Why is *then* incompatible with the present?

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The temporal adverbial *then* is cross-linguistically incompatible with the present tense, not only in matrix but also in embedded clauses. In languages such as Modern Greek, Russian, Modern Hebrew, and Japanese, where the present tense can shift referring to the 'now' of the attitude holder rather than the time of the utterance, *then* remains incompatible with the present, even though the latter denotes a time in the past or future (Ogihara & Sharvit 2012, Sharvit 2018, Vostrikova 2018, Tsilia 2021). Additionally, in Modern Greek, *then* is at the same time compatible with a deleted past (Abusch 1997), which is interpreted as a present from the point of view of the attitude holder (Tsilia 2022). Thus, *then* is incompatible with the shifted present, but compatible with the deleted past in the same language, suggesting that the two are not semantically equivalent. We introduce a new interpretation parameter, which we call 'temporal *perspective*'. The interpretation of tenses and of *then* is sensitive to the temporal perspective. Tense shift is a result of the shift of the perspective, and the incompatibility between *then* and the present is derived as a shift together effect (Anand & Nevins 2004, Sudo 2012, Deal 2020). On the other hand, the deleted past is assumed to be stripped of its perspective sensitivity, and therefore does not clash with *then*. We also provide empirical support for distinguishing the perspective from the context and the evaluation index.

1. Introduction

A present tense is typically incompatible with the restriction the temporal adverbial *then* introduces, as shown in (1).[1] Assuming that the English present in (1) indicates that Mary's sickness occurs at the time of utterance, the incompatibility with *then* arises presumably because the adverbial has to refer to a time disjoint from the present, and therefore cannot provide a coherent temporal restriction.

(1) Mary is feeling sick (*then).

This explanation could extend to the present tense in embedded environments in English, as in (2) and (3). In both sentences, the present embedded under a matrix past tense denotes a time overlapping with the time of utterance, and therefore cannot be restricted by *then*.[2]

(2) John **found** out that Mary **loves** him (*then).
 $\rightsquigarrow$ Mary loves John **now**

(3) In his childhood, Joseph **met** a woman who **loves** traveling (*then).
 $\rightsquigarrow$ the woman loves traveling **now** (adapted from Ogihara & Sharvit 2012: (19a))

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[1] We put the historical present aside for the purposes of this paper, for that see Anand & Toosarvandani 2019, 2020.

[2] The case of (2) is more complicated since a present embedded under a past tense attitude predicate in English triggers the so-called 'double-access' reading, i.e. the time of Mary's affection overlaps not only with the time of utterance, but also with the time of John's (past) realization (Smith 1978). It is, however, a general consensus that the primary contribution of the English present is to denote the time of utterance, while the overlap with the time of the attitude follows from further constraints. The 'double-access' reading will not be the primary concern of this paper, and the interested reader is referred to previous work such as Ogihara (1995, 1996), Abusch (1988, 1997), Altshuler & Schwarzschild (2013), Bary & Altshuler (2015), and Klecha (2018).

However, many languages do not follow the English pattern as described above. For instance, in Modern Hebrew, Modern Greek and Russian, a present tense embedded under a past tense attitude predicate, as in (2), can give rise to a **simultaneous** reading where the embedded present denotes a time overlapping with the time of the attitude, but not necessarily with the time of utterance. In Japanese, the present in both attitude reports like (2) and relative clauses like (3) gives rise to simultaneous readings. We will refer to the embedded present that generates such simultaneous readings as a **shifted present**.

Interestingly, even in environments that license the shifted present, the incompatibility between the (shifted) present and a temporal adverbial approximating the English *then* persists. The account we previously sketched for (1-3) fails here since the shifted present does not refer to the time of utterance. So, a puzzle arises. Using ⌜*then*⌝ as a general representation of temporal adverbials corresponding to the English *then*, we formulate the puzzle in (4), following the terminology in Tsilia (2021), as well as relevant discussion in Ogihara & Sharvit (2012):

(4) **The ⌜*then*⌝-present puzzle**
The temporal adverbial ⌜*then*⌝ cannot be adjoined to a present-tensed verb phrase, regardless of whether the present tense is shifted or not.

Meanwhile, languages such as English, where the present cannot shift, take a different path towards the simultaneous reading using a *past*-under-past configuration, as shown in (5) and (6). Here the embedded past does not necessarily introduce further backshifting from the matrix past, but is instead simultaneous with it. The two pasts denote the same time.

