

[An Empirical View on Semantic Roles Part I]

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[Two words about ourselves]

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 - Computational Linguistics
 - Saarland University, Saarbrücken, Germany
- Project SALSA: Exhaustive annotation of a German corpus with role-semantic analyses

[What this course will be about]

- “An Empirical View on Semantic Roles Within and Across Languages”
- Semantic roles
 - ...such as...AGENT, PATIENT?
 - [Peter_{Agent}] hits [Paul_{Patient}].
- Empirical view
 - Data, data, data
- Across languages
 - Sprechen Sie Deutsch?

[The structure of our course]

1. A Historical Introduction
 - Why do we want to say that Peter is an AGENT at all?
2. Contemporary Frameworks
 - [Peter_{Agent}] hits [Paul_{Patient}] vs. [Peter_{Arg0}] hits [Paul_{Arg1}]
3. Empirically Difficult Phenomena
 - What if Peter hits Paul metaphorically?
4. Role Semantics vs. Formal Semantics
 - [Peter_{Agent}] hits [Paul_{Patient}] vs. hits' (peter', paul')
5. Cross-linguistic Considerations
 - [Peter_{Agent}] schlägt [Paul_{Patient}]

[Goals of this course]

- Make you familiar with semantic roles
 - Give you a feeling for what works and what doesn't
 - Both on a conceptual and a practical level
- Make you interested in lexical semantics
- Note: Much of this course covers “research territory”
 - Discussions appreciated!

[Structure]

1. A Historical Introduction
2. Contemporary Frameworks
3. Empirically Difficult Phenomena
4. Role Semantics vs. Formal Semantics
5. Cross-linguistic Considerations

Transformational Grammar and Paraphrases

- Transformational Grammar (TG) was the first “complete” grammar formalism (Chomsky 1957)
 1. Grammar + Lexicon → Deep structure (DS)
 2. DS + Transformations → Surface structure
- TG can model **structural paraphrases**
 - Paraphrases have the same deep structure
 - Surface variation introduced by *transformations*
 - Classical example: passive [– NP] → [– by-PP]
- Weak lexicon
 - Verb arguments only specified by **phrase type**
 - Lexicon involved only in first step (construction of DS)

Problem 1: Lexically specific alternations

John *punched* [NP the paper] [PP with the pencil]
John *punched* [PP through the paper] [PP with the pencil]

- Sentences are paraphrases
 - Surface difference: Diathesis alternation
 - [– NP PP] vs. [– PP PP]
- Introduce a transformation?
 - Not a general pattern!
 - Then sentences cannot share deep structure
- Cannot express **equivalence** of [NP] and [PP] as arguments of *punch*

Problem 2: Semantic properties

- “Equivalent” arguments have the same semantic properties **across realisations and across predicates**:

John punched X with Y
John punched through X with Y
John pierced X with Y
- Each of the above statements implies the following:
 - X is a physical object
 - Y is an instrument
 - John is human
- Cannot be expressed within transformational grammar
- NB: We are speaking about literal meaning here!

Case grammar (Fillmore 68)

- Main hypothesis: There is a set of semantically motivated **deep cases (=semantic/thematic roles)**
 - **Semantic classes** of verb arguments
- Sentence = Proposition plus Modality
 - Proposition: Verb plus **Roles**
 - Modality: Negation, Tense, Mood, Aspect, ...
- Roles replace phrase types in lexicon
 - Verbs specify subcategorisation **semantically**
 - punch: [A(gentive) D(ative)]
 - Roles expand to phrase types

Fillmore's set of deep cases

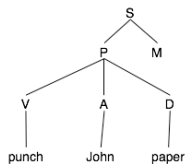
"A set of universal concepts which identify certain types of judgments humans make about the events going on":
semantic role definition in terms of typical properties

1. Agentive (A): animate instigator of an event
2. Instrumental (I): inanimate force or object causally involved in the event
3. Dative (D): the being affected by the event
4. Factive (F): the object or being resulting from the event
5. Locative (L): the location or spatial orientation of the event
6. Objective (O): anything else

Account of alternations

- Fillmore's model can account for alternations:
 - "Stronger" lexicon entries specify arguments in terms of semantic roles
 - Allows alternations to share deep structure
 - Differences arise on the way to surface structure

punch: [A(gentive) D(ative)]



John punched through the paper
 John punched the paper

Account of semantic properties

- Fillmore's model can also model semantic properties of roles...
- Can be read off role specifications
 - Agentive (A):
 - ⇒ Animate, Responsible, ...
 - Dative (D):
 - ⇒ Affected
- NB. Only *informal* account of "role meaning"

An application of semantic properties: Linking

- Transformation-driven generation of surface structure infeasible
- Modular grammar formalisms need to specify surface realisations of arguments
 - Strong correlation to **semantic properties**
 - E.g., sentience usually property of subject
- Naïve model: Match semantic with grammatical hierarchies
 - AGENT > BENEFACTIVE > RECIPIENT/EXPERIENCER > INSTRUMENT > THEME/PATIENT > LOCATIVE
 - Subject > First objects > Second object > Obliques
- More sophisticated: Lexical Mapping Theory

