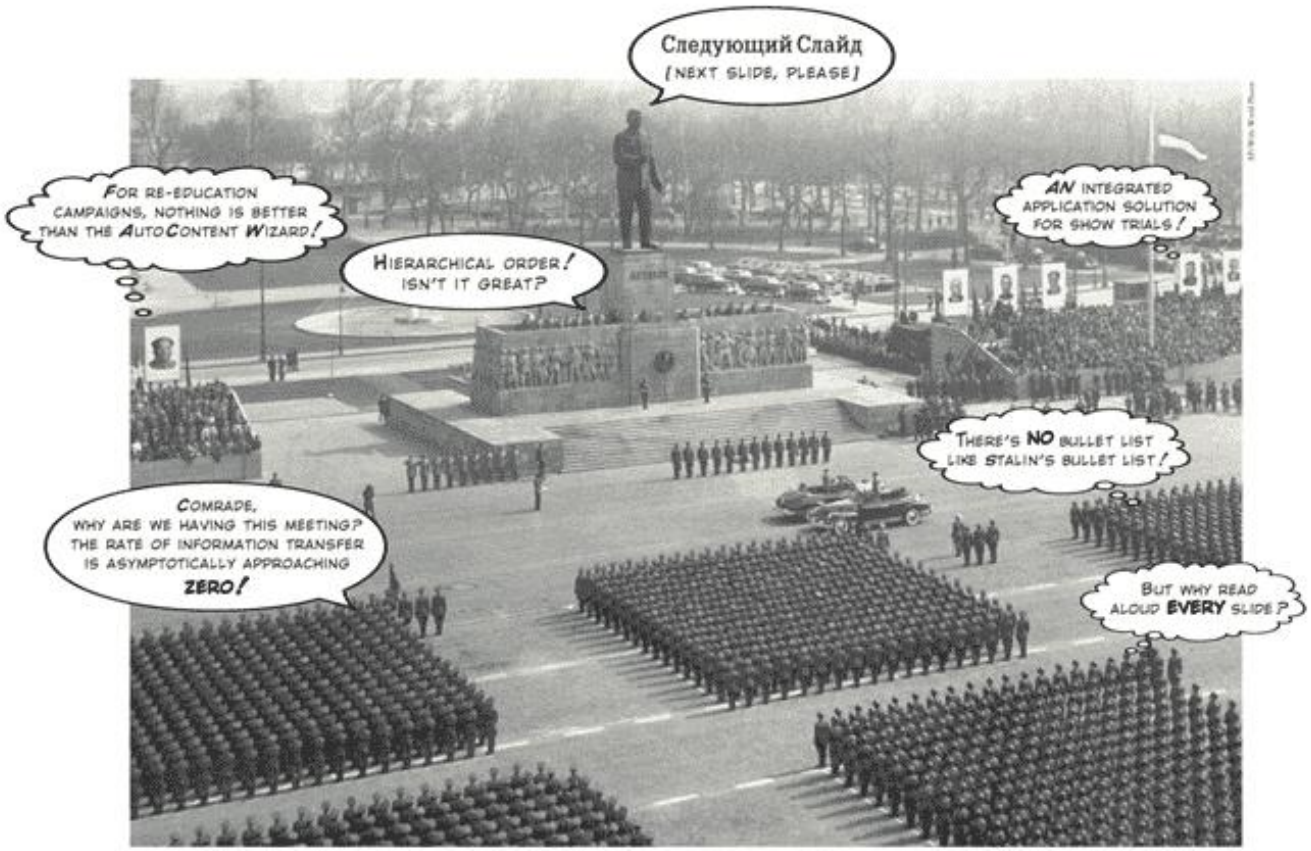
SECOND EDITION

Edward R. Tufte

The Cognitive Style of PowerPoint: Pitching Out Corrupts Within



Simulating Language Games of the Two Word Stage

. . . being an endeavor in cognitive simulation to parsimoniously re-enact verbal interactions of a toddler through translation and reckoning with pragmatic and semantic annotations of its linguistic history.

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Abstract

- Goal: Model of parent-child dialogues
  - Linguistic knowledge stored in examplars of utterances and meanings
  - Model difference in performance between production and comprehension
- Evaluation: compare responses to Childes data, demonstrate generalization with novel utterances.

Introduction

- Developmental Psychology: focus on observation, Usage-Based (UB)
- Chomskians posit the UG, we (mere mortals) have the UB
- A Rationalism vs. Empiricism debate

What to do?

> *"Instead of trying to produce a programme to simulate the adult mind, why not rather try to produce one which simulates the child's? [...] Presumably the child-brain is something like a note-book as one buys it from the stationers. Rather little mechanism, and lots of blank sheets."* – *Turing, 1950*

Let's make a model
...If it works, we don't need the UG!

Research question

- Can we implement both comprehension and production using an examplar-based model?
- Can we account for the difference between these two? (comprehension better than production)
- Is it possible to produce childlike responses in simple language games?

In short: a Turing Test with 2 year olds . . .