(5) John **found** out that Mary **loved** him (then).
$\rightsquigarrow$ Mary was in love with John when he found out (but not necessarily now).

(6) In his childhood, Joseph **met** a woman who **loved** traveling (then).
$\rightsquigarrow$ The woman loved traveling when she met Joseph (but not necessarily now)

Theoretically, there are two possible ways to obtain the simultaneous reading in a past-under-past configuration. It could be that both the matrix and the embedded past are interpreted relative to the time of utterance, and their temporal references happen to coincide. This is often referred to as temporal *de re* (Abusch 1997). Another possibility is that the tense feature of the embedded past is simply uninterpreted, or **deleted**, due to the presence of a c-commanding tense with an agreeing feature, following the well-known sequence-of-tense rule. We will not be concerned with temporal *de re* in this paper. Instead, following Abusch 1994, 1997, we will show that even though (5-6) do not help us distinguish between the two options, the existence of deleted tense in languages like English and Modern Greek is supported by more complex constructions.

Deleted tenses have been considered to be semantically indistinguishable from the shifted present, since they both give rise to a simultaneous reading and deleting the past amounts to having a present from the point of view of the attitude holder. This has led theorists to give them identical semantics (e.g. Ogihara & Sharvit 2012). However, in this paper we will demonstrate that the deleted past cannot be semantically equivalent to the shifted present, since unlike the latter it allows for temporal restrictions from the adverbial ⌜*then*⌝. Therefore some theoretical distinction needs to be made between the two to account for the full empirical picture.

The goal of our paper is therefore to provide an account of the ⌜*then*⌝-present puzzle, while also capturing the difference between the shifted present and deleted tense. Our solution is couched in a novel theory of tense. The core proposal is that the interpretations of tenses and of the adverbial ⌜*then*⌝ are sensitive to a temporal **perspective**. The perspective is an interpretation parameter (similar to the speech context) shared by expressions at least within a minimal clausal domain. The ⌜*then*⌝-present puzzle is accounted for once we assume that ⌜*then*⌝ and the present trigger conflicting perspectival presuppositions. Tense shift is obtained through the shift of the perspective parameter, so the persistence of the incompatibility between ⌜*then*⌝ and the shifted present is essentially the result of a **shift-together** effect. Meanwhile, deleted tense is assumed to have no perspectival presuppositions, and therefore generates the simultaneous reading while being restricted by ⌜*then*⌝.

Of course, adding a perspective parameter to our semantic model needs justification. We will provide arguments that in order to solve the ⌜*then*⌝-present puzzle while accounting for the deleted tense data, a

perspective parameter is indeed necessary. In particular, we will provide evidence against identifying the perspective with the **context** parameter from which indexicals draw their references from, or the **index** parameter against which truth-conditional content is evaluated. We unfortunately do not have the space to delve deeper into further clarifications on the nature of the perspective, which we leave for future research.

The rest of the paper is organized as follows. §2 elaborates on the empirical picture concerning the ⌜*then*⌝-present puzzle and deleted tense. §3 introduces our theory of tense and the corresponding formal implementations, which are adopted in §4 to account for the relevant data. §5 provides further discussion on the difference between perspective on the one hand, and context and index on the other hand. §6 concludes.

2. The puzzle

2.1. The ⌜then⌝-present puzzle with the shifted present

As mentioned in the introduction, languages such as Modern Greek, Modern Hebrew, Russian, and Japanese have a present tense that can shift in embedded environments. Below is an example from Modern Greek:

(7) To 2000, o Yanis **iksere** oti i Maria **ine** egkios.
DET 2000, DET Yanis **know.PAST** that DET Maria **be.PRES** pregnant
'In 2000, Yanis knew that Maria was (lit.: is) pregnant.' Modern Greek

Concretely, in (7), the present tense, which is embedded under the past attitude predicate *iksere* 'knew', gives rise to the simultaneous reading where Maria's pregnancy overlaps with Yanis' knowledge back in 2000. Since it is common knowledge that a single pregnancy cannot last from 2000 to 2024, the embedded present is precluded from denoting a time overlapping with the time of utterance. Therefore it receives a genuinely shifted interpretation. The same happens when the matrix predicate in is future. A possible interpretation of example (8) below is that the time of Maria's imprisonment overlaps with the time of her future speech in 2030, and not necessarily with the time of utterance.

