COMPUTATIONAL MODELING OF NARRATIVE

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Outline

- Intelligent systems
- Importance of language
- State-of-the-art language science
- Narrative
- Summary

Schlangen. “What we can learn from dialog systems that don’t work” 2009 workshop on the semantics and pragmatics of the dialog

Lakoff & Narayanan. “Toward a computational model of narrative” 2010 AAAI fall symposium series
Frankenstein creates the fiend.
Bernie Wrightson (© 1977)
Intelligent Systems
Body vs. Mind

The Turk chess player Karl Gottlieb von Windisch's 1784 book Inanimate Reason
The "standard interpretation" of the Turing Test. Image adapted from Saygin, 2000.[1]
Importance of Language
Highlighted Intelligent Behavior

Language competence is not only hard to achieve in AI but also hard to understand in Humans.

The question of language understanding: Searle’s Chinese Room
Importance of Language

Research Directions

• Understanding human language (tools-for-understanding)
• Making it possible for machines (getting-things-done)
State-of-the-art Language Science
Computational Modeling

Explaining a cognitive phenomenon in either of the following levels:

- Computational
- Algorithms
- Implementation

Marr 1982

If ..... Then
\[ B = A \times 2 \]
Else
\[ B = A + 2 \]
State-of-the-art Language Science

Dialog Systems

Artifacts responsible for a language-based real-time interaction with humans in a specific task

But even for task-oriented agents we need:

- Substantial understanding of the task environment
- Substantial understanding of the situated language

Good Examples:

- Number system *(Skantze & Schlangen 2009)*
- Watson
State-of-the-art Language Science
Dialog Systems as Computational Models

Whole-agent-models:

- Learn it
- Understand it
- Produce it
State-of-the-art Language Science
Dialog Systems as Computational Models

Schlangen’s methodology:

1) Specify the theoretical setting, restricted but capturing the problem domain

2) Operationalize the theory so that can be modeled computationally (e.g. specify modules)

3) Evaluation:
   - Comparison with human-human interaction
   - User questionnaire
   - Third-party judgment
Narrative
Definition
Story telling:
• Story: the raw materials (as they might be described in chronological order)
• Plot: how the story is told (the form of storytelling, or the structure, that the story follows)

Cohn 2009
Narrative
Complexities

- Metaphors and conceptualization
- Dynamic, fine-grained, and complex scenarios
- Counterfactual reasoning

“The US Economy is on the verge of stumbling back into recession. The jobs picture is dismal, and the one-time boost from the stimulus package is almost over. The stimulus could have been better spent to buttress the economy through job growth.”
Narrative
Step by Step Computational Modeling

Step 1: specify the theoretical setting, restricted but understandable

Dimensions of narrative structures based on theories (Cinderella):
- Moral systems and folk theories (the oppressed people will soon achieve victory!)
- Overall plot structure (3 main episodes: oppression, fight, victory)
- Plot schemes (romantic, 3 key characters)
- Motif structure (every beautiful woman sees herself as Cinderella)
- Variations (The Cinderella man)
Narrative
Step by Step Computational Modeling

Step 1: specify the theoretical setting, restricted but understandable

Theoretical dimensions of narrative structure
Narrative
Step by Step Computational Modeling

Step 2: operationalize the theory so that can be modeled computationally

Example from KARMA system: metaphor understanding

**Economic policies**

“The US Economy is on the verge of stumbling back into recession.”

**Event:** economic state change

**Leads to:** failure of the policy

**Spatial motion**

**Event:** Stumbling

**Leads to:** falling
Step 2: operationalize the theory so that it can be modeled computationally

Example from KARMA system: metaphor understanding
Narrative
Step by Step Computational Modeling

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“The US Economy is on the verge of stumbling back into recession. The jobs picture is dismal, and the one-time boost from the stimulus package is almost over. The stimulus could have been better spent to buttress the economy through job growth.”

If the current state of affairs continues, then the economy is likely to have negative growth as it did before the current recovery.
Narrative
Step by Step Computational Modeling

Step 2: operationalize the theory so that can be modeled computationally

Example from KARMA system: metaphor understanding

“The US economy is on the verge of stumbling back into recession.”

Direct evidence:
Entity: US economy
Event: Recession
Time: present

Metaphors:
Event: Stumbling
Direction: Back
Narrative
Step by Step Computational Modeling

Step 2: operationalize the theory so that can be modeled computationally

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“The US economy is on the verge of **stumbling back** into recession.

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Entity: US economy
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Step by Step Computational Modeling

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Summary

- **Schlangen 2009.** "*What we can learn from dialog systems that don’t work*”:
  - Language is one of the key abilities of artificial intelligent systems.
  - Current dialog systems are preliminary examples of language-capable systems.
  - Even in a specific and limited domain the interaction should seem natural.
  - In human language studies a whole-agent model would be helpful.
  - --- he draws a methodology to develop a whole-agent model & brings pessimistic critiques (which we skipped)

- **Lakoff & Narayanan 2010.** "*Toward a computational model of narrative*”:
  - Narrative understanding is a phenomenon that could be computationally modeled.
  - To model narrative understanding we should first study the structure of narratives and then design the desired modules.
  - Dynamic, fine-grained and complex scenarios, as well as using metaphors and counterfactual reasoning are important in modeling narratives.
  - --- they bring a high level description of KARMA system (which we poked)
Other References

- Wikipedia
- Gabriel Skantze homepage for the video :www.speech.kth.se/~gabriel/demos.html
- IBM page for videos on Watson: http://www-03.ibm.com/innovation/us/watson