Modality, Tense and Negation in Daakie (Ambrym, Vanuatu)

University of Chicago
May 16, 2012

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Gefördert durch das BMBF und VolkswagenStiftung
Gefördert durch die DFG (SFB 632)
Overview of Talk:

- Part I: DoBeS Project *Languages of Southwest Ambrym*
- Part II: A few facts about Daakie
  - Sound System
  - Basic clause pattern
  - Agreement system
  - Modal markers
- Part III: A closer look at the modal markers
- Part IV: A semantic analysis of the modal markers
- Part V: Goodies
PART I:
DoBeS Project: Languages of Southwest Ambrym

About the project:

▶ July 2009 – December 2012, funded by VolkswagenStiftung, site housed at Max Planck for Psycholinguistics, [http://www.mpi.nl/DOBES](http://www.mpi.nl/DOBES)
▶ Kilu von Prince (Linguistics) – special thanks for in-depth discussion, dissertation Soraya Hosni (Anthropology); Susanne Fuchs (Phonetics), Lena Karvovskaya (Technical support).
▶ Three languages: Daakaka, Daakie, Dalkalaen; also, there is a project on North Ambrym (Michael Franjieh, SOAS, Rausig Found.)
▶ Each language ~ 1000 speakers, actively spoken, learned by children, but potential threats (among others, Bislama loans, volcanoes, mobile phones...).
▶ Tasks, among others:
  ▶ Documentation of communication (> 12 hours of transcribed materials).
  ▶ Grammar, dictionaries
  ▶ Text collections
  ▶ Orthography
  ▶ Texts for local use, especially in schools
  ▶ Documentation of cultural practices (e.g., sand-drawing), ~ 50 hours of video.
  ▶ Documentation of family relationships and how this maps to the kinship system (about 1600 persons in database).
PART I: DoBeS Project on Southwest Ambrym, Public Appearances

www.scencemovies.de

Exhibition Sanddrawing, Humboldtbox Berlin
Vanuatu / Ambrym: Geography and languages

-- population: 270,000
-- up to 100 languages
  (Austronesian)
-- Melanesian Pidgin English
  (Bislama)
-- English, French

Ethnologue on Ambrym:
-- Southeast Ambrym
-- North Ambrym
-- Lonwolwol (now nearly extinct)
-- Dal kalaen (Ral kalaen)
-- Dakaka (Daakaka)
-- Port Vato (Daakie)
-- (Orkon, nearly extinct)
Ambrym: Geography and languages
Ambrym: Sand Drawing by Sam Tasso
A few facts about Daakie

- Previously known as Port Vato (Tryon 1976, Ethnologue).
- Spoken by about 1000 persons from Sanesup to Maranata; larger villages: Lonmei, Port Vato (Langievot), Lalinda.
- Contact with Daakaka and Dal kalaen to the west; fewer contacts to North Ambrym or Southeast Ambrym.
- Previous literature:
  - Some information in W. Paton, Ambrym (Lonwolwol) grammar, (1952) 1971
  - Word list in Tryon (1976)
  - Short katechism and hymn book (Presbyterian)
Part II: Sound System of Daakie

<table>
<thead>
<tr>
<th></th>
<th>Labial</th>
<th>Labiovelar</th>
<th>Labiodental</th>
<th>Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voiceless</td>
<td>p</td>
<td>pʰ (pw)</td>
<td>t</td>
<td>k</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Prenasalized</td>
<td>mb (b)</td>
<td>bʰ (bw)</td>
<td>nᵈ (d)</td>
<td>nᵍ (g)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Nasal</td>
<td>m</td>
<td>mʰ (mw)</td>
<td>n</td>
<td>η (ng)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Fricative</td>
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<td>s</td>
<td>h</td>
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<td>Trill</td>
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<td>Lateral</td>
<td>l</td>
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<tr>
<td>Approximant</td>
<td>u (w)</td>
<td></td>
<td></td>
<td>j (y)</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Short vowels</th>
<th></th>
<th>Long vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>i (i)</td>
<td>[y] (u)</td>
<td>u (u)</td>
</tr>
<tr>
<td>e (é)</td>
<td>[ø] (ó)</td>
<td>o (ó)</td>
</tr>
<tr>
<td>e (e)</td>
<td>[œ] (o)</td>
<td>o (o)</td>
</tr>
<tr>
<td>(ø)œ (á)</td>
<td>a (a)</td>
<td></td>
</tr>
<tr>
<td>iː (ii)</td>
<td>uː (uu)</td>
<td></td>
</tr>
<tr>
<td>eː (ee)</td>
<td>oː (óó)</td>
<td></td>
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<tr>
<td>eː (aa)</td>
<td></td>
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</tbody>
</table>

Fronting of back vowels u, o, œ to y, ø, œ triggered by alveolar (and, restricted, labial) consonants, in open syllables and in syllables with alveolar coda.
Basic clause pattern, Paradigm of pronouns and subject markers

(18) (Subject) SM Verb (Object) (Adjuncts), where SM: Subject+Modality marker.

(19) *temát ngyee la-m vehe ngye lan sili*

demon pl 3pl-re carry pr.3sg loc path

‘The demons carried him on the path.’
Paradigm of subject markers, pronouns, and modal markers.