The Model / exemplars

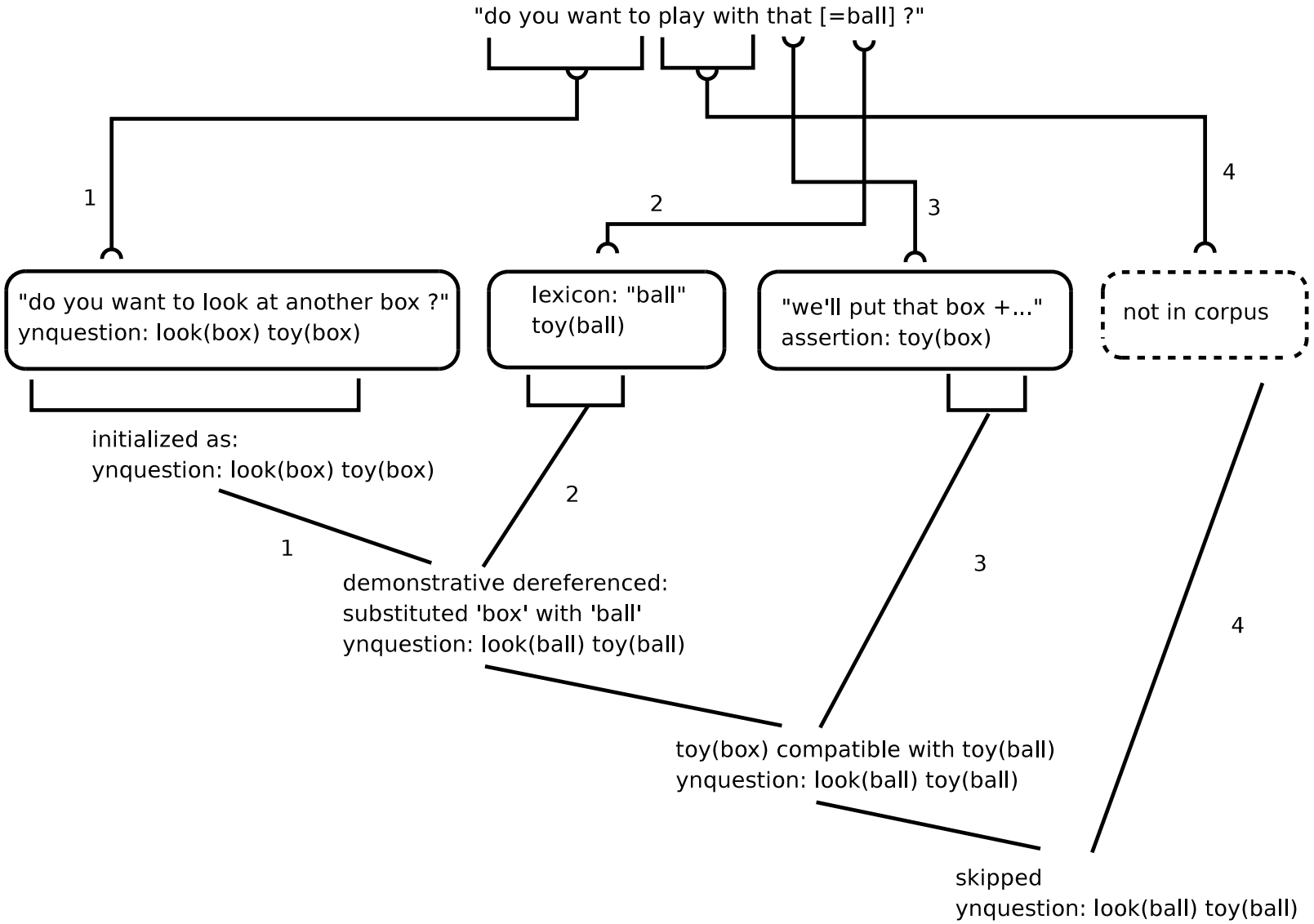
- Semantic-pragmatic representation:
  - include speech acts, focus (things pointed to), categories, actions and objects (variable or not)
  - minimal (flat) structure.
  - Start with 'seed' exemplars with correct interpretations:

```
"what's a kitty say " : 'whquestion: do(X) animal(cat[2])',
"that's a donkey"     : 'assertion: point(donkey) animal(donkey)
'meouw'               : 'assertion: do(meouw) animal(cat)',
[..]
```

The Model / mechanisms

- interpolate exemplars with overlap in word forms using partial unification on meanings to interpret novel utterances:
  `assertion: animal(bunny) do(X)'`
  $\oplus$ `assertion: do(hop) animal(bunny)`
  = assertion: animal(bunny) do(hop)
  (instantiated (X) with (hop))
- . . . and extract to produce relevant responses:
  `assertion: do(hop) animal(bunny)`
  "it hop ." $\Rightarrow$ hop

Interpretation depicted as resolution process



Output - generalize novel utterance

```
Parent:  where lives birdie ?
initial exemplar:
          ("that's where a birdie lives is in a nest .",
           'assertion: point(nest) animal(bird)')
      '?' in "who's this ?"
      and 'whquestion: point(X) person(X)'
      matches 'assertion: point(nest) animal(bird)'
      interpretation: assertion: point(nest) animal(bird)
      reaction: assertion: point(nest) animal(bird)
reduced: that's where a birdie lives is in a nest .
      topic: animal(bird)
Child:  nest
```

Results

Letting the model talk to itself:

```
*MOT: this is a gate .
*CHI: gate
*MOT: okay well Mommy will color too .
*CHI: Mommy color
*MOT: what does a cow say ?
*CHI: moo@o
*MOT: oh isn't that [= CHI's paper] nice .
*CHI: nice
```

Results

Ellipsis:

```
Parent: kitty do ?
interpretation: whquestion: do(X) animal(cat)
reaction: assertion: do(meow) animal(cat)
Child: meow@o
```

Establishing a topic:

```
Parent:  ball
Child:  ball
Parent:  throw it
Child:  ball
```