(8) To 2030, i Maria **tha** pi oti **ine** sti filaki.
DET 2030, DET Maria **FUT** say that **be.PRES** to-the jail
'In 2030, Maria will say that she is in jail.' Modern Greek

In relation to this, one of our central empirical points is that even when the present is shifted, it is incompatible with ⌜*then*⌝, as shown in (9) and (10) who form minimal pairs with (7) and (8) respectively.

(9) *To 2000, o Yanis **iksere** oti i Maria **ine** egkios **tote**.
DET 2000, DET Yanis **know.PAST** that DET Maria **be.PRES** pregnant **then**
Intended: 'In 2000, Yanis knew that Maria was (lit.: is) pregnant then.' Modern Greek

(10) *To 2030, i Maria **tha** pi oti **ine** sti filaki **tote**.
DET 2030, DET Maria **FUT** say that **be.PRES** to-the jail **then**
Intended: 'In 2030, Maria will say that she is in jail.' Modern Greek

The incompatibility of the shifted present with ⌜*then*⌝ can be observed in Modern Hebrew with the adverbial *az*, in Russian with *togda*, and in Japanese with *tooji*. For reasons of space, we will illustrate the paradigm with Modern Greek in the current paper. Again for reasons of space, we will restrict our attention only to attitude reports as in (7)–(10), omitting the otherwise interesting discussions pertaining to relative clauses.[3]

[3] Cases with relative clauses such as (3) constitute a distinct paradigm: only Japanese allows the present to shift in a relative clause under a past tense matrix verb, whereas all languages allow the present to shift in a relative clause under a future tense matrix verb (see also Ogihara & Sharvit 2012). Interestingly, regardless of the licensing conditions of the shifted present, the ⌜*then*⌝-present puzzle arises across the board. We believe that our analysis of tense shift can be extended to relative clauses, but we leave an account of the full tense shift typology for future research.

2.2. Shifted present is not deleted tense

We mentioned above that simple past-under-past constructions like (5) and (6) cannot help us distinguish between a temporal *de re* and a tense deletion analysis of the simultaneous reading. To adjudicate between the two, we need to resort to more complex constructions like (11), first formulated in Abusch 1988 for English after Kamp & Rohrer's (1984) discussions on French:

(11) John decided a week ago that in ten days he would say to his mother that they **were having** their last meal together.

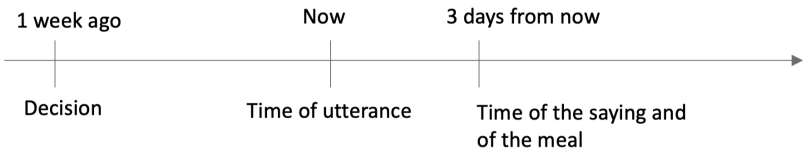

Figure 1: Temporal relations in (11).

As illustrated in Figure 1, representing the temporal relations in (11), the most deeply embedded past *were having* does not denote a time preceding the time of utterance or any other salient moment established throughout the discourse. In fact, despite the morphological past, it denotes a time in the future with respect to the time of the utterance and with respect to the 'now' of the attitude holder. Therefore the temporal *de re* analysis cannot account for these complex cases; we need to posit a deletion mechanism in order to derive the simultaneous reading.

The same point can be made for Modern Greek with the example in (12) (see also Sharvit 2018, Tsilia 2021, 2022). Once again, the most deeply embedded past, *sinadjiondusan* 'were meeting' denotes a time in the future with respect to the time of utterance, simultaneous with Jorghos' anticipated speech.

(12) Prin mia evdhomadha, o Jorghos ipe oti se dheka meres tha eleghe stin
Before one week DET Jorghos say.PAST that in ten days will say.IMPFV.PAST to-the
kopela tu oti **sinadjiondusan** ja teleftea fora.
girlfriend his.GEN that meet.IMPFV.**PAST** for last time
'A week ago, Jorghos said that in ten days he would say to his girlfriend that they were meeting for the last time' Modern Greek (Sharvit 2018: (40))

Given that it also has a shifted present, Modern Greek has (at least) two ways to achieve a simultaneous reading: through a shifted present or through tense deletion. This makes it very suitable for illustrating our next point: even though a shifted present and a deleted past both generate a simultaneous reading, they are not semantically equivalent. Indeed, in the following example, a deleted past is compatible with *tote* 'then', in contrast with (9) and (10), where the ⌜*then*⌝-present puzzle arises.

