Dynamic Analysis for Practical Language

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Assumption 1: a major component of a theory of imperative *meaning* is an account of their *conventional force*.

Assumption 2: accounts of imperative force have three parts.

- A *regimented language* for representing "logical forms" (in a very attenuated sense) of natural language imperative clauses
- A sufficiently rich *algebra of update programs*
- A mapping $[\cdot]$ between them.

My main goals in this talk fall into two piles.

- General/methodological: to organize the debate, give people new to the debate a sense of (how I see) the lay of the land.
  - Outline theoretical possibilities for each component of an account of CIF.
  - Locate the major extant accounts in the resulting partition.
  - Use this apparatus to articulate some precise theoretical constraints on the shape of an account of imperative force.
- Specific: applying these theoretical constraints to identify and resolve specific problems with extant accounts:
  - Identify spurious and serious challenges to the major types of account.
  - Give an account of the meaning of certain imperative constructions.

Ordinary imperatives (OIs) are of the form $!\phi$

- Shut the window!

Conditional imperatives (CIs) are of the form $(\mathit{if}\phi)(!\psi)$

- If the temperature drops, shut the window!

Syntactically complex imperatives (SCIs) are of the form $!\phi * !\psi$

- Take a shower and change your shirt [Conjunctive]
- Post or burn the letter [Disjunctive]

Quantified imperatives (QIs) are of the form $Qx!\phi$.

- Everyone$_i$ take off their$_i$ coat! [$\forall$]
- Someone$_i$ bring me their$_i$ coat! [$\exists$]

CIs, SCIs, QIs demand a new understanding of updates—as *restrictable* (CIs), *composable* ($\wedge$, $\forall$), and *relationizable* ($\vee$, $\exists$).

Methodological component. Meaning as Use (MAU)

- $!\phi$'s meaning is a matter of what a speaker uses it to do (its *conventional function in discourse*, CF).
- CF is explanatorily fundamental.
- The job of a theory of meaning is to define an interpretation $[\cdot]$ mapping a sentence into its CF.
- I treat CFs as CCPs, or instructions for updating one's mental state—modeled as a function α from an input state σ to an output state $\sigma\alpha$. (I'll use "CCP" interchangeably with "illocutionary" or "speech act.")

Empirical component. Imperative use as practical. Imperative CF contrasts with declarative CF, along two dimensions.

- Imperatives are *directive*, declaratives *representational*.
- *Performative*. Imperatives create ($\neq$ describe) obligations.

Standard Speech Act Accounts start with a theoretically motivated picture of the metaphysics of speech acts, which subsequently constrains their regimented language and understanding of $[\cdot]$.

Specifically, illocutionary force is said to be analogous to propositional attitudes (Stenius 1967, Lewis 1970, many others).

- Both fit into the schema *S* Ψ*'s that* ϕ
- Contents, as such, have no inherent attitudinal or illocutionary function. Both attitudes and speech acts are the result of combining a attitude-type (belief, desire, etc.) or speech act-type (assertion, directing, etc.) with a forceless content.
- So, modeling *imperative* force means saying how a direction with content ϕ updates information-states (contexts, etc.).
- The attendant regimented language is one in which speech act operators take widest scope for any speech act designator.

Lewisian (Target-Setting). Imperatives create corresponding deontic facts.

> *Suppose that at t the Master says to the Slave $!\phi$; and suppose that the sphere of permissibility just before t contains some worlds, accessible at t, where ϕ is false at t. Then the sphere must contract to cut those worlds out: at t, and thereafter at least until the next change, none of those worlds are permissible. If the Master changes the sphere in this way by saying $!\phi$, we say that the Master commands that ϕ.*
>
> *(David Lewis, 1979, "A Problem about Permission")*

This is not an dynamic theory of meaning for imperatives—not, in fact, a theory of meaning at all. But we can make it into one.

- $[!\phi]$ outputs a state verifying (satisfying) $\Box\phi$.
  An imperative $!\phi$'s CF is to command.
- What is it for a state to verify $\Box\phi$?
  - A state $\sigma = \langle I_\sigma, ok_\sigma \rangle$
    $I_\sigma \subseteq W$ is the sphere of relevant possibilities
    $ok_\sigma \subseteq I_\sigma$ is the sphere of permissibility
  - A state verifies $\Box\phi$ iff ϕ holds throughout ok_σ:
    $\sigma \vDash \Box\phi$ iff $ok_\sigma \subseteq [\![\phi]\!]$
  - A basic hallmark of dynamic accounts: $\vDash$ relates *representations of states of mind* (rather than worlds) to sentences.
- What does $[!\phi]$ do to make a state verify $\Box\phi$?

$$ok_{\sigma[!\phi]} = ok_\sigma \cap [\![\phi]\!] \tag{1}$$

Portner (2004, 2007, 2010) (Mechanistic). The most systematic semantic account of imperatives on the market.

