

WP 4: Semantic Content

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WP 4 Participants

CNR-ILC, Pisa

DFKI, Saarbruecken

INRIA-LORIA, Nancy

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WP 4 Objectives

- Develop metamodels compliant with the state of the art in computational semantics, and with wide academic and industrial support
- Identify interoperable concepts for semantic annotation in accordance with the metamodels, and describe these in the form of data category entries (ISO 12620)
- Develop test suites in 4 European languages, for testing viability and usability of proposed data categories and to support and promote their use.



Areas of semantic annotation

- Temporal information (*temporal entities and relations*)
- Coreference (*referential entities and links*)
- Semantic roles (*ways of participating in events and situations*)
- Dialogue acts (*communicative functions of elements in interactive discourse*)

External Relations

- ISO TC 37/SC 4/TDG 3: Thematic Domain Group on Semantic Content



LIRICS WP 4 and TDG 3:

*Data categories defined in WP 4 are subject to certification
ISO TC 37/SC 4/TDG 3*

by

- ACL-SIGSEM Working Group for the Representation of Multimodal Semantic Information



*Joint LIRICS - ISO/TDG3 - ACL/SIGSEM workshops:
Tilburg '05, Nancy '05, Marina del Rey '06, Paris '06,
Cambridge, MA '06, Tilburg '07*

WP 4 Outstanding Results (1)

Metamodeling

- Metamodel established for temporal information, now used in ISO-TimeML
- Metamodels established for semantic roles, reference annotation, dialogue acts

Data categories

- Data categories for: semantic role annotation, dialogue act annotation, reference annotation certified by ISO TC 37/SC 4 Thematic Domain Group 3, Semantic content □

WP 4 Outstanding Results (2.1)

Evaluation of data categories for dialogue acts

- Inter-annotator agreement measurements for English and Dutch
- 2 experienced annotators annotating from raw text and audio
- Results: **almost perfect agreement** (Rietveld & van Hout, 1993: kappa ≥ 0.80), suggesting possibility for future ISO project on annotation standard.

WP 4 Outstanding Results (2.2)

<i>Function class</i>	<i>kappa</i>
Information-seeking	0.98
Information-providing	0.99
Feedback	0.99
Interaction management	0.96
Social obligations management	0.94
<i>Average agreement</i>	<i>0.97</i>

WP 4 Outstanding Results (3)

Evaluation of semantic role data categories

Inter-annotator agreement measured for English, Dutch; 3 *inexperienced, untrained* annotators working on raw text

Remarkable results: **substantial agreement** (Rietveld & van Hout, 1993: $0.61 \leq \text{kappa} \leq 0.79$); step forward in the direction of annotation standard.

	A1-A2	A1-A3	A2-A3	average
English	0.64	0.68	0.62	0.65
Dutch	0.60	0.65	0.56	0.61

Semantic role annotation

Strong points of LIRICS work:

- unequivocal conceptual analysis of semantic role as a manner of participating in a state or event;
- strict separation of semantic role from:
 - syntactic role
 - semantic properties of participants
 - semantic properties of events/states
- clear definitions in terms of properties of participation involvement

Semantic roles in different initiatives

VerbNet: “Agent: generally a human or an animate subject. Used mostly as a volitional agent, but also used for controlled subjects such as forces and machines.”

(<http://verbs.colorado.edu/~mpalmer/projects/verbnet.html>)

LIRICS: /agent/: “Participant in an event who initiates and carries out the event intentionally or consciously; and that exists independently of the event.”

FrameNet: Agent, Arguer, Artist, Author, Buyer, Carrier, Cause_to_shine, Communicator, Cook, Copy, Destroyer, Employee, Entity, Grantor, Heat_source, Host, Judge, Killer, Noisy_event, Parents, Partners, Preventing_cause, Self_mover, Sleeper, Sound_source, Student, Text, Vehicle, and 54 others...

(<http://verbs.colorado.edu/semlink/>)

Summary of main results

- Foundational work: fruitful in all areas; successful Metamodelling -- temporal metamodel taken over in ISO-TimeML
- Establishment of peer group as ACL-SIGSEM Working Group, beyond lifetime of LIRICS
- Successful cooperation with ISO TC 37/SC 4/ TDG3:
 - Start-up of development of standard for temporal annotation;
 - Certification of data categories for dialogue acts, semantic roles and reference annotation
- Remarkable results in establishing and evaluating data categories for dialogue acts and semantic roles; more start-ups in TC 37/SC 4 expected soon.

WP 4 Deliverables

D4.1 "Methodological aspects of semantic annotation and representation". (September 2005)

- Development of methodological foundations for semantic metamodels
- Comparative analysis of alternative semantic annotation efforts in various areas.

D4.2 "Defining a preliminary set of interoperable semantic descriptors". (August 2006)

- First draft of set of data categories for the annotation of temporal information, reference, semantic roles and communicative functions.

WP 4 Deliverables

D4.3 “Documented compilation of semantic data categories.” (April 2007)

Data categories for: time and events (rolling over into ISO SemAF Part 1, Time and events), semantic roles, dialogue act functions, reference annotation

D4.4 “Multilingual test suites for semantic annotation.” (June 2007)

Sets of texts and dialogues in English, Dutch, Italian, French, German, Spanish annotated with data categories for semantic roles, dialogue acts and reference, with analysis of viability and usability.