(13) Prin mia evdhomadha, o Jorghos ipe oti se dheka meres tha eleghe stin
Before one week DET Jorghos say.PAST that in ten days will say.IMPFV.PAST to-the
kopela tu oti **sinadjiondusan tote** ja teleftea fora.
girlfriend his.GEN that **meet.IMPFV.PAST then** for last time
'A week ago, Jorghos said that in ten days he would say to his girlfriend that they were meeting then for the last time'

Thus, we find that within the same language ⌜*then*⌝ is compatible with deleted but not with shifted tense. This suggests that, contrary to what we commonly assume, deleted and shifted tense are not semantically equivalent. Therefore, whatever our solution to the ⌜*then*⌝-present puzzle is, it has to be able to distinguish between shifted and delete tense. Let us now turn to the proposal.

3. The perspective-sensitivity of tense and ⌜*then*⌝

Our proposal is centered around a novel theory of tense. As we alluded to early on, we will propose that the interpretations of tenses and ⌜*then*⌝ are relative to a **perspective** parameter. The ⌜*then*⌝-present puzzle would thus arise because the present and ⌜*then*⌝ trigger conflicting perspectival presuppositions. Meanwhile, tense shift is a result of the shift of the perspective, and the persistence of the ⌜*then*⌝-present puzzle with shifted present is the result of a shift-together effect.

Our analysis is heavily inspired by theories of **indexical shift**. Indexical shift refers to the phenomenon whereby, in many languages, indexical expressions such as *I, you, here, now* can receive a shifted interpretation in speech/attitude reports (like shifted tense). The sentence (14) below is an example from Nez Perce.[4] It is ambiguous between two possible interpretations of the embedded indexical pronoun. Under the non-shifted reading, the first-person pronoun draws its reference from the utterance context and refers to the speaker. But under the **shifted** reading, it refers to the subject attitude holder, *Beth*, the author of the reported attitude context.

(14) Mipx Beth hi-neek--e [pro kuu-se-∅]?
where.to Beth.NOM 3SUBJ-think-P-REM.PAST [1SG go-IMPERF-PRES]
✓Non-shifted: Where did Beth$_i$ think I was going?
✓Shifted: Where did Beth$_i$ think she$_i$ was going? Nez Perce, Deal 2020: (5)

An important feature of indexical shift that directly inspired our treatment for clausemate present and ⌜*then*⌝ is the **shift-together** constraint. It states that all shiftable indexicals (of the same type) within a minimal clausal domain must draw their references from the same context (see e.g. Anand 2006: (100)). Consider the following example:

(15) Ne-'níc-em pee-∅-n-e 'in-haama-na, ['im-im ciq'aamqal
1SG-older.sister-ERG 3/3-say-P-REM.PAST 1SG-husband-ACC [2SG-GEN dog(ERG)
hi-twehkey'k-∅-e 'iin-e].
3SUBJ-chase-P-REM.PAST 1SG-ACC

a. ✓My sister$_s$ told my husband$_h$ that his$_h$ dog chased her$_s$.
b. ?My sister$_s$ told my husband$_h$ that your dog chased me.
c. ✗My sister$_s$ told my husband$_h$ that your dog chased her$_s$.
d. ✗My sister$_s$ told my husband$_h$ that his$_h$ dog chased me. Nez Perce, Deal 2020: (30)

The default interpretation of (20) is one where both indexical pronouns retrieve their references from the *reported* speech context as in (20a), so that the first-person pronoun *'iin-e* is interpreted as 'my sister' (the reported speaker) and the second-person pronoun *'im-im* as 'my husband' (the reported addressee). The other possible reading in (20b), albeit being less preferable, is one where neither indexical shifts, i.e. the first-person pronoun refers to the speaker 'me' and the second-person pronoun to the addressee 'you'. Importantly, it is impossible for only one of the two embedded indexicals to shift, be it the first-person pronoun as in (20c) or the second-person pronoun as in (20d). In other words, if one of the indexicals shifts, the other has to as well. A parallel constraint will be predicated on clausemate present and ⌜*then*⌝ – once the former is shifted, the latter must be as well, and therefore the ⌜*then*⌝-present puzzle arises.

To build up to our theory of tense, we will provide next a brief introduction to the theory of indexical shift, in particular the parameter-based analysis developed in Anand & Nevins (2004) and Anand (2006). We will then enrich it with the perspective parameter, accounting for the ⌜*then*⌝-present puzzle and the difference between shifted and deleted tense.

[4] Languages that have been reported to allow indexical shift include e.g. Amharic (Schlenker 1999), Zazaki (Anand & Nevins 2004, Anand 2006), Japanese (Sudo 2012), Uyghur (Shklovsky & Sudo 2014), Korean (Park 2016), Nez Perce (Deal 2020) a.o.