<table>
<thead>
<tr>
<th>Person</th>
<th>Singular</th>
<th>Plural</th>
<th>Dual</th>
<th>Paucal</th>
<th>Pronoun SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>ngyo na-m</em></td>
<td><em>kemee keme-m</em></td>
<td><em>komoo komo-m</em></td>
<td><em>kememdyee kidye-m</em></td>
<td>Pronoun SM</td>
</tr>
<tr>
<td>1+2</td>
<td><em>et da-m</em></td>
<td><em>adoo do-m</em></td>
<td><em>adyee dye-m</em></td>
<td>Pronoun SM</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><em>ngyak ko-m</em></td>
<td><em>kimim ki-m</em></td>
<td><em>kamoo ka-m</em></td>
<td><em>kamdyee kamdye-m</em></td>
<td>Pronoun SM</td>
</tr>
<tr>
<td>3</td>
<td><em>ngye mwe, me, mwi, mi, mo, mu, ma</em></td>
<td><em>ngyee la-m</em></td>
<td><em>koloo kolo-m</em></td>
<td><em>ki(l)yee kiye-m</em></td>
<td>Pronoun SM</td>
</tr>
</tbody>
</table>

**Table of Modal markers**

<table>
<thead>
<tr>
<th></th>
<th>Suffix (with 3rd Plural)</th>
<th>3rd Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realis</td>
<td><em>la-m</em></td>
<td><em>mwe, me, mwi, mi, mu, ma, mo</em></td>
</tr>
<tr>
<td>Irrealis</td>
<td><em>la-p</em></td>
<td><em>bwe, be, bwi, bi, bu, ba, bo</em></td>
</tr>
<tr>
<td>Distal</td>
<td><em>la-t</em></td>
<td><em>te, ti, to</em></td>
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<tr>
<td>Negation</td>
<td><em>la-re</em></td>
<td><em>tere</em></td>
</tr>
<tr>
<td>N</td>
<td><em>la-n</em></td>
<td><em>ne, ni, no</em></td>
</tr>
</tbody>
</table>
Part III: A closer look at the modal markers.

Realis:

Ongoing events:

(26) \textit{obwer anvu mi myuu mo do}\textsuperscript{16} taro introduced 3sg.re grow 3sg.re slow
    ‘This Fiji taro is growing slow.’

Past events:

(27) \textit{meerin na-m mee o-ke-le na-m lehe} \textsuperscript{17}
    long.time.ago 1sg-re come loc-comp-prox 1sg-re look
    ‘long time ago, I came here, I looked.’

Generic statements:

(28) \textit{ko-m ko=tot} \textsuperscript{17} \textit{mo-nok} \textsuperscript{18} ko-m ta=kuu~kuu} \textsuperscript{19} yee mwi\textsuperscript{20} ti-tisii
    2sg-re clear=grounds re-finish 2sg-re cut.out tree 3sg.re fall.down.distr
    ‘after you clear the grounds, you cut out the trees, they fall down’

Fictional worlds:

(29) \textit{mwe pwet mwe sele wilin talin} \textsuperscript{21} bye-n
    3.re prog 3s.re put.on skin.tr body.tr body-3sg
    ‘he was/is putting on the skin of his (= another man’s) body’
Use of modal markers: Realis in embedded clauses

Complement of factive propositional attitude verbs, complementizer: *ke*

(30) mo longane ke timaleh kiye mwe pwet mo sóró mo-mele Jemis3.029
3SG.RE hear COMP.RE child DEM.SG 3SG.RE PROG 3SG.RE talk RE-this.way
‘He heard that the child was talking in this way.’

(31) mo-mele mwe kiibele ke vanten mu-syoo la-m du o-ki-ye Jemis1.012
RE-this.way 3SG.RE know COMP.RE man RE-some 3PL.RE stay LOC-COMP-DIST
‘This way, he knows that some men stay there.’

Reason clauses:

(32) na-m pwet [hospital] em ne[m] mese=en byen ke popat mwe te ye-k Boa1
1SG.RE stay house TR sick-NOM because COMP.RE pig 3SG.RE cut leg-1SG 0.79
‘I stayed in the hosp. because the pig bit my leg.’

Temporal clauses:

(33) bili ke mwe saa=kuu wilin by-en me mee me timaleh man soo mu wuo Bong2.
time COMP.RE 3SG.RE take.off skin.TR body-3SG 3SG.RE come 3SG.RE child male SG.IND 3SG.RE good 022
‘When he took off his skin, he became a good-looking young man.’
Use of modal markers: Irrealis

In commissive clauses:

(34) \( na-p^{25} \) id\( i^{26} \) ok\( ^{26} \) masólo \( 1_{SG-IR} \) take poss.food.1_{SG} fish
‘I will take my fish.’, ‘I promise to take my fish.’

In jussive clauses:

(35) la-m kie ka da-p van tyenem \( 3_{PL-RE} \) say that 12_{PL-IR} go home
‘They said, let’s go home.’

In commands:

(36) ko-p sengane de-re\( ^{27} \) mee na-p a\( n^{27} \)\( e \)
2_{SG-IR} give some-{DET} come 1_{SG-IR} eat.TR
‘Give me some of it and so that I will eat it.’

Future reference with prefix a- to subject marker:

(37) vant\( e^{28} \) desoo\( ^{28} \) a-be mee bwi id\( i^{29} \) pija en\( ^{29} \) d\( o^{29} \)
man {NSPEC-SOME} fut-3_{SG-IR} come 3_{SG-IR} take picture of {REF} probably
‘Some man or other will come and to take a picture of it (a palm tree with five branches)’

desoo: indefinite quantifier in non-real is contexts;
in real is contexts: soo ‘one’
Use of modal markers: 
Irrealis in embedded clauses

Non-factive complement clauses; irrealis complementizer ka instead of realis ke.

(38) na-m longbini ka na-p punen soo\textsuperscript{30}  
1sg-re want comp.har 1sg-ir tell story one  
‘I want to tell a story.’

(39) mwe páne basee kingyee-ye mwe neknak ka bu du ba ane  
3sg-re roast bird dem.pauc-dist 3sg-re ready comp 3sg-ir stay.pl 3sg-ir eat.tr  
‘He roasted the birds and was ready to eat them.’

(40) ngale la-m kiibele ka la-p kuo soo~soo  
then 3pl-re know comp.har 3pl-ir run one-redup  
‘Then they knew/were able to run away one by one.’

Non-factive temporal clauses, cf. German als / wenn

(41) a-na-p ane sówe bili ka ot bi mitmyet  
Fut-1sg-ir eat.tr what time comp.har place 3sg-ir dark  
‘What will I eat when it is dark?’

Content of thought often expressed in direct speech.
Use of modal markers: Distal modality

Indicating time at which an event happened:

(23) yaa te van te pwet\textsuperscript{11} ti piipili mwe kuoli=mee\textsuperscript{12} tyenem \hspace{1cm} Ilsong2.021
\hspace{1cm} sun 3SG.DST go 3SG.DST prog 3SG.DST red 3SG.RE return-come home
\hspace{1cm} ‘When the sun was getting red, he went back home.’

