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OFrLex: A Computational Morphological and Syntactic Lexicon for Old French

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Abstract
In this paper we describe our work on the development and enrichment of OFrLex, a freely available, large-coverage morphological and syntactic Old French lexicon. We rely on several heterogeneous language resources to extract structured and exploitable information. The extraction follows a semi-automatic procedure with substantial manual steps to respond to difficulties encountered while aligning lexical entries from distinct language resources. OFrLex aims at improving natural language processing tasks on Old French such as part-of-speech tagging and dependency parsing. We provide quantitative information on OFrLex and discuss its reliability. We also describe and evaluate a semi-automatic, word-embedding-based lexical enrichment process aimed at increasing the accuracy of the resource. Results of this extension technique will be manually validated in the near future, a step that will take advantage of OFrLex’s viewing, searching and editing interface, which is already accessible online.

Keywords: Morphological lexicon, Syntactic lexicon, Lexicon Enrichment, Old French

1. Introduction
Old French regroups romance languages qualified as Oïl languages used in the north of France, south of Belgium and in the Anglo-Norman islands spoken from 8th century to 14th century. They contrast with the Oc languages that come from the south of France. Contrary to Middle French, Old French possesses nominal declination. Both led to contemporary French and possess relatively free word order: verbs are often in second position following a non subject constituent. Moreover, there is no spelling standardisation in Old French, even for proper nouns from the same author. The main textual databases with semi-automatic lemmas and part-of-speech tags (PoS) are the Base de Français Médiéval (BFM - Medieval French Base) (Guilhot et al., 2017)1 with more than 4 million words and the Nouveau Corpus d’Amsterdam (NCA - New Amsterdam Corpus) (Stein and al., 2008)2 with more than 3 million words. The main treebanks for Old French are the Syntactic Reference Corpus of Medieval French (SRCMF) (Stein and Prévost, 2013) and the Old French subpart from the Modéliser le changement : les voies du français (MCVF) corpus (Martineau, 2008). However, they do not share the same syntactic and POS tag sets, and only SRCMF is on open access with part of it in Universal Dependencies (UD) (McDonald et al., 2013) format3.

In the available resources different kinds of text are gathered. Some vary in style (prose, verse), literary genre (religious, historical, didactical, etc.), or even in time span (from 10th century to 13th century). Nevertheless, there is no available morphological lexicon,4 and a fortiori no syntactic lexicon5 for Old French. Most of the existing lexicons and dictionaries are either not made for later natural language processing exploitation or only contains minimal morphological (and sometimes syntactic) information.

In this paper, we present the morphological and syntactic lexicon for Old French named OFrLex. The creation of this lexicon is semi-automatic with a substantial manual process. Moreover, it forced the resolution of multiple obstacles: to structure and merge multiple resources not necessarily originally structured, to fuse the heterogeneous and not always consistent lexical information, and to create lexicon information such as morphological classes and valency from scratch or from incomplete source information. Hence, OFrLex was made using automatic tools and manual correction or addition of information. This lexicon can be used for improving Old French dependency parsing and PoS tagging.

The paper is organised as follows. We start by summarising related work (Section 2.) before presenting the lexicon initial creation process with the different language resources used (Section 3.3.). We then present our methodology to automatically enrich the lexicon (Section 4.2.) and explain our distribution strategy for OFrLex (Section 5.). Finally, we show preliminary results on PoS tagging using the lexicon (Section 6.) before tackling future work and improvements (Section 7.).

1http://bfm.ens-lyon.fr
2https://sites.google.com/site/achimstein/research/resources/nca
3https://github.com/UniversalDependencies/UD_Old_French-SRCMF/
4A morphological lexicon is a collection of entries of the form (inflected form, lemma (often a citation form), morphological features) (extensional inflectional lexicon) or a collection of entries of the form (citation form, inflection class label) associated with an inflectional grammar that defined how to generate inflected forms given the citation form and an inflection class label (intensional inflectional lexicon).
5A syntactic lexicon associates each entry (generally at the lexeme level) with syntactic information, including valency information, control/raising/attribute information, and other types of information describing the syntactic behaviour of the entry.
2. Related Work

Recent work used the previously mentioned textual databases for Natural Language Processing (NLP) tasks. PoS tagging has been applied on SRCMF using TreeTagger (Schmid, 1999; Stein, 2014) and Conditional Random Fields (Lafferty et al., 2001; Guibon et al., 2014; Guibon et al., 2015) as a preparation for Old French dependency parsing using Mate (Bohnet, 2010). On the other hand, lexicon enrichment is a part of the lexicon creation process and has been the subject of several research work, particularly for morphological lexicons. Nicolas et al. (2010) developed an unsupervised morphological rule acquisition tool which was combined with the Alexina framework (Walther and Nicolas, 2011; Nicolas et al., 2012) to enrich morphological lexicons. Another approach used to enrich or create a lexicon is derived from parsebanking (Rosén and de Smedt, 2007) which consists of creating a new treebank by applying a well-known and tested grammar or parser on the corpus. Recently, incremental parsebanking showed good results for enriching morphological lexicons with high coverage (Rosén et al., 2016). Valency retrieval through deverbative nouns was also tackled (Fučíková et al., 2016) but requires a task oriented gold dataset. Another recent enrichment strategy consists into using word embeddings to obtain clusters of words in order to enrich a lexicon (Siklósi, 2016).