3.1. A theory of indexical shift

Anand & Nevins's analysis of indexical shift, which is faithfully couched in Kaplan's (1979) two-dimensional semantics, characterized the interpretation function as relative to a context parameter c and an evaluation index i (along with an function g for variable assignment):

(16) $[\![\cdot]\!]^{c,i,g}$

The context c and index i are homologously formalized as quadruples: $\langle c_s, c_a, c_t, c_w\rangle$, $\langle i_s, i_a, i_t, i_w\rangle$, consisting of a speaker/author, an addressee, a time and a world. Indexicals draw their references from the context:

(17) a. $[\![\text{I}]\!]^{c,i,g} = c_s$
b. $[\![\text{now}]\!]^{c,i,g} = c_t$

Speech/attitude predicates function as quantifiers that bind the *indices* used to evaluate the truth value of the embedded clause. Here is an example of a typical entry for a speech predicate, where the bound index i' represents the context used to evaluate the reported speech:

(18) $[\![\text{say}\ \varphi]\!]^{c,i,g} = \lambda t.\, \lambda x.\, \forall \boldsymbol{i'} \in \textbf{SAY}(t)(x)(i_w).\, [\![\varphi]\!]^{c,\boldsymbol{i'},g} = 1$
Where $i' \in \textbf{SAY}(t)(x)(i_w)$ if and only if i' is *compatible* with what x says at t in i_w

The final ingredient of the analysis is the **context-shifting operator** $\textbf{OP}_c$ that overwrites the context parameter with the evaluation index, a Kaplanian 'monster':

(19) $[\![\textbf{OP}_c\ \varphi]\!]^{c,i,g} = [\![\varphi]\!]^{\boldsymbol{i},i,g}$

The shift-together constraint is captured under the assumption that $\textbf{OP}_c$ applies only at a clause boundary, thus affecting all indexicals within its clausal domain. As illustrated in (20), either $\textbf{OP}_c$ applies (20b) at a clause boundary and both indexicals draw their references from a shifted parameter, or $\textbf{OP}_c$ does not apply and both indexicals are interpreted relative to the context of the utterance.

(20) a. $[\![\text{your dog is chasing me}]\!]^{c,i,g} = \textsc{chase}(\textsc{dog-of}(\boxed{c_a}))(\boxed{c_s})(i_w)$
b. $[\![\textbf{OP}_c\ \text{your dog is chasing me}]\!]^{c,i,g} = [\![\text{your dog is chasing me}]\!]^{i,i,g}$
$= \textsc{chase}(\textsc{dog-of}(\boxed{i_a}))(\boxed{i_s})(i_w)$

3.2. Adding the perspective

Our theory of tenses mirrors that of indexicals, with the addition of a distinct perspective parameter π. The interpretation function is therefore updated to the following:

(21) $[\![\cdot]\!]^{c,\boxed{\pi},i,g}$

To keep things simple, π is taken to be a simple time parameter (unlike the context and index which are modeled as quadruples), and it is set by default to the time of utterance c_t.[5] With this addition, the semantics of (non-deleted) present and ⌜*then*⌝ may be given as in (22) and (23). Both of them are treated as temporal pronouns (following Partee 1973) with perspectival presuppositions – the present is required to denote a time overlapping ('$\circ$') with π, and ⌜*then*⌝ a time disjoint from π. Our account for the ⌜*then*⌝-present

[5] In a full-fledged theory, this default value may be the result of a truth convention like the following:

(1) Truth Convention
A sentence S with the LF φ is true relative to the utterance context c and assignment function g iff $[\![\varphi]\!]^{c,c_t,c,g}(c) = 1$.

puzzle essentially capitalizes on the contradictory presuppositions that preclude ⌜*then*⌝ from restricting the value of the present.[6]

(22) $[\![\textbf{PRES}_n]\!]^{c,\pi,i,g} = g(n)$ only if $\boxed{g(n) \circ \pi}$, otherwise undefined.

(23) $[\![\text{then}_n]\!]^{c,\pi,i,g} = g(n)$ only if $\boxed{\neg(g(n) \circ \pi)}$, otherwise undefined.

Finally, just like c, π may be shifted by an operator $\textbf{OP}_\pi$ that overwrites the perspective parameter with the time component of the evaluation index:

(24) $[\![\textbf{OP}_\pi\ \varphi]\!]^{c,\pi,i,g} = [\![\varphi]\!]^{c,i_t,i,g}$

We now have all the tools we need to proceed to the analysis.