Temporal scene setters in discourse:

(44) meerin temát la-t pwee \hspace{1cm} Boa3.025
\hspace{1cm} before demon 3PL-DIST many
\hspace{1cm} ‘In times before, there were many demons.’

Adjectival predication

(45) ko-p bwengbang van tyenem ke to-bo \hspace{1cm} Ilsong2.013
\hspace{1cm} 2SG-IR play go village comp dist-big
\hspace{1cm} ‘You can play towards the big village.’

Content of false thoughts:

(42) temát ngyee\textsuperscript{31} mon la-m deme ka te met byen b-on mwe sek \hspace{1cm} Saelas.026
\hspace{1cm} demon PL too 3PL-RE think comp.IR 3SG.DST dead because smell-3SG 3SG.RE stink
\hspace{1cm} ‘The demons, too, thought that he was dead, as he stank (lit. his smell was stinking)’
Modality in conditional clauses

Irrealis in protasis of “indicative” conditionals, future in apodosis.

(43) *molo ka bo longane diliri gon monok,*

incubator.bird COMP 3sg.ir feel egg.3sg EMPH finish

‘The incubator bird, when it feels its egg(s) finished,

\[a-be mee mwe^{32} pisih pán weren kege mwe pwet mwi tivin weren^{33}\]

FUT-3s.ir come 3sg.re lay.eggs under x.place COMP.REL 3s.re stay 3s.re bury.tr x.place

then it comes and lays eggs under the place where it stays and buries them.’

Distal in protasis of future-oriented conditional, future in apodosis:

(46) *Ko-p pyak ne ti-ri koloo le, vih mane vyoh.*

2sg-ir choose TR IDEF.NHUM-DETR two prox banana with ripe.coconut

‘You choose one of these two, the banana or the coconut.

*Ko-t pyak soro ke tu wuo, a-ko-p idi popat desoo.*

2sg.dist choose reach COMP 3sg.dist good FUT-2sg-ir take pig NRE.ONE

If you choose right, then you get take a pig.’

Distal in protasis and apodosis of counterfactual conditional:

(47) *Ka ko-t pyak ne vyoh, a-ko-t idi popat.*

COMP 2sg-dist choose TR coconut 2sg-dist take pig

‘If you had chosen the coconut, you would have gotten the pig.’
Negation: -r and -n

Negation marker -r:

(24) *Lalinda mana Langievot, kolo-re wuwo ne koloo*¹³
   Lalinda with Langievot 3DU-RE.N peaceful TRANS pron.3d
   ‘Lalinda and Langievot were not in peace with each other.’

Negation marker -n in main clauses headed by complementizer *sa ka*:

(49) *sa ka wel-em³⁵ ne nek ne ti-ri kingyee ye*

   COMPO.NEG COMPO.NR skin-2SG 3SG.N afraid TR IDEF-NHUM-DETR DEMPL LOC.DIST
   ‘Don’t be afraid of those things.’

Negation marker -n in dependent clause, negative-implying embedding verb (cf. Romance):

(48) *na-m notselaane ka na-n govene ti-ri desoo*

   1SG-RE think.wrongly that 1SG-N make IDEF-NHUM-DETR NSPEC-SOME
   ‘I couldn’t do anything’, ‘I wanted to do something but I couldn’t.’

Negation concord with marker -n in embedded clauses:

(25) *lisepep tere longbini ka ne tah=tone*

   lisepep 3SG.RE.N want COMPO.NR 3SG.N sit.down=for
   ‘The lisepep¹⁴ did not want to wait for it.’
But: \textit{n} marker can also express denontic necessity!

Expression of deontic necessity:

\begin{enumerate}
\item \textit{(ka)} ko-\textit{n} peten
  \begin{tabular}{ll}
  comp.\textit{nr} & 2sg-\textit{n} \tab \textit{tell}\textunderscore \textit{truth} \\
  \end{tabular}
  \text{‘You must tell the truth.’}
\end{enumerate}

Alternative construction, derived from Bislama \textit{mas}, cf. English \textit{must}

\begin{enumerate}
\item ko-\textit{p} mas peten
  \begin{tabular}{ll}
  2sg-\textit{re} & must \tab \textit{tell}\textunderscore \textit{truth} \\
  \end{tabular}
  \text{‘You \textbf{must} tell the truth.’}
\end{enumerate}
Part IV: Analysis of modals in Daakie

Model structure for modality:
- Modals express quantifications over possible worlds (Kripke, Lewis, Kratzer).
- World-time indices \(i\), out of a set \(I\).
- Ordered: \(i \leq i'\) iff \(i\) is before \(i'\), or \(i = i'\).
- Relation \(\leq\) is a partial order.

Sections with respect to index \(i_0\):
- Realis: \(\{i \mid i \leq i_0\}\)
- Irrealis (Potentialis): \(\{i \mid i_0 < i\}\)
- Distal: all indices; no relation to utterance index.
Interpretation format of modal markers: Realis

Input for semantic interpretation; example of sentence with syntactic structure:

\[(\text{IP} \text{ Enet}_{3\text{sg}} \text{ [I } \text{ [io mo}_{\text{RE}_{3\text{sg}}} \text{ [VP gone } \text{ NP páng}]]\text{]}\text{]}\]

‘Enet made / is making fire.’

