worlds quantified over are elements of $\mathcal{M}$(i), which means that the antecedent by which the domain is restricted is realizable.

4 Accounting for Optative of Secondary Sequence

4.1 Tracking the Modal Domain Coordinate

Recall that $\mathcal{M}$(i) was defined to be a domain of histories dependent on the intensional index i, with $\mathcal{M}(c) \subset \mathcal{A}_{\tau(c)}$. The way in which $\mathcal{M}$(i) changes under attitude predicates, however, has not yet been examined.

We assume that the presupposition of (mere) possibility associated with the antecedent clause of an embedded optative appears is indeed relative to the beliefs of the author of the intensional context, but more corpus research is needed to find a Classical Greek example which can verify this. If there is indeed a parallel between the Classical Greek and English FLV constructions, then (25) below provides evidence that constraints on the likelihood of the antecedent clause depend on the author of the nearest intensional context rather than on the matrix speaker.

(25) a. S1: I've known since yesterday that Mary will come to the party, though John doesn't yet. But John thinks that if Mary came to the party he would have a great time.

b. # S1: Since yesterday John has been convinced that Mary will come to the party. And John thinks that if Mary came to the party he would have a great time.

The FLV antecedent clause "Mary came to the party" in (25a) is acceptable despite the matrix speaker recognizing Mary's attendance at the party as a certainty rather than as an unlikely event. In contrast, the sequence in (25b) is clearly unacceptable, which we attribute to the fact that the intensional author John considers Mary's attendance a certainty.

If the possibility supposition introduced by the optative likewise is relative to the attitude holder of the nearest intensional context, under our current analysis it must be that the attitude predicate shifts the value of $\mathcal{M}$(i) such that the worlds of $\mathcal{M}$(i) are those of the histories quantified over by the attitude predicate. This behavior is expected given the shifting of other intensional coordinates under attitude predicates.

As to the temporal orientation of $\mathcal{M}$(i), it is clear that the use of the optative of secondary sequence in an embedded clause critically depends on the relationship of the event time and the evaluation time of the higher clause. However, the optative as currently conceived simply relates two modal domains: the domain M being restricted, and $\mathcal{M}$(i). The only way for the optative to be affected by the temporal relations in a higher clause without introducing additional arguments to its denotation is if the temporal orientation of one domain is associated with the evaluation time of the higher clause while the temporal orientation of the other domain is associated with the event time of the higher clause. Since its elements are passed as history arguments to the embedded clause, M reflects the temporal orientation determined by the embedding predicate and the modal base, which correspond to the event time of the higher clause. Therefore, $\mathcal{M}(\mathrm{i})$ must contain information about the higher evaluation time.

This can be accomplished by stipulating that every history in a shifted domain coordinate $\mathcal{M}(\mathrm{i})$ is a set of actual histories of the time coordinate of a higher intensional context. This seems reasonable since we have already defined $\mathcal{M}(\mathrm{c})$ such that it is a subset of the actual histories of the matrix time of evaluation. This generalization is formalized below as a constraint on any operators which shift the coordinate $\mathcal{M}(\mathrm{i})$.

(26) *Constraint on Shifting $\mathcal{M}(i)$*
When the denotation of any lexical item $[\![\alpha]\!]^{i,c,g}$ causes the complement of α to be evaluated with respect to a new intensional index i' such that $\mathcal{M}(i') \neq \mathcal{M}(i)$, it must be the case that $\mathcal{M}(i') \subseteq \mathcal{A}_{\tau(i)}$.

In order for such an account to remain plausible, we would expect that under attitude predicates either M is derived from $\mathcal{M}(\mathrm{i})$ or $\mathcal{M}(\mathrm{i})$ is derived from M. The former is more elegant from a compositional perspective, since it is easy to conceive that modal alternative worlds are calculated before temporal orientation is shifted. However, divorcing calculation of modal alternative worlds from calculation of a new temporal orientation requires a new account of the association between modal bases and temporal orientation which was the basis of Klecha (2014). On the other hand, there is little motivation for a modal domain already shifted in temporal orientation to shift back again, so (26) is very stipulative if $\mathcal{M}(\mathrm{i})$ is derived from M. We remain neutral on this issue and proceed solely on the basis of (26).

To summarize, an intensional domain coordinate $\mathcal{M}(i')$ shifted by an attitude predicate in an intensional context i that quantifies over a modal domain M is of the form $\mathcal{M}(i') = \big\{(w, \tau(i)) : w \in \omega(M)\big\}$. $\mathcal{M}(i')$ also retains the ordering source of M.

4.2 More Relations on Modal Domains

We now define additional relations that can hold of two modal domains. These are crucial to the account of the optative of secondary sequence in §4.3.

