Variable costs

Lecture 1: Variables and how they vary

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`http://dkcosts.kvf.me`

Introduction

The variable costs that variable expressions impose on the context.

Who we are David (dib@utexas.edu)

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Who you are Hopefully you have some experience of graduate level formal semantics, but some logic and philosophy of language, and exposure to linguistic methodology may suffice.

The point To introduce research problems centering on the formal semantics and pragmatics of variables.

Goals

- Variables are ubiquitous in semantics, but introduced piecemeal into the analysis of various constructions. We study variables as a topic in its own right.

- What diagnostic methods can be used for identifying variables, what properties do variables have, and to what extent are those properties uniform?

- We focus on variable costs: the extent to which expressions with unbound variables constrain contexts of interpretation.

Plan

Monday Introduction to the problem of variable costs; classic cases of context dependency.

Tuesday Beyond binding.

Wednesday Big ideas in the theory of variables and contextual resolution.

Thursday Presupposition, accommodation, and the strong contextual felicity requirement.

Friday Conclusions for the taxonomy and theory of variables and for meta-semantics.

Introducing
the puzzle of variable costs

Accommodating values for variables

- Many expressions depend for their interpretation on context — they have presuppositions.

- When presuppositional requirements are not common ground, hearers may accommodate.

- In modern semantic theory, many types of expressions are analyzed using a restricted variable that must be filled in by context.

- However, sometimes accommodating information needed to give values to variables is difficult, and the difficulty of accommodating, i.e. the cost, varies dramatically across constructions and contexts.

Partee's marbles

Partee (p.c. to Heim 1982):

(1) a. I dropped ten marbles and found all of them, except
         for one. It is probably under the sofa.

     b. ?I dropped ten marbles and found only nine of them.
         It is probably under the sofa.

$\Rightarrow$ The difficulty of processing pronouns without clearly
identified or mentioned referents has been noted for a long
time.

What hasn't always been clear is that different variable expressions place different constraints on context:

(2)   It was a great party. Everyone (*of them) had a great time.

Generalizing costly accommodation

You're holding a bag of avocados, you've just started talking to someone randomly in a café, and they say:

(3) a. # She/The woman has an awesome guacamole recipe, so you should ask her for it.

b. There's this woman I know and she/the woman has an awesome guacamole recipe, so you should ask her for it.

(4) a. The woman who's serving drinks at the bar next door has an awesome guacamole recipe, so you should ask her for it.

b. # The other woman who's serving drinks at the bar next door has an awesome guacamole recipe, so you should ask her for it.

(5) a. # If you want to know what to do with those avocados, I have an awesome guacamole recipe too.

b. If you want to know what to do with those avocados, I know someone with an awesome guacamole recipe, and I have an awesome guacamole recipe too.

Again, imagine someone you've just started talking to randomly in a café saying:

(6) a.   What are you doing later?

     b.   # What are you doing beforehand?

     c.   I know you'll be doing something later, but what are you doing beforehand?

Cheap accommodation

Same stranger in a café context:

(7) a. Sorry I have to go, I have to get my sister from the airport.

 b. I live a long way from here, and work in a local bar. *(ambiguous)*

 c. If you need tickets to any shows, just go to the pub next door, and ask the tall woman behind the bar.

Where do we use variables?

Where do we use variables?

Pronouns and their ilk

Third Person Personal Pronouns

Paradigmatic expressions for binding:

(8)   All students love their professors

High cost in neutral / out of the blue contexts:

(9)   Hi, my name is David. I'm in Latvia with (?them / some people).

But sometimes we can accommodate a referent for a pronoun:

(10)   "Number 2, never let 'em know your next move
        Don't you know Bad Boys move in silence and violence?
        Take it from your highness
        I done squeezed mad clips at these cats for their bricks
        and chips" *(Ten Crack Commandments, The Notorious
        B.I.G.)*

(11) "Is He A Cheater? 10 Unmistakable Signs He Is Cheating On You!"

https://www.vixendaily.com/love/signs-he-is-cheating/

Note also costs for accommodating duality of dual pronouns:

(12) a.   Kai cooked two dishes, and I like both/neither.

      b.   *Kai cooked some food, and I liked both/neither.

Participant Pronouns

Logic of using variables is based on variability in reference:

(13) Kai: My name is Kai.

   David: #No it's not: my name is David.

Hard to construct contexts that don't provide an inferable speaker and addressee, so it's hard to talk about the costs imposed on context.

(14)   Click Here if You Want to Know Who I Am.
       (de Saint-Georges, 1998)

At least some uses of 1st person plurals seem to impose costs:

(15) (David sitting alone at a table, Kai arrives.)
      Kai: Do you have a light?
      David: #We don't smoke!

Limited binding behavior in English, but 2nd person can function generically. These multiple-pro constructions seem to require the use of variables and a binder.

(16) a. You get what you pay for.
    (= Generically when X pays for Y, X gets no better than Y)

   b. You are what you eat.

   c. You can't take it with you when you die.

   d. You reap what you sow.

   e. You win some, you lose some.

This implicitly quantified multiple-pro proverb structure is parallel to:

(17)   The bigger they are, the harder they fall

Sometimes participant pronouns have shifty meanings, e.g. Zazaki (Iranian, eastern Turkey) (Anand and Nevins, 2004):

(18) *Hɛseni va   kɛ   ɛz dɛwletia*
      Hesen said that I   rich.be.PRES

      'Hesen said that I am rich.' / 'Hesen$_i$ said that he$_i$ is rich.'

Deictic Pronouns

Binding:

(19) a. When I have found some magic beans, these/those are what I will plant

    b. If I have a class to teach, this/that is what I will be thinking about.

Cost:

(20) a. Kai: David, why are you hopping around?

    b. David: Something/#this/#that is in my shoe.

Reflexives

We normally think of reflexives as requiring local government, but the governor doesn't need to be overt. They are prima facie bindable (c), but also analyzed as valence reducers.

(21) a. Give yourself a pat on the back!

      b. (Kai sees David with a huge box of chocolates)
          David: It's not just for myself! *(Felicitous?)*

      c. Every woman helped herself.

Reciprocal Pronouns and Relational Adjectives

Like reflexives, reciprocal "each other" must be governed, ◇ covertly.

(22) a. All the children like each other / one another.

b. Help each other!

c. Who should you love? Each other!

d. When a group of people are trapped in a tough situation, helping each other is the only option.

Relational adjectives are more flexible:

(22) e.   All the children like the same / different teachers.

f.   If one of us gives a class on some topic, the other will give a class on a different topic.

"Else" (like pro) prefers non-government by its antecedent.
This is probably a pragmatic preference.

(23) a. Mary likes John, and Jane likes somebody else.
     (prefer: $\neq$John)

   b. When shaving this morning, Kai suddenly saw
      somebody else in the mirror. *($\neq$Kai?)*

   c. Hi, welcome to the hotel. Somebody else will assist
      you in a moment. *($\neq$speaker)*

   d. (Phone rings) She's with somebody else!

Rest stop

What we covered today:

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Lecture 1 Takeaways

- Variables offer a path to a unified analysis of context dependency, but not all variables are the same.
- We introduced variable costs, variation in the constraints variables place on context.
- We began a whirlwind tour of constructions that might have free variables.
- Tomorrow we move on to cases lacking the core property of quantificational bindability, and pose the question: why?

Tomorrow's smorgasbord:
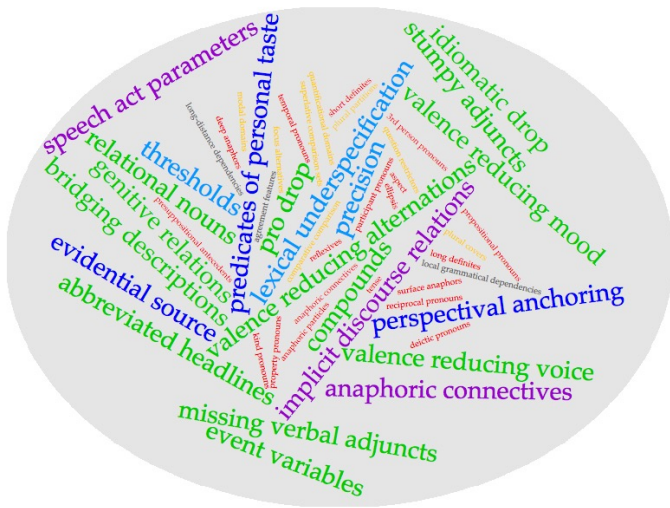
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References

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Variable costs

Lecture 2: Variables: pushing the limits

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The story so far

- Variables offer a path to a unified analysis of context dependency, but not all variables are the same.

- We introduced variable costs, variation in the constraints variables place on context.