Reference with respect to a context index:

\[[\alpha](i_0) = \text{the meaning of expression } \alpha \text{ at index } i_0.\]

Meaning of VP at an utterance index \(i_0\) (responsible, e.g., for deictic expressions):

\[\llbracket_{\text{vp gone páng}}\rrbracket(i_0)
= \lambda i \lambda x [x \text{ makes fire at } i]\]

Modal markers introduce second index, which stands in a relation to first index. In Reichenbachian terms:

-- First index: Event index, \(i'\)
-- Second index: Utterance index, typically bound to utterance situation \(i_0\)

The realis marker is particularly complex:

-- VP is true at event index;
-- Event index precedes reference index;
-- requirement for realis:

\[
\exists i' \leq i_0 \text{ such that the proposition is true at that index.}
\]

\[(\llbracket I \llbracket\text{io RE} \llbracket\text{VP}]\rrbracket (i_0) = \lambda i \lambda i' [i' \leq i \land \llbracket \text{VP}(i_0)(i')(x) \land \exists i' \leq i_0 [\llbracket \text{VP}(i_0)(i')(x)]] \]

\[(\llbracket\text{IP Enet}_{3\text{sg}} \llbracket I \llbracket\text{io mo}_{\text{RE}_{3\text{sg}}} \llbracket\text{VP gone páng}]\rrbracket (i_0)
= \lambda i \lambda i' [i' \leq i \land \text{E. makes fire at } i' \land \exists i' \leq i_0 [\text{E. makes fire at } i']]]\]
Realis (continued)

... from last slide:

(52) \( [[i \downarrow io RE] \text{VP}] (i_0) = \lambda i \lambda i' \lambda x [i' \leq i \land [[\text{VP}] (i_0)(i')(x) \land \exists i' \leq i_0 [[\text{VP}] (i_0)(i')(x)]] \)

(53) \( [[\text{IP} Enet [3sg] [I mo [RE][3sg] [\text{VP} gone pāng]]] (i_0) = \lambda i \lambda i' [i' \leq i \land E. makes fire at i' \land \exists i' \leq i_0 [E. makes fire at i']] \)

Existential closure of event index at level of CP:

(54) \( [[\text{CP} [c_0 \exists] \text{IP}] (i_0) = \lambda i \exists i' [[\text{IP}] (i_0)(i')] \)

(55) \( [[\text{CP} \exists [\text{IP} Enet [3sg] [mo [RE][3sg] [\text{VP} gone pāng]]]] (i_0) = \lambda i \exists i' [i' \leq i \land E. makes fire at i' \land \exists i' \leq i_0 [E. makes fire at i']] \)

A proposition that

-- applies to indices \( i \) for which it holds that they are later or equal to an index \( i' \)
  at which the proposition \( \lambda i' [E. makes fire at i'] \) is true;

-- **provided that** this proposition is true at some index \( i' \)
  before or equal to the index of interpretation \( i_0 \) (contribution of realis mood)

-- This proviso is a **precondition**: If not satisfied, proposition is necessarily false.

Application to index of interpretation \( i_0 \) at the level of ForceP (Assertion):

(56) \( [[\text{ForceP} [\text{Force0 ASSERT}] \text{CP}] (i_0) = [[\text{CP}] (i_0)(i_0) \)

(57) \( [[\text{ForceP ASSERT} [\text{CP} \exists [\text{IP} Enet [3sg] [mo [RE][3sg] [\text{VP} gone pāng]]]]] (i_0)(i_0) = \exists i' [i' \leq i_0 \land E. makes fire at i' \land \exists i' \leq i_0 [E. makes fire at i']] \)

Notice: This proposition is informative, as realis expresses a precondition, not a presupposition:
True if there is a \( i' \leq i_0 \) such that Enet makes fire at \( i' \), false if there is no such \( i' \).
Realis modality

simple proposition: \( \lambda i[\varphi(i)] \)

proposition satisfies realis precondition:
\( \lambda i[\varphi(i) \land \exists i'[i' \leq i_0 \land \varphi(i')]] \)

asserted realis proposition
\( \lambda i[i \leq i_0 \land \varphi(i) \land \exists i'[i' \leq i_0 \land \varphi(i')]] \)
Realis modality

simple proposition: 
\[ \lambda i[\varphi(i)] \]

proposition satisfies realis precondition: 
\[ \lambda i[\varphi(i) \land \exists i'[i' \leq i_0 \land \varphi(i')]]: \text{empty} \]

asserted realis proposition 
\[ \lambda i[i \leq i_0 \land \varphi(i) \land \exists i'[i' \leq i_0 \land \varphi(i')]]: \text{empty} \]
Realis in embedded clauses

Realis complementizer \( ke \), assumption of a category \( \text{cP} \):

\[
[\text{vp} \ \text{kiibe} \ [\text{cP} \ ke \ [\text{ip} \ \text{Enet} \ mo \ \text{gone} \ \text{páng}]]]
\]

think CP.RE Enet 3SG.RE make f re
‘know that Enet made / makes f re’

Complementizer \( ke \) expresses a modal notion:
-- Universal quantification over the set of indices that stand in accessibility relation \( R \)
-- Realis precondition (underlined)

\[
(58) \quad [[[\text{cP} \ [\text{cP} \ 0 \ \text{ke}] \ \text{CP}]]](i_0) = \lambda i \lambda R[\forall i''[R(i)(i'') \rightarrow [[\text{CP}](i_0)(i'')]] \land [[\text{CP}](i_0)(i_0)]
\]

Application to realis CP is possible, as the two realis preconditions match:

\[
(59) \quad [[[\text{cP} \ \text{ke} \ [\text{cP} \ \exists \ [\text{ip} \ \text{Enet}_{[3sg]} \ [\text{r} \ mo_{[\text{re}][3sg]} \ [\text{vp} \ \text{gone} \ \text{páng}]]]]]]](i_0)
\]

\[
= \lambda i \lambda R[\forall i''[R(i)(i'') \rightarrow \exists i' \leq i''[\text{E. makes fire at } i \wedge \exists i' \leq i_0[\text{E. makes fire at } i']]]
\land \exists i' \leq i_0[\text{E. makes fire at } i' \wedge \exists i' \leq i_0[\text{E. makes fire at } i']]]
\]

The embedding verb specifies the accessibility condition:

\[
(60) \quad \text{a. } [[[\text{vp} \ \text{kiibe} \ [\text{cP} \ \text{ke} \ \text{Enet} \ \text{mo} \ \text{gone} \ \text{páng}]]]]](i_0)
\]

\[
= \lambda i \lambda x[\forall i''[\text{EPIST}(i)(i'')(x) \rightarrow \exists i' \leq i''[\text{E. makes fire at } i' \wedge \text{precond.1}]] \land \text{precond.2}]
\]