(27) *Extensions of Arbitrary Histories*
A history $h \lhd k$ is an extension of an history k iff $\omega(h) = \omega(k)$ and either $a \leq b$ for all $a \in \tau(h)$ and $b \in \tau(k)$ or $a \geq b$ for all $a \in \tau(h)$ and $b \in \tau(k)$.

(28) *Extensions of a Modal Domain (Final Version)*
A domain of histories $L \lhd_f M$ is an extension of M iff for all $h \in L$ there exists some $k \in M$ such that $h \lhd_f k$.

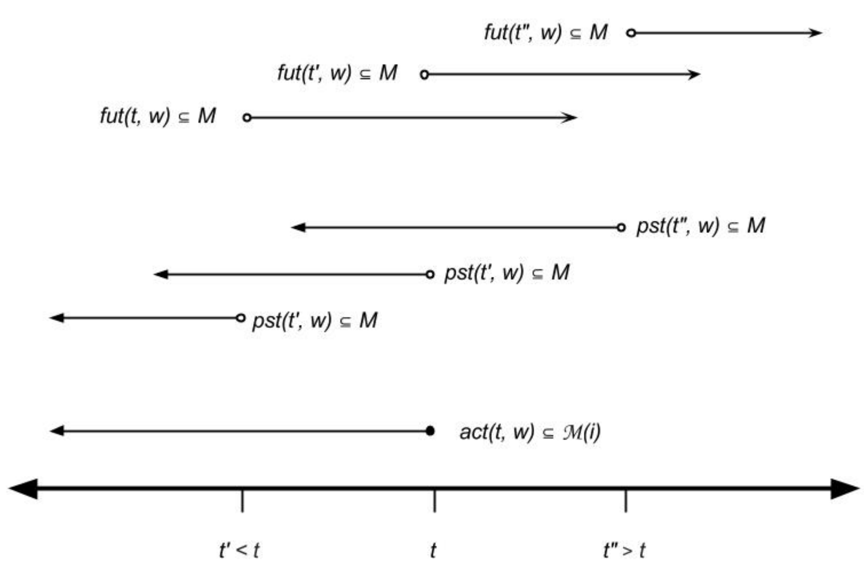
(27) and (28) straightforwardly expand on the corresponding definitions in §3.2: one history extends another iff it branches from an endpoint of the other history, and one modal domain extends another iff all its histories are extensions of histories in the other domain. A subset, intersection, and asymmetric difference relation on modal domains below are defined below.

(29) *More Relations on Modal Domains*
For any two modal domains L and M,
a. $L \subseteq M := 1$ iff $\omega(L) \subseteq \omega(M) \wedge \tau(L) \subseteq \tau(M)$
b. $L \cap M := \big\{(w,t) : w \in \omega(L) \cap \omega(M) \wedge t = \tau(L) \cap \tau(M) \wedge t \neq \varnothing\big\}$
c. $L - M := \big\{h \in L : \omega(h) \notin \omega(M) \wedge \tau(h) \cap \tau(L) = \varnothing\big\}$

4.3 Domain Relations between Embedded $\mathcal{M}$(i) and M

We now examine all possible temporal orientations of the domain of modal quantification M in an embedded clause with respect to the temporal orientation of the higher $\mathcal{M}$(i). Future and past histories of times t, t', and t'' with world coordinate w are depicted in (30) below. Note that prospective and actual orientations pattern with future and past orientations, respectively.

(30) *Possible Temporal Orientations of* M *and* $\mathcal{M}$(i)



The relations defined in §4.2 are now used to distinguish between orientations introduced by a higher past tense and orientations not introduced by a higher past tense. The truth table in (31) below gives the value of three predicates when applied to each of the orientations depicted above. Prospective and actual orientations are included in the table only where their valuations differ from the corresponding future and past orientations.

(31)

Valuations of Modal Relation Predicates			
History	$\mathcal{M}(i) \lhd M$	$\mathcal{M}(i) \subseteq M$	$\mathcal{M}(i) \cap M = \varnothing$
$pst(t', w)$	0	0	0
$pst(t, w)$	1	0	0
$act(t, w)$	1	1	0
$pst(t'', w)$	0	1	0
$fut(t', w)$	0	0	0
$fut(t, w)$	1	0	1
$pro(t, w)$	1	0	0
$fut(t'', w)$	0	0	1

The licit environments of the optative of secondary sequence are $pst(t', w)$ and $fut(t', w)$, which are distinguished from other modal domains in that they satisfy none of the predicates listed in the columns of (31). We accordingly give the following new denotation of the optative:

(32) *Denotation of Optative (Version 2)*
$$[\![\text{OPT}]\!]^{i,c,g} = \lambda M : \neg\mathcal{M}(i) \lhd M \wedge \mathcal{M}(i) \cap M \neq \varnothing \wedge \mathcal{M}(i) \not\subseteq M \ . \ M$$

Note that since the optative morpheme is analyzed simply as a partial identity function on the modal domain of quantification and its presupposition depends solely on whether or not the event time of the higher clause is past or nonpast, the secondary optative does not affect the interpretation of the embedded clause, as desired.

