A Preference Semantics for Imperatives

Will Starr

Cornell University
Sage School of Philosophy
will.starr@cornell.edu
http://williamstarr.net

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Observation 1
Ross, Disjunction, Consequence and Imperatives

1. If what (1a) says is true, then what (1b) says is true
   (1a) Kathy posted the letter
   (1b) Kathy posted the letter or Kathy burnt the letter
   • Classical semantics predicts this: \( P \models P \lor B \)
   • Suppose that what (2a) commands is required
   • Does it follow that what (2b) commands is required?
   (2a) Kathy, post the letter!
   (2b) Kathy, post the letter or burn the letter!
   • Ross’ (1944) Puzzle: \( P \models P \lor B \) but \( !P \not\models !P \lor !B \)
   • Proposition being true \( \neq \) command being required?

2. Proposition being true \( \neq \) command being required?
   • Maybe:
     - Propositions are true, commands are satisfied
   • Then imperative consequence is satisfaction-preservation
   • So maybe \( !P \models !P \lor !B \)
   • Maybe talk of requirement was pragmatic noise...

Against Satisfaction Consequence
1. Correct propositions are true
2. Correct commands are?
   • Satisfied \( \times \); Required \( \checkmark \)
Observation 1

Imperative Consequence is not about Satisfaction

Fact 1: !P \neq May B
- President’s command:
  \( (3) \) Will, post the letter!
- I cannot infer that
  \( (4) \) I may burn the letter

Against Satisfaction Consequence
- If imperative consequence is about satisfaction:
  \( !P \models !P \lor !B \)
- Consequence is transitive:
  \( !P \models May B \times \times \)

Fact 2: !P \lor !B \models May B
- The president’s command:
  \( (5) \) Will, post the letter or burn the letter!
- I can infer:
  \( (6) \) I may burn the letter

Observation 2

Felicity, Context & Information

(7) \# Unicorns don’t exist. Bring me a unicorn!
(8) \# The door is open. Open the door!
Relatedly:
(9) a. I don’t have a brother.
    b. \# If I had a brother, call him!

Generalization
The felicity of imperatives depends on the mutual information against which they are issued. Specifically, the possibility of the action they proffer must be open.

Bonus for: saying why imperatives are about open actions.

Observation 3

Imperatives Scope Under Connectives

(10) Go home and I’ll go to the grocery store.
    a. Assertion Conditional:
        Go home! And if you do, I’ll go to the store
    b. Sequenced:
        I’ll go to the grocery store and you go home
    c. Command Conditional:
        If you go home, I’ll go to the grocery store
        (And, you know what happens when I shop!)

- Sequenced requires imperative to scope under and
- Arguably, same point holds for conditional imperative:
  (11) If you’re sleepy, drink coffee!
  (12) If Chris gets up, I’ll call on him and you close the door.
Information

• Informational contents (*propositions*) are sets of possible worlds
  • These sets distinguish ways world might be (worlds in the set) from ways it isn’t (worlds excluded from set)
• One informational content is particularly useful for understanding how linguistic interactions unfold:

**Contextual Possibilities (c)**

As communication and inquiry unfold, a body of information accumulates. Think of this information as what the agents are mutually taking for granted in some way. I call the set of worlds embodying this information c, short for *contextual possibilities*. (Stalnaker 1978; Lewis 1979)

Issues

• It’s not just information that accumulates in communication and inquiry (Bromberger 1966)
• There are issues (e.g. Hamblin 1958; Roberts 1996).
• They can be thought of as ways of grouping worlds in c into competing alternative propositions.

**Alternatives (C)** (e.g. Groenendijk 1999; Hulstijn 1997)

Alternatives represent open, competing propositions the agents are concerned with deciding between; their issues. Formally, this grouping of c may be identified with a set of sets of worlds; call it C. There is no need to also keep track of c: it is just the union of all the alternatives in C.

Inquiry also progresses by gaining information, i.e. the elimination of worlds.
\[ \{w_{AB}, w_{Ab}, w_{aB}, w_{ab}\} \Rightarrow \{w_{AB}, w_{AB}\} \]

Figure: Accepting the information that A

Inquiry also progresses by recognizing issues, i.e. introducing alternatives.
\[ \{\{w_{AB}, w_{Ab}, w_{aB}, w_{ab}\}\} \Rightarrow \{\{w_{AB}, w_{AB}\}, \{w_{aB}, w_{ab}\}\} \]

Figure: Recognizing the issue whether A
Agents not only gather information and identify competing alternatives, they form **preferences** regarding those alternatives.

