HG2002 Semantics and Pragmatics

Situations

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Lecture 5

https://bond-lab.github.io/Semantics-and-Pragmatics/

Overview

- Revision: Truth
  - Logic and Truth
  - Entailment
  - Presupposition
- TAM: Tense, Aspect and Modality
- Mood and Evidentiality
- Next week: Chapter 6: Participants

Revision: Sentence Relations and Truth

Logic

- Classical logic is an attempt to find valid principles of argument and inference.

a	If something is human then it is mortal	**premise**
b	Socrates is human	**premise**
c	Socrates is mortal	**conclusion**

- Can we go from a and b to c? Yes

- Truth is **empirical**: The premises need to correspond with the facts of the world
  - Sentences have **truth values** (true, false or unknown)
  - The state of the world that makes a sentence true or false are its **truth conditions**

Methods of Argument

➢ Modus Ponens

a	If something is human then it is mortal
b	Socrates is human
c	Socrates is mortal

$p \rightarrow q, p \vdash q$

➢ Modus tollens

a	If something is human then it is mortal
b	Zeus is not mortal
c	Zeus is not human

$p \rightarrow q, \neg q \vdash \neg p$

➢ Hypothetical syllogism

a	If something is human then it is mortal
b	If something is mortal then it dies
c	If something is human then it dies

$p \rightarrow q, q \rightarrow r \vdash p \rightarrow r$

➢ Disjunctive syllogism

(modus tollendo ponens: affirm by denying)

p	Either a human is mortal or a human is immortal
q	A human is not immortal
r	A human is mortal

$p \oplus q, \neg p \vdash q$

Empirical truths and connectives

p	q	$p \rightarrow q$	$p \wedge q$	$p \vee q$	$p \oplus q$	$p \equiv q$	$\neg p$
		if	and	or	XOR	iff	not
T	T	T	T	T	F	T	F
T	F	F	F	T	T	F	F
F	T	T	F	T	T	F	T
F	F	T	F	F	F	T	T

- Words themselves often carry more implications
  I did A and B often implies *I did A first*

- There are many ways of saying the operations

Necessary Truth, A Priori Truth and Analyticity

- Arguments from the speaker's knowledge
  - **A priori** truth is truth that is known without experience.
  - **A posteri** truth is truth known from empirical testing.

- Arguments from the facts of the world
  - **Necessary truth** is truth that cannot be denied without forcing a contradiction.
  - **Contingent truth** can be contradicted depending on the facts.

- Arguments from our model of the world
  - **Analytic truth** Truth follows from meaning relations within the sentence.
    can include word meaning
  - **Synthetic truth** Agrees with facts of the world.

Entailment

Entailment

a	The evil overlord assassinated the man in the red shirt.
b	The man in the red shirt died.

A sentence a entails a sentence b when the truth of the first (a) guarantees the truth of the second (b), and the falsity of the second (a) guarantees the falsity of the first (b).

- Sources of Entailment
  - Hyponyms
    (1) *I rescued a dog today.* vs *I rescued an animal today.*
  - Paraphrases
    (2) *My mom baked a cake.*vs *A cake was baked by my mom.*

Presuppositions

- Many statements assume the truth of something else

  (3) a. *Mary's sister bakes the best pies.*
  b. *Mary has a sister.*

- Negating the presupposing sentence a doesn't affect the presupposition b whereas negating an entailing sentence destroys the entailment.

- Sources of Presuppositions
  - Names presuppose that their referents' exist
  - Clefts (*it was X that Y*); Time adverbial; Comparative
  - Factive verbs: *realize*; some judgement verbs: *blame*; …

- Presupposition is one aspect of a speaker's strategy of organizing information for maximum clarity for the listener.

Language meets Logic (again)

- **formal semantics** is also known as
  - **truth-conditional semantics**
  - **model-theoretic semantics**
  - **Montague Grammar**
  - **logical semantics**

- A general attempt to link the meaning of sentences to the circumstances of the world: **correspondence theory**
  - If the meaning of the sentence and the state of the world correspond then the sentence is **true**

Model-Theoretical Semantics

1. Translate from a natural language into a logical language with explicitly defined syntax and semantics

2. Establish a mathematical model of the situations that the language describes

3. Establish procedures for checking the mapping between the expressions in the logical language and the modeled situations.