4.4 Returning to Future-Oriented Constructions

Although (32) looks different from the previous denotation of the optative, in environments of modal quantification not introduced by attitude predicates which shift the intensional index, they are equivalent after a relatively minor modification.

Consider each presupposition in (32) in turn. Any actual history $h \in \mathcal{M}(i)$ is the past extension of a future history with the same temporal center, so the only way in the future-oriented constructions we have examined for the presupposition $\neg\mathcal{M}(i) \lhd M \wedge \mathcal{M}(i)$ to be satisfied is if there are histories in $\mathcal{M}(i)$ whose worlds do not belong to any histories of M. Therefore, this presupposition reduces to $\omega(\mathcal{M}(i)) \nsubseteq \omega(M)$, which may relate to the unlikeliness implicature on the FLV.

However, because future histories and actual histories of any time t cannot have overlapping time coordinates, it will always be the case that $\mathcal{M}(i) \cap M = \varnothing$ if $M \lhd_{fut} \mathcal{M}(i)$, so the presupposition $\mathcal{M}(i) \cap M \neq \varnothing$ cannot be satisfied by an optative in a future-oriented construction. This does mean, however, that the presupposition $\mathcal{M}(i) \nsubseteq M$ is trivially true since there is no overlap between the modal domains.

A modified denotation of the optative is given below in (33).

(33) *Denotation of Optative (Third Version)*

$$[\![\textsc{opt}]\!]^{i,c,g} = \lambda M : \neg\mathcal{M}(i) \lhd M \wedge \mathcal{M}(i) \nsubseteq M \wedge \big(\mathcal{M}(i) \cap M \neq \varnothing \vee \mathcal{M}(i) - M \neq \varnothing\big) \,.\, M$$

The presupposition $\mathcal{M}(i) - M \neq \varnothing$ can never be satisfied by a modal domain under the optative of secondary sequence because it is never be the case that a world belonging to M does not also belong to $\mathcal{M}$(i). Therefore, the presupposition that $\mathcal{M}(i) \cap M \neq \varnothing$ still must be satisfied by the modal domain M under an optative of secondary sequence, as desired in order to ensure that optatives of secondary sequence are only licit under a higher past embedding verb.

In the case of the future-oriented optative, we have already presupposed that for some history $h \in \mathcal{M}(i)$, $\omega(h)$ does not belong to any history of M, so if that history does not temporally overlap with a history of $\mathcal{M}$(i) the presupposition is satisfied. The only way for M to not share any time intervals with $\mathcal{M}$(i), which consists of actual histories, is for M to be a future history (assuming they have the same temporal center corresponding to the evaluation time of the clause), so this presupposition can be reduced in the case of the future-oriented optative constructions to $M \lhd_{fut} \mathcal{M}(i)$.

The only element now missing from our previous denotation of the optative in future-oriented constructions is the possibility presupposition, which we reintroduce directly into the denotation in the form of a subset relation $\omega(M') \subseteq \omega(\mathcal{M}(i))$ between the worlds of $\mathcal{M}$(i) and a subset $M' \subseteq M$. This presupposition is trivially satisfied in the case of the secondary optative since as discussed in §4.1 it is always be the case that under an attitude predicate $\omega(\mathcal{M}(i)) = \omega(M)$.

(34) *Denotation of Optative (Final Version)*

$$[\![\textsc{opt}]\!]^{i,c,g} = \lambda M : \exists M' \subseteq M \,[\, \omega(M') \subseteq \omega(\mathcal{M}(i)) \,] \wedge \neg\mathcal{M}(i) \lhd M \wedge \mathcal{M}(i) \nsubseteq M \wedge \big(\mathcal{M}(i) \cap M \neq \varnothing \vee \mathcal{M}(i) - M \neq \varnothing\big) \,.\, M$$

The combination of relations used in the denotation above has been chosen to fit the data, and is less motivated than desired. However, insofar as we have shown it is possible to give the future-oriented optative and optative of secondary sequence a unified analysis as a simple modal restrictor, we hope to have demonstrated that such a perspective yields a fruitful line of inquiry. We suspect that with further work the above denotation can be simplified while maintaining such a unified treatment.

One possibility is that the licensing of the optative of secondary sequence is actually affected by the temporal orientation of the embedding verb. This could considerably simplify (34), but would contradict the established grammatical tradition, so significant corpus work would be needed to establish this possibility.

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