Resulting meaning of sentence:
-- For all indices \( i'' \) that are/were epistemically accessible to Lissing,
-- there is an index \( i' \leq i'' \) s.th. Enet made fire at \( i' \), under the precondition that \( \text{E. indeed made fire} \)
  (to know is to believe something that is true)
-- under the precondition that all of the above is indeed the case (realis marker of main clause).

\[
\text{b. } [[[\text{forceP} \ \text{assert} \ [\text{cp} \ \exists \ [\text{ip} \ \text{Lissing}_{[3sg]} \ [\text{r} \ mwe_{[\text{re}][3sg]} \ [\text{vp} \ \text{kiibe} \ \text{ke} \ \text{Enet} \ \text{mo} \ \text{gone} \ \text{páng}]]]]]]](i_0)
\]

\[
= \exists i \leq i_0[\forall i''[\text{EPIST}(i)(i'')(L.) \rightarrow \exists i' \leq i''[\text{E. makes fire at } i' \wedge \text{precond.1}]] \land \text{precond.2}
\land \exists i \leq i_0[\forall i''[\text{EPIST}(i)(i'')(L.) \rightarrow \exists i' \leq i''[\text{E. m. fire at } i' \wedge \text{precond.1}]] \land \text{precond.2}]
\]
Example of embedded realis clause

\[ \lambda i[\text{Enet makes fire at } i] = \varphi \]

Lissing m'we kiibele
ke Enet mo gone p'ang:
true:
- Lissing's believes it:
  \[ \forall i \in \text{EPIST}(i_0) \exists i' \leq i[\varphi(i')] \]
- factivity:
  \[ \exists i' \leq i_0[\varphi(i')] \]
Example of embedded realis clause

\[ \lambda i [\text{Enet makes fire at } i] \]

Lissing mwe kiibele
ke Enet mo gone páng:
false (or pres. violation):
- Lissing’s believes it:
  \[ \forall i \in \text{EPIST}(i_0) \exists i' \leq i [\phi(i')] \]
- but: lack of factivity:
  \[ \exists i' \leq i_0 [\phi(i')] \text{ is false.} \]
Realis negation

Simplest interpretation:
Negation of existence of an index at which proposition is true.

\[(61) \quad [[F \text{ RE-N VP}]](i_0) = \lambda i \lambda i' \lambda x \neg \exists i'' \leq i[[VP](i_0)(i'')]]\]

Another option:
Negation of existence within a reference index, seen as interval (cf. Partee 1973, example *I didn’t turn off the stove*).

\[(62) \quad [[F \text{ rep} \text{ ASSERT } [\text{cp } \exists [\text{ip } \text{ Enet [tete } \text{ RE-N}][\text{3s}] [\text{vp gone pâng}]]]](i_0) = \exists i' \neg \exists i'' \leq i_0 \land \text{E. makes fire at } i'']\]

(62) = \exists i' \neg \exists i'' [i'' \subseteq i' \land i' \leq i \land [VP](i_0)(i'')] \]

where \(i'\) is a time interval.

(62) = \exists i' \neg \exists i'' [i'' \subseteq i' \land i' \leq i_0 \land \text{E. makes fire at } i''], where \(i'\) is a time interval.
Realis negation

Enet tere gone páng.
Indices for which the proposition \( \lambda i[\text{Enet makes fire at } i] \) cannot be true.
Irrealis modality: Future reference

Interpretation of irrealis as future-directed -- “potentialis”:

(63)  
\[ [\text{Ir} \ VP](i_0) = \lambda i \lambda i' \lambda x[i < i' \land [VP](i_0)(i')(x)] \]

(64)  
\[ [\text{IP} E\text{net}_{[3sg]} \ b\text{we}_{[3sg]} \ [\text{gone p\text{á}ng}]](i_0) = \lambda i \lambda i'[i < i' \land E. \ makes \ fire \ at \ i'] \]

This interpretation is too weak for future reference in branching time model:
-- Existential quantification over i’ too weak – expresses just possibility.
-- We need quantification over all future indices, or all expectable indices (Dowty 1977).
-- This universal quantification can be related to the future prefix a-.

(65)  
\[ [\text{CP FUT IP}] = \lambda i \forall i'[i \leq i' \rightarrow \exists i''[i' \sim i'' \land [IP](i_0)(i')(i'')]] \]

(66)  
\[ [\text{CP FUT IP} E\text{net}_{[3sg]} a_{\text{fut}} b\text{we}_{[3sg]} [\text{gone p\text{á}ng}]](i_0) \]
\[ = \lambda i \forall i'[i \leq i' \rightarrow \exists i''[i' \sim i'' \land i < i'' \land E. \ makes \ fire \ at \ i'']] \]

where \( i \sim i' \) iff \( i, i' \) are part of the same history, i.e. \( i \leq i' \) or \( i' \leq i \).
Irrealis modality: Future reference

*Enet abwe gone páng:*
The proposition \( \lambda i [\text{Enet makes fire at } i] \) must be true at least once for every future branch of \( i_0 \)
Irrealis modality: Wishes

Irrealis for the expression of wishes:

-- Representation of preferences following Heim (1992):

\[(67) \quad \llbracket \text{ForceP \ P} \text{REF IP} \rrbracket(i_0) = \forall i, i'[i, i' \text{ maximally similar to } i_0 \land \llbracket \text{IP} \rrbracket(i_0)(i)(i) \land \neg \llbracket \text{IP} \rrbracket(i_0)(i_0)(i') \rightarrow \text{speaker}(i_0) \text{ prefers } i \text{ over } i']\]

\[(68) \quad \llbracket \text{ForceP \ P} \text{REF \ [IP kop_{2.sg}[IR] gone pāng]} \rrbracket(i_0)
= \forall i \forall i'[i, i' \text{ maximally similar to } i_0 \land \llbracket \text{addr}(i_0) \text{ m. fire in } i \rrbracket \land \neg \llbracket \text{addr}(i_0) \text{ m. fire in } i' \rrbracket 
\rightarrow \text{speaker}(i_0) \text{ prefers } i \text{ over } i']\]

