Integrating grammatically relevant lexicalized meaning into morphological analyzers

Katina Bontcheva, Nicolas Kimm, Natalia Mamerow

Heinrich-Heine-University Düsseldorf

Outline

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2. Theoretical Background

    1. Realizational morphology

    2. Vendler's four time schemata

    3. Scalarity and manner/result complementarity

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Integrating Aspectually Relevant Properties of Verbs into a Morphological Analyzer for English

Motivation

➢ Aim: Construction of a morphological analyzer that includes semantic properties (e.g. (non-)scalarity, valency).

➢ Valency information is necessary for syntactic parsing and has been used in Constraint Grammar shallow parsers and in dependency parsers.

➢ Advantages of our approach:

  ➢ The valency-pattern tags are added to classes of verbs rather than to individual lexical entries.

  ➢ It is possible to provide alternative outputs for the integrated aspectually relevant semantic information.

Outline

Integrating Aspectually Relevant Properties of Verbs into a
Morphological Analyzer for English

Theoretical background

- Realizational morphology
  - Gregory Stump. 2001. Inflectional Morphology: A Theory of Paradigm Structure. Cambridge: Cambridge University Press.
- Vendler classes
  - Zeno Vendler. 1957. Verbs and Times. The Philosophical Review, Vol. 66, No. 2., 143-60
- Scalarity and manner/result complementarity
  - Malka Rappaport Hovav. 2008. Lexicalized Meaning and the Internal Temporal Structure of Events. In: S. Rothstein, (ed.), Theoretical and Crosslinguistic Approaches to the Semantics of Aspect. Amsterdam: John Benjamins, 13-42.
  - Malka Rappaport Hovav and Beth Levin. 2010. Reflections on Manner/Result Complementarity. In: M. Rappaport Hovav, E. Doron, and I. Sichel (eds.). Syntax, Lexical Semantics, and Event Structure. Oxford: Oxford University Press, 21–38.

Vendler classes: pros and contras

- Vendler's four time schemata:
  - States
  - Activities
  - Accomplishments
  - Achievements
- Pro: Vendler's classification was widely accepted and is used in most current studies on aspect.
- Contras:
  - Vendler does not classify verbs but VPs.
  - Part of the features used to differentiate between the classes are not lexicalized by the verb but can be determined at the VP level.
  - This classification allows multiple class membership even for the same word sense. Thus *run* can be activity and accomplishment, e.g., *running/running a mile*.
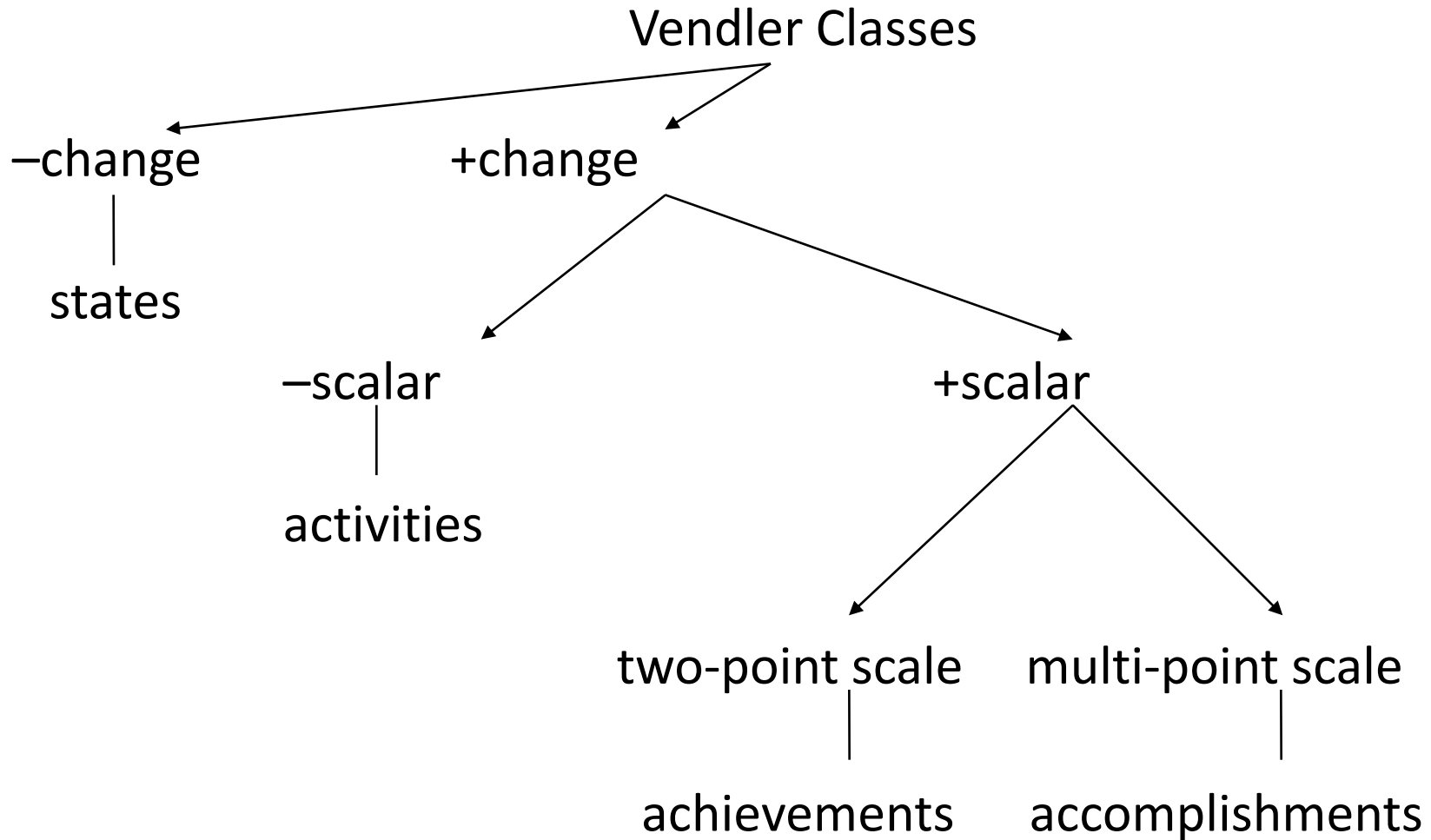
Rappaport Hovav & Levin (RH & L) classes

