met*: A method for Discriminating Metonymy and Metaphor by Computer

(Fass, 1991)

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Outline

- Introduction
  - theoretical background
  - computational approaches
- Main part
  - met*
  - Collative Semantics (CS)
  - example analyses of metonymy and metaphor
- Conclusions

Metaphor

Example

"The car drank gasoline"

Definition

Metaphor: a trope in which one entity is used to ***view*** another entity to which it bears a *partial resemblance*.
(< μετα - φορά = carry over)

Metonymy

Example

"The ham sandwich is waiting for his check"

Definition

Metonymy: a trope in which one entity is used to ***refer*** to another that is *related* to it.
(< μετα - όνομα = change of name)

Metaphor views

Example

"Love is a rose"

Metaphor views

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1. **Comparison**: the *tenor* bears partial resemblance (*ground*) to the *vehicle*, non literal comparison

Metaphor views

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2. **Interaction**: *vehicle* is a template for seing *tenor* in novel way

Metaphor views

Example

"Love is a rose"

1. **Comparison**: the *tenor* bears partial resemblance (*ground*) to the *vehicle*, non literal comparison
2. **Interaction**: *vehicle* is a template for seing *tenor* in novel way
3. **Selection Restrictions Violation**: a metaphor violates the selectional restrictions of words in context

Metaphor views

Example

"Love is a rose"

1. **Comparison**: the *tenor* bears partial resemblance (*ground*) to the *vehicle*, non literal comparison
2. **Interaction**: *vehicle* is a template for seing *tenor* in novel way
3. **Selection Restrictions Violation**: a metaphor violates the selectional restrictions of words in context
4. **Conventional Metaphor**:
   - orientational (e.g. MORE IS UP, HAPPY IS UP),
   - ontological (TIME IS A SUBSTANCE, THE VISUAL FIELD IS A CONTAINER)
   - structural metaphors (ARGUMENT IS WAR, TIME IS MONEY)

Metonymy

Examples

"David drank the glasses"
"They played Schumann"
"Rob bought a Ford"

- Organize instances of metonymy into categories, **metonymic concepts**:
  - PART FOR WHOLE
  - CONTAINER FOR CONTENTS
  - ARTIST FOR ART-FORM
  - PRODUCER FOR PRODUCT

Distinctive characteristics between Metaphor and Metonymy

- Relationship established

Metaphor based on **similarity**: being alike in essentials or having characteristics in common

Metonymy founded on **congruity**: being connected or touching

- Primary Function

Metaphor a way of concieving one thing *in terms of* another, **understanding**

Metonymy allows one entity to *stand for* another, **referential**

Computational Approaches to Metaphor and Metonymy

- Metaphor:
  - Martin (1990)
  - Narayanan (1999)
  - Terai (2007)
- Metonymy:
  - TEAM: a transportable natural-language interface system by Grosz (1983)
  - TACITUS: A Message Understanding System (Hobbs et al., 1989)
  - Markert&Nissim (2009)
  - Shutova&Teufel (2009)

Basic assumptions (1)

Literalness	Metonymy	Metaphor	Nonliteralness/Anomaly

Literal meaning: satisfied constraint preferences

Example

"The baby drank milk"

Metonymy: source-target in a metonymic inference relation

Example

"The baby drank the bottle"

Basic assumptions (2)

