UIMA/U-Compare Enju Parser

1. BASIC INFORMATION

Tool name

UIMA/U-Compare Enju Parser

Overview and purpose of the tool

Syntactic parser for English. Outputs predicate-argument structures. Also outputs base forms for each token.

The tool is provided as a UIMA¹ (Ferrucci et al., 2006) component, which forms part of the in-built library of components provided with the U-Compare platform (Kano et al., 2009; Kano et al., 2011; see separate META-SHARE record)² for building and evaluating text mining workflows. The U-Compare Workbench (see separate META-SHARE record) provides a graphical drag-and drop interface for the rapid creation of workflows.

A short description of the algorithm

The grammar of Enju is based on the theory of Head-driven Phrase Structure Grammar (HPSG). In HPSG, constraints on the structure of a language are represented with *typed feature structures*. Enju uses a wide-coverage probabilistic HPSG grammar (Miyao & Tsujii, 2002; Miyao & Tsujii 2003; Miyao et al., 2004; Miyao & Tsujii, 2005; Ninomiya et al., 2006; Ninomiya et al., 2007; Miyao & Tsujii, 2008) and an efficient parsing algorithm (Tsuruoka et al., 2003; Ninomiya et al., 2005; Ninomiya et al., 2007)

One of the characteristics of HPSG is that most of the constraints on syntax and semantics are represented in lexical entries, while only a small number of grammar rules (corresponding to CFG rules) are defined and they represent general constraints irrelevant to specific words. This is because the constraints on the structure of a sentence are mostly introduced by words.

Syntactic/semantic constraints of words/phrases are represented in the data structure called *sign*. In the current implementation of Enju, the structure of the sign basically follows Pollard and Sag (1994) and <u>LinGO English Resource Grammar (ERG)</u>, while the type hierarchy is much simplified and modified not to use complex constraints nor Minimal Recursion Semantics (MRS).

Constraints of phrases include various syntactic features (part-of-speech, agreement, tense, etc.).

¹ http://uima.apache.org/

² http://nactem.ac.uk/ucompare/

The CONT feature represents the predicate-argument structure of the phrase. Predicate-argument structures represent relations of logical subject/object and modifying relations. The CONT feature of the sign of the top node shows the predicate-argument structure of the whole sentence.

PHON: A sequence of words governed by the phrase					
SYNSEM	LOCAL	CAT	HEAI	Constraints inherited from the head daughter MOD: Constraints of a modifying phrase POSTHEAD: Whether this phrase modifies a preceding phrase	
			VAL	Subcategorization frame SUBJ: Constraints of left phrases that will be subcategorized COMPS: Constraints of right phrases that will be subcategorized SPR: Constraints of specifiers that will be subcategorized SPEC: Constraints of a specifying phrase CONJ: Constraints of conjuncts	
		CON	CONT: Predicate-argument structure		
		CON	NX: Currently not used		
		Γ	Constraints of long-distance dependency		
	NONLOCAL		INHER	Constraints inherited from the daughters QUE: Constraints of wh-question words REL: Constraints of an antecedent phrase of a relative clause SLASH: Constraints of a phrase in long-distance dependencies F_REL: Constraints of free relatives	
			TO_BI	Constraints bound in this phrase QUE: Constraints of wh-question words REL: Constraints of an antecedent phrase of a relative clause SLASH: Constraints of a phrase in long-distance dependencies F_REL: Constraints of free relatives	

The Enju system uses *UP* (<u>http://www.nactem.ac.uk/enju/mayz-manual/up.html</u>, included in the MAYZ package), a general-purpose parser for unification grammars. UP parses a sentence with provided lexical entries and grammar rules. Enju creates the data passed to UP in the following way.



2. TECHNICAL INFORMATION

Software dependencies and system requirements

The tool is provided as a UIMA component wrapped around a web service. Thus, the tool must be run within the Apache UIMA framework. Alternatively, it can be run within the U-Compare framework. The component has been specifically designed to work in U-Compare workflows and is compliant with the U-Compare type system.