An alternative approach: The cognitive tradition

- Claim: Motion is central semantic domain
- Semantic roles = motion/location concepts
 - Agent, Theme, Location, Source, Goal
- Other semantic fields can be mapped onto the motion domain
 - Look = Direction of gaze
 - Speak = Direction of message
- Gruber (1965)
- Jackendoff's work (e.g. 1983)

Some Problems

Assumptions of semantic role theories

- What assumptions can we make about semantic roles?
 - The more assumptions, the stronger the theory
- The most important assumptions:
 - There is a small, fixed set of semantic roles
 - Thematic roles are atomic
 - Every argument position is assigned exactly one role
 - Every thematic role is assigned to at most one argument
 - Thematic roles are independent of one another
- Every assumption has been contested

Definition of the role set

- Assumption: there is a unique set of semantic roles
 - Fillmore: 6 roles, including one "default role" (objective)
 - But: "additional cases will surely be needed"
- Importance: Basic "vocabulary" of theory
- Fundamental problem: What counts as evidence for positing semantic roles?
 - Evidence from semantic properties/inferences?
 - Evidence from alternations (syntactic)?
- Problematic phenomenon: Symmetrical verbs
 - [Pigeons] resemble [doves]: One, or two roles?

Atomicity of roles

- Assumption: No subsumption relations between roles
- Importance: If roles not atomic, can introduce infinitely fine role distinctions
- Problematic phenomenon: RECIPIENT appears to be subtype of GOAL
 - I sent a package to the boarder/border.
 - I sent the boarder/*border a package.
- Difference in grammaticality calls for distinction - but both roles cannot be realised at the same time:
 - *I sent the boarder a package to the border

Uniqueness of argument analysis

- Assumption: Every argument is assigned exactly one role
- Importance: Guarantees consistency and completeness of analysis
- Problematic phenomenon: Commerce predicates (buy, sell)
 - Buyer and seller are both AGENTS and RECIPIENTS
 - Difference between **buy** und **sell**: Foreground / background of participants

Uniqueness of role assignment

- Assumption: Every role is assigned to at most one argument
- Importance: Guarantees consistency of analysis
- Problematic phenomenon: Complex event predicates
 - Many languages have causative predicates / serial verb constructions involving two agents
 - [I_{Agent}] make_laugh [you_{Agent}]

[Independence of roles]

- Assumption: Presence / Absence of one role should not influence status of other roles
- Importance: Interaction between roles makes theory cumbersome
 - Must always speak about role groups
- Problematic phenomenon: Goal/Theme alternation
 - Dale hit [the board_{Goal}].
 - Dale hit [the board_{Theme}] [against the wall_{Goal}].

[The result...]

- Much research activity in the 1970s
- Notion of “semantic role” was accepted into linguistic mainstream
 - Chomsky’s Government and Binding: theta theory
 - Theta criterion: Bijection between arguments and semantic roles
- But could not be consolidated into single, comprehensive theory
 - Main problem: Definition of semantic role
 - “I can’t define it but I know it when I see it”

[Dowty (1989)]

- Question: Can semantic roles be defined on proper *semantic* grounds?
 - Rejection of syntactic (alternation-based) criteria
 - Rejection of „one-sentence semantic characterisations“ (too weak)
- A new methodology for their definition
 - *Individual thematic role*: Complete set of entailments for a verb-specific argument position
 - *Thematic role type*: Intersection of *individual thematic roles* over all verbs

Independence

- Main hypothesis: **Independence**
 - „Interesting“ thematic role types do not contain entailments referring to individual verbs
 - Coarse-grained roles as „natural classes“ of verb meaning
- Problem: Concrete/abstract LOCATION/GOAL roles
 - John rolled the ball [to the fence_{Goal}].
 - Mary explained the idea [to John_{Goal}].
- Dowty: „However, I have no idea at present how to go about constructing a criterion that permits thematic roles to depend on what we might call natural classes of verb meanings“

Dowty (1991)

- Roles are not clearly separable concepts, but *cluster concepts*
 - Role definition through features generally impossible: „outside the linguistic system“
- There are only two prototypical roles: PROTO-AGENT and PROTO-PATIENT
 - Individual arguments have different „degrees of membership“ in proto-agent and proto-patient
 - Claim: Can still explain linking

Definition of proto-roles

- | | |
|---|---|
| ■ PROTO-AGENT | ■ PROTO-PATIENT |
| ○ Volitional involvement | ○ Change of state (including coming-to-be, going-out-of-being) |
| ○ Sentience (and/or perception) | ○ Incremental theme |
| ○ Causes event | ○ Causally affected by the event |
| ○ Movement | ○ Stationary |
| ○ Referent exists independently of action of verb | ○ Referent may not exist independently of action of verb, or not at all |

Proto-roles and linking

- No single property is essential for one of the roles
 - Argument with most PROTO-AGENT properties becomes subject
 - Argument with most PROTO-PATIENT properties becomes object
- If two arguments compete for a proto-role, both linking patterns are possible (psych verbs)
- Some arguments don't receive any role
- Problems:
 - Verbs with PROTO-PATIENTS as subjects (suffer, undergo)
 - Being a causer appears to be especially strong property (wins over other properties?)

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