From <tiger2/> to ISOTiger – Community Driven Developments for Syntax Annotation in SynAF

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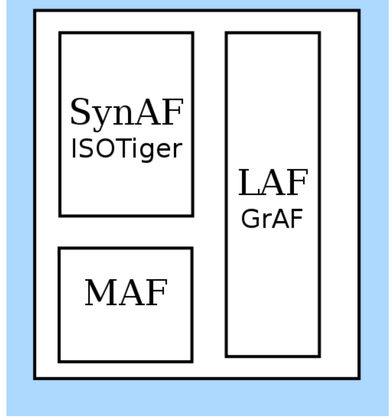
Architecture of corpus standards

Specifications and serializations (XML)

- SynAF: [ISO 24615]
  - Grammatical features
  - Phrase structures
  - Dependency structures
  - XML: ISOTiger
- MAF: [ISO 24611]
  - Tokenizing
  - Word forms: single, multi, fused
  - Inflection
  - XML: in appendix
- LAF: [ISO 24612]
  - Graph-based representation of primary data and annotations
  - General exchange format
  - XML: GrAF



Separation of representation and content

- Terminals in SynAF are equivalent to MAF word forms.
- Annotation vocabulary should be defined by means of a data category registry (DCR), cf. ISOcat. [ISO 12620]

The SynAF metamodel

- Syntactic Nodes
  - Terminal nodes for morpho-syntactically annotated word forms or for empty elements T_node
  - Non-terminal nodes: can be annotated with syntactic categories from the phrasal, clausal and sentential level NT_node
- Syntactic Edges between both terminal and non-terminal nodes supports representation of both constituency and dependency analyses
- Annotations
  - Can be applied to nodes and edges alike
  - Should make use of a DCR according to [ISO 12620]

An XML serialization for SynAF

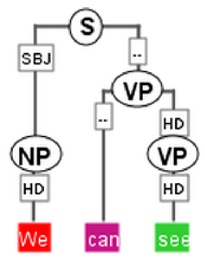
- Based on TIGER-XML, an existing and utilized format, [König et al. 2003] rather than 'inventing' a completely new format.
- Modified wrt TIGER-XML, to represent dependency structures, to relate annotations to a DCR, to allow for different node and edge types, etc.

TIGER-XML

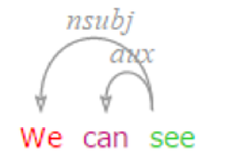
```
<head>
  <!-- ... -->
  <annotation>
    <feature name="word" domain="T"/>
    <feature name="cat" domain="NT">
      <value name="NP">nominal phrase</value>
      <value name="S">sentence or clause</value>
      <value name="VP">verbal phrase</value>
    </feature>
    <edgelabel>
      <value name="HD">head</value>
      <value name="SBJ">subject</value>
      <value name="--"/>
    </edgelabel>
    <secedgelabel/>
  </annotation>
</head>
```

We can see

⊟ tiger2 (constituents)



⊟ tiger2 (dependencies)




```
<body>
  <s id="s1">
    <graph root="s1_nt4">
      <terminals>
        <t id="s1_t1" word="we"/> <!-- we -->
        <t id="s1_t2" word="can"/><!-- can -->
        <t id="s1_t3" word="see"/> <!-- see -->
      </terminals>
      <nonterminals>
        <nt id="s1_nt1" cat="NP">
          <edge label="HD" idref="s1_t1"/>
        </nt>
        <nt id="s1_nt2" cat="VP">
          <edge label="HD" idref="s1_t3"/>
        </nt>
        <nt id="s1_nt3" cat="VP">
          <edge label="--" idref="s1_nt2"/>
          <edge label="HD" idref="s1_t2"/>
        </nt>
        <nt id="s1_nt4" cat="S">
          <edge label="SBJ" idref="s1_nt1"/>
          <edge label="--" idref="s1_nt3"/>
        </nt>
      </nonterminals>
    </graph>
  </s>
</body>
```