- $!\phi$ proposes $[\![\phi]\!]$ for addition to the addressee σ's "To-Do List" Π_σ.

$$\Pi_{\sigma[!\phi]} = \Pi_\sigma \cup \{[\![\phi]\!]\} \tag{2}$$

- A To-Do List for a state σ characterizes a permissibility sphere.
- It characterizes an ordering on possibilities: $w \preceq_{\Pi_\sigma} v$ iff everything in Π_σ that v satisfies is satisfied by w.
- Possibilities are ok (according to σ) just if no other possibility in I_σ is strictly better (according to $\preceq_{\Pi_\sigma}$).

Comparison. Both accounts tie imperative CF closely to commanding.

- The Lewis-inspired account *conventionalizes* this:

  For any σ and ϕ : $\sigma[!\phi] \vDash \Box\phi$
- Portner conventionalizes something else: $!\phi$ makes ϕ-possibilities *ceteris paribus favored*. To utter $!\phi$ is to give one's addressee a reason to realize ϕ. This tends to make ϕ obligatory, but only *ceteris paribus*.

  Whenever σ is indifferent between ϕ and $\neg\phi$, it follows that $\sigma[!\phi] \vDash \Box\phi$.

  On the other hand, typically, $\sigma[!\phi]...[!\neg\phi] \nvDash \Box\neg\phi$.

On the main non-dynamic account (**propositionalism**) imperative meanings are typed as *propositions*.

- **The Modal Account** (Aqvist 1964, Han 1998, Schwager 2006, Aloni 2007): *get lost* $\approx$ *you must get lost*

$$[\![!\phi]\!] = [\![\Box\phi]\!] \tag{3}$$

Explananda for modal accounts. MAs must explain why, despite their semantics, imperatives:

- Have a paradigmatically practical, non-representational use.
- *Cannot* be used to proffer their semantic contents.
- On Stalnaker's model of assertion, since $[\![!\phi]\!] = [\![\Box\phi]\!] =$ a proposition p (a picture of a way the world might be), we expect $\sigma[!\phi] = \langle I_\sigma \cap p, \Pi_\sigma \rangle$.
- But addition to my information changes *what I believe about* what I must do, not *what I must do*.

Maybe obligation-change is a **byproduct** of interpretation?

- **Gricean reasoning?** In uttering $!\phi$, S expressed $p = [\![\Box\phi]\!]$. But if S *meant* p, S violated the Quality Maxim. S is cooperative, so S didn't mean p.

  Problem: conversational implicatures are cancelable:

$$+\text{Some dogs bark. Indeed, all do.} \tag{4}$$

$$\#\text{Go away, although I do not care if you do.} \tag{5}$$

Lewis (1979) and Schwager (2006) say it's presuppositional:

- An utterance of $!\phi$ by S in a context c is appropriate only if c recognizes S as an authority about $\Box\phi$. Given an appropriate utterance of $!\phi$ in c, c *deferentially adjusts* to make $\Box\phi$ true.
- This looks ok: dynamicists need deference to authority too!

But then isn't the modal content idle? In fact: NO!

The Standard Account. Speech acts (forces, CFs, etc.) specifiable with terms of the form $\ulcorner F(p) \urcorner$, where F designates a kind of force, p its content.

- This leaves two choices for the meaning of a CI.

Choice 1: Wide-scoping. CIs *command that* p, for some p.

$$[(if\,\phi)(!\psi)] := [!(\phi \supset \psi)] \tag{6}$$

Problem. CIs articulate constraints on planning relative to contingencies (situations relevant to planning, hence specified in terms of *information*).

- Given a CI *if it rains, shut the window!*, even when $\sigma \vDash$ *it's not raining*, σ adjusts its plans for where *it learns it's raining*.
- This generalizes the Ramsey Test for indicatives: to evaluate $(if\,\phi)(\psi)$ (for any ψ), (i) temporarily add ϕ to your information, (ii) evaluate/execute ψ.

Contingency planning is not reducible to planning that $\phi \supset \psi$ in the current situation! Notice (12-14) place *consistent constraints* on a plan.

