# The broader epistemic future

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*@ Commitment phenomena through the study of evidential markers in Romance languages*
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# Outline

Many Romance languages[1] have a future tense that overlaps with an epistemic future.

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Many Romance languages[1] have a future tense that overlaps with an epistemic future.

> **Example**
>
> (1)  a.  Il  negozio chiuderà        alle 4 del pomeriggio (future tense)
>          the shop     close.FUT.3SG at   4 of  afternoon
>          'The shop will close at 4 pm.'
>      b.  A quest'ora Giovanni sarà          a  casa  (epistemic future)
>          at this.hour Giovanni be.FUT.3SG at home
>          'At this time, Giovanni will be at home.'           (Mari, 2009)

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Table : Future periphrases (conjugating for *a cânta* 'to sing', 3SG)

|                          | X.LIT              | X.COLLOQ          |
|--------------------------|--------------------|-------------------|
| Simple                   | va cânta           | o cânta           |
| Perfect                  | va fi cântat       | o fi cântat       |
| Progressive              | va fi cântând      | o fi cântând      |
| Past Perfect             | va fi fost cântat  | o fi fost cântat  |
| Past Perfect Progressive | va fi fost cântând | o fi fost cântând |

To provide a unified account from the point of view of their temporal and epistemic-evidential properties.

# Outline

> **Definition**
>
> Temporal perspective: the time at which the epistemic claim is made.

(2)    a.    He might be home.

       b.    Va/O fi    acasă.

              X       be home

              'He will be home.'

              = PRES(MIGHT/X(he be home)

              = It is now that it is epistemically possible/X that...

> **Definition**
>
> Temporal orientation: the time of evaluation of the proposition in the scope of a modal.

(3)   a.   He might be home now / later.

b.   Va/o fi   acasă acum / mai târziu.
X      be home now   / later
'He will be home now / later.'
= PRES(MIGHT/X(STATIVE now / later))

c.   He might sing *now / later.

d.   Va/o cânta *acum / mai târziu.
X     sing   now    / later
'He will sing *now / later.'
= PRES(MIGHT/X(EVENTIVE *now / later))

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         PRES(X((By(TOMORROW)(PERFECT (he leave))))

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- Temporally, our X future tense is merely a special case of PRESENT(X.LIT/COLLOQ (STATIVE/EVENTIVE)) which picks out X.LIT as an auxiliary and only the future orientation option of statives.

# Outline

Modals can be captured in terms of 3 dimensions:

- modal force: necessity, weak necessity, good possibility, possibility, slight possibility, at least as good a possibility, better possibility, probability

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- ordering source: deontic, bouletic, stereotypical, doxastic, etc.

# Epistemic 'must'

## Example

Modal force: Necessity.

Modal base: In the real world, the light is on in John's room, it is a warm summer evening, etc.

Ordering source: When the light is on in John's room, he is home.

_____

Inference/Epistemic necessity: John must be home.

## Definition

"[...] a conversational background is the kind of entity which might be referred to by the utterance of a phrase like *what is known* [...] What is known is different from one possible world to another. And what is known in a possible world is a set of propositions. In our semantics, a conversational background will therefore be construed as a function which assigns sets of propositions to possible worlds. In particular, the meaning of *what is known* will be that function from W into the power set of the power set of W, which assigns to any world w of W the set of all those propositions which are known in w." (Kratzer, 1981, 43)

- Set of possible worlds: $W = \{w_1, w_2, ..., w_n, ...\}$

# Conversational backgrounds II

- Set of possible worlds: $W = \{w_1, w_2, ..., w_n, ...\}$
- The power set of $W$:
  $P(W) = \{\{w_k, ..., w_k\}, \{w_k, ..., w_k\}, ...\{w_k, ..., w_k\}, ...\}$

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- $f : W \to P(P(W))$
  $= f : \{w_1, w_2, ..., w_n, ...\} \to \{\{p_k, ..., p_k\}, ..., \{p_k, ..., p_k\}, ...\}$

- modal base for $w_@$: $f(w_@) = \{p_1, p_2\}$
  $p_1 = \{w: \text{The light is on in John's room in } w.\} = \{w_@, w_1, w_2, w_3\}$
  $p_2 = \{w: \text{It is a warm summer evening in } w.\} = \{w_@, w_3, w_5\}$

# Ordering of accessible worlds

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- ordering source for $w_@$: $g(w_@) = \{q_1, q_2\}$
  $q_1 = \{w$: When the light is on in John's room in w, he is home in w.$\} = \{w_@, w_4, w_7\}$ $q_2 = \{w$: Nobody other than John goes into John's room in w.$\} = \{w_@, w_3\}$

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**Definition**

For any pair of worlds $w_1$ and $w_2$, we say that $w_1$ comes closer than $w_2$ to the ideal set up by Q iff the set of propositions from Q that are true in $w_2$ is a proper subset of the set of propositions from Q that are true in $w_1$.

# Epistemic necessity

$[\![$*must (in view of the facts) (in view of what the speaker knows/believes) (John be at home)*$]\!] =$

$= 1$ iff $\forall$ w' $\in$ max$_{g(w_@)}(\cap f(w_@))$: John is at home in w' $=$

$= 1$ iff $\forall$ w' $\in$ max$_{\{q_1, q_2\}}(\{w_@, w_3\})$: John is at home in w' $=$

$= 1$ iff $\forall$ w' $\in \{w_@\}$: John is at home in w' $=$

$= 1$ iff John is at home in $w_@$

# X vs. must

- *must* has a dual, X doesn't.
  - The equivalent of *must* in Romanian is *trebuie*, which also has a dual - '(se) poate'.