Literalness	Metonymy	Metaphor	Nonliteralness/Anomaly

Metaphor: source-target in a relevant analogy relation

Example

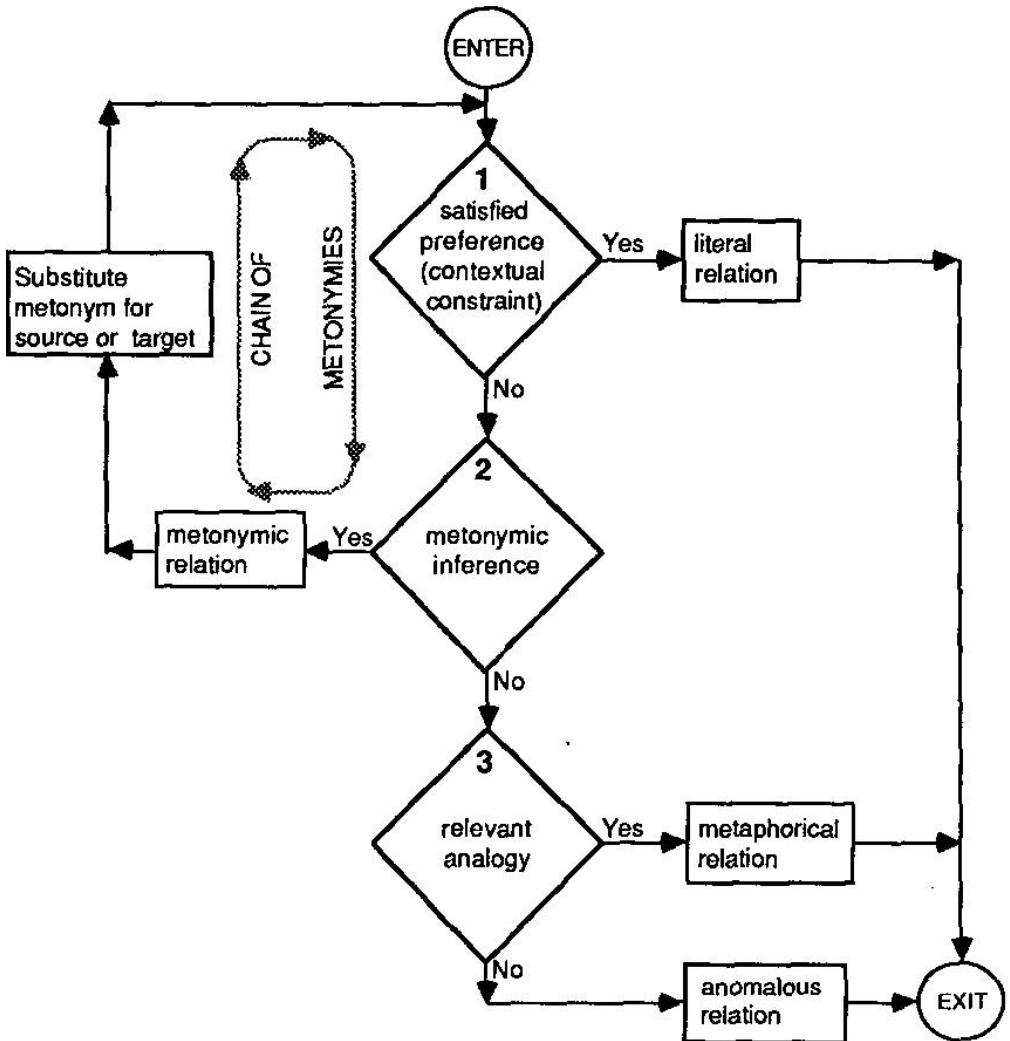
"The car drank gasoline"

Anomaly: preference constraint violation, no metonymic inference, no relevant analogy

Example

"The baby drank the table"

The met* Method



Observations on the met* method

1. literalness is distinct from the others, which are all nonliteral
2. metonymies can occur in chains
3. metaphor and anomaly are the hardest to tell apart (and thus require the most extended processing to distinguish).

Collative Semantics (CS)

Collative Semantics (CS) is a semantics for Natural Language Processing - extension of Preference semantics - implemented in the meta5 program

Goal is to **distinguish the type of semantic relations** between the meanings of words

Preference-based relations

Components of CS:

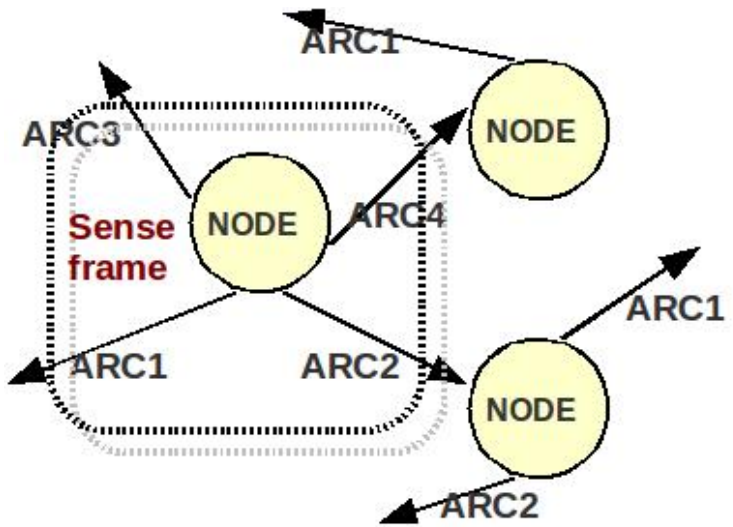
1. **sense-frames**
2. **collation**
3. semantic vectors
4. screening