4. Accounting for the data

4.1. The ⌜then⌝-present puzzle, explained

Let us start with the ⌜*then*⌝-present puzzle in simple root clauses, with the following working example:

(25) *Erica is angry then.

Assuming that *then* introduces a time that contains ($\supseteq$) the temporal reference of the present, (25) is interpreted as follows:

(26) $[\![\text{Erica be-}\textbf{PRES}_n \text{ angry then}_m\ ]\!]^{c,\pi,i,g}$

a. presupposition: $\boxed{(g(n) \circ \pi)} \wedge \boxed{\neg(g(m) \circ \pi)}$

b. assertion: $\textbf{ANGRY}(g(n))(\textbf{E})(i_w) \wedge \boxed{g(n) \subseteq g(m)}$

The three factors highlighted in the boxes explain the ⌜*then*⌝-present puzzle as a semantic anomaly. If the perspectival presuppositions of ⌜*then*⌝ and the present in (26a) are satisfied, there is no way the asserted temporal containment in (26b) can hold – the part of $g(n)$ that overlaps with π has to fall outside of $g(m)$.

The explanation extends straightforwardly to the shifted present. Let's take the English pseudo-glossing in (27) as a working example, where the embedded present is intended for a simultaneous reading similar to (7).

(27) *Nate said Erica is angry then. English pseudo-glossing
LF: $[\![\text{Nate say-}\textbf{PAST}_k\ [\boxed{\textbf{OP}_\pi}\ \text{Erica be-}\textbf{PRES}_n \text{ angry then}_m]]\!]^{c,\pi,i,g}$

a. $[\![\boxed{\textbf{OP}_\pi}\ \text{Erica be-}\textbf{PRES}_n \text{ angry then}_m]\!]^{c,\pi,i,g} = [\![\text{Erica be-}\textbf{PRES}_n \text{ angry then}_m]\!]^{c,i_t,i,g}$

i. presupposition: $\boxed{g(n) \circ i_t} \wedge \boxed{\neg(g(m) \circ i_t)}$

ii. assertion: $\textbf{ANGRY}(g(n))(\textbf{E})(i'_w) \wedge \boxed{g(n) \subseteq g(m)}$

b. presupposition: $g(k) < \pi_t \wedge \forall i' \in \textbf{SAY}(g(k))(\textbf{N})(i_w).\ \boxed{g(n) \circ i'_t} \wedge \boxed{\neg(g(m) \circ i'_t)}$

c. assertion: $\forall i' \in \textbf{SAY}(g(k))(\textbf{N})(i_w).\ \textbf{ANGRY}(g(n))(\textbf{E})(i'_w) \wedge \boxed{g(n) \subseteq g(m)}$

[6] We set aside the potential complication that the perspective-sensitivity of ⌜*then*⌝ may be better characterized as an *anti-presupposition* (Percus 2006). This is shown in the following example (p.c. Philippe Schlenker):

(i) When it's sunny but cold, I don't go out; when it's sunny and warm, *then* I go out. So now I'm going out.

Then seems to refer to a time that at least includes the present, so the disjointness inference is not as stable as a presupposition would dictate.

The key step to derive the shifting of the present, as shown in (27a), is to apply the perspective-shifting operator $\textbf{OP}_\pi$ to the embedded clause. It overwrites the local perspective with the time component of the index, but guarantees crucially that the shifted perspective is still a parameter shared by both $\textbf{PRES}_n$ and then_m. The speech predicate *say* then binds the index i, while filtering the presuppositions triggered by the embedded clause, generating the results shown in (27b-c). The presupposition in (27b) indicates that (i) the embedded present is shifted to overlap with Nate's past speech, and (ii) the reference of ⌜*then*⌝ is shifted as well to be disjoint from Nate's speech, which together preclude the temporal containment asserted in (27c). Therefore, modulo a parameter-based analysis for tense shift, essentially the same set of factors are responsible for the ⌜*then*⌝-present puzzle.

4.2. Deleted tense is not perspective-sensitive

The system also extends naturally to an account for the contrast between shifted and deleted tense. Unlike the shifted present, which triggers a perspectival presupposition, we can model deleted tense as devoid of any perspective sensitivity. It therefore becomes a temporal pronoun *without* any presupposition:

(28) $[\![\textbf{PAST}_n]\!]^{c,\pi,i,g} = g(n)$

Now let's apply (28) to the working example in (29), again with English pseudo-glossing for clarity. The embedded past on *missed* is intended to generate a simultaneous reading through tense deletion.

