1 Introduction

English: Will has 2 interpretations: Future and Epistemic.

(1) Abe will go to the store (tomorrow).
(2) That will be Abe at the door (now).
    ‘According to what I believe, that must be Abe at the door.’

(Condoravdi 2003, Hornstein 1990, Sarkar 1998, among many others)

Two options for Future Markers:

<table>
<thead>
<tr>
<th>LEXICAL AMBIGUITY:</th>
<th>COMPOSITIONAL:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Future Tense, 1 Modal</td>
<td>1 Modal</td>
</tr>
</tbody>
</table>

Benefit of Compositional Approach:

- Morphological identity is no accident.

Hindi: Hindi future morpheme -gaa displays similar interpretive possibilities.

- Future

(3) Abe kaam kar-e-gaa
    Abe work do-Subj-gaa
    ‘Abe will do work.’

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Epistemic Modal

(4) Abe kaam kar-taa ho-∅-gaa
    Abe work do-IMPF AUX.Subj-gaa
    ‘Abe must $EPIST$ do work.’

Today:

• I will argue for a compositional account of -gaa

Why Hindi Matters: In Hindi, more at issue than just a case of ambiguity.

• Structural position of -gaa limits interpretation.

Preview of Analysis:

1. -gaa is a necessity modal, not a tense.
2. -gaa takes one of two Modal Bases: (Kratzer 1991)
   • Epistemic/Doxastic MB
   • Metaphysical MB for future readings (Condoravdi 2003)
3. Choice of base depends on meaning of sister:
   • -gaa + TP $\rightarrow$ Epistemic MB
   • -gaa + AspP $\rightarrow$ Metaphysical MB

2 What’s in a Modal?

• Denotations of modals contain (at least) two things. (Kratzer 1991)
  – Modal Base (accessibility relations, contextually determined)
  – Modal Force (Existential, Universal)

• For this talk, I’ll be concerned with just two Modal Bases:
  – EPISTEMIC MB - worlds compatible with an agent’s epistemic state at (w,t)
  – METAPHYSICAL MB - metaphysical alternatives of (w,t)
    Metaphysically accessible future paths branch off from the NOW
    (Condoravdi 2003, Thomason 1970)

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1We see that the subjunctive form of verb is used. I abstract away from this for the present, assuming that the subjunctive is simply a type of ‘modal agreement’. I will not continue to gloss gender or person agreement on AUX or $\sqrt{Verb}$ for the sake of simplicity. I take this agreement to be a constant feature across all conjugations with no semantic contribution.
3 Hindi

Primary data for the talk:

- **Future Verb** ( -gaa on √Verb)

(5) Abe kaam kar-e-gaa.
    Abe work do-gaa
    ‘Abe will do work.’

- **Epistemic Habitual** ( -gaa on AUX)

(6) Abe bahut kaam kar-taa  ho-gaa
    Abe much work do-IMPF AUX-gaa
    ‘Abe must_{EPIS}t work a lot.’ (…looking at his CV.)

Individual contributions of:

- The Auxiliary ho
- ho-gaa
- -gaa when paired with √Verb

3.1 Ho: the Auxiliary

Ho is a hard-working morpheme.²

- **Ho** can be a copula.

(7) Abe linguist thaa/hai.
    Abe linguist AUX.IND-Past/Pres
    ‘Abe was/is a linguist.’

- **Ho** is a tense-auxiliary.

- **Imperfective Habitual**

(8) Abe kaam kar-taa  thaa/hai.
    Abe work do-IMPF AUX.IND-Past/Pres
    ‘Abe used-to/ does work.’

- **Progressive**

(9) Abe kaam kar rahaa  thaa/hai.
    Abe work do PROG AUX.IND-Past/Pres
    ‘Abe was/is doing work.’

²I believe the best way to analyze ho is as a dummy support morpheme that hosts verbal affixes blocked from coupling with the verb by aspectual morphology.
• *Ho* also functions as a perfect.
  - **Perfect**
    
    (10) Abe-NE kaam ki-yaa *thaa/hai.*
     Abe-ERG work do-PFV AUX.IND-Past/Pres
     ‘Abe had/has done work.’

3.2 *Ho-gaa*

• *Ho-gaa* can always have epistemic readings (across construction types).
• *Ho-gaa* can have future readings only with future-oriented Adverbials.

