


Old English Universal Dependencies: Categories, Functions and Specific Fields

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Abstract: The aim of this paper is to lay the foundations of the application of the framework of Universal Dependencies to Old English. Such application will result in the morphological and syntactic annotation of a large data set of Old English with Universal Dependencies categories and relations. The aim of this paper involves two tasks. Firstly, it is necessary to select the relevant categories from the set of universal part-of-speech tags and to identify the Old English exponents of the universal set of morphological features. Secondly, the dependency relations holding in Old English should be listed. The main conclusion of this paper is that two specific fields should be added to the standard Universal Dependencies annotation scheme in order to account to two central aspects of Old English, namely, a gloss field, given the historical character of the language; and a morphological relatedness field, in order to account for its associative lexicon.

1 INTRODUCTION


The aim of this paper is to lay the foundations of the application of the framework of Universal Dependencies (hereafter UD) to Old English. The research reported here is the point of departure of the morphological and syntactic annotation with UD of ParCorOEv2 (henceforth ParCor), an open access annotated parallel corpus Old English-English (Martín Arista et al., 2021). Ultimately, the digitised annotation of ParCor with structured data in a relational database will allow for the computational processing of Old English, including the specific tools and techniques for low-resource languages (Anastasopoulos 2019).

Universal Dependencies (de Marneffe et al., 2021) is a model of morphological and syntactic annotation devised for the compilation of computerised data sets that facilitate cross-linguistic comparison (de Marneffe et al., 2014) aimed to natural language processing (Nivre, 2015) and to areas of applied linguistics like language acquisition and translation (MacDonald et al., 2013; Nivre, 2016). The annotation includes UPOS (universal part-of-speech tags; Petrov et al., 2012), XPOS (language-specific part-of-speech tags), Feats (universal

morphological features), lemmas, and dependency heads and labels (Nivre et al., 2016). The 2015 release of the UD dataset consisted of ten treebanks representing ten languages, whereas the 2021 release comprises 183 treebanks over 104 languages (Nivre et al., 2020).

Old English is the historical stage of the English language spoken in England between approximately the 5th and the 11th centuries (CE). Written records, which can be traced back to the 8th century onwards, comprise approximately 3 million words in around 3,000 texts. The main lexicographical sources of Old English include the dictionaries by Bosworth-Toller (1973), Sweet (1976) and Clark-Hall (1996), as well as the *Dictionary of Old English* (Healey, 2018). The main textual sources of Old English are *The Dictionary of Old English web corpus* (3,000,000 words; Healey et al., 2004) and *The York-Toronto-Helsinki Parsed Corpus of Old English Prose* (Taylor et al., 2003).

The paper is organised as follows. Section 2 and Section 3 focus on the categorial part, while Section 4 deals with relational aspects. Section 5 presents the extra fields required by Old English. Section 6 draws the main conclusions.

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2 PART-OF-SPEECH TAGS

UD annotation consists of categories and relations. Beginning with categories, two types are considered: lexical category and inflectional category. This is called *XPOS* (language-specific Part-of-speech tags) and *Feats* (universal morphological features). The annotation also includes lemmas, dependency heads and dependency labels (Nivre et al., 2016).

Table 1 compares the traditional set of parts of speech and the universal part-of-speech set of UD (Petrov et al., 2012). As can be seen in Table 1, the set of UPOS is larger than the traditional inventory in order to qualify as typologically valid. Notice that, in Table 1, *X* stands for ‘foreign word’, *sym* is a non-punctuation symbol and *punct* marks ‘punctuation’, which is not used consistently in Old English but rather added by text editors.

Table 1: Traditional parts of speech vs. universal part-of-speech tags.

Traditional POS	UPOS
Noun	noun
	propn
Verb	verb
	aux
Adjective	adj
–	det
	num
Adverb	adv
Pronoun	pron
Preposition	adp
Conjunction	cconj
	sconj
Interjection	intj
–	part*
	x
–	sym**
–	punct***

Table 2 lists the specific categorial tags of Old English. The right column in Table 2 provides instances by category.

Table 2: Old English exponents and realisations of Universal part-of-speech tags.