➢ Dynamic verbs either lexicalize scales (scalar verbs) or do not (non-scalar verbs).

➢ Non-scalar verbs lexicalize manner.

➢ Scalar verbs lexicalize result.

➢ Scalar verbs lexicalize two major types of scales – multi-point scales and two-point scales.

➢ The chosen aspectually relevant properties are complementary.

➢ All lexical distinctions described here have grammatical consequences which are relevant to aspectual composition.

Pros of RH & L classes

➢ The verbs fall into disjunctive classes. There is no multiple class membership (for the same word sense).

➢ The aspectual properties are lexicalized exclusively by the verb and are not computed at the VP level.

➢ The lexicalized aspectual properties constrain the syntactical behavior of the verb.

➢ Manner verbs in English show a uniform argument-realization pattern: they can appear with unspecified and non-subcategorized objects.

➢ Result verbs are more constrained and less uniform in their argument realization patterns. Transitivity (in contrast to the manner verbs) is an issue.

Vendler classes and scalarity (Van Valin (to appear), following RH 2008)

Vendler Classes

–change → states

+change
  –scalar → activities
  +scalar
    two-point scale → achievements
    multi-point scale → accomplishments

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Intersecting inflectional and semantic classes

➢ Inflectional classes (regular, irregular and suppletive verbs) are disjunctive by default.

➢ RH & L aspectual classes (manner, multi-point scale and two-point scale verbs) are also disjunctive (in contrast , e.g., to Vendler classes).

➢ The intersections of inflectional classes with aspectual classes produce sets of bases that share the same inflectional class and semantic class.

