Charting the Benefits of a New Perspective on Over-specification

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Overview

(Re-)Defining Over-specification

MTuna Corpora and Findings

Future Work

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(Re-)Defining Over-specification
- Gricean Maxim of Quantity
- TYPE in Referring Expressions

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Gricean Maxim of Quantity [Grice, 1975]

The speaker should:

1. Include Enough information to allow an addressee to identify an intended referent;
2. Not be more informative than necessary.

The first rule defines the concept of an *distinguishing description*: a description $\mathcal{D}$ should be able to single out the referent r from distractors, i.e., $\bigcap_{P_i \in \mathcal{D}} [\![P_i]\!] = \{r\}$.

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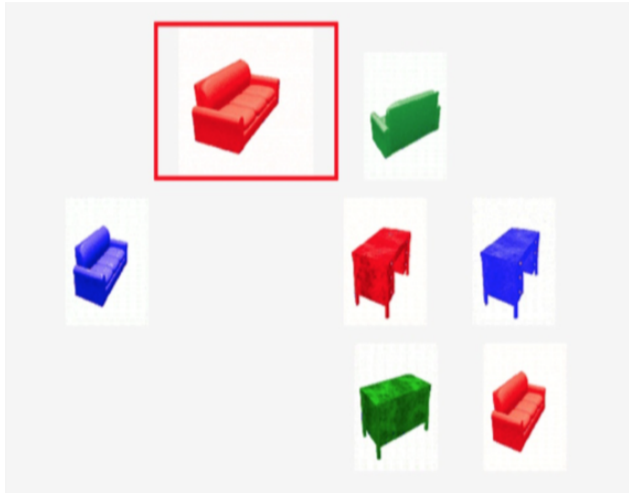
Tuna Corpora [Deemter et al., 2012]

- Focusing on an assessment of the *humanlikeness* of the logical forms (do not rely on linguistic form) generated by a given REG algorithm;
- Evaluated by DICE [Dice, 1945]:



$$DICE(\mathcal{D}_H, \mathcal{D}_A) = \frac{2 \times |\mathcal{D}_H \cap \mathcal{D}_A|}{|\mathcal{D}_H| + |\mathcal{D}_A|}$$

where $\mathcal{D}_* = \{P_1, ..., P_n\}$ ($\{\cdot\}$ is a bag).

- Furniture corpus (simple) vs. People corpus (hard).
- Referring to a single object vs. Referring a set of two objects.
- A Mandarin version: MTuna
- High DICE score $\not\Rightarrow$ a distinguishing description.

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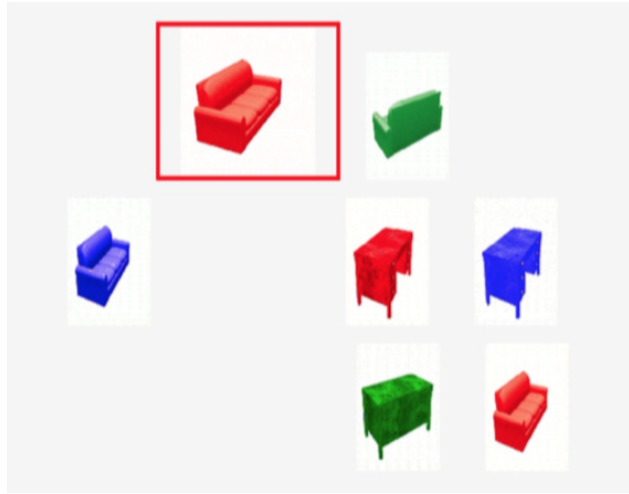

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A Definition of Over-specification

[Engelhardt et al., 2006, Koolen et al., 2011, Engelhardt et al., 2011] called a RE over-specified if it breaks the second rule of Gricean Maxim of Quantity.

- BUT, how to define the situation of a RE with only necessary information (*Minimal Description*)?
- One definition that is often used: None of the properties in D can be removed, i.e., $\nexists P(P \in \mathcal{D} \wedge \bigcap_{P_i \in \mathcal{D}-\{P\}} [\![P_i]\!] = \{r\})$