- We began a whirlwind tour of constructions that might have free variables, focusing on personal pronouns.

Beyond Personal Pronouns

Deep and Surface Anaphors

From Hankamer and Sag (1976):

(1) a. (Hankamer attempts to stuff 9-inch ball through 6-inch hoop)

   Sag: #It's not clear that you'll be able to $\emptyset$.

   (VPE)

   b. (Same context)

   Sag: It's not clear that you'll be able to do it.

   (Predicate anaphora)

(2) a. (Sag produces a cleaver and prepares to hack off his left hand)
Hankamer: #Don't be alarmed, ladies and gentlemen, we've rehearsed this act several times, and he never actually does $\emptyset$.

b. (Same context)
Hankamer: He never actually does it.

Presuppositional Antecedents In General

Parallelism between pronominal anaphora resolution and presupposition satisfaction suggests presuppositions might be treated as variable-like (Van der Sandt, 1992):

(3) a. Mary used to smoke and she stopped.

 b. Whenever a woman smokes, she eventually stops.

 c. If Mary used to smoke, then she stopped.

 d. Mary might smoke. She would eventually stop.

Temporal Pronouns

(4)   a.   Mary left at three, and probably Fred left
then/after/before/sooner/earlier/later, 5 minutes
later/etc.

        b.   Mary was here for three hours, and Fred was here
*while / *during / *until.

        c.   (Phone rings, you answer)
Hi, what will you be doing ?then / at 3pm?

(4) d. Whenever we go to a movie, we go for a drink afterwards.

"Ago" lacks anaphoric and bound readings, and seems to be restricted to picking out a time relative to the utterance time (a "pure indexical" Schlenker 2003):

(5)   a.   I got here five minutes ago.

      b.   When Hadrian built the wall, Caesar had landed in Britain over 60 years earlier / before / ?ago.

Tense

For tense, the Reichenbachian reference time acts like a
variable, again with behavior parallel to pronouns:

(6) a. Kai arrived at 10pm. He was tired.

    b. Whenever a T.Rex chased a hadrosaur, it caught it.

The reference time is often readily accommodable:

(7) "Pocahontas is remembered as the Native American Powhatan princess who saved the life of Englishman John Smith, married John Rolfe and fostered peace between English settlers and Native Americans."

(https://www.ancient-origins.net/history-famous-people/

true-story-pocahontas-not-told-disney-002285)

Lexical and Grammatical Aspect

(8) Kai: What have you done since I last saw you?

    David: I have written a book!

Implies the writing process took place within the time between
the last meeting and now, but tense only accounts for the
restriction to being before utterance time.

The problem is that perfects are supposed to pick out post-states of actions.

(9)   Most days this week she has written 10 or more pages of her dissertation.

(The same inference is obtained with "wrote", but is less surprising.)

Set variables

Quantificational Domain Restrictors

The restrictor of a quantificational determiner gets deictic, discourse anaphoric and bound readings:

(10) a. Can everybody hear me?

b. Yesterday I met a group of students. Most were working hard.

c. Whenever I met a group of students, most were working hard.

The restrictor of an adverbial quantifier also gets deictic, discourse anaphoric and bound readings:

(11) a. For better or worse, students usually take fewer courses in the second week.

   b. There are a lot of rooms available near the Riga city center. Usually/mostly they have an en suite bathroom.

   c. If you stay in a hotel in Riga, usually you get breakfast.

Modal Domain Restrictions

(You know the drill!)

(12) a. (Seeing Kai striding through Riga) He must have
           just had his morning coffee.

      b. Perhaps Mary will take Chemistry 101. She ought
          to pass.

      c. Mary might go to college or might travel round the
          world. In each case / either way she ought to be
          happy.

Focus Alternatives

Discourse anaphoric:

(13)   a.   It looks like you've only been drinking

      b.   Which of the instructors is a professor at MIT?

          (Only) $[Kai]_F$ is a professor at MIT.

Contextually inferred:

(14)   Only $[students]_F$ students were in the room.

      ($\nLeftrightarrow$ no furniture etc.)

(Note: focal alternatives can have free variables, but true quantificationally bound readings don't seem to occur.)
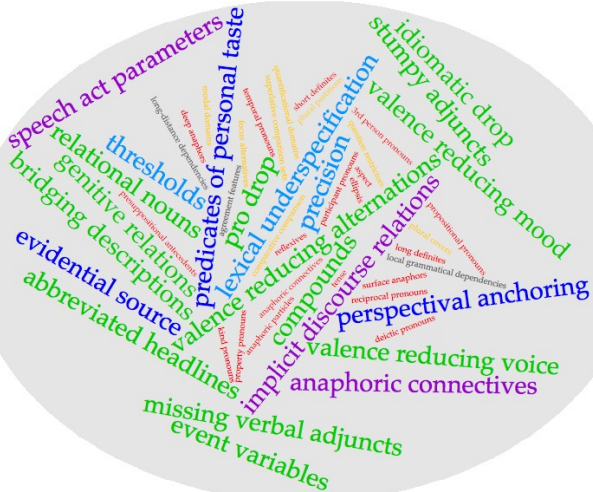
Question Restrictors

(15) a. When you met my students yesterday, which student impressed you most?

b. I'm in Riga. Where can I go for a decent espresso?

c. For every city in the Baltic, please tell me where I can go for a decent espresso.

Plural Partitions And Covers

(16)   a.   At most seven students wrote nine papers about five different topics.

        b.   *True iff: ∃ group of at most 7 students A, set of 9 papers P, set of 5 topics T, s.t. ∃ partitions on S, P, and T where: each student was in a subgroup of A that wrote something in P,*
each paper was written by a subgroup of S,
each paper was about a subset of T, and

             each topic was a subject of one or more member of P.

Comparative And Superlative Comparison Sets

(17) a. Mary is taller / the tallest.

      b. Out of the students in the class, Mary is the tallest.

      c. In each cohort of students, the tallest student is
          one of the oldest.

speech act parameters
relational nouns
thresholds
genitive relations
bridging descriptions
predicates of personal taste
evidential source
abbreviated headlines
pro drop
lexical underspecification
valence reducing alternations
precision
compounds
implicit discourse relations
perspectival anchoring
idiomatic drop
stumpy adjuncts
valence reducing mood
valence reducing voice
anaphoric connectives
missing verbal adjuncts
event variables

long-distance dependencies
deep anaphora
agreement features
modal subordination
temporal anaphora
short definites
3rd person pronouns
presuppositional anteceability
sluicing
presuppositions
prepositional pronouns
long definites
local grammatical dependencies
reflexives
anaphoric connectives
anaphoric particles
surface anaphors
reciprocal pronouns
property concepts
pronominal point
deictic pronouns

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Valence reduction

Pro Drop

- Generally missing subjects/objects have a similar range of interpretations to 3rd and participant pronouns.

- One difference: 3rd person null pronouns have a greater tendency to be highly salient than overt pronouns.

Pro-drop is the norm in many languages (e.g. Spanish, Korean), but note that colloquial English often drops arguments in addition to other material:

(18)   a.   Feeling ok?

       b.   Eaten?

       c.   Push!

       d.   On my way!

       e.   Bake for 15 minutes!

But note this use in Korean (Han, 2006):

(19) ∅   *san-ey*   *ka-eya*   ∅   *holangi-lul*
      (SBJ)   mountain-to   go-only-if   (SBJ)   tiger-Acc

         cap-ci
         catch-PresDec

      'Only if (one) goes to the mountains (one) catches a
      tiger.'

Abbreviated Newspaper Headlines

(20) a. "∅ Points, ∅ shoots, ∅ scores" *(Fortune Magazine, Nov 15, 2004)*

b. "∅ Hurt in car crash: Eight girls aged between 11 and 16 have been injured in a collision with a car near a Liverpool school"
(*The Daily Mail, 17 February, 2016*, from Hakobyan 2016)

Similar to diary style argument drop:

(21) $\emptyset$ Taught class. $\emptyset$ Went badly. Class ended before $\emptyset$ finished.

Idiomatic Drop

(22) a. Like father, like son.

      b. Waste not, want not.

      c. Better late than never.

      d. Once bitten, twice shy.

      e. Easy come, easy go.

      f. Waste not want not.

Valence Reducing Mood

Imperatives typically lack an argument, but sometimes have something like bound readings.

(23) a. Follow me!

b. Everyone, if you don't have a ticket, join this queue!