<tiger2/> [Bosch et al. 2012, Romary et al., to appear]

```
<head>
  <!-- ... -->
  <annotation>
    <feature name="cat" domain="nt"
      dcr:datcat="http://www.isocat.org/datcat/DC-1506">
      <value name="NP" dcr:datcat="http://www.isocat.org/datcat/DC-2256"/>
      <value name="S" dcr:datcat="http://www.isocat.org/datcat/DC-2295"/>
      <value name="VP" dcr:datcat="http://www.isocat.org/datcat/DC-2255"/>
    </feature>
    <feature name="label" domain="edge" type="prim"
      dcr:datcat="http://www.isocat.org/datcat/DC-5596">
      <value name="HD" dcr:datcat="http://www.isocat.org/datcat/DC-2306"/>
      <value name="SBJ" dcr:datcat="http://www.isocat.org/datcat/DC-2261"/>
      <value name="--"/>
    </feature>
    <feature name="label" domain="edge" type="dep"
      dcr:datcat="http://www.isocat.org/datcat/DC-2304">
      <value name="aux" dcr:datcat="http://www.isocat.org/datcat/DC-2262"/>
      <value name="nsubj">nominal subject</value>
    </feature>
  </annotation>
</head>
```

```
<body>
  <s xml:id = "s1">
    <graph xml:id="s1_g1">
      <terminals>
        <t xml:id="s1_t1" tiger2:corresp="m1.maf#wf1"/> <!-- we -->
        <t xml:id="s1_t2" tiger2:corresp="m1.maf#wf2"/> <!-- can -->
        <t xml:id="s1_t3" tiger2:corresp="m1.maf#wf3"> <!-- see -->
          <edge tiger2:type="dep" label="nsubj" tiger2:target="#s1_t1"/>
          <edge tiger2:type="dep" label="aux" tiger2:target="#s1_t2"/>
        </t>
      </terminals>
      <nonterminals>
        <nt xml:id="s1_nt1" cat="NP">
          <edge tiger2:type="prim" label="HD" tiger2:target="#s1_t1"/>
        </nt>
        <nt xml:id="s1_nt2" cat="VP">
          <edge tiger2:type="prim" label="HD" tiger2:target="#s1_t3"/>
        </nt>
        <nt xml:id="s1_nt3" cat="VP">
          <edge tiger2:type="prim" label="--" tiger2:target="#s1_nt2"/>
          <edge tiger2:type="prim" label="HD" tiger2:target="#s1_t2"/>
        </nt>
        <nt xml:id="s1_nt4" cat="S">
          <edge tiger2:type="prim" label="SBJ" tiger2:target="#s1_nt1"/>
          <edge tiger2:type="prim" label="--" tiger2:target="#s1_nt3"/>
        </nt>
      </nonterminals>
    </graph>
  </s>
</body>
```

```
<flib n="constituency features">
  <f xml:id="catNP" name="cat">
    <symbol value="NP"
    dcr:datcat="http://www.isocat.org/datcat/DC-2256"/>
  </f>
  <f xml:id="catS" name="cat">
    <symbol value="S"
    dcr:datcat="http://www.isocat.org/datcat/DC-2295"/>
  </f>
  <f xml:id="catVP" name="cat">
    <symbol value="VP"
    dcr:datcat="http://www.isocat.org/datcat/DC-2255"/>
  </f>
  <f xml:id="labelHD" name="cat">
    <symbol value="HD"
    dcr:datcat="http://www.isocat.org/datcat/DC-2306"/>
  </f>
  <!-- ... -->
</flib>
<flib n="dependency features">
  <!-- ... -->
</flib>
```

Proposals for ISOTiger

```
<!-- LAF reference mechanism to primary data:
                          |w|e|  |c|a|n|  |s|e|e|
                          0 1 2 3 4 5 6 7 8 9 10 -->
<!-- Only possible in cases where span is equal to word form. -->
<terminals>
  <t xml:id="s1_t1" from="0" to="2"/> <!-- we -->
  <t xml:id="s1_t2" from="3" to="6"/> <!-- can -->
  <t xml:id="s1_t3" from="7" to="10"/> <!-- see -->
</terminals>
```

```
<nt xml:id="s1_nt1"> <!-- utilizing feature library -->
  <fs feats="#catNP"/>
  <edge xml:id="s1_e3" type="prim" target="#s1_t1">
    <fs feats="#labelHD"/>
  </edge>
</nt>
```

```
<nt xml:id="s1_nt1"> <!-- utilizing feature structure -->
  <fs>
    <f name="cat"
    dcr:datcat="http://www.isocat.org/datcat/DC-1506">
      <symbol value="NP"
      dcr:datcat="http://www.isocat.org/datcat/DC-2256"/>
    </f>
  </fs>
  <edge xml:id="s1_e3" type="prim" target="#s1_t1">
    <!-- ... --> </edge>
</nt>
```

https://github.com/laurentromary/ISOTiger

Graph visualizations: http://annis-tools.org/ [Krause and Zeldes, to appear]

DIN: http://www.din.de/ **ISO:** http://www.iso.org/

DIN-NA 105: http://www.nat.din.de/ **ISO/TC 37/SC 4** Language resource management

Contact person: Gottfried Herzog (DIN-NA 105) – gottfried.herzog@din.de **ISOcat:** http://www.isocat.org/

ISO 24612:2012 Language resource management – Linguistic annotation framework (LAF)

ISO 24611:2012 Language resource management – Morpho-syntactic annotation framework (MAF)

ISO 24615-1:2014 Language resource management – Syntactic annotation framework (SynAF) – Part 1: Syntactic model

ISO 12620:2009 Terminology and other language and content resources – Specification of data categories and management of a Data Category Registry for language resources

ISO/DIS 24615-2 Language resource management – Syntactic annotation framework (SynAF) – Part 2: XML serialization (ISOTiger)

Bosch et al. 2012 Bosch, Sonja, Key-Sun Choi, Éric Villemonte De La Clergerie, Alex Chengyu Fang, Gertrud Faass, Kiyong Lee, Antonio Pareja-Lora, Laurent Romary, Andreas Witt, Amir Zeldes & Florian Zipser (2012) "<tiger2/ > as a standardized serialisation for ISO 24615 - SynAF". *Proceedings of the 11th International Workshop on Treebanks and Linguistic Theories (TLT11)*. 37–60. Lisbon, Portugal.

König et al. 2003 König, Esther, Wolfgang Lezius & Holger Voormann (2003) "TIGERSearch 2.1 User's Manual. Chapter V - The TIGER-XML treebank encoding format". IMS, Universität Stuttgart, Germany.

Krause and Zeldes, to appear Krause, Thomas & Zeldes, Amir (to appear) "ANNIS3: A New Architecture for Generic Corpus Query and Visualization". Digital Scholarship in the Humanities.

Romary et al., to appear Romary, Laurent, Zeldes, Amir & Zipser, Florian (to appear) "<tiger2/ > - Serialising the ISO SynAF Syntactic Object Model". Language Resources and Evaluation.