Translating English into a Logical Metalanguage

- Consider simple sentences
  - Represent the predicates by a capital **predicate letter** these can be n-ary
  - Represent the **individual constants** by lower case letters
  - Represent **variables** by lower case letters (x,y,z)

- Join simple sentences with logical connectives treat relative clauses as **and**

  (4) *Bobbie who is asleep writhes*: A(b) $\wedge$ W(b)

  (5) *Bobbie is asleep and Freddie drinks*: A(b) $\wedge$ D(f)

  (6) *Freddie drinks and sleeps*: D(f) $\wedge$ S(f)

  (7) *Freddie doesn't drink beer*: $\neg$ D(f,b)

  (8) *If Freddie drinks whiskey Bobbie sleeps*: D(f,w) $\rightarrow$ S(b)

Quantifiers in Predicate Logic

- Quantifiers bind variables and scope over predications
  - **Universal Quantifier** ($\forall$: *each, every, all*)
  - **Existential Quantifier** ($\exists$: *some, a*)

(9) *All students learn logic*: $\forall x\ (S(x) \rightarrow L(x,l))$
(10) *A student learns logic*: $\exists x\ (S(x) \wedge L(x,l))$
(11) *Some students learn logic*: $\exists x\ (S(x) \wedge L(x,l))$
(12) *No students learn logic*: $\neg\exists x\ (S(x) \wedge L(x,l))$
(13) *All students don't learn logic*: $\forall x\ (S(x) \rightarrow \neg L(x,l))$

- All variables must be bound

Tutorial Solutions

Translate the following into predicate logic, using restricted quantifiers $\forall$ and $\exists$. If a sentence is ambiguous, give both readings.

(14) *Lancelot hated all dragons*
$\forall x\ (D(x) \rightarrow H(l,x))$

(15) *Every dragon feared Lancelot*
$\forall x\ (D(x) \rightarrow F(x,l))$

(16) *One dragon feared every knight.*
$\exists x\ (D(x) \wedge \forall y(K(y) \rightarrow F(x,y)))$
or $\exists x \forall y\ (D(x) \wedge (K(y) \rightarrow F(x,y)))$
$\forall y(K(y) \rightarrow \exists x\ (D(x) \wedge F(y,x)))$
or $\forall y \exists x(K(y) \rightarrow (D(x) \wedge F(y,x)))$

(17) *Somebody searched for the Holy Grail*
$\exists x\ (P(x) \wedge S(x,h))$

(18) *Every dragon did not like spinach*

$\forall x\ (D(x) \rightarrow \neg L(x,s))$

$\neg\forall x\ (D(x) \rightarrow L(x,s))$

(19) *Every dragon who did not like spinach feared Lancelot*

$\forall x\ ((D(x) \wedge \neg L(x,l)) \rightarrow F(x,l))$

I would accept $\forall x\ ((D(x) \rightarrow \neg L(x,l)) \rightarrow F(x,l))$

(20) *Not every one searched for the Holy Grail*

$\neg\forall x\ (P(x) \rightarrow S(x,h))$

(21) *No dragon searched for Lancelot*

$\neg\exists x\ (D(x) \wedge S(x,l))$

Some Advantages in Translating to Predicate Logic

- Explicit representation of scope ambiguity

  (22) *Everyone doesn't love semantics*

  a. *It is not the case that all people love semantics*:
  $\neg\forall x$ (L(x,s))

  b. *All people have the property of not loving semantics*:
  $\forall x(\neg L(x,s))$

- But the big advantage is in reasoning with the real world **denotational semantic analysis**

Situations

Situations

Here we look at the meanings of situations described by sentences: in particular how we can talk about time and belief.

- How are situations classified?
- How does this classification affect the way we can talk about these situations?
- How are different types of verbs lexically biased towards describing situation types?