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Example

Killer wants to go to school (Paul Simon, slightly adapted)

1 killer   killer   +N+Nom+Sg

2 wants   want   +N+Nom+Pl

                             +V+Pres+3P+Sg

3 to   to   +Prep

                             +InfMark

4 go   go   +V+Pres+Non3PSg +V+Inf

                             +N+Nom+Sg

5 to   to   +Prep

                             +InfMark

6 school school   +V+Pres+Non3PSg +V+Inf

                             +N+Nom+Sg

7 .   .   +Punct

Example

A shallow syntactic parser typically uses mainly the POS tags:

1 killer	killer	+**N**+Nom+Sg
2 wants	want	+**N**+Nom+Pl
		+**V**+Pres+3P+Sg
3 to	to	+**Prep**
		+**InfMark**
4 go	go	+**V**+Pres+Non3PSg +**V**+Inf
		+**N**+Nom+Sg
5 to	to	+**Prep**
		+**InfMark**
6 school	school	+**V**+Pres+Non3PSg +**V**+Inf
		+**N**+Nom+Sg
7 .	.	+**Punct**

Example

Accordingly, the tokens can receive the following phrase-syntax tags:

1.	killer	NPHead	PCompl	Premod	
2.	wants	NPHead	PCompl	MainV+F	
3.	to	PPHead	Premarker		
4.	go	NPHead	PCompl	MainV+F	MainV-F
5.	to	PPHead	Premarker		
6.	school	NPHead	PCompl	MainV+F	MainV-F

Example

If no semantic constrains apply, the following analyses are possible:

word 1	word 2	word 3	word 4	word 5	word 6
NPHead	MainV+F	PPHead	PCompl	PPHead	PCompl
Mary	*moved*	*with*	*John*	*to*	*Canada*
NPHead	MainV+F	PPHead	PCompl	Premarker	MainV-F
Pam	*went*	*to*	*Switzerland*	*to*	*recover*
NPHead	MainV+F	Premarker	MainV-F	PPHead	PCompl
Killer	*wants*	*to*	*go*	*to*	*college*
NPHead	MainV+F	Premarker	MainV-F	Premarker	MainV-F
John	*promised*	*to*	*try*	*to*	*sleep*
Premod	NPHead	Premarker	MainV-F	PPHead	PCompl
Killer	*whales*	*to*	*migrate*	*to*	*Antarctica*

[…]

Example

1 killer   killer   +N+Nom+Sg

2 wants   want   +N+Nom+Pl

                                  +V+Pres+3P+Sg

3 to   to   +Prep

                                    +InfMark

4 go   go   +V+Pres+Non3PSg +V+Inf   <multi-point>

                                    +N+Nom+Sg

5 to   to   +Prep

                                    +InfMark

6 school   school   +V+Pres+Non3PSg +V+Inf

                                    +N+Nom+Sg

7 .   .   +Punct

Example

Multi-point scale verbs are used with PPs that mark scale:

killer	NPHead	PCompl	Premod	
killer	NPHead			
wants	NPHead	PCompl	MainV+F	
wants	MainV+F			
to	PPHead	Premarker		
to	Premark			
go	NPHead	PCompl	MainV+F	MainV-F
go	MainV-F			
to	PPHead	Premarker		
to	PPHead			
school	NPHead	PCompl	MainV+F	MainV-F
school	PCompl			

Example

Multi-point scale verbs are used with PPs that mark scale:

killer	NPHead	PCompl	Premod	
killer	NPHead			
wants	NPHead	PCompl	MainV+F	
wants	MainV+F			
to	PPHead	Premarker		
to	Premark			
go	NPHead	PCompl	MainV+F	MainV-F
go	MainV-F			
to	PPHead	Premarker		
to	PPHead			
school	NPHead	PCompl	MainV+F	MainV-F
school	PCompl			

Advantages of the Approach

➢ Alternative outputs for the integrated aspectually relevant semantic information can be provided.

➢ Redundancy is avoided by identifying abstract lexicalized properties that are shared across large groups of verbs.

➢ The computational efficiency of the morphological analyzer is not jeopardized.

➢ The integration of semantic properties improves the performance of syntax parsers that use the output of the morphological analyzer.

Outline

Future work

➤Implementation of state verbs

➤Work on noun semantic classes

➤Cross-linguistic examination of the approach

Thank you!

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References

Rappaport Hovav, M. & Levin, B. (2008). Lexicalized Meaning and the Internal Temporal Structure of Events. In: S. Rothstein, (ed.), *Theoretical and Crosslinguistic Approaches to the Semantics of Aspect*. Amsterdam: John Benjamins, 13-42.

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