Sense-frame examples

```
sf(crook1,
        [[arcs,
        [[supertype, criminal1]]],
        [node0,
        [[it1, steal1, valuables1]]]]).
sf(crook2,
        [[arcs,
        [[supertype, stick1]]],
        [node0,
        [[shepherd1, use1, it1],
        [it1, shepherd1, sheep1]]]]).
```

Sense-frames

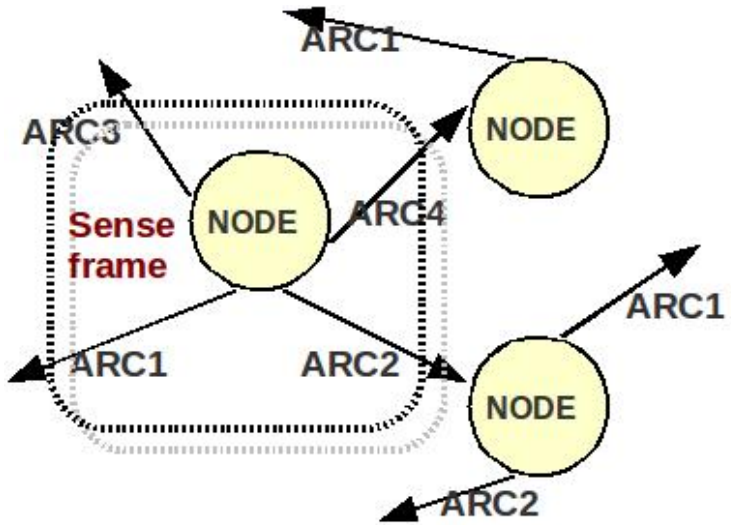
sense-frame (sf) = ARCS + NODE



schematic representation of sense-frames

Sense-frames

sense-frame (sf) = ARCS + NODE



schematic representation of sense-frames

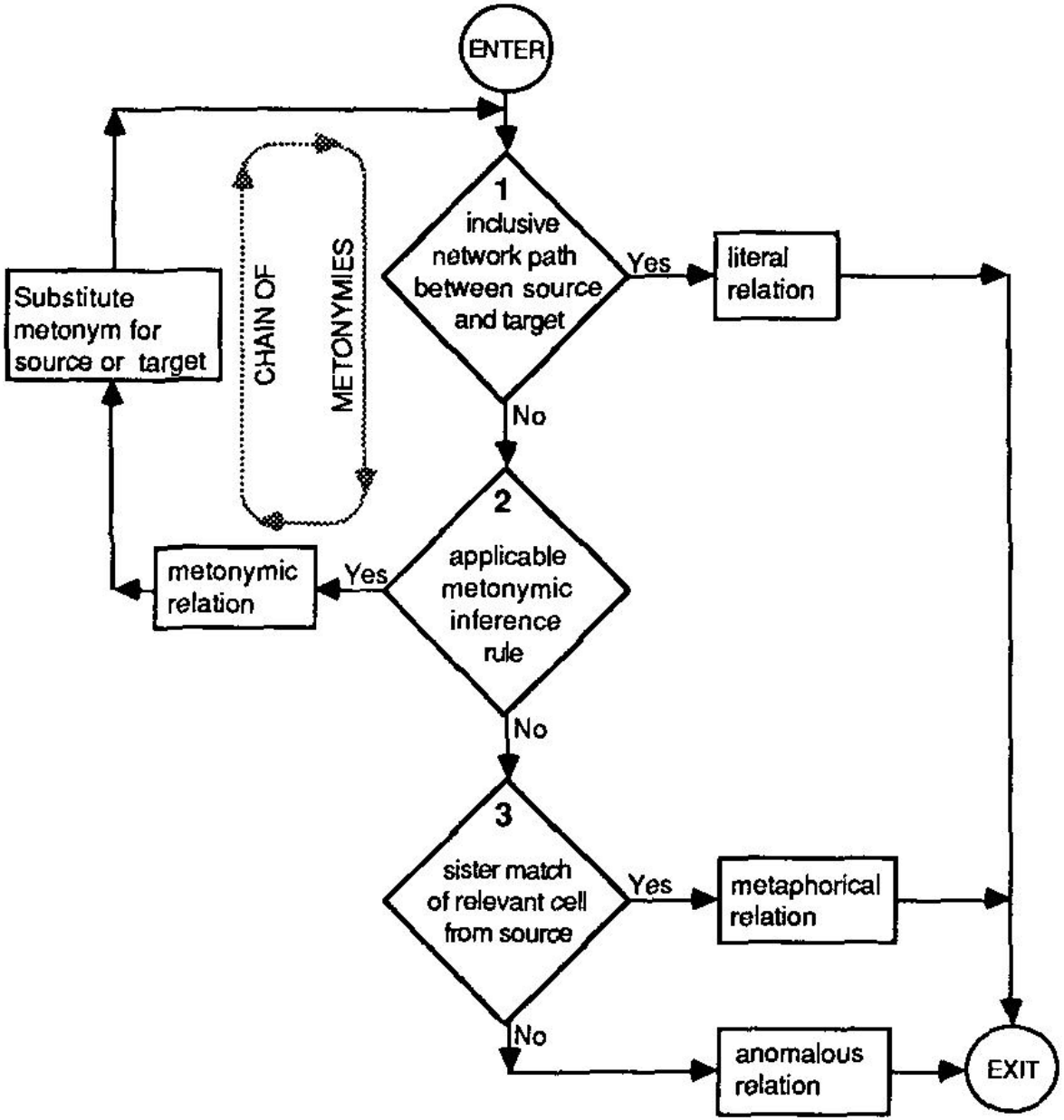
Sense-network a densely structured semantic network of word senses, constructed by all arcs of the sense-frames