Central to **decision theoretic** approaches to rational choice, as applied in philosophy, AI and economics (e.g. Ramsey 1931; Newell 1992).

Of relevance here: the preferences being mutually taken for granted for the purposes of an interaction.

Parallel to Stalnaker’s common ground.

A body of preferences can be represented as a binary **preference relation** on the alternatives.

I.e. a set of pairs of propositions constructed from $c$.

**Preference State ($R$)**

- $R$: binary relation on alternatives (open propositions)
- $R(a, a')$: $a$ is preferrable to $a'$
- Each pair in $R$ is called a **preference**
- Set of (non-empty) alternatives over which $R$ is defined: issues at stake in $R$, $C_R$
- Set of worlds among those alternatives: the contextual possibilities written $c_R$

**Information in a Preference State**

- $\{w_{AB}, w_{Ab}, w_{aB}, w_b\} \Rightarrow \{w_{AB}, w_{Ab}\}$
- $\{\{w_{AB}, w_{Ab}, w_{aB}, w_b\}, \emptyset\} \Rightarrow \{\{w_{AB}, w_{Ab}\}, \emptyset\}$

**Issues in a Preference State**

- $\{\{w_{AB}, w_{Ab}, w_{aB}, w_ab\}\} \Rightarrow \{\{w_{AB}, w_{Ab}\}, \{w_{aB}, w_{ab}\}\}$
- $\{\{w_{AB}, w_{Ab}, w_{aB}, w_ab\}, \emptyset\}$
  $\Rightarrow \{\{w_{AB}, w_{Ab}\}, \emptyset\}, \{\{w_{aB}, w_{ab}\}, \emptyset\}\}$
### Preference and Inquiry

#### Preference and Inquiry

**Figure:** Coming to prefer A (to ¬A)

\[ \{ \langle w_{AB}, w_{Ab}, w_{aB}, w_{ab} \rangle, \emptyset \} \Rightarrow \{ \langle w_{AB}, w_{Ab} \rangle, \{ w_{aB}, w_{ab} \} \} \]

**Figure:** Adding (separate) preference for B to preference for A

\[ \{ \langle w_{AB}, w_{Ab} \rangle, \{ w_{aB}, w_{ab} \} \} \Rightarrow \{ \langle w_{AB}, w_{Ab} \rangle, \{ w_{aB}, w_{ab} \}, \{ w_{AB}, \{ w_{aB}, w_{ab} \} \} \} \]

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### Preference, Rationality & Context

#### Preference, Rationality & Context

**Preference, Rationality & Context**

Using Preference to Make Rational Choices

- Given preference relation, which alternatives are best?
- How do you use preferences to decide what to do?
- In decision theory, this takes the form of defining a choice function (Hansson & Grüne-Yanoff 2009)
- A choice function \( C h \) maps a preference state \( R \) to the set of best alternatives according to \( R \)

**Proposal: Choice, Permission, Requirement**

1. \( C h(R) \) are the alternatives permissible according to \( R \)
2. Required by \( R \): unique alternative permitted by \( R \)

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### Preference, Rationality & Context

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**Preference, Rationality & Context**

The Choice Function: Logical Weak Dominance

**Which Alternatives are Best?**

1. Competition between preferred alternatives \( P(R) \)
   - Left member in some pair
2. If preferred alternative \( a \) is entailed another preferred one, then \( a \) is out
3. If \( a \) entails a dispreferred alternative, \( a \) is out

**Choice: Formally**

\[ C h(R) = \{ a \in P(R) | \forall a' \in P(R) : a' \subseteq a \land \forall a' \in D(R) : a \subseteq a' \} \]

\[ [D(R): \text{dispreferred alternatives}] \]
Three Observations A Preference Semantics References

