# A Dynamic Default Logic Model of Successful Speech Acts

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## Introduction

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# Speech acts: What are they?

- Acts which are conducted via speech—marrying, promising, apologizing, ordering, refusing, congratulating, threatening, etc.
- Not all acts of speech are speech acts—"I divorce you" does not (in many cultures) divorce you.
- Three important features:
  - ▶ Locutionary act: The actual utterance, and its ostensible meaning according to standard semantics (what is said and meant)
  - ▶ Illocutionary act: The act that is performed via this locutionary act (what is done)
  - ▶ Perlocutionary act: The effect of the locutionary act (what happened as a result)

# Speech acts: What makes them successful?

Previous work emphasises he role of the listener / listener's uptake:

- Austin (felicity conditions)
- Searle (constitutional rules)
- Grice (maxim of relation)
- Williamson (knowledge norms of assertions)
- Sbisà (objective requirements)
- etc.)

# Speech acts: Where's the speaker?

- The success of a speech act involves converging on a shared intention
- Speakers can use speech acts manipulate listeners
- The phenomenology of choosing speech acts: Speaker $S$ intends some particular outcome $o$, so $S$ reflects on their own phenomenological sense of self, and picks a particular speech act $a$ that would generate $o$ in them.
- How can we model the speaker's reasoning process?
- How can we model the speaker's beliefs about the success of their speech act?

# Logical characteristics of speech acts: Previous work

- No general framework / formalisation
- Dialogical logic (Uckelman, Alama, Knoks 2014)
- Relationship between speech acts and emotional states (Guiraud, Longin, Lorini, Pesty, Rivière 2011)
- Public announcements and knowledge updates (various)
- Dynamic epistemic logic and preference change (van Benthem and Liu 2007; Yamada 2008)

# Logical characteristics of speech acts: Our contribution

The reasoning involved is a type of *default reasoning*, with two types of defaults:

1. Defaults that indicate how to generate internal states ("compliments embarrass people," "people whose partners are unfaithful feel wronged").
2. Defaults that tie an observable effect with an internal state ("embarrassed people blush" and "when someone is wronged, they take vengeance")

Defaults of the first type arise via *phenomenological introspection*: "I would react this way, if someone said this to me."

Then the speaker picks a speech act which they think will generate that internal state, and then observes the outcome to see if their speech act was successful.

# A simple example

The speaker $S$ wishes to embarrass the listener $L$. On the basis of the default "compliments embarrass people," generated from $S$'s self-reflection "compliments embarrass me", $S$ says "You're so beautiful!", performing the speech act of complimenting. The speech act causes $L$ to blush; $S$ observes this blush, and uses the default "embarrassed people blush" to conclude their act was successful.

# Generalizing the example

More generally, when $S$ performs a speech act, the following will be generated:

1. A Reaction: an internal physiological reaction in the listener.
2. A Response: the physiological reaction generates a physical response (e.g., blushing, or speaking, or something).
3. An Observation: $S$ observes the physical reaction.
4. Reasoning: $S$ uses default reasoning to understand the reactions to determine if their intended outcome was achieved.

If it has, then they have made a successful speech act. If it hasn't, then they might need to revise their defaults.

# Default logic: What is it?

- First introduced by Reiter (1980).
- No single / unique system, but
- A *family* of systems, often combinations with other types of logic, e.g.,

  - ▶ modal default logic (McDermott and Doyle 1980, McDermott 1982)
  - ▶ autoepistemic logic (Moore 1985; Lin and Shoham 1990)
  - ▶ modal default implication (Ben-David and Ben-Eliyahu 1994)

# Default logic: The basics

Most basic inference rule schema:

$$\frac{\alpha \text{ (prerequisite): } \beta_1, \cdots, \beta_n \ (n \geq 1) \text{ (justifications)}}{\gamma \text{ (conclusion)}} \text{ (Default Inference Rule)}$$

# Reasoning with defaults in speech act choice (1)

How can $S$ conclude from $L$'s blush that $L$ was indeed embarrassed by the compliment? Need more than just "embarrassed people blush"; $S$ also needs to know there are no potential defeaters, such as $L$ being in a room that's unusually warm, or $L$ not having a fever. These defeaters *also* come from introspection:

$$\frac{K_S(R(S) \wedge \neg \text{room too warm} \wedge \neg \text{sick}(S)) : B_S(S \text{ feeling } E)}{B_S(S \text{ feeling } E)} \text{ (Rule 1)}$$

(That is, if $S$ knows that they are having response $R$ and the room isn't too warm and they aren't sick, then they know they are having reaction $E$, embarrassment.)

We can also represent this as a default conditional:

$$K_S(R(S) \wedge \neg \text{room too warm} \wedge \neg \text{sick}(S)) \overset{\square}{\to} B_S(S \text{ feeling } E)$$

# Reasoning with defaults in speech act choice (2)

$S$ can generalize their own experience to any rational agent:

$$\frac{B_S(\text{rational agent } L) \wedge K_S(R(L) \wedge \neg\text{room too warm} \wedge \neg\text{sick}(L)) : B_S(L \text{ feeling } E)}{B_S(L \text{ feeling } E)} \text{ (Rule 2)}$$

If $S$ has no evidence that the potential defeaters are in place, they can simplify their reasoning:

$$(B_S(\text{rational agent } L) \wedge K_S R(L)) \overset{\square}{\to} B_S(L \text{ feeling } E)$$

Then, when $S$ believes $L$ is indeed a rational agent, and $S$ observes $R(L)$, $S$ will believe $L$

# Reasoning with defaults in speech act choice (3)

- Successful speech acts involves *dynamics*: Something changes before and after $S$ speaks.
- With defaults in place, we can model success of speech acts by checking whether the Response correlated with the desired Reaction is observed after the $S$ speaks, and wasn't before.

Let $b$="You are so beautiful". Then:

$$\mathsf{Say}(S, b) \wedge !_{\langle S, L \rangle}[b](K_S R(L) \wedge B_S(L \text{ feeling } E)) \rightarrow K_S(\mathsf{Success}(S, b))$$

# Conclusions

- Much philosophical / linguistic work on speech acts puts the power of successful speech acts into the ears of the listener.
- This overlooks the importance of the choosing the *right* speech act to achieve a goal (be successful)
- It also overlooks the speaker's ability to reflect on their own self and use default reasoning to guide their choice of speech act.
- Dynamic Default Logic offers a way to model this.
- Details still to be worked out!

# Many thanks!