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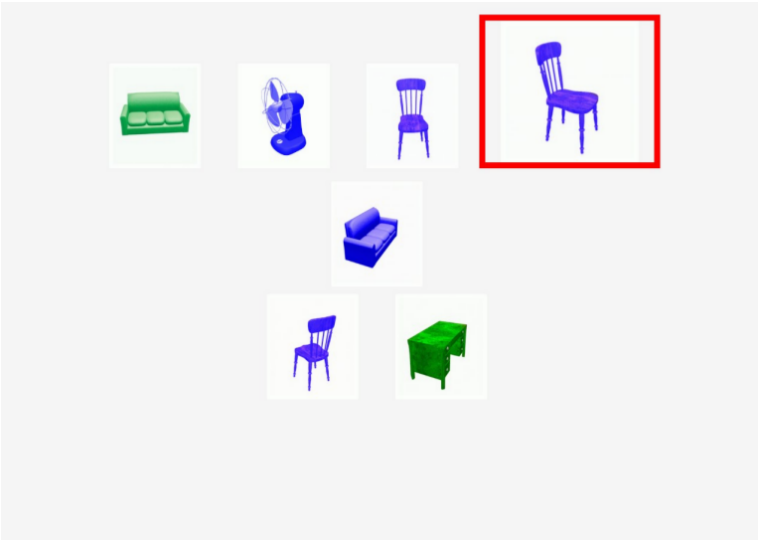
$\mathcal{D} = \{\texttt{COLOUR} = \textit{blue}, \texttt{SIZE} = \textit{small}\}$

An Example



- $\mathcal{D}_1 = \{\texttt{SIZE} = \textit{large}\}$
- $\mathcal{D}_2 = \{\texttt{ORIENTATION} = \textit{right}, \texttt{TYPE} = \textit{chair}\}$
- $|\mathcal{D}_2| > |\mathcal{D}_1|$
- $\nexists P(P \in \mathcal{D}_2 \wedge \bigcap_{P_i \in \mathcal{D}_2 - \{P\}} [\![P_i]\!] = \{r\})$

- A broader definition of *Minimal Description* [Dale and Reiter, 1995]: a RE $\mathcal{D} = \{P_1, ..., P_n\}$, where there is no distinguishing description $\mathcal{D}' = \{P_1, ..., P_m\}$ such that $m < n$ (that is, $|\mathcal{D}'| < |\mathcal{D}|$);
- $\mathcal{D}_2 :=$ *Numerical Over-specification*.
- Can numerical over-specification help listeners to identify targets? Or NOT? Or the OPPOSITE?

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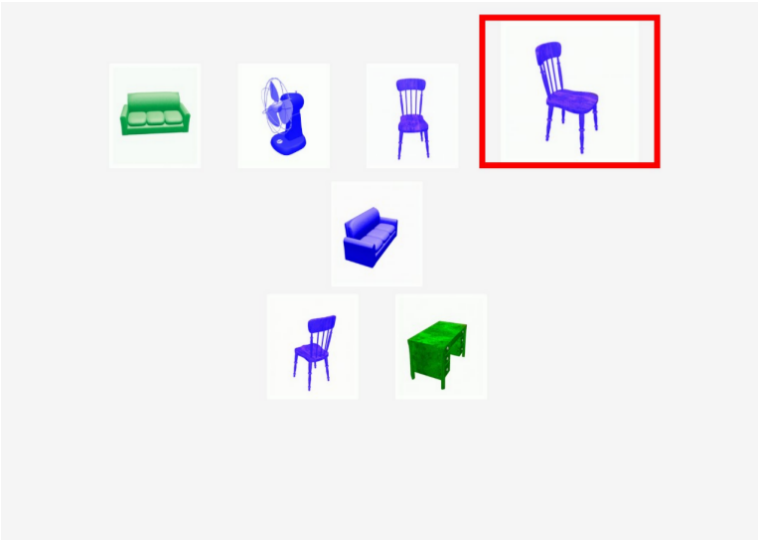

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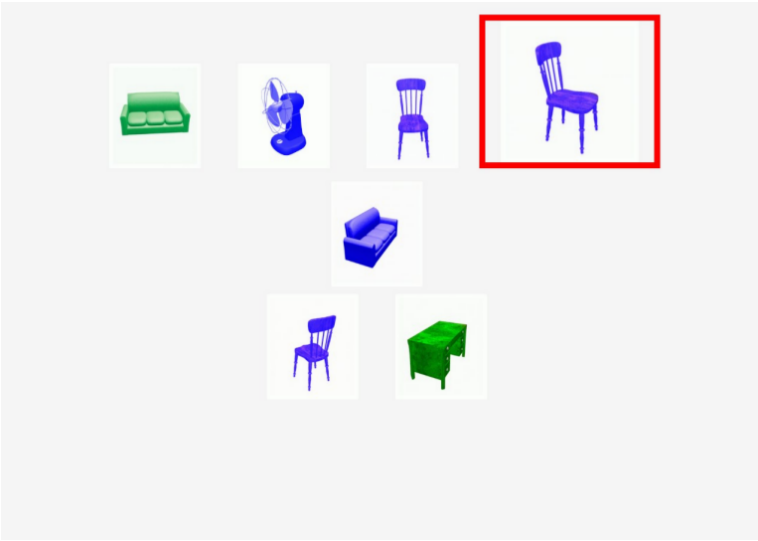