(29) Bob **said** that he **missed** Charlie **then**. English pseudo-glossing
LF: $[\![\text{Bob say-}\textbf{PAST}_k\ [\text{Bob miss-}\textbf{PAST}_n\ \text{Charlie then}_m]]\!]^{c,\pi,i,g}$

a. presupposition: $g(k) < \pi_t \wedge \forall i' \in \textbf{SAY}(g(k))(\textbf{B})(i_w).\ \boxed{\neg(g(m) \circ \pi)}$

b. assertion: $\forall i' \in \textbf{SAY}(g(k))(\textbf{B})(i_w).\ \textbf{MISS}(g(n))(\textbf{C})(\textbf{B})(i'_w) \wedge \boxed{g(n) \subseteq g(m)}$

Because the deleted past has no perspectival presupposition, no contradiction arises between asserted and presupposed content. One might object that the LF proposed in (29) does not contain the perspective-shifting $\textbf{OP}_\pi$. With respect to the compatibility between deleted past and ⌜*then*⌝, this does not matter – irrespective of the presence of $\textbf{OP}_\pi$, deleted tense has no perspectival presupposition that would lead to a conflict between presupposed and asserted content. That being said, the LF in (29) is the one that generates the simultaneous reading. If $\textbf{OP}_\pi$ is present and applied to the embedded clause, it would shift the local perspective to the time of Bob's past speech, and the presupposition of $\textit{then}_m$ would force it to denote a time disjoint from the reported speech. In that case it can no longer be used to coherently restrict the reference of the deleted past if the simultaneous reading is intended. This will become relevant in the next section.

5. Perspective is not Context or Index

In the interest of theoretical simplicity, one could be tempted to collapse the perspective parameter to the temporal component of the context or the index. However, in this section, we would like to argue that this cannot be done if we want to capture the entire empirical picture sketched in §2. Specifically, if our solution to the ⌜*then*⌝-present puzzle is on the right track, the perspective would need to be a distinct interpretation parameter from both the context parameter and the evaluation index.

5.1. Perspective is not Context

Suppose the perspective π is in fact just the time component c_t of the context parameter. In that case, tenses and ⌜*then*⌝ are essentially temporal indexicals like ⌜*now*⌝, ⌜*tomorrow*⌝ and ⌜*yesterday*⌝. Assuming that tense shift is still effected by the shift of the perspective/context (so that we derive the shift-together effect between ⌜*then*⌝ and the present), we would predict that tense shift is concomitant with the shifting of temporal indexicals. But this prediction is not borne out. Consider this example from Modern Greek:

(30) To 1960, o Yanis iksere oti i Maria **ine** omorfi (**#tora**).
DET 1960, DET Yanis know.PAST that DET Maria **be**.PRES beautiful **now**
'In 1960, Yanis knew that Maria was (LIT.: is) beautiful.' Modern Greek (Tsilia 2021: (100))

Without the temporal indexical *tora* 'now', the embedded present in (30) can be shifted to yield a simultaneous reading where it reports Yanis' past knowledge in 1960 that Maria was beautiful at the time of his knowledge. However, adding the temporal indexical *tora* 'now' forces an implausible reading where Yanis clairvoyantly predicted Maria's state of beauty at the time of utterance (much latter than his state of knowledge). In other words, the temporal indexical *tora* 'now' cannot shift but instead has to refer to the time of utterance, and therefore blocks the embedded present from the shifted interpretation that is otherwise available. This pattern extends to all languages with a shiftable present discussed in this paper (i.e. Modern Hebrew, Russian and Japanese).

There is another reason not to collapse context and perspective. Indexical shift is generally recognized as a phenomenon typically restricted to speech/attitude reports (e.g. both Anand (2006) and Deal (2020) propose a shifting operator *selected* by certain speech/attitude predicates). Tense shift, on the other hand, may occur in non-attitudinal environments such as relative clauses, in languages like Japanese (Kusumoto 1999, Ogihara 1996, Ogihara & Sharvit 2012). These facts suggest that even if the underlying mechanisms of tense shift and indexical shift are similar, they should not be treated as the same operation, let alone being regulated by the same interpretation parameter.