Collation

Collation **matches** the sense-frames of two word senses and finds a system of **multiple mappings** between them.

↓

discrimination of the semantic relation between the word senses.


ENTER
1
inclusive network path between source and target
Yes
literal relation
No
2
applicable metonymic inference rule
Yes
metonymic relation
Substitute metonym for source or target
CHAIN OF METONYMIES
No
3
sister match of relevant cell from source
Yes
metaphorical relation
No
anomalous relation
EXIT

Metonymy Discrimination (1)

sense-frame retrieval

Example

"Ted played *Bach*". (=the music of Bach)

- Sense frame play12

```
sf(play12,
        [[arcs,
        supertype, perform1]]],
        [node2,
        [[agent,
        [preference, human being1]],
        [object,
        [preference, music1]]]]).
```

Metonymy Discrimination (2)

chain of metonymies

Example

"Ted played *Bach*". (=the music of Bach)

- **Chain of metonymies** from the target (surface object) to the source (selectional preference of the verb):

Metonymy Discrimination (3)

final literal relation

Example

"Ted played *Bach*". (=the music of Bach)

- **Literal relation** between the source and the selectional preferences of the play12.

sf(play12,
[[arcs,
supertype, perform1]]],
[node2,
[[agent,
[preference, human being1]],
[object,
[preference, music1]]]]]).

Metaphor discrimination (1)