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- *must* has a dual, X doesn't.
  - The equivalent of *must* in Romanian is *trebuie*, which also has a dual - '(se) poate'.
- *must* is associated with necessity, X - with probability.
  X seems to express sometimes possibility, sometimes necessity
  - a variable epistemic force!
  - (But see (Yanovich, 2013) for arguments that *must* used to be a variable force modal too...)

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(6) *I have just been offered a new position, but I don't have all the details yet, I am asking if you think it's a good opportunity:*

    a.    O            fi  și  nu  o               fi, e  prea
        X.COLLOQ.3SG be and not X.COLLOQ.3SG be is too
        devreme să     spunem.
        early      SUBJ tell.SUBJ.1PL

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devreme să     spunem.
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b.  Poate să     fie        și   poate să    nu   fie,
may   SUBJ be.SUBJ.3SG and may   SUBJ not be.SUBJ.3SG
e prea devreme să     spunem.
is too   early     SUBJ tell.SUBJ.1PL
'It may be and it may not be, it's too early to tell.'

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   a.   O                           fi  şi   nu  o                          fi, e  prea
        X.COLLOQ.3SG  be  and  not  X.COLLOQ.3SG  be  is  too
        devreme să       spunem.
        early      SUBJ  tell.SUBJ.1PL

   b.   Poate  să      fie             şi   poate  să      nu  fie,
        may   SUBJ  be.SUBJ.3SG  and  may   SUBJ  not  be.SUBJ.3SG
        e  prea devreme să       spunem.
        is  too   early      SUBJ  tell.SUBJ.1PL
        'It may be and it may not be, it's too early to tell.'

   c.   #Trebuie  că    este  şi   trebuie  că    nu  este, e  prea devreme
        must      that  is    and  must      that  not  is    is  too   early
        să      spunem.
        SUBJ  tell.SUBJ.1PL
        'It must be and it must not be, it's too early to tell.'

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(7)  a.  He may be home. In fact, he must be home (he never goes out on Sunday).

b. #He must be home. In fact, he may be home.

c.  O             fi   acasă. De fapt,
    X.COLLOQ.3SG be home   in   fact
    trebuie/#poate să      fie           acasă.
    must/may      SUBJ be.SUBJ.3SG home
    'He is probably home. In fact, he must/#may be home.'

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         c.  #O              fi  fost  acasă în momentul
            X.COLLOQ.3SG be been home in time.the
            crimei,      dar nu  cred.
            murder.GEN but not believe.1SG

- Compatibility with adverbs of various strengths:

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  (9)  Sigur     / Precis     / Probabil / Poate
       for-sure / certainly / probably / perhaps
       o                       fi  plecat din   oraş.
       X.COLLOQ.3SG  be gone   from town
       'S/he certainly / undoubtedly / probably / possibly is out of town.'

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- They can be accounted for by the same mechanism of domain restriction via the ordering source. Depending on how much ordering shrinks the set of accessible worlds, the epistemic force of FUT will be perceived as weaker or stronger, with an admissible probability ranging from, for example, 50% to a maximum of 100%.

# Probability

- $w_3 <_Q w_2 <_Q w_1 <_Q w_0$

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- $Pr(w_0) = .35$, $Pr(w_1) = .55$, $Pr(w_2) = .70$, and $Pr(w_3) = .85$

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- $Pr(\{w_0\}) + Pr(\{w_1\}) + Pr(\{w_2\}) + Pr(\{w_3\}) = 15/15$

| | | | |
|---|---|---|---|
| $\text{Pr}(\emptyset) = 0$ | $\text{Pr}(w_2) = 4/15$ | $\text{Pr}(w_3) = 8/15$ | $\text{Pr}(w_2, w_3) = 12/15$ |
| $\text{Pr}(w_0) = 1/15$ | $\text{Pr}(w_0, w_2) = 5/15$ | $\text{Pr}(w_0, w_3) = 9/15$ | $\text{Pr}(w_0, w_2, w_3) = 13/15$ |
| $\text{Pr}(w_1) = 2/15$ | $\text{Pr}(w_1, w_2) = 6/15$ | $\text{Pr}(w_1, w_3) = 10/15$ | $\text{Pr}(w_1, w_2, w_3) = 14/15$ |
| $\text{Pr}(w_0, w_1) = 3/15$ | $\text{Pr}(w_0, w_1, w_2) = 7/15$ | $\text{Pr}(w_0, w_1, w_3) = 11/15$ | $\text{Pr}(w_0, w_1, w_2, w_3) = 15/15$ |

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- The future tense meanings of X, they can be understood in exactly the same way, with the constraint that the probability of the epistemic judgement has to be 1.

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- presumptive X is defined iff the modal base is determined by incomplete evidence
- future tense X is defined iff the modal base is determined by complete evidence

# Outline

The future tense and the presumptive/epistemic future are just different manifestations of the same basic modal, with all the temporal, quantificational, and evidential properties that this entails.

Thank you!

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