OE XPOS	OE realisations
t	
common noun	hlāfweard ‘steward’, mūða ‘mouth (of a river)’, sǣcol ‘jet’
proper noun	Egipte ‘the Egyptians’, Iringes weg ‘Milky Way’, Legaceaster ‘Chester’
main verb	sleacian ‘to slow’, ðoterian ‘to cry’, twengan ‘to pinch’
auxiliary verb	bēon ‘to be’, habban ‘to have’, weorðan ‘to become’
adjective	gnēað ‘frugal’, inwit ‘thick’, meagol ‘mighty’
demonstrative-article	se ‘the’
numeral (cardinal and ordinal)	ðrīe ‘three’, fēowerfene ‘fourteen’, hundseofontigoða ‘seventieth’
adverb	grundlinga ‘horribly’, hedendlīce ‘strictly’,
pronoun	sumhwilc ‘some’, ðu ‘you’, ðīn ‘your’
adposition	betweox ‘between’, gēan ‘against’,
coordinating conjunction	and ‘and’, ge ‘and also’, oððe ‘or’
subordinating conjunction	hwær ‘where’, ðēah ‘although’, ðy ‘because’
interjection	ǣ ‘oh!’, ēuwā ‘wow!’, nū ‘lo!’
foreign word	silua ‘forest’, torre ‘tower’
punctuation	, ; : ? !

3 MORPHOLOGICAL FEATURES

In UD, morphological features have different values, which are sorted alphabetically. The Old English relevant features include pronominal type

(demonstrative-article, indefinite pronoun, interrogative pronoun, personal pronoun and relative pronoun); numeral type (cardinal, ordinal); possessive; foreign word; abbreviation; wrong spelling; gender (feminine, masculine, neuter); number (dual, plural, singular); case (accusative, dative, genitive, instrumental, nominative); reflexive; comparison (comparative, positive, superlative); person (1, 2, 3); verbal form (finite, infinitive, participle); mood (imperative, indicative, subjunctive); tense (past, present); voice (active, middle, passive); and polarity (affirmative, negative). Nominal features like gender, number and case are relevant to Old English verbs because present and past participles are often inflected according to the adjectival declension. On the features listed above, it is also worth mentioning that wrong spellings are suppressed or normalised by editors, who frequently provide alternative readings rather than ‘correct’ or ‘incorrect’ renderings. UD features and types as applied to Old English are presented in Table 3.

Table 3: Features and values of Old English morphological features.

Feature	Values
pronominal type	Dem-Art Ind Int Prs Rel
numeral type	Card Ord
possessive	Yes
foreign word	Yes
abbreviation	Yes
wrong spelling	Yes
gender	Fem Masc Neut
number	Dual Plur Sing
case	Acc Dat Gen In Nom
reflexive	Yes
comparison	Cmp Pos Sup
person	1 2 3
verbal form	Fin Inf Part
mood	Imp Ind Sub
tense	Past Pres
voice	Act Mid Pass
polarity	Aff, Neg
person	1 2 3
gender	Fem Masc Neut
number	Dual Plur Sing
case	Acc Dat Gen In Nom
invariable form	Yes

4 DEPENDENCY RELATIONS

The basic dependency relations distinguished in the UD framework (de Marneffe et al., 2021) can be broken down into nominal phrase dependencies, simple clause dependencies and complex clause

dependencies. Dependency relations are defined by means of dependency heads and labels. Dependency heads are content words, while function words do not usually show dependents of their own. The basic opposition holds between core arguments (subjects, objects and clausal complements) and oblique modifiers (adjuncts and oblique arguments).

The following universal dependency relations are found in Old English. *acl* (clausal modifier of noun), *acl:relcl* (relative clause modifier), *advcl* (adverbial clause modifier), *advmod* (adverbial modifier), *advmod:emph* (emphasizing word, intensifier), *advmod:lmod* (locative adverbial modifier), *amod* (adjectival modifier); *appos* (appositional modifier), *case* (case marking), *cc* (coordinating conjunction), *cc:preconj* (preconjunct), *ccomp* (clausal complement), *csubj:pass* (clausal passive subject), *conj* (conjunct), *cop* (copula), *csubj* (clausal subject), *det* (determiner), *det:poss* (possessive determiner), *discourse* (discourse element), *dislocated* (dislocated elements), *fixed* (fixed multiword expression), *flat* (flat multiword expression), *flat:foreign* (foreign words), *flat:name* (names), *goeswith* (goes with), *iobj* (indirect object), *list* (list), *mark* (marker), *nmod* (nominal modifier), *nmod:poss* (possessive nominal modifier), *nmod:tmod* (temporal modifier), *nsubj* (nominal subject), *nummod* (numeric modifier), *obj* (object), *obl* (oblique nominal), *obl:agent* (agent modifier), *obl:arg* (oblique argument), *obl:lmod* (locative modifier), *obl:tmod* (temporal modifier), *orphan* (orphan), *parataxis* (parataxis), *punct* (punctuation), *root* (root) and *vocative* (vocative).