**Epistemic Readings**

• When an auxiliary bears *-gaa* - Epistemic ‘must’ interpretation available.
  - With Instantiation Time (Inst-Time) in the present:
    - **Epistemic Progressive**
      (11) Abe kaam kar rahaa ho-gaa.
       Abe work do PROG AUX-gaa
       ‘Abe must<sub>EPIST</sub> be doing work.’
    - **Epistemic Perfect**
      (12) Abe-NE kaam ki-yaa ho-gaa.
       Abe-ERG work do-PFV AUX-gaa
       ‘Abe must<sub>EPIST</sub> have done work.’
  - Or Inst-Time in the past with Past Adverbials.\(^3\)
    - **Epistemic Progressive (PAST)**
      (13) Kal Abe kaam kar rahaa ho-gaa.
       Yesterday Abe work do PROG AUX-gaa
       ‘Abe must<sub>EPIST</sub> have been doing work yesterday.’ (cf. Sharma 2008)

• Evaluation Time (ET) of epistemic must is **NOW**
  (Condoravdi 2002,2003, Hacquard 2006, among others)

3.2.1 **Future Readings**

• Future orientation is possible, but **only** with future-oriented adverbial.\(^4\)

(14) Doctor banne ke-bad, Abe khush ho-gaa.
     Doctor become after, Abe happy AUX-gaa.
     ‘After Abe becomes a doctor, he will be happy.’

\(^3\)True also of the copula and habitual readings.
\(^4\)This is true for Perfect and Progressive readings as well. It is not true of habituals. See Appendix B for discussion.
3.3 $\sqrt{\text{Verb}} + \text{gaa}$

- $\sqrt{\text{Verb}} + \text{gaa}$ has obligatory future IT.
- $\sqrt{\text{Verb}} + \text{gaa}$ cannot have epistemic reading.

(15) Abe kaam kar-e-gaa
     Abe work do-gaa
     ‘Abe will do work.’
     #‘Abe must do work.’

4 -gaa Behaves Unlike a Deictic Tense

- Lack of epistemic reading on (15) is an obstacle to a unified modal account of -gaa.
- -gaa exhibits behavior not found with deictic tenses.
  - In embedded contexts, it can be evaluated relative to the local evaluation time

4.1 Epistemic Reading

- When embedded, the Eval-Time of (some) epistemic modals is the Inst-Time of embedding predicate.

(16) Abe thought Mary might be pregnant. Now he knows she isn’t.

- This is true of (ho)-gaa

(17) Abe-NE soc-aa thaa ki Mary pregnant ho-gii.
     Abe-ERG think-PFV AUX.PAST that Mary pregnant AUX-gaa
     ‘Abe (had) thought that Mary must be pregnant.

4.2 Future Readings

- Embedded modals can be evaluated relative to Inst-Time of embedding predicate. (Abusch 1998, a.o.)

(18) (Today is Sunday.)
    a. On Friday Abe thought Mary would go to the store yesterday.
    b. On Thursday Abe said that Mary might win Friday’s lotto, and she did.

- Deictic tenses do not allow this type of shift.

(19) ??Two years ago Abe said that Mary is pregnant. (Deictic present = NOW)

- -gaa can be keyed to Internal Now like English would.
Picchle saal, Abe-NE kah-aa thaa ki Mary mar-e-gii, par mar-ii last year Abe-ERG say-PFV AUX.Past C Mary die-gaa but die-PFV nahii NEG
‘Two years ago, Abe said that Mary would die, but she didn’t.’

5 Interim Summary

- Epistemic Inst-Time maybe be backshifted by Adverbials.
- Epistemics with -gaa have Universal Force.
- Future Inst-Time with ho-gaa requires Adverbial.
- $\sqrt{\text{Verb}}+\text{gaa}$ → Epistemic MB impossible
- Embedded -gaa does not behave like a deictic tense.

6 The Modal

Rough denotations for Epistemics:

\begin{enumerate}
  \item (21) a. Abe kaam kar-taa ho-gaa
      Abe work do-IMPF AUX-gaa
      ‘Abe must do work.’
      $\forall w'$ consistent with speaker’s knowledge in w NOW, Abe does work NOW in w'.
    b. Picchle saal Abe kaam kar-taa ho-gaa
      last year Abe work do-IMPF AUX-gaa
      ‘Abe must have done work last year (habitually).’
      $\forall w'$ consistent with speaker’s knowledge in w NOW, Abe does work last-year in w'.
\end{enumerate}

A rough denotation for a simple Future:

\begin{enumerate}
  \item (22) Abe kaam kar-e-gaa
      Abe work do-gaa
      ‘Abe will do work.’
      $\forall (w',t')$ that are metaphysical alternatives to w NOW, Abe does work at $t'$ in w'.
\end{enumerate}

How can we derive these meanings?