If it rains, just bring the umbrella. $:=![R \supset (U \wedge \neg S)]$ (7)

If it does not, just bring the sunglasses. $:=![\neg R \supset (\neg U \wedge S)]$ (8)

Bring both. $:=!(U \wedge S)$ (9)

If the CIs tell us how to plan in the current contingency, (12-14) are incst!

Choice 2: Narrow-scoping (update "deferred") CIs express a conditional speech act: $[!\psi]$ is executed when the state verifies ϕ.

$$[(if\,\phi)(!\psi)] = [!\psi] \cap \{\langle \sigma, \tau \rangle : \sigma \vDash \phi\} \tag{10}$$

Advantage. Seems vaguely consonant with the spirit of the Ramsey Test.

Problem. A CI like (11) typically establishes a CO like (12).

If school is cancelled, go to the library. (11)

If school is cancelled, you should go to the library. (12)

More generally, even when σ doesn't verify ϕ, we *typically* have:

- **Fact 1**: σ doesn't verify $(if\,\phi)(\Box\psi)$
  (The CI's role is to *make* the state verify the corresponding CO.)
- **Fact 2**: $\sigma[(if\,\phi)(!\psi)]$ does verify $(if\,\phi)(\Box\psi)$
  (The CI succeeds.)

This is *impossible* on the conditional speech act account, since, when σ doesn't verify ϕ, the update *idles*: $\sigma[(if\,\phi)(!\psi)] = \sigma$.

Upshot. But where dynamic theorists have difficulty even *identifying a suitable meaning* for a CI, the modal account has none at all:

- The meaning of the CI is identified with the corresponding CO: $[\![(if\,\phi)(!\psi)]\!] := [\![(if\,\phi)(\Box\psi)]\!]$.
- No need to posit a *speech act* α such that $\sigma\alpha \vDash (if\,\phi)(\Box\psi)$.

Standard accounts lack an account of the force of certain QIs.

$$\text{Have the orchestra play Beethoven's Fifth!} := addr!play(orch, 5^{th}) \quad (13)$$

$$\text{Play Beethoven's Fifth (together)} := orch!play(5^{th}, orch) \quad (14)$$

$$\text{Everyone}_i \text{ play her}_i \text{ part} := ??? \quad (15)$$

$$\text{Someone}_i \text{ bring me her}_i \text{ chair} := ??? \quad (16)$$

Note: that is not because the Lewis and Portner accounts have no account of what QIs do to a state. Lewis: they introduce an obligation, for each addressee. Portner: they add to the TDL, for each addressee.

- The problem is that the domain of meanings is composed of operations like *introducing an obligation* (Lewis) or *adding to a TDL* (Portner).

For both CIs and QIs:

- We have a pretty good idea of what speech act they are supposed to express.
- But those speech acts cannot, it seems, be represented in a manner consistent with the standard account.
- In the next part of the talk, we will try something else.

The Basic Idea. The modal account errs in direction-of-fit: imperatives *establish* (not represent) modal facts. They set targets for a plan, *specified in terms of modal facts*.

- This suggests a broadly Lewisian strategy for identifying a CF for basic, unembedded imperatives: an imperative's CF is *to propose that a salient plan come to verify a corresponding modal fact*.
- **Part 1**: Identify the property $\mathcal{P}$ a state has when it verifies $\Box\phi$.
  Part 2: $\mathcal{P}$ is the property that $!\phi$ proposes a state to satisfy.
  Part 3: Define $[\cdot]$ so that $\sigma[!\phi]$ satisfies $\mathcal{P}$.

Generalizing the idea. If $C = \kappa!\phi\kappa'$, $MOD(C) := \kappa\Box\phi\kappa'$ is C's corresponding modal sentence. So, given *any* imperative C:

- **Part 1**: Identify the property $\mathcal{P}$ a state has if it verifies $MOD(C)$.
  Part 2: Define $[\cdot]$ so that $\sigma[C]$ satisfies $\mathcal{P}$.

I'll implement this in a roundabout way: define a regimented metalanguage, give it a semantics, gesture at how it realizes this strategy.

Standard illocutionary syntax.

Let Δ be the standard account's regimented illocutionary metalanguage: the language in which imperative "LFs" are given. Δ is constructed from the speech act operator !, a first-order language $\mathcal{L}$, and a set of individual constants $\mathcal{A}$ and variables $\mathcal{V}$.