Although the dependency relations *aux* (auxiliary), *aux:pass* (passive auxiliary), *nsubj:pass* (passive nominal subject), *expl* (expletive) and *expl:impers* (impersonal expletive) are relevant for the syntactic annotation of Old English, it must be borne in mind that they make reference to phenomena that are on the grammaticalisation cline in Old English (Denison 1993; Ringe and Taylor 2014; Petré 2014; Martín Arista and Ojanguren López 2018). For instance, the Old English counterpart of the modal auxiliary *will* can be used both as a general verb, in instances like *oððe hu he wolde ðæt hio wære...* ‘or how he would that it should be’ (BOET.005.046.013); and as a pre-auxiliary, as in *Forðam ic nu wille geornlice to Gode cleopian* ‘Wherefore I will now earnestly call upon God’ (BOET.003.019.004). The passive has not been fully grammaticalised in Old English yet, given that the past participle frequently shows adjectival inflection that expresses agreement with the subject, as is the case in *hi næron for nanum cræfte gecorene* ‘they were chosen for no virtue’, in which the masculine

plural nominative *gecorene* agrees in gender, number and case with the subject *hie*. There is still fluctuation between *bēon* ‘to be’ and *weorðan* to become as passive auxiliaries in Old English. As for the passive subject, it is still possible for the agent to preserve the dative case in the corresponding passive, thus *And him wæs gedemed fram unrihtwisum demum* ‘And he was judged by folly judges’ (ÆAdmon 1 006000 (4.31)). Regarding expletives, they are not compulsory in Old English yet, as happens in *Wæs eac micel wundor þæt an wulf wearð asend* ‘It was also a great miracle that a wolf was sent’ (Æ LS (Edmund) 003900 (145)), in which there is no anticipatory subject to *wæs*. Finally, the formal subject of impersonal verbs is often left unexpressed, as in *norþan sniwde* ‘it rained from the north’ (Sea 000800 (31)). To summarise, the dependency relations aux (auxiliary), aux:pass (passive auxiliary), nsubj:pass (passive nominal subject), expl (expletive) and expl:impers (impersonal expletive) are distinguished in the annotation of Old English for descriptive reasons, even though they have not been fully grammaticalised yet.

5 OLD ENGLISH SPECIFIC FIELDS

Once all the relevant categories and functions have been identified or specified for Old English, the next step is to decide whether additional tags (coded in specific fields) are necessary to annotate this historical stage of the language or not. The standard CoNLL-U annotation format distinguishes ten fields, listed and defined in Table 4.

Table 4: Fields in CoNLL-U annotation (from <https://universaldependencies.org/docs/format.htm>).

ID	Word index, integer starting at 1 for each new sentence; may be a range for tokens with multiple words.
FORM	Word form or punctuation symbol.
LEMMA	Lemma or stem of word form.
UPOSTAG	Universal part-of-speech tag.
XPOSTAG	Language-specific part-of-speech tag.
FEATS	List of morphological features from the universal feature inventory or from a defined language-specific extension.
HEAD	Head of the current token, which is either a value of ID or zero (0).
DEPREL	Universal Stanford dependency relation to the HEAD (root iff HEAD = 0).
DEPS	List of secondary dependencies (head-deprel pairs).
MISC	Any other annotation.

The tokenisation as well as the fields FORM and LEMMA are imported automatically from ParCor. Units smaller than a word (tokens) are presented in the Appendix. They can also be imported from ParCor. The fields UPOSTAG and XPOSTAG are adapted from the morphological tags of ParCor (see Appendix on grammatical classes). At this stage, HEAD and DEPREL are inserted manually.

Two extra specific fields are required to adequately annotate the morphology and syntax of Old English. The first is GLOSS. As we are annotating a historical language, a translation into Contemporary English facilitates the annotator’s task. Inflectional forms, lemmas and glosses are automatically imported from ParCor.

Table 5: Inflectional forms and glosses from ParCor.

Inflectional form	Gloss
Ðu	you
ðe	who
ðam	the
winterdagum	winter days
selest	gifest
scorte	short
tida	times
and	and
ðæs	the
summeres	Summer’s

The second specific field proposed in this paper is MORPHREL (morphological relatedness). In a language characterised by the existence of large derivational families with transparent morphological relations (Kastovsky 1992) and generalised inflectional inheritance of the prefix *ge-* (Martín Arista 2012), a paradigmatic field specifying short-distance and long-distance morphological relatedness constitutes a remarkable explanatory resource. For instance, the derived adjective *unābrecedlic* ‘inextricable’ is morphologically related (short-distance) to the adjective **ābrecedlic* as well as to the primitive strong verb BRECAN ‘to break, tear, crush, shatter, burst, break up, destroy, demolish’ (long-distance morphological relatedness). These facts are indicated in the MORPHREL field as **ābrecedlic / BRECAN*.