Valence Reducing Voice

(24) a. Mistakes were made. (*passive*)

b. The knife cuts well. (*middle*)

Valence reduction also occurs with antipassivization and object incorporation (Chuj, from Coon 2016):

(25) a.   *Ix-ko-xik   te' k'atzitz*
               PFV-A1P-chop CLF wood

               'We chopped the wood.'

    b.   *Ix-onh-xik-w-i   k'atzitz*
               PFV-B1P-chop-AG-IV wood

               'We wood-chopped'

Valence Reducing Alternations

(26) a. David broke the laptop.

       b. The laptop broke.

(27) a. David ruined the laptop.

       b. * The laptop ruined.

(28) a. Kai loaded the phone with apps.

   b. Kai loaded the apps (onto the phone).

   c. The apps loaded.

   d. ? The hay loaded.

Missing Verbal Adjuncts

(29)   Brutus (brutally) stabbed Caesar (in the back) (with a
       knife) (at noon) (on the 14th of March) (2063 years ago)
       (in the forum) (with considerable dexterity) (surrounded
       by other senators).

Such data motivated Davidson (1967) to introduce event
variables to encode verb-adjunct dependencies.
Standardly event variables are existentially closed during
composition.

Relational variables

Relational Nouns

(30) a.   A ship docked. The captain came ashore.

      b.   Less than three ships were in port because the captain was ashore.

(31) At a typical US school, a majority of parents are heavily involved.
(Not e.g. parents of teachers / janitors, or parents of non-school-students who are teachers / janitors)

Genitive Relations

Arbitrary semantic relations can be expressed by Saxon genitives, of-phrases, and genitive cases, not just possession:

(32) a. The Russian genitive of negation involves no possession. *(And neither does this "of")*

b. Tuesday's class is mine. Whose is Wednesday's?

c. Every child was asked to describe a different painting. Mary's painting was the Mona Lisa.

Similar variability is found in the interpretation of "have":

(33)   Every child was asked to describe a different painting.
       Mary had the Mona Lisa.

Stumpy Adjuncts

When clauses are modified by free adjuncts the semantic
relation between them must be inferred (Stump, 1985):

(34) a. Having no shame, David gave the class shirtless.
          (Shamelessness caused shirtlessness)

      b. Showing no shame, David gave the class shirtless.
          (Shamelessness accompanied shirtlessness)

(34) c. Demonstrating a lack of good sense, David gave the class shirtless.

(Shirtlessness evidences lack of sense)

d. Smart as you are, you see what we mean.

(Smartness causes understanding)

Bridging Descriptions

(35) a. Kai gave a talk. The slides were exemplary.

       b. Whenever Kai gives a talk, the slides are exemplary.

- Clark and Haviland (1977) provide explicit measures for the processing cost of bridging descriptions.
- In reading-time decision tasks, it took $\approx$ 150ms extra to process bridging descriptions.

(A Bridge Too Far?)

The bridging relation must be identifiable:

(36)   Kai tried to prep for class, but the music / #chicken was too loud.

Compound Meanings

(37) a. A car box is very useful (if you need somewhere to
          store your car / somewhere to store things in your
          car / a box that you can drive / a box made of car
          parts / a box in the shape of a car / a box that
          transforms into a car).

      b. Every seat had a drink in front of it. The apple juice
          seat was the least coveted one.

Words

Precision / Granularity

(38) a. I know where my mother is (to within 50 miles).

b. I know that my mother is in England. (But of course, I can't be absolutely sure.)

c. It weighs 150kg (or 148kg to be precise (or 148.35kg to be even more precise)).

d. The kids are the same height (more or less).

e. It's red (or, more precisely, crimson).

Thresholds

(39) a. "Which NBA player was short but very successful?"

…

"Allen Iverson. He is 6 feet tall (1.83 metres).

Which is very short by basketball standards."

(https://www.quora.com/Which-NBA-player-was-short-but-very-successful)

b. Fred is tall.

c. All Fred's children are tall.

d. Many Latvian children play chess.

Lexical Underspecification and Ignorance

"Consider for example the proceedings that we call 'games'. I mean board-games, card-games, ball-games, Olympic games, and so on. What is common to them all? –Don't say: 'There must be something common, or they would not be called 'games' '–but look and see whether there is anything common to all. –For if you look at them you will not see something that is common to all, but similarities, relationships, and a whole series of them at that." (Wittgenstein 1953, #66)

Perspective

Predicate of Personal Taste

(41) a. Most Italians think a cheeseburger is tasty (to an American).

b. If you haven't eaten all day, a cheeseburger is tasty! *(ambiguous)*

Perspectival Anchoring

(42) a. Will you come/go to the meeting?

       b. Rightwingers think the commie bastards are out to take their guns!

(42) c. "Far out on the grassy knoll of sexology, there is a cult of prochastity researchers who claim that the late Alfred Kinsey was a secret sex criminal, a Hoosier Dr. Mengele, who bent his numbers toward the bisexual and the bizarre in a grand conspiracy to queer the nation and usher in an era of free sex with kids." (Quoted in Harris and Potts 2009)

Japanese *yaru* ('give') conveys similar empathy for agent and recipient, but *kareru* conveys empathy for recipient above agent. In (43), from Oshima (2016), there's ambiguity as to whether speaker empathizes with Yumi OR speaker presents Ken as doing so.

(43) *Ken-wa Mari-ga Yumi-o tetsudatte kureta to*
      K.-Th   M.-Nom   Y.-Acc help.Ger   yaru.Prs Comp

      omotte   iru.
      believe.Ger Npfv.Prs

      'Ken believes that Mari gave Yumi a hand.'

Evidential Source

Evidential source can be marked, but may not be, so then the exact source could be represented as a variable. E.g. Turkish (Aksu-Koç et al., 2009):

(44) a. Pencere kırıl-mış
    (Through seeing pieces of glass, I infer that) The window is broken.

 b. Pencere kırıl-ıyor-muş
    (I am told that) The window is/was being broken.

Rhetorical

Anaphoric Connectives

(45) a. Kai is at MIT. However, he's not there now.

b. Kai is at MIT. So he likes coffee.

Implicit Discourse Relations

Implicit relations get filled in at a discourse level:

(46) a. Kai likes coffee. David likes tea. *(parallel)*

      b. Does Kai like coffee? Kai is at MIT. He likes coffee.
         (explanation)

      c. Kai drank his coffee. He left for work. *(narration)*

Is there an argument for making e.g. Stumpy adjunct relations
but not discourse relations into LF variables?

Speech Act Parameters and Indexicality

(47) a. I promise (you) that I will leave.

   b. I will leave (and that's a promise).

   c. (I suggest you) Help yourself to coffee!

   d. (I order you to) Clean up afterwards!

(48) a. *A: So this guy Trump, right, so,   uh, yeah,*
          B: uhuh   yeah   no   yeah

      b. *A: uh, what do you reckon?*
          B: Yeah,

      c. *A: no,   right?*
          B: well no, uh, not my cup a tea!

Adjacency pairs, backchannels & overlaps are indexical (Clark, 2004):

(49) B: I don't know, whatever you reckon cos I'm picking them up about gone eleven or something.

    A: Right.

    B: It's not like halfway through+

    A: Wicked.

    B: +the evening.

    A: Uh huh.

(49)   B: So maybe I could pick you up from work and+
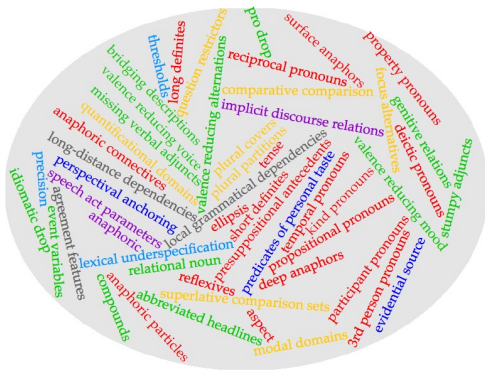   A: Cool. Yeah.
       B: +go for some tea.
       C: Ace. That would be really cool.
       B: Ah yeah.

(49) A: I'm defi– Yeah that's fine for me.

B: Oh that's good then.

A: Oh excellent.

B: I–I'm going to put that in, in pen now.

A: Wicked.   *(corpus transcript from McCarthy 2003)*

Rest stop

What we've covered:

Takeaways

- We began to look more systematically at deictic, quantificationally bound, and discourse anaphoric readings.
- In some cases, quantificationally bound readings seem to be missing, or else it's not obvious what they would even amount to.
- We saw one case ("ago", like "I") of a *pure indexical* where only a subset of deictic readings are possible.
- One possibility: these differences might be explained using a character/content distinction.

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References

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Variable costs

Lecture 3: Big ideas

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ESSLLI 2019
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Recap

Recap

- Many constructions have meanings that vary with context
- It's tempting to model that with variables
- Several parameters of variation among those cases:
  - variable costs imposed on the context
  - (im)possibility of deictic readings
  - (im)possibility of anaphoric readings
  - (im)possibility of bound readings

3

We would like to have a general framework for analysis and taxonomy.