Notice: This interpretation scheme requires irrealis.
Irrealis in embedded clauses; to know how and to know that

Irrealis complementizer *ka*, like *ke* except for realis precondition:

\[(\text{CP} \text{ ka CP})(\text{i}_0) = \lambda i \lambda x \forall i''[R(i)(i'')) \rightarrow (\text{CP})(\text{i}_0)(i'')]\]

Specification of accessible relation by embedding verb, here *kiibele* ‘to know (how)’

\[(\text{VP} \text{ kiibele} \ [\text{CP} \ni \text{IP} \ni v \ bwe \ bwe [3SG] \ [\text{VP} \text{ gone pango}]])](\text{i}_0)
= \lambda i \lambda x \forall i''[\text{ABILITY}(i)(i'')(x) \rightarrow \exists i''[i'' < i' \land x \text{ makes fire at } i']]\]

\[(\text{CP} \ni \text{IP} \ni \text{Enet} [3SG] \ [\text{IP} \ ni \ mwe [3SG] [\text{VP} \text{ kiibele ka bwe gone pango}]]])](\text{i}_0)
= \lambda i \exists i'[i' \leq i \land \forall i''[\text{ABILITY}(i')(i'')(x.E.) \rightarrow \exists i''[i'' < i' \land E. \text{ makes fire at } i'']]] \land \ldots \]

‘To know that’:
-- *kiibele* with realis complementizer, realis complement clause: ‘to know that’
   \[\text{mwe kiibele ke van ten mu-syoo lam du okiye}\]
   3SG.RE know COMP.RE man RE-some 3PL-RE stay there
   ‘He knows/knew that some men stay/stayed there.’
-- *kiibele* with irrealis complementizer, future complement clause: ‘to know that s.th. will be’
   \[\text{kye-m kiibele ka Jisas a-bwe kuone kiye}\]
   3PAUC-RE know COMP.NR Jesus FUT-IR.3SG help 3PAUC
   ‘They thought that Jesus would help them.’

Proposal:
-- Basic meaning of *kiibele*: ‘to believe’
-- To believe sth. about past/present indices: to believe that sth. has happened.
-- To believe sth. about future indices: to believe that sth. will happen in all future histories.
-- To believe sth. about one’s own actions: to know how;
   knowing how entails that one performs an action in at least one branch in the future.
Example of embedded irrealis clause: *kiibele ka* ‘to know how’

*Enet me kiibele ka bwe gone páng.*
‘Inet knows how to make fire.’

For every $i'' \in \text{ABILITY}(i')(\text{Enet})$ there is a $i'''$, $i'' \leq i'''$ such that *Enet makes fire* $\mathbb{B}(i_0)(i''')$
Irrealis mood in protasis of conditionals

Protasis in irrealis mood, apodosis in irrealis future a + irrealis. Irrealis complementizer specifies future as accessibility relation.

\[
\lambda i \forall i'[[[[IP]\text{ IP}][CP]]](i_0)(i)(i') \rightarrow [[[CP]](i_0)(i')]
\]

\[
[[\text{ForcelP assert } [CP \text{ molo}, \text{IP} t_1, \text{bo}_{[3sg][m]} \text{ longane diliri}]] [CP t_{\text{abe}}_{[\text{fut}][3sg][m]} \text{ pisih}]]](i_0)
= \forall i'[i_0 < i' \land \text{bird feels egg in } i' \rightarrow \forall i''[i_0 < i'' \rightarrow \exists i''''[i'''' \sim i'''' \land i' < i'''' \land \text{bird lays egg in } i'''']]]
\]

For all indices \(i'\) in the future, when the incubator bird feels an egg at \(i'\), then in all histories that \(i'\) is a part of, there is an index \(i''''\) at which the bird lays an egg.

To be understood:

- \(i'\) and \(i''''\) tend to be closely related, causal/temporal relation
- Literally a statement about the future, but generalizable to other indices as well.
- Possible generalized meaning of \(ka + \text{IRREALIS}, a + \text{IRREALIS}\):
  - reference to set of indices that are compatible with the knowledge of speaker at \(i_0\).
Conditionals: Irrealis in protasis, future in apodosis

bird feels egg
bird lays egg
Distal modality: Specifying temporal reference

Distal modality is used in stative predications (habituals, adjectival)
-- Modelled as quantification over the times of an interval
-- Requires a model that contains time intervals (index intervals).

Distal modality does not refer to the time of utterance:
-- No reference to $i_0$ in its semantic representation.
-- Consequently, IP is a proposition, not a relation between two indices;
   for type homogeneity, we could assume dummy index, constant relation.

\[
(73) \quad [[_T \text{ DIST} VP]](i_0) = \lambda i \lambda x \exists i' \leq i \forall i'' [i' \leq i'' \leq i \rightarrow \text{[VP]}(i_0)(i'')(x)]
\]

\[
(74) \quad [[\text{IP} \ yaa{[3sg]} \ [te{[3sg]}[3sg] \ [VP \ van]]]](i_0) = \lambda i \exists i' \leq i \forall i'' [i' \leq i'' \leq i \rightarrow \text{the sun goes (down) at } i'']
\]

Setting temporal reference for other clauses
-- QU: temporal quantifier, $\exists$ or other, e.g. kevene wobuong ‘every day’
-- Specification of restrictor of quantifier by $te$-clause in Spec-CP

\[
(75) \quad [[\text{CP Spec-CP} [c_0 QU] \text{ IP}]](i_0) = \lambda i \ [QU]: [[\text{Spec-CP}](i_0) [[\text{IP}](i_0)]
\]

\[
(76) \quad [[\text{ForceP ASSERT} \ [\text{CP} \ [\text{IP} \ yaa{[3sg]} \ te{[3sg][3sg]} \ van] \ [c_0 \ \exists^{44} [\text{IP} \ Enet{[3sg]} \ mo{[3sg][3sg]} \ gone \ pâng]]]](i_0) = \exists i: \exists i' \leq i \forall i'' [i' \leq i'' \leq i \wedge \text{the sun goes at } i''] [i \leq i_0 \wedge \text{E. m. fire at } i \wedge \exists i' \leq i_0 [\text{E. m. fire at } i']]\]
\]