Δ is defined as the smallest set such that:

- $\phi \in \mathcal{L}, x \in \mathcal{V} \Rightarrow x!\phi \in \Delta$
- $\phi \in \mathcal{L}, a \in \mathcal{A} \Rightarrow a!\phi \in \Delta$

Non-standard illocutionary syntax. Standard illocutionary syntax isn't rich enough. So we'll enrich it. We begin with a set of basic speech acts (about which more below) Π. We will also add:

- A suppositional device $\underline{:}(\cdot)$
- Regular operators: ';' (sequencing), '+' (relationalizing). ';' = relation-composition ($\circ$), while '+' = relation-union ($\cup$).

The new regimented metalanguage Δ^* is the smallest set s.t.:

- $\Pi \subseteq \Delta^*$
- $\phi \in \mathcal{L}, \alpha \in \Pi \Rightarrow \underline{\phi}(\alpha) \in \Delta^*$
- $\alpha, \beta \in \Delta^* \Rightarrow \alpha;\beta \in \Delta^*$ and $\alpha + \beta \in \Delta^*$

Finally, we define the operators $\bigwedge$ and $\bigvee$. Let $\Sigma(s)$ be an environment in which the string s occurs. Then, if $\Sigma(s) \in \Delta^*$:

- $\bigwedge_{F(s)} \Sigma(s) = \Sigma(s_1);...;\Sigma(s_n)$ iff $F(s_j)$, $1 \leq j \leq n$.
- $\bigvee_{F(s)} \Sigma(s) = \Sigma(s_1) + ... + \Sigma(s_n)$, iff $F(s_j)$, $1 \leq j \leq n$.

Semantics. There are two salient tasks.

- Give the semantics for Δ^*
- Say how OIs, CIs, SCIs, and QIs map onto elements of Δ^*

The key semantic ingredient remains the *state*. We'll treat states as primitive here, assuming that, for any state σ, there is a To-Do List function T_σ defined for each individual.

- $[\cdot]$ is, as before, a relation on states
- For each individual a, $T_\sigma(a)$ is a *contingency plan*: a function from contingencies (situations) to sets of propositions.

Basic speech acts: a basic imperative imperative tells someone *what to do in a specific contingency*.

- OIs say what to do in *any relevant* contingency, so they are represented as sequences of basic imperatives
- CIs say what to do in *a subset* of the relevant contingencies, so they too are represented as sequences of basic imperatives

Complex speech acts: more formally, letting $[\underline{\phi}(a \amalg \psi)]$ be the operation of altering a specified contingency plan for a (the one holding in the situation fully characterized by ϕ) so that ψ is obligatory with respect to that plan:

- $a!\phi := \bigwedge_{[\![\psi]\!] \subseteq W} \underline{\psi}(a \amalg \phi)$
- $(if\,\phi)(a!\psi) := \bigwedge_{[\![\chi]\!] \subseteq [\![\phi]\!]} \underline{\chi}(a \amalg \psi)$

What are contingencies? For our purposes, just *bodies of information* (subsets of W) (cf. Charlow 2009, to appear), so:

$$T_{\sigma[(if\,\phi)(a!\psi)]}(a) = T_{\sigma[\underline{\chi_i}(a \amalg \psi)]...[\underline{\chi_n}(a \amalg \psi)]}(a),$$

$$\text{for all } 1 \leq j \leq n \text{ such that } [\![\chi_j]\!] \subseteq [\![\phi]\!]$$

Things to note:

- Unconditional imperative force is a special, *restricted* variety of conditional imperative force. (Cf. Kratzer 1981, on modal conditionals, and Isaacs & Rawlins 2008, on CQs.)
- Affinities with the Isaacs & Rawlins (2008) account of CQs, which has CQs performing the basic interrogation operation (partitioning) on hypothetical contexts enriched by the antecedent's information. We, too, have CIs performing the basic directive operation (whether Lewisian or Portnerian) on bodies of information (indeed, a series thereof) enriched by the antecedent's information.

A different problem: predicting the desired interactions with the corresponding deontic conditionals requires revision of the Kratzer (1981) semantics, so that the *if*-clause supplies the relevant contingency. I have in mind something like:

$$[\![(if\,\phi)(a\Box\psi)]\!]^{\sigma} = 1 \Leftrightarrow$$
$$\{u \in [\![\phi]\!] : \forall v \in [\![\phi]\!](v \preceq_{T_\sigma(a)([\![\phi]\!])} u \Rightarrow u \preceq_{T_\sigma(a)([\![\phi]\!])} v)\} \subseteq [\![\psi]\!]$$

Informally, $(if\,\phi)(a\Box\psi)$ says the **best-on-the-supposition-that-ϕ** ϕ-worlds, given a's obligations, are ψ-worlds.