Reference: satisfactory coverage; relation to syntactic and morphosyntactic annotation needs special effort to increase usability. Semantic roles and dialogue acts: outstanding results, suggesting possibilities for future activities in ISO.

WP 4 - related publications

- Geertzen, O., Petukhova and H. Bunt (2007) 'A Multidimensional Approach to Utterance Segmentation and Dialogue Act Classification'. In *Proc. 8th SIGDIAL Workshop on Discourse and Dialogue*, Antwerp, pp. 140 -- 149.
- Petukhova, O., A. Schiffrin and H. Bunt (2007) 'Defining Semantic Roles' (with Olga Petukhova and Amanda Schiffrin). In *Proc. Seventh International Workshop on Computational Semantics (IWCS-7)*. Tilburg, pp. 362 -- 365.
- Bunt, H., and A. Schiffrin (2007) 'Interoperable concepts for dialogue annotation. In *Proc.. 7th Int. Workshop on Computational Semantics (IWCS-7)*, Tilburg, pp. 16 - 27.
- Petukhova, O., and H. Bunt (2007) 'A multidimensional approach to multimodal dialogue annotation.' *Proc.. 7th Int. Workshop on Computational Semantics (IWCS-7)*, pp. 142 - 153.
- Petukhova, O., A. Schiffrin and H. Bunt (2007) 'Defining Semantic Roles.' *Proc.. 7th Int. Workshop on Computational Semantics (IWCS-7)*, pp. 362 - 265.
- Morante, R., H. Bunt and S. Keizer (2007) 'A dialogue act based model for context updating.' In *Proc. 11th Int. Conference on the Semantics and Pragmatics of Dialogue (DECALOG 2007)*, pp. 9 - 16.
- Bunt, H. (2006) 'Computational pragmatics and dialogue corpus annotation.' In *Proc. 10th International Pragmatics Conference*, Gothenburg, pp. 1220 - 1222.
- Bunt, H. and A. Schiffrin (2006) 'Methodological aspects of semantic annotation'. In *Proc. Fifth International Conference on Language Resources and Evaluation (LREC 2006)*, Genova, pp. 1444 -- 1449.
- Bunt, H. (2006) 'Dimensions in Dialogue Act Annotation'. In *Proc. Fifth International Conference on Language Resources and Evaluation (LREC 2006)*, Genova, pp. 958 - 963.
- Geertzen, J. and H. Bunt (2006) 'Measuring annotator agreement in a complex hierarchical dialogue act scheme.' In *Proc. 7th SIGDIAL Workshop on Discourse and Dialogue*, Sydney, pp. 126 -- 133.
- Bunt, H. and Y. Girard (2005) 'Designing an Open, Multidimensional Dialogue Act Taxonomy'. In: *DIALOR'05, Proc. 9th Int. Conference on the Semantics and Pragmatics of Dialogue*, Nancy, pp. 37 -- 44.

WP 4 - related conference presentations

9th Int. Conference on the Semantics and Pragmatics of Dialogue (DIALOR), Nancy, April 2005

5th Int. Workshop on Inference in Computational Semantics (ICoS'05), Nancy, September 2005 (**invited talk** by *Laurent Romary & Harry Bunt*)

5th Int. Conf. on Language Resources and Evaluation (LREC '06), Genova, June 2006
(2 papers)

7th Int. Workshop on Discourse and Dialogue (ACL-SIGdial 2006), Sydney, July 2006

7th Int. Workshop on Computational Semantics (IWCS-7), Tilburg, January 2007 (3 papers)

Int. Workshop on Multimodal Output Generation (MOG 2007), Aberdeen, January 2007
(**keynote speech** by *Harry Bunt*)

11th Int. Conference on the Semantics and Pragmatics of Dialogue (DECALOG), Trento, May 2007

10th International Pragmatics Conference, Gothenburg, July 2007

8th Int. Workshop on Discourse and Dialogue (ACL-SIGdial 2007), Antwerp, September 2007
(2 papers)

21st Pacific Asia Conference on Language, Information and Computation, (PACLIC-21), Seoul, November 2007 (**keynote speech** by *Harry Bunt*)

WP 4: Impact

- Work on the annotation of temporal information: LIRICS metamodel and preliminary data categories taken together with previous TimeML studies as starting point for **ISO TC 37/SC 4 work item: “Semantic Annotation Framework Part 1, Time and Events”** (a.k.a. ‘ISO-TimeML’).
Project team: James Pustejovsky, Branimir Boguraev, Harry Bunt, Kiyong Lee and Nancy Ide.
- Work on dialogue act annotation: development of multidimensional DIT++ scheme for functional annotation and representation; application in IMIX PARADIME (Parallel Agent-based Dialogue Management Engine).

WP 4: Future Activities

For semantic annotation in general:

- establish formal semantic interpretation of semantic annotations (e.g. In ISO: Temporal interval semantics for ISO-TimeML)
- integrate annotation of time, reference, semantic roles and dialogue acts, and provide integrated formal semantics (project proposal to Dutch Science Foundation)
- develop methods for automatic semantic annotation (PhD project)

For individual semantic domains:

- temporal annotation: contribute to development of ISO standard
- for dialogue act and reference annotation: move in direction of ISO projects (in TC 37/SC 4)
- for semantic role annotation: comparative evaluations of LIRICS data categories with FrameNet, PropBank, VerbNet,... (in ACL-SIGSEM)