‘When the sun was going down / As the sun is going down, Enet made / is making fire.’
Distal modality: Specifying temporal reference

- **sun is going down**
- **Enet makes fire**
Distal modality in main clause, temporal reference specified by adverbial

Distal in main clause, with Spec-CP filled by temporal adverbial, here *meerin* ‘long ago’, deictically referring to \( i_n \)

\[
(77) \quad \text{[[ForP assert [[CP meerin [C \exists [IP temat[3so/pl] [r lat[3pl][past] pwee]]]]]](i_0)}
\]

\[= \exists i : i < < i_0 \exists i' \forall i'' [i' < i'' \leq i \land \text{there are many demons at } i''] \]

Notice: “realis” interpretation originates by deictic temporal adverbial, not by realis mood.

- ‘long time ago’
- ‘there are many demons’

Alternative option: *meerin* species a time interval in the past, interval of *meerin* and of distal modality clause align.
Distal modality: Adjectival predications

Distal modality in adjectival predications
-- Realis relative clause complementizer *ke* creates reference to utterance index *i₀*

(78) \[ [[\text{AP } ke \text{ IP}]](i₀) = \lambda i \lambda x [[\text{IP}](i₀)(i)(x) \land [[\text{IP}](i₀)(i₀)(x)]] \]

(79) \[ [[\text{NP tyenem \ [AP ke \ [IP \_ [\_ to\text{[3sg]dstr} \ [VP bo]]]]]]](i₀) = \lambda i \lambda x [x \text{ is a village in } i \land \exists i' \leq i \forall i''[i' \leq i'' \leq i \rightarrow x \text{ is big in } i'] \land \exists i' \leq i \forall i''[i' \leq i'' < i₀ \rightarrow x \text{ is big in } i₀]] \]
Distal modality, Non-factive attitude predicates

Distal modality in complements of non-factive propositional attitude verbs.  
-- Distal expresses no relation to realis (past, present) or future.

\[(\lambda i \lambda x \forall i'[THINK(i)(i')(x) \rightarrow \exists i'' \leq i'' \forall i'''[i'' \leq i''' \leq i' \rightarrow \text{he is dead at } i']][i_0])\]

‘think that he is dead’
Distal modality in conditional clauses

Distal in protasis of conditional with future apodosis restricts accessibility relation of the future in the main clause.

\[(81) \quad [[\text{ForceP ASSERT} \left[ CP \left[ IP \, \text{kot}_{2\text{sg}}[\text{dist}] \right] \, \text{pyak ne vyoh} \right] \left[ CP \left[ FUT \left[ IP \, \text{akop}_{\text{fut}}[2\text{sg}]\text{[IR]} \right] \, \text{idi popat} \right] \right]]]((i_0))
\]

\[\forall i' : \exists i'' \, i' \leq i'' \wedge \left[ (i_0 \leq i' \rightarrow \exists i''' \, [i' \sim i'' \wedge i_0 < i''' \wedge \text{you}(i_0) \text{ get pig at } i''']\right]\]

‘You will get a pig, provided that you have chosen a coconut.’

Ignoring the stativity part, which is irrelevant here:
-- For every i’ for which it holds that addressee chooses a coconut at i’
-- it holds that i’ follows the utterance time, and the addressee gets a pig in the branch of i’.

Distal in protasis with future+distal in apodosis

\[(82) \quad [[\text{ForceP ASSERT} \left[ CP \left[ IP \, \text{kot}_{2\text{sg}}[\text{dist}] \right] \, \text{pyak ne vyoh} \right] \left[ CP \left[ \text{akop}_{\text{fut}}[2\text{sg}]\text{[dist]} \right] \, \text{idi popat} \right] \right]]]((i_0))
\]

\[\forall i' : \left[ \text{you}(i_0) \text{ choose coconut at } i' \right] \left[ R_{(i_0)}(i'') \rightarrow \exists i''' \, [i' \sim i'' \wedge \text{you}(i_0) \text{ get a pig at } i'']\right]\]

Simplified representation, suppressing the stativity part.

Meaning:
-- For every i’ for which it holds that addressee chooses a coconut at i’,
-- if i’ is accessible from the utterance index by the accessibility relation R of the conditional,
-- it holds that the addressee gets a pig in the history that i’ belongs to.

Notice:
-- No restriction to future of utterance index;
-- interpretation as hypothetical conditional.
The N modality: Use in commands and deontic statements

Complex behavior, but simple representation:
-- does not change the VP denotation,
-- hence does not relate to the utterance index $i_0$

\[ \llbracket \iota \ N \ \text{VP} \rrbracket \llbracket (i_0) = \lambda i \lambda x [\llbracket \text{VP} \rrbracket (i_0)(i)] \]

\[ \llbracket \text{IP} \ [\iota \ \text{kon}_{[25g][N]} \ \text{peten}] \rrbracket \llbracket (i_0) = \lambda i [\text{you}(i_0) \text{ are truthful at } i] \]

Use in commands (cf. infinitival constructions in German: *Jetzt mal herhören!*

\[ \llbracket \text{[ForceP COMMAND [CP REF [IP kon peten]]]} \rrbracket \llbracket (i_0): \]

- speaker($i_0$) commands addressee($i_0$) to act such that $\llbracket \text{kon peten} \rrbracket (i_0)(\text{REF}(i_0)) = \text{true}$, where $\text{REF}(i_0)$ is the index that speaker($i_0$) refers to at $i_0$, condition: $i_0 < \text{REF}(i_0)$.

Deontic modal statement with complementizer *ka*
- Complementizer introduces universal quantification over accessibility relation
- Accessibility relation: Deontic modality.
- $n$-marked sentence specifies proposition that should be true at all accessible indices,
  - realis not possible, as this would come with a realis precondititon,
  - irrealis not a good option, as this would come with a future-oriented interpretation

\[ \llbracket [\epsilonP \ ka \ [\text{IP kon}_{[25g][N]} \ \text{peten}]] \rrbracket \llbracket (i_0) = \lambda i \forall i' [\text{R}(i)(i') \rightarrow \text{you}(i_0) \text{ truthful at } i'] \]
The N modality: Use in the context of negation.