Independent motivation for the revision (**skippable!**). Kolodny & MacFarlane (2010): ten miners are all trapped in a shaft (A or B, but which?) and threatened by waters. We can block one shaft or neither, but not both. If we block the shaft they're in, all are saved. If we guess wrong, all die.

On the Kratzer semantics, unless (i) ordering-sources are information-sensitive and (ii) *if*-clauses 'shift' the ordering-source for a modal, (M1), (M2), and (M3) are provably inconsistent. (For discussion and proofs, see Charlow 2009, 2010.)

(M1) *If they're in A, should block A* $\approx (if\,in\_A)(\Box bl\_A)$
(M2) *If they're in B, should block B* $\approx (if\,in\_B)(\Box bl\_B)$
(M3) *May block neither* $\approx \neg\Box(bl\_A \vee bl\_B)$

But most informants hear (M1), (M2), and (M3) as, not merely consistent, but *true*. (Similar as for the umbrella example above.)

Quantified imperatives can be analyzed in terms of these operations. Supposing the "context" c provides a set of addressees A_c and a function T_c from members of A_c to their contingency plans, a universally quantified-subject imperative expresses sequencing along two dimensions. (See esp. Charlow 2011.)

- Syntax: $\forall x!\phi := \bigwedge_x \bigwedge_\psi \underline{\psi}(a \amalg \phi)$
- Semantics: $c[\forall x!\phi] = \{c' : \forall a \in A_c : T_{c'}(a) = T_{c[!\phi]}a\}$
  [ϕ becomes required for everyone.]

However, an existentially quantified-subject imperative expresses relationalizing over sequencing:

- Syntax: $\exists x!\phi := \bigvee_x \bigwedge_\psi \underline{\psi}(x \amalg \phi)$
- Semantics: $c[\exists x!\phi] = \{c' : \exists a \in A_c : T_{c'}(a) = T_{c[!\phi]}a\}$
  [All open alternatives require someone to see to it that ϕ]

SCIs fall naturally into place. Interestingly, some of their more puzzling properties are handled as a matter of course.

- In the interest of brevity, I only offer an overview here.
- See Charlow (2011, Ch. 4) for further detail.

Conjunctive imperatives.

Take a shower and buy a new shirt (17)

- Syntax: $a!\phi;a!\psi$
- Semantics: $[a!\phi;a!\psi] := [a!\phi] \circ [a!\psi]$
  $\{\sigma\}[a!\phi;a!\psi] = \{\sigma' : \sigma[a!\phi;a!\psi]\sigma'\}$
- Roughly, updating with $a!\phi;a!\psi$ means recognizing two requirements: a requirement that ϕ and a requirement that ψ.

Central puzzle for treatments of conjimps is automatically handled:

- Conjimps generate distinct (but simple) requirements (and permissions), rather than a single complex requirement (permission)
- Partial compliance therefore possible
- Different from imperative like *lick and seal the envelope* ($\approx!(\phi \wedge \psi)$)

Disjunctive imperatives.

Post or burn the letter (18)

- Syntax: $a!\phi + a!\psi$
- Semantics: $[a!\phi + a!\psi] := [a!\phi] \cup [a!\psi]$
  $\{\sigma\}[a!\phi + a!\psi] = \{\sigma' : \sigma[a!\phi + a!\psi]\sigma'\}$
  Roughly, updating with a disjunctive imperative involves recognizing different states as alternatives—one requiring the left disjunct, another requiring the right.

Some puzzles for standard treatments of disjunctive imperatives are automatically handled:

- Disjunctive imperatives generally have *free choice* interpretations: the agent is expressly permitted to realize either disjunct, and required to realize at least one.

Empirical progress through new foundations.

- It is methodologically suspect to begin, as *nearly every major reference in speech act theory does*, with an a priori attractive account of speech acts, and design a theory of meaning around that.
- CIs/QIs show the standard account *does* need serious revision.
- Adding a regular operators to our regimented metalanguage allows us to handle phenomena that trouble major extant accounts.
- Such revisions turn out to be quite handy for accounting for SCIs.

The viability of dynamic analysis.

- Accounting for the meanings of the various kinds of imperatives does not require giving up on a dynamic account of their meanings.
- Far from it: the resulting account is an indirect argument for dynamic analysis. Linguistic meaning is dynamic because the best-confirmed theory of practical meaning uses dynamic meanings.

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