Stative or Dynamic

- Differences in states

  (23) *The museum is open.*
  (24) *The museum opens at nine.*
  (25) *The fruit is ripe.*
  (26) *The fruit is ripening.*

- A situation can be
  - **Static**: stable for its duration
  - **Dynamic**: change over time
  - Which of the above are stative and which dynamic?

Semantics motivates Syntax

- There is typically a correlation between states and adjectives, and between verbs and dynamic situations.

  (27) *I am writing a paper.*
  (28) *The paper is hard to read.*
  (29) *Kim poured water into the glass.*
  (30) *The glass is full.*

- There are exceptions

  (31) *Be brave!*
  (32) *Sandy is being foolish.*
  (33) *She knows what semantics is.*
  (34) *He loves cats.*
  (35) *The cat has green eyes.*

Different Verb Classes

- Verbs differ in whether they are stative or dynamic.

  (36) *John knows how to drive.*
  (37) *John learned how to drive.*

- **Stative**
  - Steady situation, relatively unchanging
  - no reference to an explicit start or endpoint

- **Dynamic**
  - Situations that have internal phases

Properties of Stative Verbs/Adjectives

- Usually incompatible with progressive aspect

  (38) *John is learning German.*
  (39) **John is knowing German.*

- Usually strange with imperatives

  (40) *Learn German!*
  (41) *? Know German!*

- Exceptions: ***remain, have, …***

Dynamic Verbs

- **Durative** vs. **Punctual**
  - whether situation described by verb lasts for a period of time or not

    (42) *John blinked.* (punctual)

    (43) *John slept.* (durative)

- **Telic/Bounded/Resultative** vs. **Atelic/Unbounded**
  - whether situation described by verb has a natural point of completion

    (44) *John built a raft.* (telic)

    (45) *John gazed at the clouds.* (atelic)

    If you interrupt a telic process, then it may not finish.
  - Typically test with *in/for 10 minutes*: telic/atelic

Depends on the whole sentence

(46) *John was swimming.* (atelic)

(47) *John was swimming in the biathlon.* (telic)

- There is a derivational process to turn atelic into telic verbs in some languages.
  - German: *essen* “eat” → *aufessen* “finish eating”
- It can also be done with an auxiliary
  - Japanese: *kaku* “write” → *kaki-oeru* “finish writing”
- It can also be done with a particle
  - English: *eat* → *eat up*

Punctual verbs

- **Punctual verbs** (Semelfactive) describe events that occur for a brief moment

- They can get an **iterative** interpretation if the duration is prolonged

  (48) *John coughed.*
  (49) *John coughed all night.*
  (50) *The traffic lights flashed.*
  (51) *The traffic lights flashed the entire time.*

Situation Types

Situations	Stative	Durative	Telic	Examples
State	+	+		***desire, know***
Activity	–	+	–	***run, drive a car***
Accomplishment	–	+	+	***bake, walk to school, build***
Punctual	–	–	–	***knock, flash***
Achievement	–	–	+	***win, start***

(52) *Kim desires more cowbell*

(53) *Sandy drives to school*

(54) *Hiromi compiled a lexicon*

(55) *Bobby tapped on the window*

(56) *Alex lost the race*

Tense

Tense, Aspect and Modality

- We need to distinguish grammatical expression from meaning
  - Tense vs Time
  - Grammatical Aspect vs Semantic Aspect
  - Mood vs Modality
  - Surface Case vs Deep Case
- The relation between them is refered to as
  - linking; syntax-semantics interface; grammar

How Universal is Tense?

- Grammatical tense is different from semantic time
- English has `past/non-past`
- Latin marks `past/present/future`
- Chibemba (Bantu) has **metrical tense**
  - Remote Past ($<$ yesterday)
  - Removed Past (yesterday)
  - Near Past (today)
  - Immediate Past (past few hours)
  - Immediate Future (next few hours)
  - Near Future (today)
  - Removed Future (tomorrow)
  - Remote Future ($>$ tomorrow)

