

# Automatic Metaphor Interpretation

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# Project Information

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- Feldbacher-Escamilla, Christian J. (2015b). “Automatic Metaphor Interpretation in the Framework of Structural Semantics”. In: *Proceedings of the Artificial Intelligence and Simulation of Behaviour (AISB) 2015 Convention*. April 20–22. Ed. by Johnson, Colin. AISB. Canterbury.

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- Feldbacher-Escamilla, Christian J. (2015a-04-20/2015-04-22). *Automatic Metaphor Interpretation*. Conference. Presentation (contributed). Annual Convention of the Society for the Study of Artificial Intelligence and Simulation of Behaviour (AISB). University of Kent: AISB.
- Feldbacher-Escamilla, Christian J. and Hudetz, Laurenz (2013-09-12/2013-09-14). *Automatic Metaphor Interpretation. Applied in an Analysis of Atheistic Argumentation*. Conference. Presentation (contributed). Salzburg Conference for Young Analytic Philosophy (SOPhiA). University of Salzburg: Department of Philosophy.

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- Templeton Cluster funded research unit *New Atheism Systematically Discussed*; overarching project: *Analytic Theology* (#15572).

# Introduction

In this talk we are going to sketch our intermediate results on

- Metaphor recognition
- Metaphor interpretation
- Automation of metaphor recognition and interpretation

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# Analyzing Metaphorical Claims and Arguments

# Metaphorical Claims and Arguments

- Not all metaphors are used non-cognitively. Some metaphors aim at truth.
- Metaphorical claims and arguments are used quite frequently, even in scientific contexts. (Particularly, New Atheists often use metaphors in their claims and arguments.)
- The common methods for evaluating literal claims and arguments are not (directly) applicable to metaphorical ones. Taken literally, metaphors are always false (or meaningless).
- *Question:* How can we analyze metaphorical claims and arguments?

# Metaphorical Claims and Arguments

- A rough way of evaluating metaphorical claims and arguments:
  - ① Identify the principal metaphorical expressions occurring in the claim or argument.
  - ② Interpret the statements containing these expression.
  - ③ Paraphrase the entire claim or argument.
  - ④ Evaluate the paraphrased argument by means of common methods.
- First of all, we need a method of recognizing, analyzing and interpreting metaphors.
- We want to find an automatic method for these tasks.

# Automatic Metaphor Interpretation



# Metaphor Recognition

What does it mean that an expression in a context is not used in its literal meaning?

## Definition (very general criterion)

An expression is a metaphorical expression in a context iff

- 1 the context is assumed to be semantically perfect and
- 2 if the expression is used in its literal meaning, then the context is obviously semantically imperfect.

E.g.: 'Achilles was a lion in the battle.'

If we take 'Achilles' to be understood in its literal meaning, i.e. talking about a human, and also 'lion' in its literal meaning, i.e. talking about a non-human animal, then the sentence (context) is obviously wrong (semantically imperfect).

Hence, at least one of the expressions is a metaphorical one.

# Metaphor Recognition

Especially one notion has to be clarified: 'obviousness'.

'obviousness' seems to be necessary in order to distinguish semantical imperfectness through metaphors from semantical imperfectness in general.

E.g., to claim 'All birds can fly.' is just false, not speaking metaphorically.

There are different degrees of the obviousness of semantical imperfectness:

- ⓓ1 Semantical imperfectness through mixing up categories
- ⓓ2 Semantical imperfectness through definitional falsity
- ⓓ3 Semantical imperfectness through contradicting commonplaces
- ⋮

We assume that obviousness of semantical imperfectness up to the degree D3 is characteristic for metaphors.

# Metaphor Recognition

If we consider our example 'Achilles was a lion in the battle.', it turns out that at least one expression is used metaphorically:

- '... is a lion' is defined on a set containing animals (including humans), so there is no mixing up of categories. D1: passed...
- The claim is not logically false, but definitionally (the dictionary states two opposing characteristics for 'lion' and 'man' (as genus of 'Achilles'), namely 'non-human' and 'human') D2: not passed...

Note: The criterion provided here does not allow us to figure out which expression is the metaphorical one.

Someone could speak, e.g., about the Achilles of Homer's *Iliad*, fighting bravely the Trojans.

But someone could, e.g., speak also about a lion fighting against a rival as bravely as Achilles did.

This question can be decided only with respect to a broader context.

# Metaphor Recognition

In order to decide this question, we expand our framework and use some important parts of the semiotical theory *structural semantics*, which was invented in 1966 by Algirdas Julien Greimas (cf. Nöth 1995, part.V, section on Greimas).

There are two important notions of structural semantics needed for our automatized metaphor recognition (and later on: interpretation):

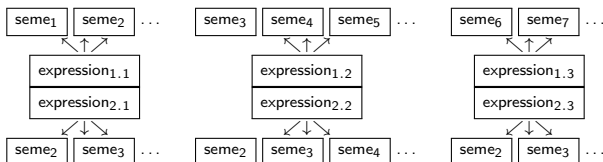
- Seme
- Isotopy

# Metaphor Recognition

Very simplified speaking one can say that:

- Semes are the minimal semantical units that are mapped to expressions.
- If an expression is used in a text, then the semes of the expression are set.
- The more a seme is set within a text, the more dominant it is in the text (iteration increases dominance).
- The most dominant semes within a text are the isotopes of the text.