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Hypotheses (for both MTuna and ETuna)

- More over-specifications in People (harder) corpus;
- More under-specifications in People (harder) corpus;
- Numerical Over-specifications occurs in the corpus.

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Results in MTuna (single referent)

	#RE	Over-specifications
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(1) a. (MD) 红色 的 / the red object
b. 红色 的 桌子 / the red table

Results in MTuna (single referent)

	#RE	Over-specifications	
Furniture	224	166	
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	#RE	**Real** Over-specifications	Nominal Over-specification
Furniture	224	83	83
People	256	146	54

Formal Definitions

1. *Real Over-specification* arises when a description has superfluous non-TYPE attributes, i.e., a description $\mathcal{D} = \{P_1, ..., P_n\}$ where at least one of the $P \epsilon \mathcal{D}$ is such that $P \neq \texttt{TYPE}$ and $\bigcap_{P_j \in \mathcal{D} - \{P\}} [\![P_j]\!] = \{r\}$.
2. *Nominal Over-specification* is a description $\mathcal{D}$ in which any $P \in \mathcal{D}$ that causes $\bigcap_{P_j \in \mathcal{D} - \{P\}} [\![P_j]\!] = \{r\}$ is TYPE; in other words, only TYPE attributes are superfluous, no other attributes is superfluous.

Other Issues Related to TYPE

- [Dale and Reiter, 1995] (IA) added a provision to ensure that each logical form generated contains a TYPE (to ensure REs have head nouns);
- BUT, it not always true for some languages or domains.
- There are 97% and 85% superfluous TYPE attributes in English and Chinese, respectively;
- In MTuna, there are much more superfluous TYPE in furniture corpus (94%) than people corpus (74%).
  1. People corpus has only one type of TYPE: person;
  2. Furniture corpus has four types of TYPE: chair, fan, sofa and table.

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MTuna corpora

- Mandarin Chinese version of the Tuna corpora [van Deemter et al., 2017b];
- Most trials are inherited from Tuna experiment, but it also has extras;
- Two settings: REs in subject positions or in object positions [van Deemter et al., 2017a]:
  1. ____在红色方块中/____zai hongse fangkuai zhong
  2. 红色方块中的是____/hongse fangkuai zhong de shi ____
- In some trials in MTuna, `TYPE` is used for distinguishing objects.

Some Results in MTuna[1]

	total	minimal	real	nom	num	under
Furniture	399	46	135	128	24	66
People	400	17	246	68	14	54

1. No significant difference between the proportion of under-specifications in Furnture and People corpus ($p > .1$);
2. More real over-specifications and fewer minimal descriptions in the people corpus ($p < .01$);
3. 5% of REs were numerical over-specifications;
4. There are more over-specifications and fewer under-specifications in subject position ($p < .01$).

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Summary so far

- Over- and under-specification: the standard view;
- A new perspective on specification
- Using this perspective to understand REs in a corpus

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Referring to Plural Referents (a set)

(2) a. the red table and the red chair
b. the red table and chair
c. the red furniture

- From 2a to 2b is syntactic aggregation;
- From 2b to 2c is semantic aggregation.

Comparing between Languages (MTuna vs. (E)Tuna)

	minimal	real	nom	num	under
Furniture (Mandarin)	3.6	37.1	37.1	0	18.6
People (Mandarin)	6.3	57	21.1	0.4	14.5
Furniture (English)	0.7	41.9	37.5	0	19.6
People (English)	2.6	77.9	7.1	0	12.3

Table: Results in overlapped singular portion (normalised).

1. No significant difference between under-spec in two Languages ($p > .1$), much more than expected;
2. More real over-specifications and less minimal descriptions in ETuna ($p < .01$) (*man* vs. 男人);
3. Numerical over-specification never appears in ETuna;
4. ETuna has more superfluous `TYPE` attributes ($> 97\%$) than that in MTuna ($p < .01$);
5. More analysis to come...

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Conclusions

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3. More under-specifications than expected (5%),
   Should REG algorithms sometimes underspecify as well?
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