1. How do we set IT? (NOW in 21a, last-year in 21b, $t'$ in 22)
2. How do we set ET? (NOW in all 3)
3. How do we determine the right MB?
6.1 Setting IT

- For Epistemics:
  - Inst-Time is set by Tense, uncontroversially.

- For Futures:
  - Inst-Time is determined by metaphysical alternatives.

- I adopt the view that only two (deictic) tenses exist: [Past] and [Present] (Condoravdi 2002, 2003, Partee 1973)

6.2 Setting ET

- Epistemics’ Eval-Time is always NOW, regardless of Inst-Time.

  (23) Raamu {pichle saal | aajkal} bahut aam khaa-taa ho-gaa
  Raamu {last year | nowadays} many mango eat-IMPF AUX-gaa

  ‘Ramu must have eaten many mangoes (habitually) last year/ Ramu must eat many mangoes nowadays.’

- For now I assume that the Eval-Time of Futures is also NOW⁵

- I will build this orientation towards the NOW into the denotation of -gaa.

6.3 Structures

(24)  
<table>
<thead>
<tr>
<th>Epistemic</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>gaaP</td>
<td>TP</td>
</tr>
<tr>
<td>T</td>
<td>AspP</td>
</tr>
<tr>
<td>Asp</td>
<td>VP</td>
</tr>
<tr>
<td>∆</td>
<td>...</td>
</tr>
</tbody>
</table>

- Scope of modal:

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⁵If there are cases where the evaluation time for Futures is back-shifted ⇒ Future’s Eval-Time set by Tense, as IT.

ii) ??Mai-NE 40 saal pehele us bacce-ko dekhaa thaa jo 10 saal bad PM ban-egaa
1sg-ERG 40 year before that child-OBL see-PFV AUX-Past who 10 year later PM become-gaa

‘40 years ago I saw the child who 10 years later would become president.’
Futures below empty Tense\(^6\)

- Interpretation of Modal is related to type of sister.
- We give \([gaa]\) a flexible type.
  - This allows \(-gaa\) to compose with both TP and AspP
  - Modal contribution constant.
- Denotation of \(-gaa\):

\[
\begin{align*}
[\text{gaa}] &= \{ \\
&\quad \lambda_p(w_t) . \lambda w. \forall (w') \in MB(w, \text{NOW}) \rightarrow p(w') \quad \text{(when sister is TP)} \\
&\quad \lambda P_{(i,w_t)} . \lambda w. \forall (w',t') \in MB(w, \text{NOW}) \rightarrow P(w',t') \quad \text{(when sister is AspP)}
\end{align*}
\]

6.4 Role of Modal Bases

- Modal Height determines Interpretation.

\([\text{gaa} + TP] = \text{MUST} + \text{Proposition} \rightsquigarrow \text{Epistemic MB}
\]

\([\text{gaa} + AspP] = \text{MUST} + \text{Property of Times} \rightsquigarrow \text{Metaphysical MB}
\]

- Why?

Type of alternative that MB provides restricts composition.

Epistemic Alternatives

- EPISTEMIC MB = \{w': w' is consistent with agent's knowledge in w at t\}
  - Epistemic alternatives are worlds
  - Not (w,t) pairs, so incompatible with \(\forall (w',t')\)

Metaphysical Alternatives

- METAPHYSICAL MB = \{(w',t'): (w',t') is a metaphysical alternative to w at t'\}
  - Metaphysical Alternatives are (w',t') pairs
  - Metaphysical Alternatives necessarily refer to times.
  - Branches from t' are intervals - (t',\(\infty\))
  - (t',\(\infty\)) = IT
    - Compare with Dowty’s (1977) Inertia Worlds

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\(^6\)There is reason to believe that null Tense is available in Hindi. Perfective constructions lack overt tense specification. Under the assumption that ho acts as dummy-support for stranded tense morphology, the absence of ho in the perfective and future is explained by lack of Tense. In future progressive readings, I assume the presence of ho is not due to Tense, but rather just to host -gaa, which cannot affix to \(\sqrt{Verb}\) because PROG intervenes.
6.5 Examples

(26) Abe kaam kar-e-gaa. →

\[ \lambda w. \forall w' \in META(w, NOW) \rightarrow \exists e. \text{doing}(e, Abe, work) \text{ in } w' \text{ at } (NOW, \infty) \]