5.2. Perspective is not Index

One could also argue that we can collapse the perspective to the temporal component of the evaluation index, i.e. $\pi = i_t$. In fact, to some extent, this is the position that many previous approaches take (e.g. Ogihara 1996, Abusch 1997, Kratzer 1998, Kusumoto 1999, Ogihara & Sharvit 2012 a.o.). In this case, the present and ⌜*then*⌝ would receive denotations like the following:

(31) $[\![\textbf{PRES}_n]\!]^{c,i,g} = g(n)$ only if $\boxed{g(n) \circ i_t}$, otherwise undefined.

(32) $[\![\text{then}_n]\!]^{c,i,g} = g(n)$ only if $\boxed{\neg(g(n) \circ i_t)}$, otherwise undefined.

(33) $[\![\textbf{PAST}_n]\!]^{c,i,g} = g(n)$.

Assume the (quite standard) semantics for speech/attitude predicates still hold, thus treating them as quantifiers over evaluation indices (see (18)). A consequence of identifying π with i_t is that tense shift is predicted to be *obligatory* in speech/attitude reports, as illustrated below:

(34) Nate said Erica is angry. English pseudo-glossing
LF: $[\![$Nate say-$\textbf{PAST}_k$ [Erica be-$\textbf{PRES}_n$ angry]$]\!]^{c,i,g}$

a. $[\![$Erica be-$\textbf{PRES}_n$ angry$]\!]^{c,i,g} = \textbf{ANGRY}(\text{g(n)})(\textbf{E})(i_w)$ only if $g(n) \circ i_t$
b. presupposition: $g(k) < \pi_t \wedge \forall i' \in \textbf{SAY}(g(k))(\textbf{N})(i_w).\ g(n) \circ i'_t$
c. assertion: $\forall i' \in \textbf{SAY}(g(k))(\textbf{N})(i_w).\ \textbf{ANGRY}(g(n))(\textbf{E})(i'_w)$

That is, because the speech predicate always binds the evaluation index of the embedded clause, and the tense is anchored to the index, any tense embedded under the speech predicate is interpreted relative to the time of the reported speech. This is however empirically inadequate. Even in languages where tenses *can* shift, like Modern Greek, Modern Hebrew, Russian, and Japanese, this shifting is not obligatory. Indeed, certain temporal adverbials may force the present to be interpreted with respect to the time of utterance. As shown in (35), although Modern Greek allows for a shifted present in reported speech under future, the presence of *tora* 'now' forces the reading where Maria's imprisonment is in the present.

(35) To 2030, i Maria **tha** pi oti **ine** sti filaki tora.
DET 2030, DET Maria **FUT** say.PFV that **be.PRES** to-the jail now
'In 2030, Maria will say that she is in jail now.' Modern Greek

Another reason not to identify π with i_t, closely related to the issue of obligatory tense-shift, has to do with the previous discussion regarding the deleted tense (see (29)). Recall that in order to get a coherent reading where ⌜*then*⌝ provides a temporal restriction for the deleted tense targeting a simultaneous reading, the interpretation of ⌜*then*⌝ has to remain unshifted. Otherwise it would denote some time disjoint from the shifted perspective/index, i.e. the time of the matrix speech/attitude, which would rule out the simultaneous reading. But by identifying π with i_t, one would predict obligatory perspective-shift, contrary to fact. After all, collapsing π and i_t effectively leads to identifying shifted with deleted tense, which is why most previous accounts would fail to capture their difference.

Therefore, reducing the perspective to either the temporal component of the context or the index will lead to undesirable predictions, and it is an important empirical claim of the paper that the interpretation of tenses calls for a *distinct* perspective parameter π.

6. Conclusion

We delved into the ⌜*then*⌝-present puzzle, the observation that the temporal adverbial ⌜*then*⌝ is cross-linguistically incompatible with the present even when shifted, while being perfectly compatible with deleted tense. We proposed a solution to the puzzle, inspired by theories of indexical shift, and treating the phenomenon as the result of a shift together effect in the temporal domain. In our system, shifted tense and ⌜*then*⌝ are perspective-sensitive and have conflicting presuppositions. They thus exhibit a shift together effect, having to be interpreted under the same parameter in their minimal clausal domain. What is more, we accounted for the newly observed difference between shifted and deleted tense by arguing that deleted tense has had its perspective-sensitivity precisely deleted, thus not having any presuppositions that conflict with ⌜*then*⌝. Thanks to the temporal adverbial ⌜*then*⌝ we were able to better understand the mechanisms and nature of tense shift, as well as discover a previously ignored difference between shifted and deleted tense.

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