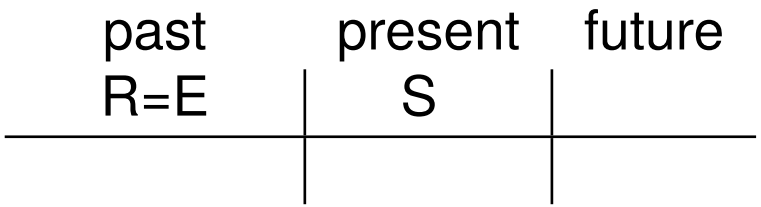
Tense and Time

- Locate a situation to with respect to a point in time
  - S = speech point
  - R = reference time
  - E = event time

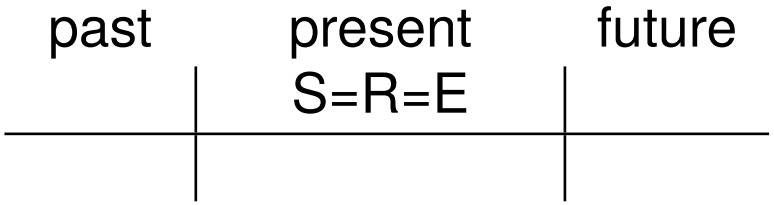
- Hans Reichenbach (1947)

Simple Tense

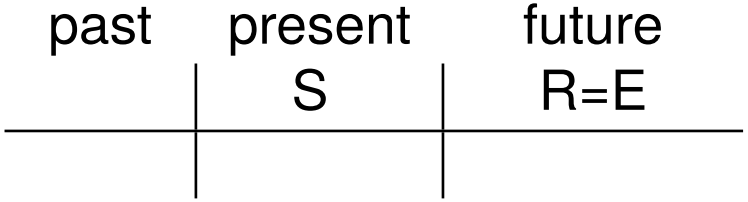
- Past ($R = E < S$) *saw*



- Present ($R = S = E$) *see*

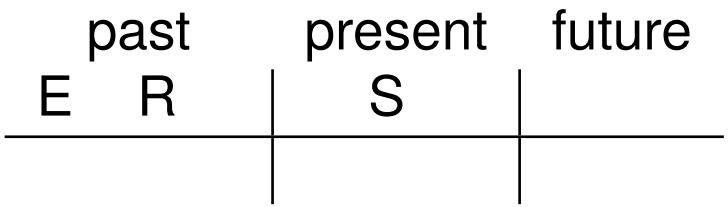


- Future ($S < R = E$) *will see*



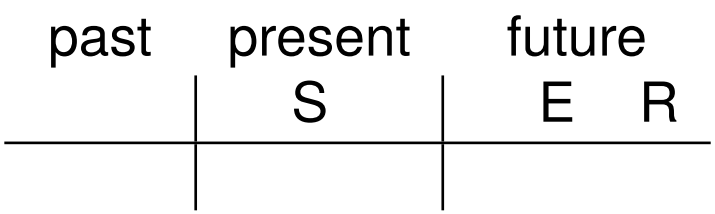
Complex Tense

- Past Perfect ($E < R < S$) *had seen*



By 1939 my Father had seen many arrests

- Future Perfect ($S < E < R$) *will have seen*



By 2039 my son will have seen many things

Aspect in English

- Finer grained talking about time!
- **Progressive** is used for ongoing processes (unfinished)
  - **Past Progressive** *I was building the building*
  - **Present Progressive** *I am building the building*
  - **Future Progressive** *I will be building the building*
- **Perfect** compares the time to the reference point
  - **Past Perfect** *I had built the building* ($E < R < S$)
  - **Present Perfect** *I have built the building* ($E < R = S$)
  - **Future Perfect** *I will have built the building* ($S < E < R$)

Aspect more generally

- **Perfective** focuses on the end point
  - **Completive** *I built the building*
  - **Experiential** *I have built the building*
- **Imperfective**
  - **Progressive** *I was listening/I am listening*
  - **Habitual** *I listen to the Goon Show*
- Different languages grammaticalize different things

Mood

Mood and Modality

- Modality expresses varying degrees of the speaker's commitment and belief

(57) *She has left by now.*
(58) *She must have left by now.*
(59) *She could have left by now.*
(60) *She needn't have left by now.*
(61) *She couldn't have left by now.*
(62) *She has to leave by now.*
(63) *She must leave by now.*
(64) *She can leave now.*

Other means of expression

- Explicit External Verb

  (65) *I know that* S

  (66) *I believe that* S

- Adverb or Adjective

  (67) *It is certain that* S

  (68) *It is likely that* S

  (69) *I will probably* S

  (70) *I will definitely* S

Knowledge vs Obligation

- **Epistemic modality**: Speaker signals degree of knowledge.