Today's plan

Big ideas about variables

- A bit of history

- Partee's phenomenology of variables

- The textbook meta-semantics of free variables

- Variable-free semantics and its meta-semantics

- Another kind of variable-free analysis

- Case study: implicit variables

- Prospects for a general framework

A bit of history

The full intellectual history of the variable has yet to be written.

Milestones

Frege in his Begriffsschrift gave the first fully adequate treatment of first order predicate logic. It crucially involved quantifiers binding variables in argument positions of predicates.

Tarski gave a semantics for first order predicate logic. It interprets variables relative to a variable assignment or a sequence of individuals. Quantifiers manipulate the variable assignment.

Open sentences (sentences with free variables) either play only a temporary role or are given a tacitly universal interpretation.

Variables are important and puzzling

Tarski 1941: "the invention of variables constitutes a turning point in the history of mathematics"

Russell 1903: "the variable is a very complicated logical entity, by no means easy to analyze correctly"

Variables continue to be puzzling

- Fine, Kit. 2003. The role of variables. *Journal of Philosophy* 100(12). 605–631. doi:10.5840/jphil20031001214.

- Pickel, Bryan & Brian Rabern. 2016. The antinomy of the variable: A Tarskian resolution. *Journal of Philosophy* 113(3). 137–170. doi:10.5840/jphil201611338.

- Wehmeier, Kai F. 2018. The proper treatment of variables in predicate logic. *Linguistics and Philosophy* 41(2). 209–249. doi:10.1007/s10988-017-9224-9.

Variables in natural language

Quine and Geach pointed out the similarity between variables in formal logic and pronouns in natural language.

In much of early generative grammar, pronouns were treated as proxies for NPs and the idea of treating them as variables was not foremost.

Bach, McCawley, Karttunen, and others argued that at least sometimes pronouns need to be treated as variables.

Montague's UG (1970) proposed treating unbound pronouns as free variables, receiving a value from context. He posited an assignment function as a contextual parameter.

Partee 1973 argued that tense behaves like pronouns and should get a parallel referential/variable treatment.

Cooper's 1975 dissertation proposed domain restriction variables (used both for contextual restrictions and for hooks for adjoined relative clauses)

Cooper's 1979 "The Interpretation of Pronouns" was a classic exposition of a Montague-style analysis of pronouns as variables.

Positing free variables as semantic glue was part of classic analyses of nominal compounds (Dowty 1979, Moortgat 1983), adverbial adjuncts (Stump 1981), genitives (Partee 1984).

Implicit variables are discussed in Partee 1984 (on compositionality) and most importantly in her 1989 CLS paper "Binding implicit variables in quantified contexts".

Positing free variables to be supplied with contextually salient values is now a commonplace device. Our project is to investigate the overall picture.

How to spot variables: Partee's triad

Partee 1973 on tense

- Partee argues that tense should be given a pronominal analysis

- The evidence is that tense mirrors the types of uses that pronouns have

- She distinguishes three uses:
  - deictic or demonstrative
  - discourse anaphoric
  - bound variable

Three uses of pronouns

(1) He shouldn't be in here.

(2) Sam took the car yesterday and Sheila took it today.

(3) Every student spoke to the student in front of him.

Three uses of tenses

(4) I didn't turn off the stove.

(5) Sheila had a party last Friday and Sam got drunk.

(6) When you eat Chinese food, you're always hungry an hour later.

By the book

The textbook semantics for pronouns

Due to Cooper, adopted in Heim & Kratzer:

(7) For any variable assignment g:
$[\![\text{she}_i]\!]^g = g(i)$

This presupposes:

- that *i* is in the domain of *g*
- that $g(i)$ satisfies the semantics of the ϕ-features of the pronoun

NB: no mention of prior context or the like, semantic value simply specified relative to a variable assignment.

The textbook metasemantics

Heim & Kratzer 1988:p.243

(8)   *Appropriateness Condition*
      A context *c* is appropriate for an LF ϕ only if *c determines
      a variable assignment g_c* whose domain includes every
      index which has a free occurrence in ϕ.

(9)   *Truth and Falsity Conditions for Utterances*
      If ϕ is uttered in *c* and *c* is appropriate for ϕ, then the
      utterance of ϕ in *c* is true if $[\![\phi]\!]^{g_c} = 1$ and false if
      $[\![\phi]\!]^{g_c} = 0$.

Predictions

- A free pronoun can only be used in a context that determines an assignment to their index. (deictic and anaphoric uses).
- Variable binders can capture the index of a pronoun (bound uses).

Monstrosity

As often pointed out, this Montagovian treatment of pronouns makes variable binders into monsters, since they manipulate the very same parameter that is used to resolve contextual free variables.

Monstrosity

As often pointed out, this Montagovian treatment of pronouns makes variable binders into monsters, since they manipulate the very same parameter that is used to resolve contextual free variables.

See Del Prete & Zucchi 2018 for discussion and a way to de-monster the approach.

Variables of various types

Recall that our panoply of examples included variables of all kinds of types. How does the textbook deal with that?

(10) A variable is an ordered pair of an index (natural
      number) and a type.

Examples:

$\langle 17, e \rangle$, more commonly known as x_{17}
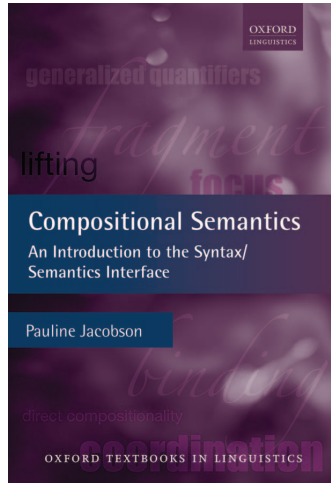
$\langle 76, \langle e, t \rangle \rangle$, sometimes known as C_{76}

…

Variables without variables

- Combinatory Logic: Schönfinkel, Curry, …

- Quine 1960 "Variables explained away"

- many others

- in semantics circles: Jacobson

Jacobson's textbook

an expression with an unbound pronoun within it is a function from individuals to whatever is the type of a parallel expression with no unbound pronoun within it

(11) She left. = $\lambda x : x$ is female. x left

In the variable-free account, the "sentence" is ultimately of category S^{NP} and not S. Its value is not a proposition but a function from individuals to propositions. Here, then, the propositional information is supplied by the listener applying this to some contextually salient individual (rather than a salient assignment).

(In fact, arguably the notion of an individual being contextually salient is somewhat less mysterious than the notion of an assignment being salient.)

Lest it seem odd to conclude that Santa loves his mother *(on the free reading) or a simple sentence like* He left *do not denote propositions but rather functions into propositions, we need merely note that the full value of such expressions is not a proposition in the variable-ful view either. These are assignment-dependent propositions, which is equivalent to saying that they are functions from assignments to propositions. Thus there is no proposition unless some contextually salient assignment is picked.*

NB: when there are multiple free "pronouns" (variables of various kinds), we get an impressively high-type Schönfinkeled multi-argument function, and they need to be fed in the right order (not a notion needed in the variable-ful account).

Jacobson doesn't spell out the meta-semantics formally, but it's roughly clear what is intended. The account is technically feasible but doesn't seem to give a special handle on our problem of giving a taxonomy of "variables".

Still puzzling

(12)   It was a great party. Everyone (*of them) had a great
        time.

Another variable-free approach

A sketch

What follows are ideas that are floating around on the fringes of the field, more common in philosophy. Ideas from Davidson, Burge, Higginbotham, but also von Stechow, and Kratzer, more recently Braun and Kupffer. We'll just sketch the notion in the barest outline.

(13)   An utterance of *I* is only appropriate in a context *c* if *c* uniquely identifies a speaker *S*, in which case $[\![I]\!]^c = S$.

(14) An utterance of *she* is only appropriate in a context *c* if *c* uniquely identifies a salient female *x*, in which case $[\![she]\!]^c = x$.

(15) An utterance of *every* is only appropriate in a context *c*
if *c* uniquely identifies a salient domain *C*, in which case
$[\![every]\!]^c = \lambda P.\lambda Q. \forall x \in P \cap C\colon x \in Q.$

A challenge

Multiple occurrences of the same lexical item in a sentence:

(16)   He doesn't like him very much.

(17)   Every student read every book.

Some natural responses

Contexts are local and constantly updated.

Various possible implementations:

- Centering Theory

- Occurrence semantics

- Dynamic semantics (but without variables????)

Interim remark

There are alternatives to the mainstream use of variables, and especially free variables, all over the place. But none of them obviously give us a better handle on building a taxonomy and explanatory framework.