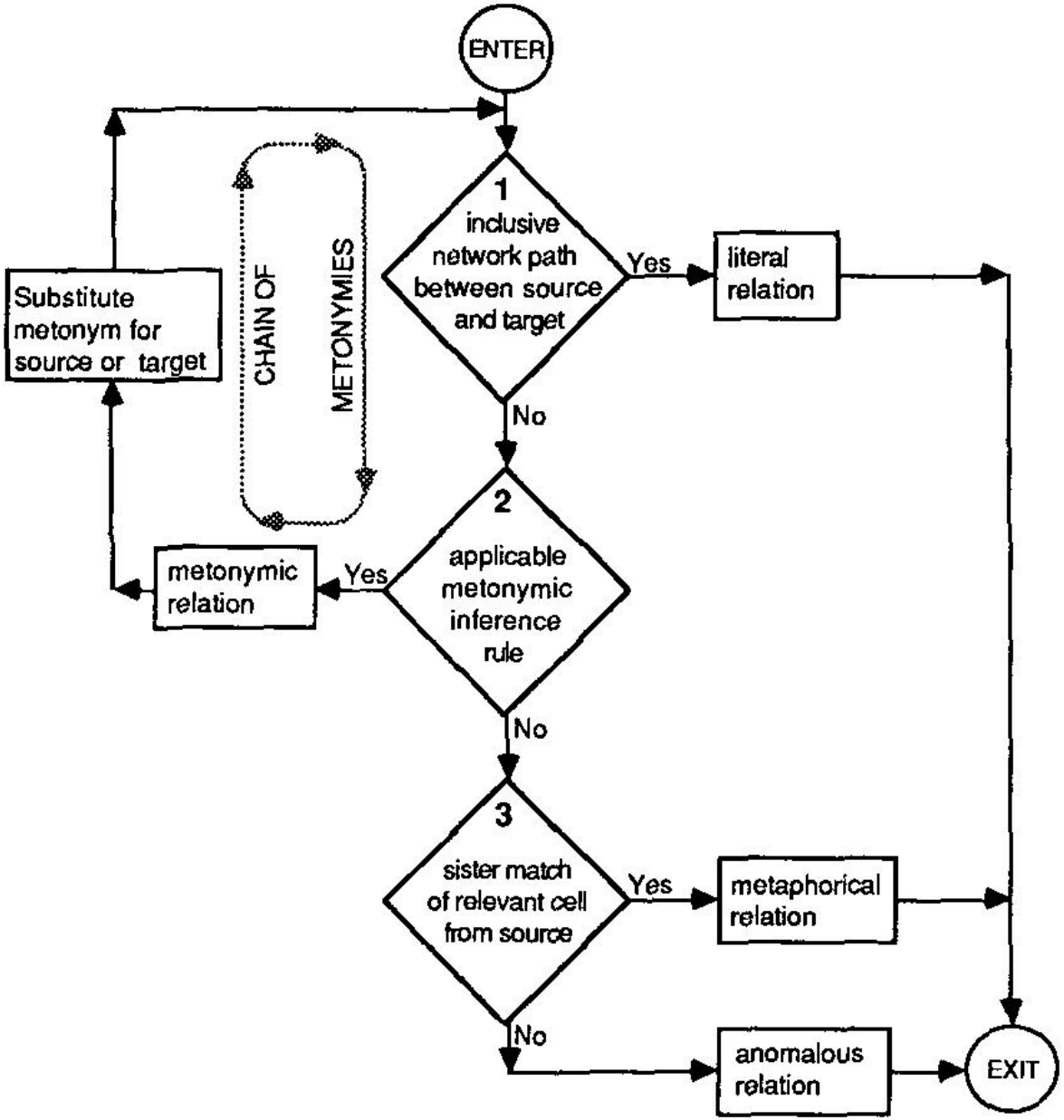
sense-frame retrieval

Example

"The **car drank** gasoline"

- Sense-frames for car1 and drink1 (verb)

```
sf(car1,
        [[arcs,
        [[supertype, motor_vehicle1]]],
        [node0,
        [[it1, use1, gasoline1]
        [it1, carry1, passenger1]]]]).
sf(drink1
        [[arcs,
        [[supertype, [ingest1, expend1]]]],
        [node2,
        [[agent, [preference, animal1]],
        [object, [preference, drink1]]]]]).
```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anomalous relation
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Metaphor discrimination (2)

sense frame mapping

Assumption: **"car"** and **"animal"** stand in a metaphoric relation → seek for ***relevant analogy***:

- match relevant cells: car1 ► animal1
- find sister network path between the nodes of the relevant cells:

$$\text{use1}_v \blacktriangleright \text{drink1}_v$$

$$\text{gasoline1}_n \blacktriangleright \text{drink1}_n$$

Else, anomalous semantic relation.

Metaphor discrimination (3)

Matching relevant cells

- Match *relevant cells* of sense-frames:

car1 ▶ animal1

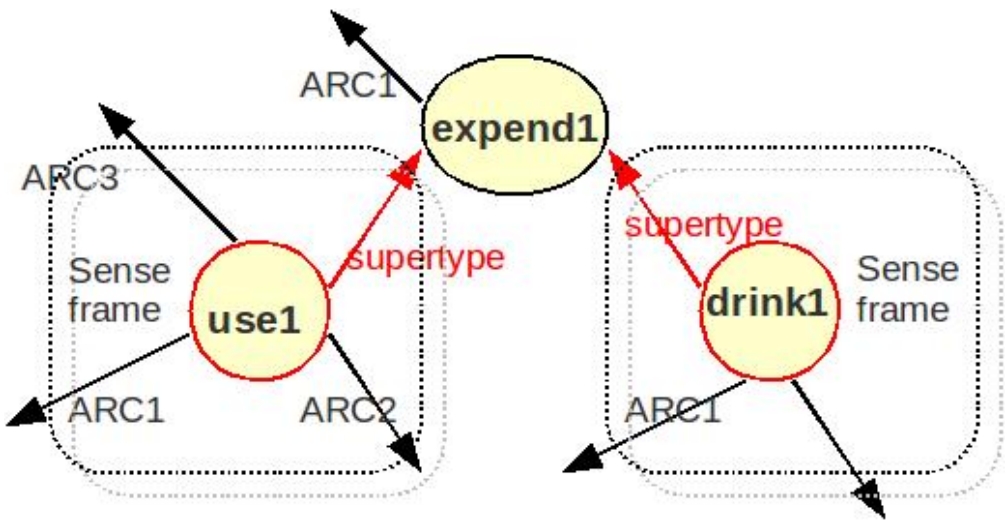
```
sf(car1,
        [[arcs,
        [[supertype, motor_vehicle1]]],
        [node0,
        [[it1, use1, gasoline1]
        [it1, carry1, passenger1]]]]).
sf(animal1,
        [[arcs,
        [[supertype, organism1]]],
        [node0,
        [[biology1, animal1],
        [it1, drink1, drink1]
        [it1, eat1, food1]]]]).
```