  (71) *You can drive this car* (You are able to)

- **Deontic modality**: Speaker signals his/her attitude to social factors of obligation and permission.
  - **Permission**

    (72) *You can drive this car* (You have permission to)

    (73) *You may drive this car*
  - **Obligation**

    (74) *You must drive this car* (You have an obligation to)

    (75) *You ought to drive this car*

Possible Worlds

- We can analyze these in terms of **possible worlds**
- We mark how close a hypothetical case is to reality:

  (76) *It must be/might be/is/can't be hot outside*

- Similarly for **conditionals** (condition/consequence)

  (77) *If it is Singapore, it will be hot outside*
  (78) *If it were Singapore, it would be hot outside*
  (79) *If you should go to Singapore, take some cool clothes*

Real vs Hypothetical

- **Realis** is used for things that occur
- **Irrealis** is used for things that are not claimed to occur (hypotheticals, negation, future)
- English doesn't mark this normally

  (80) *If I were to go* (subjunctive)

- What about Singlish? ???

  (81) *I got go.*
  (82) *I sure confirm go.*
  (83) *I maybe go.*

Mood more Generally

- Grammatical Inflection used to mark modality is called **mood**
  - **indicative** expresses factual statements
  - **conditional** expresses events dependent on a condition
  - **imperative** expresses commands
  - **injunctive** expresses pleading, insistence, imploring
  - **optative** expresses hopes, wishes or commands
  - **potential** expresses something likely to happen
  - **subjunctive** expresses hypothetical events; opinions or emotions
  - **interrogative** expresses questions

- English only really marks imperative and subjunctive morphologically on ***be***

  (84) *Be good!*

  (85) *If I were a rich man*

Evidentiality

Evidentiality

- Some languages must show you gained the evidence
  - **nonvisual sensory**: speaker felt the sensation
    - */pʰa·békʰ-ink'e/* "burned, I felt it"
  - **inferential**: speaker saw circumstantial evidence
    - */pʰa·bék-ine/* "must have burned"
  - **hearsay (reportative)**: speaker is reporting what was told
    - */pʰa·békʰ-·le/* "burned, they say"
  - **direct knowledge**: speaker has direct evidence, probably visual
    - */pʰa·bék-a/* "burned, I saw it"

Evidentiality in English

We can, and often do, mark evidentiality in English, although it is not strongly grammaticalized.

(86) *Bob is hungry.*

(87) *Bob looks hungry.*

(88) *Bob seems hungry.*

(89) *Bob is apparently hungry.*

(90) *Bob would be hungry by now.*

(91) *Look at those clouds! It's going to rain!*

(92) *Look at those clouds! # It will rain!.*

Summary of Situations

- Verb/Situation Types
  - Stative
  - Dynamic
    - Punctual
    - Durative
      - Telic/Resultative
      - Atelic
- Tense/Aspect and Time: R, S and E
- Modality
  - Epistemic
  - Deontic: Permission, Obligation
- Evidentiality

ObJoke

- PAST, PRESENT, and FUTURE walked into a bar. It was **tense**.
- Luckily, auxiliary ***have*** got a booth with a past participle. It was **perfect**.

Acknowledgments and References

- *Anne Elk's Theory on Brontosauruses* is a sketch from the thirty-first Monty Python's Flying Circus episode, *The All-England Summarize Proust Competition*.

- Why we do active learning "Active learning is an approach to instruction that involves actively engaging students with the course material through discussions, problem solving, case studies, role plays and other methods.":
  https://www.pnas.org/content/early/2019/09/03/1821936116
  You learn better (even though it may not feel that way)