(27) Abe kaam kar-taa ho-gaa. →

\[ \lambda w. \forall w' \in EPIST(w, NOW) \rightarrow \exists e. \text{doing}(e, Abe, work) \text{ in } w' \text{ at } NOW \]

\[
\begin{array}{c}
\text{Abe-do-work} \\
\text{TP} \\
\text{AspP} \\
\text{gaaP} \\
\text{T} \\
\end{array}
\]

\[
\begin{array}{c}
\text{Asp} \\
\text{VP} \\
\text{T} \\
\end{array}
\]

\[
\begin{array}{c}
\text{Pres = NOW} \\
\text{AspP} \\
\text{IMPF} \\
\text{They-do-work} \\
\end{array}
\]

7 Wrapping Up

- A compositional account of -gaa is possible
  - Position of the modal determines what modal base can be used.
  - Nature of alternatives provided by MB constrains composition.
  - Presence of auxiliary in all Epistemics *epiphenomenal*.

- More cross-linguistic support for modal treatments of the future.

References


Condoravdi, Cleo. 2003. Moods and modalities for will and would. Talk given at the Amsterdam Colloquium - Workshop on Mood and Modality.
Appendix A: Ho isn’t a modal

Does ho contribute modal force?

Answer: No, perceived force due other operators (either overt or covert), or inference.

- Prima facie reason to locate modality in ho-naa: Deontic modality can be expressed using ho.

  (28) Dev-ko kaam kar-naa hai.
  Dave-OBL work do-INF be.3sg.PresIND
  ‘Dave should do work.’

- Ho does not contribute uniform modal force across constructions.
– Existential

(29) a. (?)Voh cor ho.
   3sg thief be-3sg.SUBJ
   ‘(S)he may be a thief.’ ≠ ‘(S)he must be a thief.’

b. (?)Voh roz nahaa-taa ho.
   3sg daily bathe-IMPF be-3sg.SUBJ
   ‘He may bathe daily.’ ≠ ‘He must bathe daily.’ (Sharma 2008)

c. Ho sak-taa hai ki voh cor ho.
   Be able-IMPF be.3sgPresIND that 3sg thief be-3sg.SUBJ
   ‘It’s possible that he is be a thief.’/ ‘Perhaps he may be a thief.’

– Universal

(30) Mai-ne soc-aa ki voh roz nahaa-taa ho.
   1sg-ERG think-PFV that 3sg daily bathe-IMPF be-3sg.SUBJ
   ‘I thought that he {must bathe | bathes} daily.’

Speculative Remarks:

• In (28), modal force comes from infinitival

• Lack of indicative invites inference of possibility, but not necessity. (29)

• Ho’s ‘modal interpretation parasitic on embedding predicates force (30) (cf. Hintikka 1969)

Appendix B: Imperfectives and Future Orientation

• Imperfective-marked habituals cannot have future IT. (cf. Sharma 2008 for presumptives)

(31) */??Agle saal Japanese restaurant me chef ban-ke, Dev chaaval bana-taa ho-gaa.
   next year Japanese restaurant in chef having-become, Dave rice make-IMPF AUX-gaa
   → ‘Having become a chef, Dave will/must cook rice (habitually)’

• Recurrent future actions take plain future.

(32) Mary {ek baar | roz} cigarette pii-egii.
   Mary one time | daily cigarette drink-FUT
   ‘Mary will smoke a cigarette once/daily.’

Intuition:

(33) **Felicity condition on habitual imperfectives**
   Habits must be established at time set by TENSE.

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7Roughly synonymous with Mai-ne soc-aa ki voh roz nahaa-taa ho-gaa because embedded under universal force and epistemic MB of thought.
• Epistemic + Habitual blocked because only [Past],[Present] Tense available.
• Metaphysical + Habitual blocked because no Tense

• When IMPF not habitual, future IT possible

(34) Raamu abhi aa-taa ho-gaa
Ramu now come-IMPF AUX-gaa
‘Ramu comes now.’ ≈ ‘Ramu will be right here.’
(Context: A and B are waiting for Ramu. A asks where Ramu is, C is sure he is coming.)

• Progressives also allow future IT. (cf. Copley 2002)

(35) Raamu kal Baltimore jaa rahaa ho-gaa
Ramu tomorrow Baltimore go PROG AUX-gaa
‘Ramu must be going to Baltimore tomorrow.’

• If PROG and IMPF have identical denotation, this is no surprise. (Ferreira 2005)

• Future orientation from PROG, Epistemic interpretation from ho-gaa. (Copley 2002, Portner 1998)