6 CONCLUSION

This paper is the point of departure of the application of the UD framework to the morphological and

syntactic annotation of Old English. The relevant categories and functions have been presented, while some specific characteristics of the language have been dealt with in terms of extra fields in the annotation format. It remains for further research to decide whether or not enhanced dependencies are necessary to account for Old English null subjects and objects, shared constituents in control and raising constructions and antecedents of relative clauses.

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APPENDIX

This appendix provides the full inventory of Old English grammatical categories as well as a sample of the abbreviations and compounds required for UD token indexing.

Demonstrative-Article

se ‘the’; þes ‘this’;

Relative pronouns

ðe ‘that, who, which

Interrogative pronouns

hūlic ‘of what sort’; hwā ‘who; what; any one, some one, anything, something; each’; hwæðer ‘which of two, whether.’; hwæðer...ðe each of two, both; one of two, either’; hwæðer...or each of two, both; one of two, either’; hwæm ‘where’; hwæt ‘what’; hwæt ‘who; what; any one, some one, anything, something; each’; hwilc ‘which, what; whosoever, whichever; any (one), some (one)’; swā hwā ‘whosoever’; swā hwā swā ‘whosoever’; swā hwæðer swā ‘whichever’; swā hwær swā ‘wherever’; swā hwæt swā ‘whatsoever’; swā hwilc swā ‘whosoever’; swā...swā ‘whether...or; either...or’; swæðer ‘whichever, whosoever’; tō hwæm ‘wherefore

Indefinite pronouns

æghwā ‘each one, every one, everything, who or whatever’; æghwæðer ‘everyone, either, both; each’; æghwæt ‘each one, every one, everything, who or whatever’; æghwæt ‘anything’; ælc ‘each; any’; ænig ‘any, any one’; āhwa ‘any one’; āhwæðer ‘some one, something; any one; anything; either, each, one or other’; ānrahwā ‘everyone’; edwihte ‘anything, something’; gehwā ‘each one, every one, any one, whoever’; gehwæðer ‘both, either, each’; gehwilc ‘each, any, every (one), all, some, many, whoever, whatever’; anra gehwilc ‘each one’; hwilcwega ‘some, any, someone; little, some, not much or great; alone, anything, something’; ilca ‘the same’; nāhthwæt ‘something unknown’; nāhwæðer ‘neither’; samhwylc ‘some’; sum ‘a certain one, someone, something, one’; sumhwilc ‘a certain’; swā ‘so, the same, such, that’; swilc ‘such a one, he, the same; such; (as a relative) which’; swilc...hwilc ‘such...as; so...as’; swilc...swilc ‘so much (many)...as; as much (many)...as’; ðullic ‘such, such a’; welhwā ‘every one, every thing’; welhwilc ‘each, any, nearly every

Personal pronouns

gē ‘you’; git ‘you two’; he ‘he, she, it; (pl.) they; (reflex. pron.) himself, herself, itself’; hēo ‘she, they’; hīe ‘they’; hit ‘it’; ic ‘I’; tū ‘thou’; ðæge ‘they, these’; ðu ‘thou’; uncer ‘of us two, our (of two persons)’; we ‘we’; wit ‘we two

Coordinating conjunctions

ac ‘but; but also, moreover, nevertheless, however; because, for’; æghwæðer ge...ge ‘both...and, as well

as’; æghwæðer...and ‘both...and, as well as’; and ‘and; but; or’; būtan ‘except, except that, but, only’; būtan ðæt ‘except; unless, save that; except, but, besides, if only, provided that’; eornostlice ‘therefore, but’; ge ‘and, also’; ge...ge ‘both... and; not only... but also; whether... or’; nāhwæðer ‘neither’; ne ‘neither, nor’; oððe ‘or; and’; oððe...oððe ‘either...or’; ofðe ‘or’; sam ‘whether, or’; sam ðe...sam ðe ‘whether...or’; sam ge...sam ge ‘whether...or’; sam...sam ‘whether...or’; samðe...samðe ‘as well...as