Next a case study:
Implicit variables

Partee 1989 on implicit variables

- Partee argues that pronominal analyses should be extended to a much broader class of contentful context-dependent items such as *local, enemy, foreigner, arrive, opposite, unfamiliar*.

- The possibility of bound-variable-like dependence of open-class predicates was first brought to Partee's attention by the work of her student Jonathan Mitchell in the early 1980s (see Mitchell 1986's UMass dissertation).

Mitchell's observation

(18)   John visited a *local* bar.

(19)   Every sports fan in the country was at a *local* bar
      watching the playoffs.

Better example

(20)   Last night, David and I ordered a *local* beer.

(21)   Everyone who watched the craft beer documentary
        ordered a *local* beer the next time they were in a bar.

Dowty 1982 on implicit arguments

(22) Bill was nervously biting his nails. Everyone *noticed*.

(23) Every secretary made a mistake in his final draft. The good secretary corrected his mistake. Every other secretary didn't even *notice*.

(24) Every man who shaves off his beard expects his wife to *notice*.

Partee 1984 on enemies

(25) An *enemy* is approaching.

(26) John faced an *enemy*.

(27) Every participant had to confront and defeat an *enemy*.

Existential vs referential

(28)   a.   I've eaten.

        b.   I've noticed.

Fillmore 1986 on *contribute*

(29) a. I contributed five dollars to the movement.

   b. I contributed to the movement.

   c. I contributed five dollars.

   d. I've already contributed.

The need for a systematic survey and taxonomy

Partee 1989: For each context-dependent element, we have to specify three components.

(i) what kinds of context it can anchor to (utterance situation, discourse, sentence-internal binding/local context);

(ii) requirements on the context for the element to be defined, as presuppositions or implicatures (*farther* requires a point of view and a reference location);

(iii) meaning, generally as a function of the elements required
       in (ii), which is presumably why they're required (*farther
       on*: "more distance from the point-of-view lication along
       the point-of-view directional orientation than the reference
   location is")

Follow-up to Partee 1989

Condoravdi, Cleo & Jean Mark Gawron. 1996. The context-dependency of implicit arguments. In Makoto Kanazawa, Christopher Piñón & Henriëtte de Swart (eds.), *Quantifiers, deduction, and context*, 1–32. CSLI Publications.

The main difference

- Partee indexes implicit arguments to contexts.
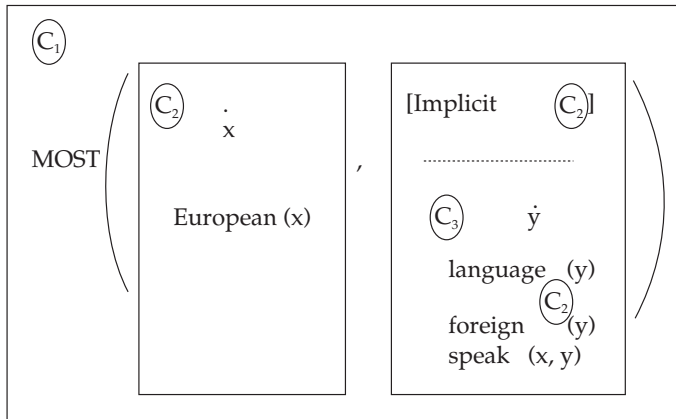- Condoravdi & Gawron treat them as variables.

Partee's *we*

(27) John often comes over for Sunday brunch.
Whenever someone else comes over too,
we (all) end up playing trios.   (Otherwise we play duets.)

(28)
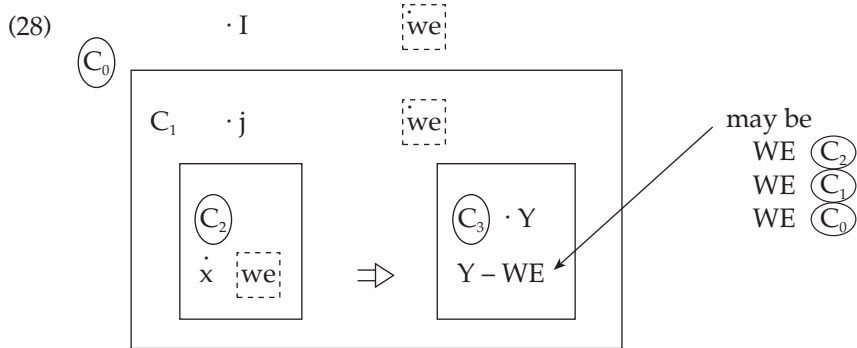
foreign

(29) Most Europeans speak a foreign language.

(30)

C_0

C_1

$$\text{MOST}\left(\begin{array}{c} C_2 \quad \dot{x} \\[1em] \text{European}(x) \end{array}\; , \; \begin{array}{c} [\text{Implicit} \quad C_2] \\[0.5em] \text{·································} \\[0.5em] C_3 \quad \dot{y} \\[0.5em] \text{language}\;(y) \\[0.5em] \text{foreign} \; C_2 \;(y) \\[0.5em] \text{speak}\;(x, y) \end{array}\right)$$

Overt antecedent requirement

Heim:

(30) a.   Every man who has a wife sits next to her.

        b.   *Every married man sits next to her.

Lots of follow-up work (Chierchia, Grosz, …)

(31) a. Every man who bet on the Superbowl won.

 b. Every man who bet on the Superbowl won the bet.

 c. Every man who bet on the Superbowl won it.

Condoravdi & Gawron's comments

if an overt argument is purely anaphoric, then it must have an overt antecedent […] no such requirement exists for an implicit argument

How to formulate a theory that can capture this notion of antecedent-hood remains an open problem and we will not address it here

Rest stop

Takeaways

- There are various ways of implementing "variables", including without variables.

- None of the ways offer a privileged handle on building a general framework for taxonomy.

- Matters of variable costs are often recognized but have not been solved.

Tomorrow

Presupposition, accommodation, and the strong contextual felicity requirement.

Variable costs

Lecture 4: Presupposition, Accommodation, Strong Contextual

Felicity

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ESSLLI 2019

`http://dkcosts.kvf.me`

Plan

- Presupposition & Accommodation background
- SCF
- optional presuppositions and accommodation of too
- difficulty of accommodating speech record
- why variables require salience
- Local effect
- content and character presuppositions
- perspective shift vs binding

Presupposition

Presupposition Projection

(1)   a.   Whoever discovered the elliptic form of the planetary orbits died in misery. (Frege, 1892)

       b.   Somebody died in misery.

       c.   Somebody discovered the elliptic form of the planetary orbits.

       d.   Whoever discovered the elliptic form of the planetary orbits did not die in misery.

(2)   a.   If whoever discovered the elliptic form of the planetary orbits died in misery, he should have kept his mouth shut.

      b.   Perhaps whoever discovered the elliptic form of the planetary orbits died in misery.

      c.   Did whoever discovered the elliptic form of the planetary orbits die in misery?

How presuppositions depend on context

Frege-Strawson Presupposition

ϕ presupposes ψ iff

truth of ψ is a necessary condition for ϕ to have a reference

Trivalent connectives (Weak Kleene)

ϕ and ψ	t	f	$\star$
t	t	f	$\star$
f	f	f	$\star$
$\star$	$\star$	$\star$	$\star$

if ϕ then ψ	t	f	$\star$
t	t	f	$\star$
f	t	t	$\star$
$\star$	$\star$	$\star$	$\star$

ϕ or ψ	t	f	$\star$
t	t	t	$\star$
f	t	f	$\star$
$\star$	$\star$	$\star$	$\star$

ϕ	not ϕ
t	f
f	t
$\star$	$\star$

Dynamic presupposition

- C encodes the conversational record, and presuppositions may depend on what holds in this record.

- C + ϕ means a variant of C with ϕ updated to it's conversational record.

- Assume C entails propositions entailed by its conversational record

- A context C admits a complex sentence ϕ iff when the sentence is uttered in C, the presupposition of every trigger in ϕ is entailed in its local context of evaluation
- ϕ presupposes ψ iff
  ψ is true in all contexts which admit ϕ

Dynamic Example

(3)   If it's raining then Kai knows it's raining

- If (3) is uttered in C, then "Kai knows it's raining" is evaluated in a local context C' = C + "it's raining".

- Clearly C' satisfies the factive presupposition of "Kai knows it's raining'

- Therefore (3) is admitted in any C for which C + "it's raining" is defined, and C need not entail that it's raining.

- Therefore (3) does not presuppose that it's raining.

Presuppositions of pronouns

(4) If a farmer owns a donkey then he beats it

- If (4) is uttered in C, then "he beats it" is evaluated in a local context C' = C + "a farmer owns a donkey".
- C' is a context with a salient farmer and donkey
- Therefore while "He beats it" presupposes salient neuter and masculine discourse referents (4) does not.

