

# POLYMNIE

## Parsing and Synthesis with Abstract Categorical Grammars

### Kick-off Meeting

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# Outline

- 1 Scientific Context
- 2 The ANR Call
- 3 Scientific Foundations
  - Abstract Categorical Grammars
  - Discourse
  - Rhetorical Structures
  - Originality
- 4 Partners
- 5 Scientific Program

# Overall Objective

## Objective

Studying and implementing the modeling of sentences and discourses in a compositional paradigm.

- Taking into account their dynamics and their structures
- Both in parsing and in generation

## Methodology

- A reversible framework: Abstract Categorical Grammars
- Modeling proposals
- Experimentation and evaluation

# ANR Classification

- Contint 2011 program (interactions and contents):
  - Semantic representation
  - Abstract representation of data
- Basic research
- Related to the CAULD INRIA project and to the ANNODIS ANR project.

# On Text Transformation

## Some examples

- Automatic translation
- Automatic summarization
- Question answering
- Text simplification

## Characteristics

- Parsing: structural or semantic representation (trees, word vectors, graphs, etc.)
- Synthesis: grammaticality and fluency

# Abstract Categorical Grammars [de Groote(2001)]

## A Grammatical Framework

- Two generated languages
  - an **abstract** language
  - an **object** language

Supported by a same mathematical structure: **sets of  $\lambda$ -terms**

- A large range of language classes can be described

## Key features

- Abstract and object structures are **relative** to each other.
- Syntactic and semantic (and pragmatic) information in the lexicon.
- Naturally fits in Montagovian formal semantics framework.

See Sylvain Salvati's talk.

# Compositional Approach to Discourse

## Dynamic Phenomena

- Context change potential
- Introduction of discourse referents
- Interpretation of pronouns
- ...

## Methodological and Technical Issues (DRT and DPL)

- Non-standard interpretation of formulas:
  - Interpretation as relations between pairs of worlds and assignment functions
  - $(\exists x.\phi) \wedge \psi \Leftrightarrow \exists x.(\phi \wedge \psi)$  (scope theorem)
- Destructive assignment and variable clash

See Richard Moot's talk  
**Continuations Semantics**

# Rhetorical Structures

- A key role in discourse coherence
- Discourse relations between text units

## Hierarchical Structure

Interacts with

- Accessibility (discourse referents or discourse units) [Asher(2008), Cristea et al.(2000)Cristea, Ide, Marcu, and Tablan]
- Summarization [Marcu(2000)]
- Text compression [Carlson et al.(2001)Carlson, Conroy, O'Leary, Marcu, Okurowski, Taylor, and Louis et al.(2010)Louis, Joshi, and Nenkova, Clarke and Lapata(2010)]

Both in parsing and generation.

See Nicholas Asher's and Laurence Danlos' talks



# Originality

## Key points

- Flexibility wrt syntactic, semantic, and discourse models
- Unified description of the linguistic levels: interaction of the lexicon with all the levels
- Computational models (type system and calculus) and reversibility properties
- Linguistic and software resources for discourse analysis/synthesis

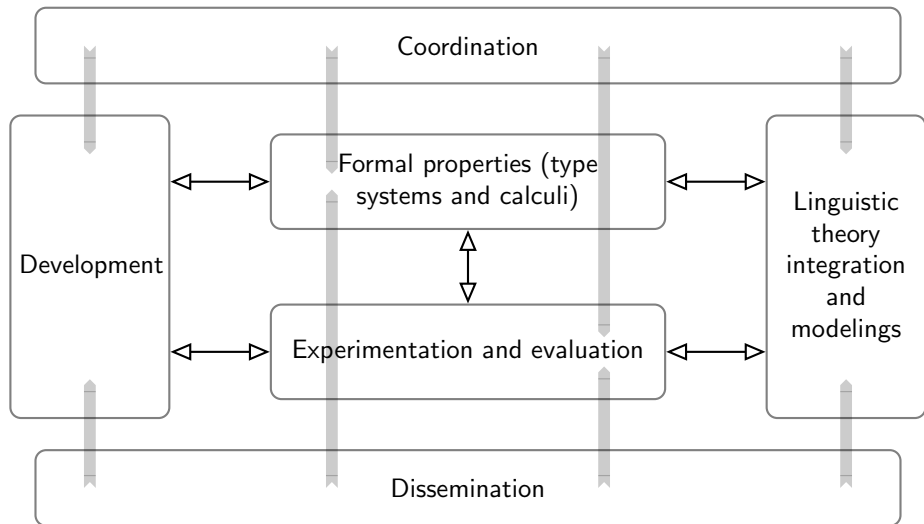
## Scientific Directions

- Computational models
- Discourse modeling and linguistic levels integration
- Linguistic relevance

# Partners

- Sémagramme(formal properties of the systems, modeling, and development)
- Alpage(linguistic theories, experimentation, and evaluation)
- Melodi(linguistic theories, experimentation, and evaluation)
- LaBRI(formal properties, modeling, development)

# Tasks Interaction



# Theoretical Tasks

## Formal properties (type systems and calculi)

- 1 Parsing and Datalog queries
- 2 Structure of the context and its operations
- 3 Type-system and calculus extensions
- 4 Decidability, complexity, and reversibility

Sémagramme (resp.?), LaBRI

## Linguistic theory integration and modelings

- 1 ACG account of G-TAG and DS-TAG
- 2 Analysis and inference of discourse relations: what is needed in the context
- 3 Discourse structures and the lexicon, the syntax, the semantics
- 4 Discourse structure modification for text summarization

Alpage (resp.), Melodi, LaBRI, Sémagramme

# Experimentation and Evaluation

## Experimentation and evaluation

- 1 Experimentations: from modeling proposal (ACG account of G-TAG, D-STAG, SDRT, etc.)
- 2 Evaluation: from the developed software and evaluation campaign participation

Melodi (resp.), Sémagramme, Alpage, LaBRI

## Development

- 1 2nd-order ACG parsing
- 2 User feedbacks and optimisation
- 3 Type-system and calculus extensions

Sémagramme (resp.), LaBRI

# Other Tasks

## Coordination

By task responsables/local coordinators

- 1 Project coordination
- 2 Scientific and technological monitoring
- 3 Administrative monitoring

## Dissemination

- 1 Annual workshops
- 2 Lectures at summer schools
- 3 Web site and software diffusion



N. Asher.

Troubles on the right frontier.

In A. Benz and P. Kühnlein, editors, *Constraints in Discourse*, volume 172 of *Pragmatics & Beyond New Series*. John Benjamins Publishing Company, 2008.



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J. Clarke and M. Lapata.

Discourse constraints for document compression.

*Computational Linguistics*, 36(3):411–441, 2010.



D. Cristea, N. Ide, D. Marcu, and V. Tablan.

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A. Louis, A. Joshi, and A. Nenkova.

Discourse indicators for content selection in summarization.

In *Proceedings of SIGDIAL 2010*, pages 147–156. ACL, 2010.

URL <http://www.aclweb.org/anthology/W/W10/W10-4327>.



D. Marcu.

*The Theory and Practice of Discourse Parsing and Summarization*.

The MIT Press, 2000.

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## Principles [de Groote(2006)]

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$$\begin{array}{l} \llbracket s \rrbracket \\ \llbracket np \rrbracket \end{array} = (e \rightarrow \llbracket s \rrbracket) \rightarrow \llbracket s \rrbracket$$

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## Example

A man is sleeping.

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