Subordinating conjunctions

ær ‘before that’; for ‘for, because’; for ðy ðe ‘because’; forðæm ‘for (the reason) that, owing to (the fact) that, for, because, on that account, therefore, seeing that’; forðy ‘for that, because, therefore’; forūton ‘without, besides, except’; gif ‘if; whether, though’; hwæðer ðe...ðe whether...or’; hwær ‘where, whither, somewhere, anywhere, everywhere’; hweðer ‘whether’; hwȳ ‘why’; mid ðy ‘while, when’; nemne ‘unless, except, save, only’; nū ‘now that, inasmuch as, because, since, when’; oð ‘until’; oððæt ‘until’; sīð ‘after, afterwards’; siððan ‘as soon as, when, since, after that, inasmuch as’; siððan...siððan when...then’; sōðhwæðere ‘however, yet, nevertheless’; swā ‘so as, consequently, just as, so far as, in such wise, in this or that way, thus, so that, provided that’; swā ðeah ‘nevertheless, yet.’; swilce ‘as if, as though’; tō ðy ðæt ‘for the purpose that, in order that’; ðā ‘then, at that time; after that time, thereupon; when, at the time that, whilst, during; there, where; seeing that, inasmuch as, if, when, since, as, because’; ðā ðā ‘when’; ðā hwīle ðe ‘while, whilst, so long as’; ðā...ðā ‘then...when’; ðær ‘there, thither, yonder; where, whither; then; when; though, if, so far as, whilst, provided that; in that respect’; ðær ðær ‘where, wherever’; ðær wið ‘in regard to that’; ðær...of ‘therefrom’; ðærforan ‘before that’; ðæt ‘that, so that, in order that, after that, then, thence’; ðæt ðe ‘that’; ðætte ‘that, so that, in order that. tō ðon ðætte so that’; ðe ‘when; or; then; where. (with comparatives) than’; ðe...ðe the...or, either...or’; ðeah ‘though, although, even if, that, however, nevertheless, yet, still; whether’; ðeah ðe ‘although’; ðeah... ðeah ‘although, still, yet’; ðenden ‘meanwhile, while, as long as, until’; ðonne ‘then; therefore, wherefore; yet; while, when; thereafter, henceforth; rather than; since; although; (with comparatives) than’; ðonne...ðonne ‘when...then’; ðonne...ðe ‘since’; ðonne...gȳt ‘as yet, even’; ðonne...hwæðere ‘yet, nevertheless’; ðy ‘because, since, on that account; therefore; then; (with comparatives) the’; ðy læs ðe ‘lest’; ðy...ðy ‘the...the’; ðylæs ‘lest’; weald ‘in case’; weald ‘ðeah perhaps, possibly’; wið ‘until.

Contractions by token (sample)

nage [ne+āgan], nagan [ne+āgan], nah [ne+āgan],
 nanen [ne+ān], nanon [ne+ān], nanre [ne+ān],]nænge
 [ne+ænig], nænige [ne+ænig], nænigre [ne+ænig],
 nære [ne+bēon], næaron [ne+bēon], næaron
 [ne+bēon], nabban [ne+habban], næfdon
 [ne+habban], næfdon [ne+habban], nyllan
 [ne+willan], nolde [ne+willan], nelt [ne+willan],
 nitendum [ne+wītan], nyte [ne+wītan], nyten
 [ne+wītan], naðer [nā+hwæðer], naðere
 [nā+hwæðer], naðor [nā+hwæðer], nauht [nā+wiht],
 nawht [nā+wiht], nawiht [nā+with], nanuht
 [nān+wiht], nanwiht [nān+wiht], nanwit [nān+wiht],
 nanwith [nān+wiht], nalæs [nā+læs], nallas [nā+læs],
 nalles [nā+læs], nateshwan [nātes+hwōn], nateshwan
 [nātes+hwōn], nahwider [nā+hwider], nahwanen
 [nā+hwanon], næfre [ne+æfre], nahwider
 [nā+hwider], nahwanen [nā+hwanon], næfre
 [ne+æfre].

Compounds by token (sample)

æfenglōm / æfenglōma (noun)	æfen + glōm
ilphlæden (adjective)	gielp + hlæden
āncorlīf / āncorlīf (noun)	āncor + lif
hringfāg / hringfāh (adjective)	hring + fāg
hūhwega / hūhugu (adverb)	hū + hwega
bedrēaf / beddrēaf (noun)	bedd + rēaf
burgtūn / burhtūn (noun)	burg + tūn
forelēoran / forlēoran (verb)	fore + lēoran(ge)
hræwīc / hræawīc (noun)	hræw + wīc
ropwærc / hropwærc (noun)	ropp + wærc