Accommodation: Karttunen

"…ordinary conversation does not always proceed in the ideal orderly fashion described …. People do make leaps and short cuts by using sentences whose presuppositions are not satisfied in the conversational context….But …I think we can maintain that a sentence is always taken to be an increment to a context that satisfies its presuppositions. If the current conversational context does not suffice, the listener is entitled and expected to extend it as required. …." (Karttunen, 1974, p. 191)

Accommodation: Stalnaker and Lewis

"Minor revision might bring our debate in line with new presuppositions." (Stalnaker, 1972, p. 398)

…*"[P]resupposition evolves according to a rule of accommodation specifying that any presuppositions that are required by what is said straightway come into existence…."* (Lewis, 1979, p. 347)

Prediction

Presupposition failure should only cause infelicity in cases where the context directly contradicts presuppositions; in a neutral context, accommodation should occur.

Strong Contextual Felicity

Tonhauser et al. (2013):

Strong contextual felicity refers to a particular condition on the felicitous use of a trigger, namely, that it can be used felicitously only if some implication associated with the trigger is established in the utterance context.

Definition

(5) a. *m*-**positive and** *m*-**neutral contexts**: An *m*-positive context is a context which entails *m*. An *m*-neutral context is a context that entails neither *m* nor ¬*m*.

b. **Strong Contextual Felicity constraint**: If utterance of trigger *t* of projective content *m* is felicitous only in an *m*-positive context, then *t* imposes a Strong Contextual Felicity constraint with respect to *m*.

Not just in English — Guaraní data

(6) *Context: The children in a class give presentations about their families. Marko is up first and begins:*

a. *#Ha'e   chokokue.*
    #PRON.S.3 farmer

    #'S/he is a farmer.'

b. *Che-ru   réra Juan. Ha'e   chokokue.*
    B1SG-father name Juan   PRON.S.3 farmer

    'My father's name is Juan. He is a farmer.'

(Tonhauser et al., 2013)

(7) (*Context*) Carla, a mother of three teenage daughters, falls on the
way to the supermarket and breaks her leg. After being in the
hospital for a week, the girls come to visit her. When she asks them
how they are doing, her youngest daughter blurts out:

Ché-**nte**	*a-mo-potĩ*	*ñande-róga!*
pron.S.1sg-only	A1sg-caus-clean	B1pl.incl-house

'Only I clean our house!'

(8) (*Context*) Maria and Sabina are walking across a meadow. They can see something ahead lying in the grass but can't figure out whether it's a rock, a piece of wood, an animal or a person. Maria has much better vision than Sabina and, as they approach, Maria says:

a. **Pe kuimba'e** *o-ke.*
   that man A3-sleep

   'That man is sleeping.'

b. **Ha'e** *peteĩ kuimba'e.*
   pron.S.3 one man

   'He's a man.'

No SCF that the referent of *ha'e* is human and the demonstratum of *pe kuimba'e* 'that man' is a man.

Additive

(9)   (*Context*) Malena is eating her lunch, a hamburger, on
       the bus going into town. A woman who she doesn't know
       sits down next to her and says:

       * *Ñande-chofeur o-karu empanáda* **avei***.*
       A1pl.incl-driver A3-eat empanada too

       # 'Our bus driver is eating empanadas, too.'

Results

Language	Trigger/Content	Projection	Property Contextual Felicity	Local Effect	Class
E	Pronoun/existence of referent	yes	yes	yes	**A**
	too/existence of alternative	yes	yes	yes	
G	*ha'e* '3rd'/existence of referent	yes	yes	yes	
	avei 'too'/existence of alternative	yes	yes	yes	

Language	Trigger/Content	Projection	Property Contextual Felicity	Local Effect	Class
E	Expressive	yes	no	no	**B**
	Appositive	yes	no	no	
	NRRC	yes	no	no	
G	Expressive	yes	no	no	
	Appositive	yes	no	no	
	NRRC	yes	no	no	
	ha'e '3rd'/human referent	yes	no	no	
	Demonstrative NP/property attribution	yes	no	no	

Language	Trigger/Content	Projection	Property Contextual Felicity	Local Effect	Class
E	*almost*/polar implication	yes	no	yes	**C**
	only/prejacent implication	yes	no	yes	
	stop/pre-state holds	yes	no	yes	
	Possessive NP/possessive relation	yes	no	yes	
G	*aimete* 'almost'/polar implication	yes	no	yes	
	(oi)kuaa 'know'/content of complement	yes	no	yes	
	–nte 'only'/prejacent implication	yes	no	yes	
	nda-...-vé-i-ma 'not anymore'/pre-state holds	yes	no	yes	
	Possessive NP/possessive relation	yes	no	yes	

Language	Trigger/Content	Property Projection	Contextual Felicity	Local Effect	Class
E	*too*/salience of established alternative	yes	yes	no	**D**
	Focus/salience of alternatives	yes	yes	no	
	that N/speaker indicates suitable entity	yes	yes	no	
G	*avei* 'too'/salience of established alternative	yes	yes	no	
	Demonstr. NP/speaker indicates suitable entity	yes	yes	no	

Explanations of variability

- Blocking
- Insufficient or unconnected content
- Identifiability of singular proposition
- Availabiity of the discourse record
- Content vs. Character presuppositions

Blocking

Zeevat (2002), drawing on Blutner (2000) and Blutner and Jäger (2003), suggests:

Blutner's Theorem If a presupposition trigger has simple expression alternatives that do not presuppose, the trigger does not accommodate.

- Cashed out in bidirectional OT, where a Do not accommodate constraint favor a non-accommodating alternative utterance.
- Perhaps a use of *she* that would depend on accommodation is blocked when there's a non-presuppositional alternative (*some woman I know*?) that would express the same content.

Example: "too"

(10)   a.   # If you want to know what to do with those avocados, I have an awesome guacamole recipe too.

          b.   If you want to know what to do with those avocados, I know someone with an awesome guacamole recipe, and I have an awesome guacamole recipe ?(too).

          c.   If you want to know what to do with those avocados, I have an awesome guacamole recipe.

Claim: (a) is blocked by (c) because (a) requires accommodation.

Example: "indeed"

(11)   a.   Context: I call, you answer, and after greetings I say:

             (*Indeed,) it's raining right now.

       b.   Latvia has a temperate and wet climate. Indeed, it's raining right now.

Problem with blocking approach

(12)   a.   I've managed to open the door.

         b.   I've opened the door.

Insufficient/disconnected content?

van der Sandt (1992) and van der Sandt and Geurts (1991) suggest that lack of content prevents accommodation:

(13)   She has an awesome guacamole recipe.

⇒ need to accommodate that the speaker is talking about a particular female, but which one? Not enough information?

But then again, how much information is really needed?

(14)   There's this woman I know. She has an awesome
        guacamole recipe.

Perhaps related to the lack of content story is the observation
(Heim's?) that it's ofte easier to accommodate things that are
connected to other referents than things which are
unconnected, "my sister" vs. "the woman".

Some SCF triggers provide plenty of content:

(15)   Jane ate a HAM sandwich.

⇒ need to accommodate that what's at issue is what kind of ham sandwich Jane ate.

The discourse record

- Accommodation fills in information that is consistent with the context.
- The context was agnostic on whether I have a daughter and so that I in fact have a daughter can be accommodated when I presuppose it.

- On the other hand, in an out-of-the-blue context there is no salient female, so accommodating that one is salient would contradict the previous context.
- Similarly, whether it is an issue in the context what kind of sandwich Jane ate is a matter of record.

This seems on the right track.

Stipulation?

Question/worry about discourse record approach:

- Does it make sense to stipulate the dependence on the discourse record in the semantics of SCF expressions?
- Does *she* mean "the female we're talking about/attending to"?
- But maybe distinctions like surface/deep are fundamental, and some sort of stipulation is needed.

Character vs content

- In two dimensional accounts of indexicality (Stalnaker, 1978; Kaplan 1989), meaning is derived in two steps:
- Character → Content → reverence
- Context is used to map character to content, and this then yields a truth value (or whatever) relative to a world of evaluation.

- E.g. The character of "I am Italian" is a function from contexts which determine a speaker S to propositions that can be characterized as Italian(S).
- If evaluated at the current context, this yields the content italian(david_beaver), which is false evaluated relative to the current world.
- Uttered in a different context, the sentence would have had the same character, but potentially a different content and truth value

- Stalnaker (1978) explicitly suggests that potentially both characters and contents (to use Kaplan's terminology) may be partial functions.

- He provides no examples.