Preference, Rationality & Context

How Choice Works: An Example

Figure: Preference for A with (separate) preference for B

- $\{\{w_{AB}, w_{AB}\}, \{w_{aB}, w_{ab}\}\}$
- Two preferred (warm) alternatives, orange and yellow
- Neither entails the other nor dispreferred (cold) alt.
- So $Ch(R) = \{\{w_{AB}, w_{AB}\}, \{w_{aB}, w_{ab}\}\}$

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Preference, Rationality & Context

How Choice Works: A More Complex Example

Figure: Pref A and B

- 4 pref. alt’s: yellow, orange, reds
- Yellow is out: reds entail it
- Orange is out: top red entails it
- Bottom red is out: it entails blue, which is a dispreferred alt
- Unique best alternative: top red
- $A \land B$ is required

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What Must Preferences Be Like for Choice to Guarantee Results?

Exclusivity

- $\forall a, a' : a \cap a' = \emptyset$ if $R(a, a')$
- When you strictly prefer one thing to another, the two can’t be compatible.

No Absurdity

- $\forall a \neq \emptyset : \langle a, \emptyset \rangle \in R$ & $\langle \emptyset, a \rangle \notin R$
- Always prefer non-absurd alternatives to absurd one.

Irreflexivity

- $\forall a : \langle a, a' \rangle \notin R$ if $a' \subseteq a$
- You can’t strictly prefer an alternative to something that entails it.

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Preference, Rationality & Context

These Constraints on Preferences are Pragmatic

Semantics, Pragmatics & Irrational Preferences

- Words can get us into irrational preference states
  - So none of these axioms are enforced in the semantics
- Rather, recognizing their satisfaction and frustration is part of pragmatics
- Grice: pragmatics is about general rational cooperation
- Decision Theory: rational agents follow preference axioms

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The Semantics: some preliminaries
Radicals & Worlds

Radicals (Informational Core)
- Basic sentences: mood marker + radical, e.g. \(!\rho\)
  - Mood markers: \(!, \triangleright, ?\)
  - Atomic radicals: A, B, C, etc.
  - Logically complex radicals: \(\neg \rho, \rho_1 \land \rho_2, \rho_1 \lor \rho_2\)

Worlds
A possible world is a function which maps atomic radicals to a unique truth-value, 1 or 0
- Dynamic Meaning: function from contents to contents
- \(R[\phi] = R': R'\) is the result of applying \(\phi\) to \(R\)
  (Veltman 1996)

The Semantics
Imperative Semantics

Imperative Semantics
\(R[!\rho] = R \cup \{(a[\rho], a-a[\rho]) | a \in A_R\}\)
- \(A_R\): non-empty \(R\)-alternatives, plus their union \(c_R\)

This amounts to a three-step process:
1. Admit all of the preferences in \(R\)
2. Local Preferences: Take each incoming non-empty alternative \(a\) and introduce a preference for the \(\rho\)-worlds in \(a\) over the non-\(\rho\)-worlds in \(a\)
3. Global Preference: Introduce a preference for all of the \(\rho\)-worlds in \(c_R\) over the non-\(\rho\)-worlds

R [!A] → Figure: R to R[!A]

\(R = \{\{w_{AB}, w_{Ab}, w_{aB}, w_{ab}\}, \emptyset\}\) ⇒
\{\{w_{AB}, w_{Ab}, w_{aB}, w_{ab}\}, \emptyset\}, \{w_{AB}, w_{aB}, w_{ab}\}\}

Radical Semantics
- \(c[A] = \{w \in c | w(A) = 1\}\), for any atomic radical \(A\)

- Subsentential semantics
- Filters alternatives for worlds where radical is true

Connective Semantics (Heim, Veltman)
- \(c[-\rho] = c-c[\rho]\)
- \(c[\rho_1 \land \rho_2] = (c[\rho_1])[\rho_2]\)
- \(c[\rho_1 \lor \rho_2] = c[\rho_1] \cup c[\rho_2]\)
- \(R[\phi \land \psi] = (R[\phi])[\psi]\)
- \(R[\phi \lor \psi] = R[\phi] \cup R[\psi]\)

