A LAF/GrAF based Encoding Scheme

for underspecified Representations of syntactic Annotations

Manuel Kountz‡, Ulrich Heid*, Kerstin Eckart*

Computational Linguistics: GRK 609‡ / IMS*, Universität Stuttgart, Germany

{kountzml|heid|eckartkn}@ims.uni-stuttgart.de

Ambiguities

Example: *Karl sieht nur Schrott in seinem Wagen.*
Karl sees only scrap in(side) his car.

- **Structural alternatives**: Attachment of preposition *in*
  sieht - in, *Schrott - in*
  (Set aside attachment of the adverb *nur*)
- **Labelling alternatives**
  PP *in seinem Wagen* is attached to verb . . .
  – as argument: *K sieht S in A = K views A as S*
  – as adjunct: *K sieht S in A = K sees S and K is in A*
- **Interdependent alternatives**
  If PP is attached to noun (*Schrott - in*), in-PP must be adjunct

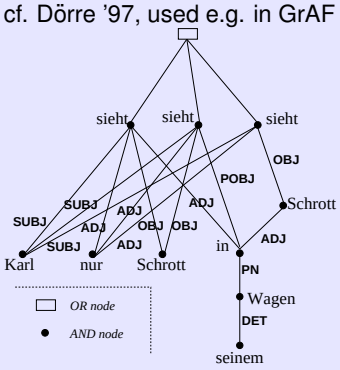
Requirements

- **Informational Efficiency**
  Encode *all information present* in the readings,
  and, at the same time, *reduce redundancy* in the encoding
- **Multifunctionality:** Usable for *several kinds of representations*
  e.g. based on various *syntactic* formalisms
  (dependency structures, TiGer);
  but also to encode *semantic* representations
- **Conformance to standards:**
  rely on LAF/GrAF, to ease *exchange*, *reuse*,
  and applicability of *standard tools & toolkits*
  (LAF: Ide & Romary '06, GrAF: Ide & Suderman '07)

Existing Approaches

for handling ambiguities
in corpus annotation

- **AND-OR-Trees**
  cf. Dörre '97, used e.g. in GrAF



  – intrinsically self-contained
  – *but* many edges, additional nodes

  ⇒ much data to store
  (partially redundant)
- **Treebanks**
  manually disambiguated

  ⇒ treebank structures as such can't represent ambiguities
- **Separate tiers for readings**
  using multi-layer annotation:
  (e.g. NITE, Carletta et al. '04)

  ⇒ highly redundant

  ⇒ non-canonical use of representational means
  – How many layers?
  – What do they stand for?

Proposed Extension to LAF/GrAF

LAF/GrAF represents **graphs** as List of nodes, list of edges

- labelled with feature structures

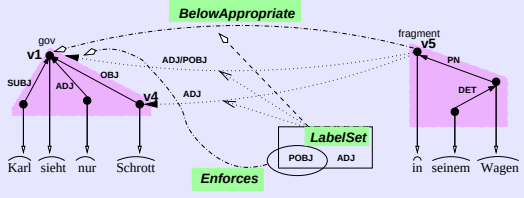
```
10 <!-- nodes -->
11 <node id="v1">     <!-- sieht   -->
12   <f name="cat" value="V"/>
13 </node>
14 <node id="v2">     <!-- Karl    -->
15   <f name="cat" value="NE"/>
16 </node>
17 <node id="v3">     <!-- nur     -->
18   <f name="cat" value="ADV"/>
19 </node>
20 <node id="v4">     <!-- Schrott -->
21   <f name="cat" value="N"/>
22 </node>
23 <node id="v5">     <!-- in      -->
24   <f name="cat" value="PREP"/>
25 </node>
26 <node id="v6">     <!-- seinem  -->
27   <f name="cat" value="PPOSS"/>
28 </node>
29 <node id="v7">     <!-- Wagen   -->
30   <f name="cat" value="N"/>
31 </node>
```

```
32 <!-- dependency edges -->
33 <edge type="dep-rel"
       id="e1" from="v2" to="v1">
34    <f name="role" value="SUBJ"/>
35 </edge>
36 <edge type="dep-rel"
       id="e2" from="v3" to="v1">
37    <f name="role" value="ADJ"/>
38 </edge>
39 <edge type="dep-rel"
       id="e3" from="v7" to="v5">
40    <f name="role" value="PN"/>
41 </edge>
42 <edge type="dep-rel"
       id="e4" from="v4" to="v1">
43    <f name="role" value="OBJ"/>
44 </edge>
45 <edge type="dep-rel"
       id="e5" from="v6" to="v7">
46    <f name="role" value="DET"/>
47 </edge>
```

```
48 <constraint-list>
49   <structural-constraint
50       id="c1" type="BelowAppropriate"
51       gov="v1" fragment="v5" />
52  <labelling-constraint
53       id="c2" type="LabelSet"
54       reference="c1"
55       labels="ADJ POBJ" />
56  <constraint-interdependency
57       id="c3" type="Enforces"
58       a="c2" aValue="POBJ"
59       b="c1" bValue="v1" />
60 </constraint-list>
```

We add to this data model a list of **constraints**

- **Structural constraints** control arrangement of *fragments*.
- **Labelling constraints** control labelling of nodes and edges.
- **Constraint inderdependencies**



Adaptation

This schema can be adapted to particular representations by **defining new constraints**:

Precondition: Representation available for fragments

1. define constraint *name & type*
2. clarify *semantics*, i.e. how to construct appropriate structures

Application Examples

Underspecified representations of *syntactic structures*

- **Dependency structures**
  along with proposed encoding of non-underspecified dependency structures in LAF/GrAF
- **TiGer**-style representation of syntactic ambiguities

(both in paper)

Encoding *semantic* USRs: e.g.

- **MRSs**: define `qeq` constraint & format for predicate logic formulas (structure ≈ trees). Semantics of `qeq` already specified. (Copestake et al. '05)
- **UDRSs**: devise `leq` constraint; need encoding for DRSs (structure: hierarchical)

Bibliography

SABINE BRANTS, STEFANIE DIPPER, SILVIA HANSEN, WOLFGANG LEZIUS & GEORGE SMITH (2002). The TIGER Treebank. Proceedings of the Workshop on Treebanks and Linguistic Theories.

ANN COPESTAKE, DAN FLICKINGER, CARL POLLARD & IVAN A. SAG (2005). Minimal Recursion Semantics: An Introduction. Research on Language & Computation 3.4. 281–332.

JOCHEN DÖRRE (1997). Efficient Construction of Underspecified Semantics under Massive Ambiguity. Meeting of the Association for Computational Linguistics. 386–393.

NANCY IDE & LAURENT ROMARY (2006). Representing Linguistic Corpora and Their Annotations. 5th International Conference on Language Resources and Evaluation, Genoa/Italy.

NANCY IDE & K. SUDERMAN (2007). GrAF: A Graph-based Format for Linguistic Annotations. Linguistic Annotation Workshop. Prague, Czech Republic: (28th—29th Jun 2007).

UWE REYLE (1993). Dealing with Ambiguities by Underspecification: Construction, Representation and Deduction. Journal of Semantics 10.2. 123–179.

JEAN CARLETTA, D. MCKELVIE, A. ISARD, A. MENGEL, M. KLEIN & M. B. MØLLER (2004). A generic approach to software support for linguistic annotation using XML. In G. SAMPSON & D. MCCARTHY (Eds.) Corpus Linguistics: Readings in a widening Discipline.

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