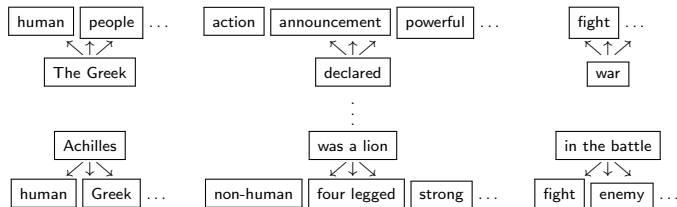
Example:



Isotopies: `seme2` and `seme3`

# Metaphor Recognition

Let's take 'Achilles was a lion in the battle.' with some more context:



Isotopies: 'human', 'fight'

As can be seen, one sense of 'Achilles' is an isotopy, whereas no sense of 'lion' is an isotopy.

Since expressions are used normally literally (default), it is likely that metaphorical expressions do not contain isotopies.

# Metaphor Recognition

We therefore expand the conditions of the criterion for metaphor recognition within the framework of structural semantics:

## Definition (more detailed criterion)

An expression is a metaphorical expression in a context iff 1, 2 and:

- 3 No seme of the expression is an isotopy with respect to the overall context.  
(In comparing expressions one can compare the degree of dominance of the expressions' semes for a comparison.)

The framework of structural semantics is not only useful for the identification of metaphors, but also for their interpretation.

In the following we will provide a short sketch of metaphor interpretation in this framework.

# Metaphor Interpretation

Once we have identified metaphors, the question arises of how to paraphrase them in a way such that the paraphrase is non-metaphorical.

Just to replace the metaphorical expression by all its semes is inadequate, since this would just make the semantical imperfectness still more obvious ( $D3 \Rightarrow D2 \Rightarrow D1 \Rightarrow$ ).

E.g.:

If we replace the metaphorical expression 'lion'

in the sentence 'Achilles was a lion in the battle.'

by its semes 'non-human', 'four legged', 'strong', 'animal' etc.

then we end up indeed with a purely literal paraphrase, but on cost of inadequacy:

'Achilles was a non-human four legged strong animal in the battle.'



# Metaphor Interpretation

What is needed is some kind of relevance filter, dropping out 'non-human', 'four legged', 'animal' and keeping 'strong'.

Here again the *iteration increases dominance* principle of structural semantics is of some need: The more dominant a seme of a metaphorical expression is within the overall context, the more likely it is to be of relevance.

If the overall context does not increase a semes' degree of dominance, then the seme is less likely to be recognised as a relevant part of a metaphor. And also the other way round: The more dominant a seme is, the easier it is to be recognised as a relevant part of a metaphor.

So, for the interpretation of a metaphor one just has to replace the metaphorical expression by the dominant semes to get a literal paraphrase.

## A Proviso on Reductionism

Cohen and Margalit argue against a reductionist point of view as follows—  
(cf. Cohen and Margalit 1970, p.471) (simplified and slightly changed):

- 1 The meaning of a complex expression is determined by the meaning of its components alone, where the meanings of the basic components are described in dictionaries. (Principle of compositional semantics)
- 2 Hence: The meaning of a metaphorical expression is either described in a dictionary directly or is determined by meanings of its components described in a dictionary. (1)
- 3 Dictionaries usually record the current use of expressions whereas metaphors are usually innovative, i.e. an expression's metaphorical usage is new. (general assumption)
- 4 Hence: The meaning of a metaphorical expression is neither described in a dictionary directly, nor is it determined by—in such a way described—components (otherwise it wouldn't be innovative). (3)
- 5 Hence, metaphors cannot be analysed compositionally. (1, 2–4)

## A Proviso on Reductionism

E.g.: 'The car shouted at me.'

- Expressions are learned by such combinations and taking into account affirmative or negative feedback.
- Learning of an expression consists in figuring out the relevant variables and putting restrictions on them.
- By this we end up with literal meaning(s) of an expression.
- Speaking in metaphors consists just in relaxing such restrictions again, i.e. in going some steps back in the whole process.

Proposal: Our account is not in contrast to this point of view.

We deny also compositionality, but we still stick to reducibility.

# Automatic metaphor recognition and interpretation

For automatic metaphor recognition and interpretation we use syntactic and semantic databases (Canoo, Duden, in the future: GermaNet).

The implementation is as follows:

## *Basic analysis*

- 1 Get the syntactical information of the expressions! (Canoo)
- 2 Transform the expressions into their normal form: Nom.Sg/Inf! (Canoo)
- 3 Extract the semes of the expressions! (GermaNet)
- 4 Extract the connotations of the expressions! (Duden)

## *Metaphor recognition*

- 1 Check whether there are any opposing semes or connotations! (Synonym- and Antonym-Databases)
- 2 If so, check which semes are more dominant! (Preceding Analysis)

# Automatic metaphor recognition and interpretation

## *Metaphor interpretation*

- ① Extract the most dominant semes! (Preceding Analysis)
- ② Transform them into the syntactical form of the metaphorical expression! (Canoo)
- ③ Replace the metaphorical expression by a concatenation of these transformations!

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