Metaphor discrimination (3)

Finding network paths

- find *sister* network path between:

$$\text{use1}_v \blacktriangleright \text{drink1}_v$$

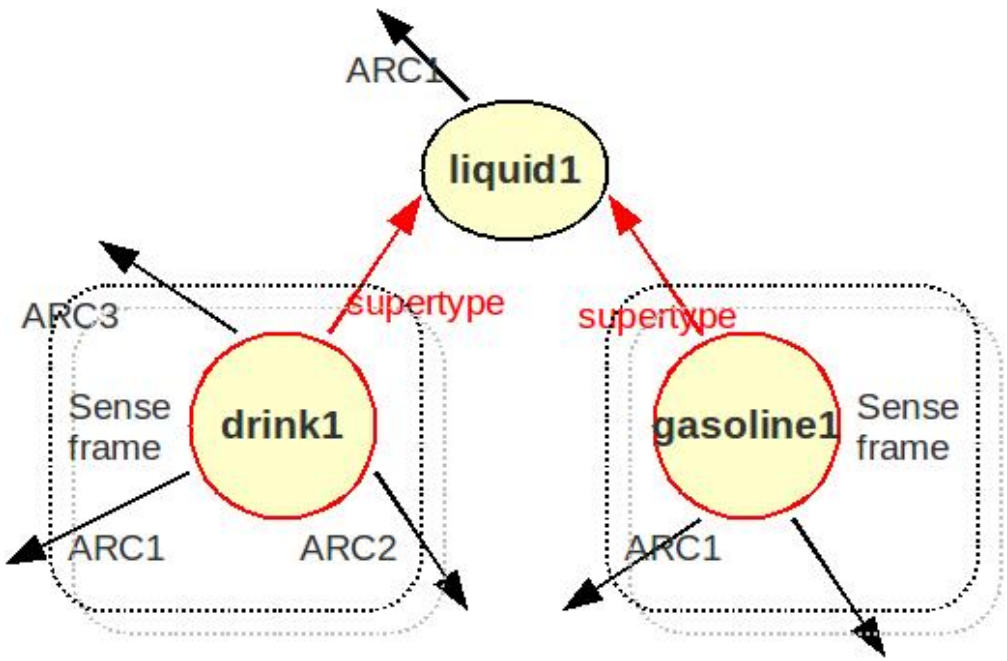


Metaphor discrimination (3)

Finding network paths

- find *sister* network path between:

$$\text{gasoline1}_n \blacktriangleright \text{drink1}_n$$



Metaphor discrimination

Relevant analogy found

Found relevant analogy between **"car"** (the surface agent) and **"animal"** (the preference agent)

"The car drank the gasoline" $\rightarrow$ **Metaphor**

Critics

Advantages

1. seems to work well
2. **reasonable** approach to metonymy and metaphor

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Advantages

1. seems to work well
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Disadvantages

1. **knowledge-based** approach,
   - everything set manually (fixed lexicon, metonymic rules)
   - limited coverage, more metonymy cases
2. **no evaluation** available; performance questioned

Summary

- **views** on metaphor and metonymy
- computational approaches
- continuous from **literalness to anomaly**
- **met***: a method for discriminating metonymy and metaphor
- collative semantics (CS): **"preference-based"** semantic relations
- metonymy and metaphor **example analyses**
- critics

Ευχαριστώ

Thanks

Discussion

Further questions?

Your opinion?

Bibliography

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