(Negation never scopes over mood Han 2001 a.o.)
Three Observations

A Preference Semantics

The Semantics

A Complex Example

The Semantics: Observation 3

Mixing Moods

The Semantics: Observation 2

Felicity, Context and Information

Figure: \( R[!A] \) to \( R[!A][!B] \)

\[
\{ \langle \{ w_{AB}, w_{Ab}, w_{aB}, w_{ab} \}, \emptyset \rangle, \langle \{ w_{AB}, w_{Ab} \}, \{ w_{aB}, w_{ab} \} \rangle, \\
\{ \langle w_{AB}, \{ w_{aB} \} \rangle, \langle w_{Ab}, \{ w_{ab} \} \rangle, \\
\{ \{ w_{AB}, w_{Ab}, w_{aB}, w_{ab} \}, \emptyset \rangle \} \} \Rightarrow \\
\{ \langle \{ w_{AB}, w_{Ab}, w_{aB}, w_{ab} \}, \emptyset \rangle, \langle \{ w_{AB}, w_{Ab} \}, \{ w_{aB}, w_{ab} \} \rangle, \\
\{ \langle w_{AB}, \{ w_{aB} \} \rangle, \langle w_{Ab}, \{ w_{ab} \} \rangle, \\
\{ \{ w_{AB}, w_{Ab}, w_{aB}, w_{ab} \}, \emptyset \rangle \} \} \\
\]

- Recall \( R[!A \land !B] = (R[!A])[!B] \)
- So this is the interpretation of conjoined imperatives
- Let’s mix in a declarative conjunct...

Figure: \( R[!A] \) to \( (R[!A])[!B] \)

- Unicorns don’t exist. Bring me a Unicorn:
  - \( (R[\Diamond \neg U])[!B] \)
- Irrational preference: preferring the absurd!
  - Hence (pragmatically) infelicitous
The Semantics: Observation 1

We want $\neg A \not\models A \lor B$

### Informational Support & Consequence (Veltman)
- $c \models \phi \iff c[\phi] = c$
- $\phi_1, \ldots, \phi_n \models \psi \iff \forall c : c[\phi_1] \cdots [\phi_n] \models \psi$

### Preferential Support & Consequence (Starr)
- $R \models \phi \iff Ch(R) = Ch(R[\phi])$
- $\phi_1, \ldots, \phi_n \models \psi \iff \forall R : R[\phi_1] \cdots [\phi_n] \models \psi$

- Both kinds of consequence and support are useful
- The first when tracking information
- The second when tracking the best alternatives

Imperatives and Modals

### Differences and Connections (Starr to appear)
- $A$ makes $A$-worlds preferable to $\neg A$-worlds
  - Doesn’t make all best alternatives contain only $A$-worlds if conflicting preference is present
  - No coherent interpretation for $\neg A$
- $\textbf{Must } A$ tests: all best alternatives entail $A$
  - $\neg \textbf{Must } A$: state doesn’t pass this test
- $\textbf{May } A$ tests: some best alternative is compatible w/ $A$
  - $\neg \textbf{May } A$: state doesn’t pass this test
- $\textbf{Descriptive use: }$ 3rd person auth. has preferences w/this feature, make common preferences match
- $\textbf{Performative use: }$ 1st person auth. has preferences w/this feature, make common preference match

Illocutionary Variability

### Semantic Effect $\neq$ Pragmatic Effect

(13)  
- a. Try the felafel! ($\textit{Advice}$)
- b. Buy a new car today! ($\textit{Advertisement}$)
- c. Have another beer! ($\textit{Permission}$)
- d. Have a nice day!/Drop dead! ($\textit{Wish}$)
- e. Leave your name at the tone ($\textit{Instruction}$)
- f. Sit down! ($\textit{Command}$)

- Imperatives introduce a common preference
  - The point and implications of doing so depend on pragmatic factors
- Pragmatic factors: how authoritative speaker’s preferences are; presumption of opposite preference; whether signaling that preference is nice; whether having that preference will help hearer achieve goals
Three Observations and a Semantics

Summary

1. Imperatives introduce preferences
2. Preferences are used to determine what’s permitted/required
3. Imperative consequence: preservation of what’s permitted/required
4. Disjunctions can introduce new preferences
   - So, !A ⊭ !A ∨ !B
5. Imperatives are sensitive to information available
   - Preferences, by nature, are restricted to live options
6. Imperatives can scope under connectives
   - Dynamic semantics for connectives captures this

Thank you!

(Slides available at http://williamstarr.net/research)