- The paradigmatic indexicals "I", "now" etc., are unhelpful, because they are always defined in normal discourse contexts.

- Many character constraints are prerequisites for identifying what the content is, or what its function in the discourse is.
- If they don't hold there may be no way to determine what should be accommodated in order that speaker and hearer have aligned common grounds.
- Maybe the content associated with "indeed", "therefore", or "too" is such that it can only be grasped relative to the correct antecedent in the context.
- This is not so for content presuppositions. Here, what is accommodated affects the conversational import of the main content, but does not determine that content.

Rest stop

Takeaways

- For presupposition, there have been increasingly many attempts to understand variation in triggers, including much work not discussed on e.g. the strong/weak trigger distinction.

- Empirically, what is needed is similar systematicity of application of diagnostics to variable-like behavior.

- At the theory end, we've begun considering explanations of variability in the behavior of variables. Tomorrow we will both add to these explanations, and take one of them further.

Plan

Monday Introduction to the problem of variable costs; classic cases of context dependency.

Tuesday Beyond binding.

Wednesday Big ideas in the theory of variables and contextual resolution.

Thursday Presupposition, accommodation, and the strong contextual felicity requirement.

Friday Conclusions for the taxonomy and theory of variables and for meta-semantics.

Optional: Evasive strategies

(Evasive) Strategies

1. Leave it to an expert
2. Doesn't matter ($\approx$ supervaluation)
3. Ballpark ($\approx$ diagonalization)
4. Special language games (e.g. "Your choice")
5. Default value
6. Trivial value

   [1–3 due to Schwarzschild 1999]

Leave it to an expert

(16)   A landscape designer is describing a house:
       In front of the house was a small garden, leading to a
       substantial lawn, which was surrounded by trees. An
       isolated space was formed. Only the HOUSE was
       visible from the trees.   (Glanzberg, 2002)

Doesn't matter

(17) *Otto goes to a party and meets Tim Stowell and learns
      from him what a syntactian is. Otto doesn't meet any
      other linguists, only art critics:*
      Alex: Which syntacticians did you meet?
      Otto: I only met Stowell.   (Schwarzschild, 1999)

Doesn't matter

Incomplete definite descriptions:

(18)   The table is buried in junk.

cf. Buchanan and Ostertag 2005

Ballpark

(19)   The prisoners spoke to each other.

(Schwarzschild, 1999)

Your choice

von Fintel and Gillies 2011:

(20)   The keys might be in the car.

Your choice

Chris Potts, p.c. to von Fintel and Gillies 2011:

(21)   Where are you from?

The granularity of the question partition is left up to the addressee's choice.

Default value

(22)   Roger is at a nearby cafe.

$\Rightarrow$ near the discourse location

How to think of the strategies

- object language operators
- ways of deriving emergency propositions (cf. Stalnaker on diagonalization)
- …

SCF vs. Non-SCF

- SCF triggers do not allow accommodation
- SCF triggers do not allow evasive strategies
- But other variable expressions do allow accommodation and/or evasive strategies

SCF with other variables

NB: we are not claiming that SCF never arises with what we've called non-SCF-triggers. SCF can arise when (for some reason) accommodation or evasive strategies are not available. An example (from King 2015):

(23)   Put a checkmark next to any large number.

No evasive strategy with SCF triggers

Imagine a context where my male colleagues are salient, but none is more salient than the others.

(24)   The restaurants around here are getting more adventurous. This morning, I had breakfast with him at Catalyst. They have an amazing new breakfast sandwich.

Wait a minute, is it really so?

Can evasive strategies apply to singular pronouns?

(25)   Watch out he's trying to shoot you!

(van Deemter, 1998)

(26)   *We are watching an air race with binoculars. Planes are copiloted with each pilot having equal time piloting the plane. We notice smoke coming from one of the planes.* He's in trouble.   (King, 2012)

Options

- Only SCF items like pronouns really are variable-like and SCF-ness follows from a simple meta-semantics. Variable/context-dependent analyses of non-SCF items are wrong.

- We need a new sophisticated meta-semantics that can predict which variable expressions give rise to SCF and which don't (because they predictably allow accomodation and/or evasive strategies).

- We need to stipulate somehow that SCF items put requirements on the discourse record.

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Variable costs

Lecture 5: The grand finale

David Beaver and Kai von Fintel

ESSLLI 2019

`https://dkcosts.kvf.me`

Today's plan

Getting to the cliffhanger

- Bindability
- Felicitous underspecification
- Evasive strategies
- Character study
- Where we are
- [optional: Semantic modularity]

Bindability

Unbindable variables

In some cases, we find deictic and anaphoric uses of a contextually variable expression, but no obvious cases of binding.

Domain restriction

(1) Most$_C$ syntacticians struggled with the class.

$g(C) \approx$ the set of students in the class

$\rightsquigarrow$ most students in the class who were syntacticians struggled with the class

If you want to learn more

See the tutorial slides at `http://mit.edu/fintel/fintel-2014-rutgers-domains.pdf`

Bound domains?

(2)   Only one class had so many lambdas that most syntacticians struggled.

for each class *x* we need to check whether most of *students in class x* who were syntacticians struggled

What's the domain variable?

Complex domain variables

(3)   Only one class $\lambda x\ x$ had so many lambdas that $\text{most}_{f(x)}$ syntacticians struggled.

x = the bound variable over classes

f = a free variable of type $\langle e, et \rangle$, whose contextual value is a function from classes to students in them

The functional variable cannot be bound

There is no evidence that the functional variable in these complex domain restrictions can be bound.

Other unbindable variables

- relational variables (glue variables in compounds, adjunction, genitives)
- [others?]

Why no binding?

Note that the unbindable variables are of high types, so …

- maybe there simply aren't binders of such high types?
- maybe variables can't actually be of such high types?

Prohibting higher type variables

- Chierchia in his 1984 dissertation:

    - The "No Functor Anaphora" constraint
      The only variables are of type e or $\langle e, t \rangle$

- Meredith Landman in her 2016 dissertation:

    - The "No Higher-Type Variables Constraint" (NHTV)
      The only variables are of type e

Much work to be done

If functional variables don't exist, we would need to explain how else the higher type contextual information is supplied and fed into the recursive semantics.

Stanley 2000

An influential consideration of the importance of binding was:

Stanley, Jason. 2000. Context and logical form. *Linguistics and Philosophy* 23(4). 391–434. [on the course website]

Felicitous underspecification

King 2018

King, Jeffrey C. 2018. Strong contextual felicity and felicitous underspecification. *Philosophy and Phenomenological Research* 97(3). 631–657. doi:10.1111/phpr.12393.

"Supplementives"

King coins the term *supplementives* for "the class of contextually sensitive expressions whose context independent meanings do not by themselves suffice to secure semantic values for those expressions in contexts".

King's claims

1. All supplementives give rise to SCF or "catastrophic failure" when there is no candidate values at all.
2. All supplementives can sometimes be used felicitously in situations where the context does not determine a specific value for them.
3. All variability is a matter of degree.
4. Hard cases like pronouns can be given a pragmatic explanation.

Pronouns

(4)   *He's a piece of work.

(5)   Did it come today?

Implicit arguments

(6) *Sophie is ready.

(7) Molly is ready.

Only

(8)   *Only Mary passed the bar exam this year.

(9)   Only Ted Cruz compares himself to Galileo.

Genitives

(10)   *Susie's car is fast.

(11)   Sophie's skis are really working for her.

Quantifier domains

(12)   *Everyone went to Dubrovnik.

(13)   (King doesn't give a felicitously underspecified example)

Tense

(14) *I owned a car.

(15) John went to a private school.

Gradable adjectives

(16)   *Check marks go above any number that is large.

(17)   Yesterday was cold.

King on why pronouns show a hard SCF

In a typical use of a deictic pronoun, the speaker's purpose in employing the device is to focus her audience's attention on a specific object so that she may communicate something about it. Should she fail to focus her audience on a specific object, her communicative purposes will be hopelessly thwarted.

pronouns/demonstratives give rise to robust SCF effects and poorly tolerate felicitous underspecification due to the fact that in typical uses, not securing a unique semantic value thoroughly undermines the communicative aims of the speaker.

King on why tense doesn't show hard SCF

Why does tense give rise to relatively mild SCF effects and why does it tolerate felicitous underspecification so well? One reason is that often when I am relating events in the past or future, it simply isn't important exactly when those events occurred and enough information is provided to give the audience an approximate sense of when they did.

Again …

(18)   #She has an awesome guacamole recipe. She roasts
        some of the garlic before mashing it.

(19)   A woman I know has an awesome guacamole recipe.
        She roasts some of the garlic before mashing it.

Why can't (18) be used with the same communicative goal as
(19)?