Assume an “excluded middle” presupposition for universal quantifier expressed by \( ka \), here rendered with \( \partial \) and in italics. (cf. Gajewski 2005, for NEG raising phenomena)

\[
\begin{align*}
\llbracket_{\text{cp}} \llbracket ka \text{ IP} \rrbracket \rrbracket_{i_0} &= \lambda i [\forall i' [R(i)(i') \rightarrow \llbracket \text{IP} \rrbracket_{i_0}(i')] \wedge \\
&\quad \partial [\forall i' [R(i)(i') \rightarrow \llbracket \text{IP} \rrbracket_{i_0}(i')] \vee \forall i' [R(i)(i') \rightarrow \neg \llbracket \text{IP} \rrbracket_{i_0}(i')]]
\end{align*}
\]

IP is true for every accessible index \( i' \), presupposed: IP is true for every or for no accessible index.

Short rendering of excluded middle presupposition:
\[
\partial \forall i' [R(i)(i') \rightarrow \{\neg\} \llbracket \text{IP} \rrbracket_{i_0}(i')].
\]

Negative complementizer \( sa \):
-- expressing negation
-- with “excluded middle presupposition” of \( ka \): equivalent to narrow-scope negation.

\[
\begin{align*}
\llbracket_{\text{cp}} \llbracket sa \text{ cP} \rrbracket \rrbracket_{i_0} &= \lambda i [\neg \llbracket \text{cP} \rrbracket_{i_0}(i)] \\
\llbracket_{\text{cp}} \llbracket sa [\text{cp} ka \text{ wel-em}_{[2sg]} ne_{[3sg][ni]} \text{ nek}] \rrbracket \rrbracket_{i_0} &= \lambda i [\neg [\forall i' [R(i)(i') \rightarrow \text{you}(i_0) \text{ afraid at i'}] \wedge \partial \forall i' [R(i)(i') \rightarrow \{\neg\} [\text{you}(i_0) \text{ afraid at i'}]]]
\end{align*}
\]
The N modality:
Negation in embedded clauses

Embedding predicate is negated:
-- Due to excluded middle presupposition of ka: correct interpretation.
-- Realis modality in dependend clauses is excluded because it would state that the proposition is in fact true.

(90)  
\[ \text{a. } [[\text{VP } kiibele_2 [\text{cp } ka ne_{[3sg][n]} 	ext{ kuui}]](i_0)] \\
\quad = \lambda i \lambda x [\forall i' [\text{ABIL}(i)(i')(x) \to x \text{ moves at } i'] \wedge \partial \forall i' [\text{ABIL}(i)(i')(x) \to \neg \{x \text{ moves at } i']]] ] \\
\text{b. } [[\text{ForceP } \text{ASSERT } [\text{cp } \exists [\text{IP } \text{Enet } \text{[3sg] [RE,N]} \text{ [VP } kiibele_2 \text{ ka ne kuui]}]]]](i_0) \\
\quad = \neg \exists i \leq i_0 [\forall i' [\text{ABIL}(i)(i')(E.) \to E. \text{ moves at } i'] \wedge \partial [(\text{excluded middle})]] \\
\quad = \forall i \leq i_0 [\forall i' [\text{ABIL}(i)(i')(E.) \to E. \text{ moves at } i'] \wedge \partial [(\text{excluded middle})]] \\
\quad = \forall i \leq i_0 [\forall i' [\text{ABIL}(i)(i')(E) \to \neg \text{ E. moves at } i']]
\]

Negative-implying embedding verbs:
-- Speaker assumes that proposition is false:
  Restriction to those indices that are not on the branch of the utterance index.
-- Hence realis or irrealis cannot be used for embedded clause.
-- N modality expresses no restriction, hence can be used in this context.

(91)  
\[ \text{a. } [[\text{VP } notselaane]](i_0) = \lambda i \lambda i' \lambda x [\text{THINK}(i)(i')(x) \wedge \neg [i' \sim i_0]] \\
\text{b. } [[\text{VP } notselaane [\text{cp } ka ne_{[3sg][n]} \text{ kuui}]]](i_0) \\
\quad = \lambda i \lambda x [\forall i' [\text{THINK}(i)(i')(x) \wedge \neg [i' \sim i_0]] \to x \text{ moves at } i'] \wedge \partial [(\text{excluded middle})]] \\
\text{c. } [[\text{ForceP } \text{ASSERT } [\text{cp } \exists [\text{IP } \text{Enet}_{[3sg]} [\text{I } [\text{mwe}_{[3sg][RE]} \text{ [VP } notselaane \text{ ka ne kuui]}]]]]]](i_0) \\
\quad = \exists i \leq i_0 [\forall i' [\text{THINK}(i)(i')(E.) \wedge \neg [i' \sim i_0]] \to E. \text{ moves at } i'] \wedge \partial [(\text{excluded middle})] \\
\quad \wedge \text{ (realis precondition)}]
Conclusion

The five (six) modal markers of Daakie:

- **m Realis:**
  Proposition true at or before $i_0$.

- **b/p Irrealis (Potentialis):**
  Proposition true after $i_0$.

- **b/p Irrealis with future a-:**
  Proposition true after $i_0$ for all future histories.

- **re Negation:**
  Proposition not true at or before $i_0$.

- **t Distal:**
  No relation to $i_0$ expressed; restricts modal accessibility relations.
  Stative interpretation: Quantification over interval

- **n Modality:**
  No relation to $i_0$ expressed; restricts modal accessibility relations.
  Compatible with uses in the scope of negation, where Realis/Irrealis are blocked.

Other claims:

- Realis / Irrealis complementizers:
  - express modal notions themselves
  - which can be restricted by the embedding predicate.
Goodies: The Story of the Redhead bird.
Examples of sand drawings:
Goodies: Sandroing, by Ilson Magekon
Goodies: Sand drawing, by Ilson Magekon