Installation

The tool is provided as an in-built component of the U-Compare workbench. However, it can also be used in other UIMA workflows. Since it is packaged as a UIMA component, no specific installation is required, following installation of the UIMA framework and/or U-Compare.

Execution instructions

The tool can be used within U-Compare simply be dragging and dropping it into a workflow using the graphical user interface of the U-Compare workbench. Alternatively, it can be incorporated into other UIMA-based workflows, by following the documentation on the Apache UIMA site. Given that the UIMA component is implemented in Java, the tool is platform-independent.

Input/Output data formats

Input data formats

The input is plain text document that has previously been read into the UIMA Common Analysis Structure (CAS) via a UIMA collection reader component. As a

prerequite, the CAS must contain sentence annotations and POSToken annotations (i.e., token annotations with part of speech information attached). Thus, appropriate components must be executed in the workflow to add these annotations prior to running the Enju parser component.

Output data format

The tool creates Enju Sentence, EnjuToken and EnjuConstituent annotations. The EnjuConstituent annotations encode the predicate-argument relations output by the parser/

Integration with external tools

As mentioned above, the tool can only be run within the UIMA or U-Compare frameworks.

3. CONTENT INFORMATION

Figure 1 shows the output of the tool in the U-Compare workbench. The arcs between words represent the dependency relations in the first sentence. The sample out is taken from the PubMed website (http://www.ncbi.nlm.nih.gov/pubmed/23172825)

Click underlined sections below to display annotation details.				
Humans are farg'arg'arg'argt supposed to aluminum from various food additives, therapeutic treatments and public areas and public treatment areas area				
the environment, and it can be potentially towic The Arg2 Arg2 Arg2 and to elucidate the protectiv				
e effects of propolis against aluminum chloride (AlCl(3))-induced histopathological and immunohi				
stochemical changes in kidney tissues of rats. Sixty Wistar Albino male rats vaverage weight 250-				
300 g) were divided into three equal groups. The first served as a negative control. The second r				
eceived AlCl(3) (34 mg/kg bw, 1/ 25 LD 50). The third were administered AlCl(3) (34 mg/kg bw, 1/				
25 LD 50) plus propolis (50 mg/kg bw). Doses were given once daily via a gavage for 8 weeks every				
day. The results showed that shrunken glomeruli, intraglomerular congestion, loss of apical micr				
ovilli, degeneration of mitochondria and widened rough endoplasmic reticulum were also observed i				
n the Proximal Convoluted Tubules of these animals. Treatment with propolis ameliorated the harmf				
ul effects of AlCl(3) ; this was also proved histopathologically by the noticeable improvement in				
the renal tissues. There were also significant variations in the expressed of ki-67 and p53 prot				
eins. It can be concluded that propolis may be promising as a natural therapeutic agent in AlCl 3				
) -induced renal toxicity and oxidative stress in rat kidneys.				

Figure 1: Output of the Enju parser in the U-Compare workbench

Running the tool on the 1 KB text on a single core machine with 8 GB RAM takes around 9738 milliseconds.

3. LICENCES

a) The UIMA wrapper code is licensed using the NaCTeM Software Licence Agreement (standard non-commercial use) – see "Enju-U-Compare-licence.pdf" in the "licences" directory. Please contact us using the details below if you require a commercial licence.

b) The underlying Enju parser web service called by the UIMA code is licensed using the NaCTeM Web Service Licence Agreement (standard non-commercial use)– see "Enju-web-service-licence.pdf" in the "licences" directory. Please contact us using the details below if you require a commercial licence.

c) The UIMA framework is licenced using the Apache licence. Please see "Apache.txt" in the "licences" directory.

4. ADMINISTRATIVE INFORMATION

Contact

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5. REFERENCES

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