King's self-caveat

Though I've claimed that how severe a supplementive's SCF effects are is to be explained by the conversational purposes it typically serves, I hasten to add that it could be that in virtue of serving the purpose it typically does, a supplementive comes to lexically encode that it's SCF effects are as extreme or mild as they in fact are. If so, such an expression e.g. may display SCF effects in a case in which we would not expect it to given the conversational purposes active in that case.

How does felicitous underspecification work?

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cf. Buchanan and Ostertag (2005)

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Character study

Character vs content

- In two dimensional accounts of indexicality (Stalnaker, 1978; Kaplan 1989), meaning is derived in two steps:
- Character $\rightarrow$ Content $\rightarrow$ reference
- Context is used to map character to content, and this then yields a truth value (or whatever) relative to a world of evaluation.

- E.g. The character of "I am Italian" is a function from contexts which determine a speaker S to propositions that can be characterized as Italian(S).
- If evaluated at the current context, this yields the content italian(david_beaver), which is false evaluated relative to the current world.
- Uttered in a different context, the sentence would have had the same character, but potentially a different content and truth value

- Stalnaker (1978) explicitly suggests that potentially both characters and contents (to use Kaplan's terminology) may be partial functions.
- He provides no examples.
- The paradigmatic indexicals "I", "now" etc., are unhelpful, because they are always defined in normal discourse contexts.

- Many character constraints are prerequisites for identifying what the content is, or what its function in the discourse is.
- If they don't hold there may be no way to determine what should be accommodated in order that speaker and hearer have aligned common grounds.
- Maybe the content associated with "indeed", "therefore", or "too" is such that it can only be grasped relative to the correct antecedent in the context.
- This is not so for content presuppositions. Here, what is accommodated affects the conversational import of the main content, but does not determine that content.

Basic data

	Deictic	Discourse	Bound
tall	W	Y	Y
she	S	Y	Y
I	Y	N	N
so	S	Y	N
therefore	N	Y	N

A simple formal model

- We use f, g to play the role of worlds, assignment functions, and Kaplanian contexts all in one.

- Partial functions with domain $\subseteq$ {*s(peaker)*, *location*, *addressee*, *now*, *w(orld)*}, *Prev(ious utterance)* $\cup\, \mathcal{I} \times \mathcal{T}$ ($\mathcal{I}$: integers, $\mathcal{T}$: types).

- Meanings $[\![.]\!]$ are functions from contexts to functions from contexts to ordinary meanings

Example

E.g. $\llbracket \text{it's raining} \rrbracket (f)$ is a function from contexts to the proposition that it's raining (at the salient location), and $\llbracket \text{it's raining} \rrbracket (f)(g) \in \{0, 1\}$

Simple indexical derivation

Write $[\![\alpha]\!]^f$ for $[\![\alpha]\!]\,(f)$, $[\![\alpha]\!]^{f^2}$ for $[\![\alpha]\!]\,(f)(f)$

$$[\![I]\!]^f = \lambda g[f(s)]$$
$$[\![laugh]\!]^f = \lambda g\lambda x[x \text{ laughs in } g(w)]$$
$$[\![NP\ VP]\!]^f = \lambda g[[\![VP]\!]^f(g)([\![NP]\!]^f(g))]$$
$$[\![I\ laugh]\!]^{f^2} = 1 \textit{ iff } f(s) \text{ laughs in } f(w)$$

Bound pronouns

$[\![\text{j S}]\!]^f = \lambda g \lambda x [[\![\text{S}]\!]^f (g[j/x])]$

$[\![\text{PRO}_j]\!]^f = \lambda g[g(j)]$

$[\![\text{t}_j]\!]^f = \lambda g[g(j)]$

$[\![\text{t}_j \text{ loves her}_j \text{ mother}]\!]^f = \lambda g[g(j) \text{ loves mother of } g(j) \text{ in } g(w)]$

$[\![\text{every woman t}_j \text{ loves her}_j \text{ mother}]\!]^{f^2}$

$\qquad = 1 \text{ iff } [\forall x\colon x \text{ is a woman} \Rightarrow x \text{ loves mother of } x \text{ in } f(w)]$

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Discourse anaphoric pronouns

$$[\![S_1. \; S_2]\!]^f = \lambda g[[\![S_1]\!]^g \wedge [\![S_2]\!]^{g'}]$$

  where g' differs from g by having variables mapped to
individuals introduced in S_1

(gloss for a dynamic semantic treatment)

Deictic pronouns

$$[\![\text{She}_j \text{ laughs}]\!]^{f^2} = 1 \text{ iff } f(j) \text{ laughs in } f(w)$$

Deep anaphora

$\llbracket \text{So}_j, \text{S} \rrbracket^{f^2} = 1$ *iff* $f(j)$ implies $\llbracket \text{S} \rrbracket^f$ in $f(w)$

Surface anaphora

$\llbracket \text{Therefore, S} \rrbracket^{f^2} = 1$ *iff* $\llbracket \text{f}(Prev) \rrbracket^f$ implies $\llbracket \text{S} \rrbracket^f$ in $f(w)$

Implicit arguments (*tall*)

- We need to distinguish between deep anaphors and *really* deep anaphors

- Deep anaphors ("she") impose a constraint on the utterance situation that some referent has been made salient through mention or indication.

- Really deep anaphors ("tall") merely require recoverability (if that).

Implicit arguments (*tall*)

- Let's say that a standard index e.g. for a pronoun is a positive integer, but a really deep index is a negative integer.

- The use of a + here is ϕ-feature-like, indicating that something cannot be accommodated if it was not already salient.

- The use of - contrarily indicates an absence of a requirement for prior salience.

Example

$$[\![\text{Mary is tall}_{-j}]\!]^{f^2} = 1 \text{ iff Mary is tall for a } f(-j) \text{ in } f(w)$$

Rule of accommodation: if U is uttered in context f, we may evaluate U relative to a context f' differing by including additional -ve indices in its domain, with values determined pragmatically.

Cliffhanger

Recap and Takeaways

- We have presented an unsolved puzzle raised by the large variety of contextually variable constructions: they impose variable costs on the context.

- We have discussed possible quick solutions appealing to general conversational principles. These do not seem to work: they predict more uniformity than we find.

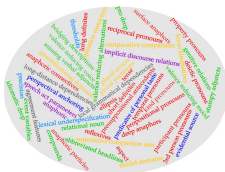- We have sketched a simple formal model that encodes at least some of the distinctions we found.

The task ahead is to do better than this proposal.

A large undertaking

- many constructions

- many diagnostics/properties

- many languages

The crossproduct of things that need investigating is immense.

Immense

$\times$ LANGUAGES

Optional:
Worries about modularity

Take an example

(28) She$_{\langle 1, e \rangle}$ invited everyone$_{\langle 2, \langle e, t \rangle \rangle}$.

$\approx$ the salient female invited everyone in the salient set

Recall the textbook's meta-semantics

Heim & Kratzer 1988:p.243

(29) *Appropriateness Condition*
A context *c* is appropriate for an LF ϕ only if *c* *determines a variable assignment g_c* whose domain includes every index which has a free occurrence in ϕ.

(28) She$_{\langle 1,e \rangle}$ invited everyone$_{\langle 2,\langle e,t \rangle \rangle}$.

So, for (28) some mechanism needs to assemble information about the context into an a function that assigns the salient female to the index $\langle 1, e \rangle$ and the salient set to the index $\langle 2, \langle e, t \rangle \rangle$.

Worry

This mechanism has to know both about the rich facts of the context and about the minutiae of formal semantics (assignment functions).

Jacobson's alternative

(reconstructed)

(30)   A context *c* is appropriate for an LF ϕ of syntactic type $S^{X,Y,Z,\cdots}$ (with a sequence of missing arguments) if *c* determines a sequence σ_c of objects of the appropriate types such that $\phi(\sigma_c)$ expresses a proporition.

As we discussed on Wednesday, that's not any better or worse than the textbook meta-semantics in terms of use of mathematical constructs.

Daniel Harris on the modularity worry

Harris, Daniel. 2019. Semantics without semantic content.
Forthcoming in *Mind and Language*.

Constraint semantics

What the semantics delivers is a constraint on what proposition the speaker must be expressing.

(31)   She$_{\langle 1,e \rangle}$ invited everyone$_{\langle 2,\langle e,t \rangle \rangle}$.

Harris: The semantics computes (31) and delivers a property of propositions:

$\lambda p.\exists x, C$: x is a salient female & C is a salient set.

$$p = \lambda w. \forall y \in C: x \text{ invited } y \text{ in } w.$$

Suspicion

KvF: I'm not sure this really solves the modularity problem. In the end, we still need a mediating mechanism between pragmatics and semantics.

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