Morphological lexicons have been used for several tasks. From constraints derived from lexicon at PoS tagging time (Kim et al., 1999; Hajič, 2000) to additional lexicon-based features combined with standard ones during the training process (Chrupała et al., 2008; Goldberg et al., 2009; Denis and Sagot, 2012). To improve these lexicon usages for different tasks such as multilingual PoS tagging supported by a lexicon (Sagot, 2016), we need to create a computational morphological lexicon for Old French: the OFrLex lexicon.

3. Lexicon Creation

3.1. Heterogeneous Language Resources

The idea behind OFrLex is to derive all information from different sources in order to obtain a morphological Old French lexicon. We try to take into consideration all freely available language resources for this task.

FROLEX With this objective in mind we first used FROLEX\(^6\) (Serge Heiden, 2016). The FROLEX lexicon is a combination of information coming from the Base de Français Medieval (BFM - Medieval French Base) (Guillot et al., 2017), the Nouveau Corpus d’Amsterdam (NCA - New Amsterdam Corpus) (Stein and al., 2008), and the Dictionnaire du Moyen Français (ATILF, 2015) (DMF - Middle French Dictionary). These language resources being already merged in one resource, we use the million extensional entries from FROLEX. By extensional entry, we refer to the fact that each one of these entries links to an attested inflected form, and not a lexeme, as visible in Table 1. Depending on the sources, information for each entry may vary. However, the part-of-speech tags (PoS) are already converted to their CATTEX\(^7\) (Guillot et al., 2010) equivalent with additional gender and number. Even if this resource is convenient as it merge multiple ones, some of the entries have noise (i.e., multiple entries for one form with same incomplete information). Moreover, lemmas do not follow the same convention depending on the source from which they were extracted. The usage of DMF, a dictionary for Middle French, and the fact that lemmas are not represented by all their inflected forms, makes some entries and silence irrelevant for our purpose of obtaining a morphological lexicon for Old French.

Wiktoryary Wiktoryary\(^8\) is a free dictionary which contains 6,500 entries for Old French corresponding to a lexeme and containing formalised descriptions for the inflection classes. The lexeme mengier\(^9\) (i.e. to eat) comes with alternative forms such as mangier, along with the etymology, and english gloss, and inflection information. We use the extraction process described in Sagot (2014): converting Wiktoryary (wiki format) into a structured XML file before using it to extract morphological entries. A morphological entry consists of a citation form, an inflection class identifier, and the list of stems or irregular forms if relevant. Finally, we manually developed a morphological grammar describing the most important inflection classes present in Wiktoryary. This morphological grammar use the Alexina\texttt{PRQRLI} format (Sagot and Walther, 2013). For instance, for verbs we use a model containing 8 stems and 2 exponent levels: an intermediate level for some consonant palatalisation at the end a stem for instance, and higher level for standard terminations in 4 set of rules. The latter follows the Paradigm Function Morphology principle (Stump, 2006).

\textbf{Altfranzösisches Wörterbuch by Tobler and Lommatzsch (TL)} Altfranzösisches Wörterbuch (shorten as TL) is the reference dictionary for Old French, written in German. We used two versions created and distributed by Peter Blumenthal and Achim Stein\(^10\).

- The first version is made of a list of lemmas manually obtained accompanied by an index of forms from the Godefroy’s dictionary. Each information possesses a source information “tl” for TL and “g” for the Godefroy’s dictionary. Simplified entries are visible in Table 2. In this Table, main entries (Haupteingtrag) are distinguished from secondary entries or variants (mainly graphical ones). Secondary entries are linked to the main one in a many-to-one fashion. Moreover, multiple reference links are given for main and secondary entries: page, line, etc.

- The second version used is obtained through Optical Character Recognition (OCR) with numerous recog-

\(^6\)https://github.com/sheiden/Medieval-French-Language-Toolkit

\(^7\)CATTEX is a set of Part-of-Speech tags taking into account morphosyntactic information.

\(^8\)https://en.wiktionary.org/

\(^9\)https://en.wiktionary.org/wiki/mengier

\(^10\)https://www.ling.uni-stuttgart.de/institut/ilr/toblerlommatzsch/downloads.htm
Table 1: Example entries from FROLEX

| Form   | Frequency | Original tag | Extended CATTEX tag | Lemma | Source |
|--------|-----------|--------------|---------------------|-------|--------|
|        | BFM DMF   | AFLEX BFM DMF | conv. 1 conv. 2     |       |        |
| abassera | 2 0       | no pos       | no pos OUT          | no lemma | BFM    |
| abasseur | 0 0       | subst. masc. | NOMcom NOcom        | abasseur | DMF    |
| abasseur | 0 0       | verb         | VER                 | abasseur | DMF    |
| gaiement | 0 9       | adv.         | ADV                 | gaiement | DMF    |
| gaiement | 1 0       | ADVgen       | ADVgen APD          | no lemma | BFM    |

3.2. Merging Information

To create the OFrLex lexicon we need to aggregate all sources by linking information to unique entries. To do so, we first use the citation forms contained in TL using all DECT entries and their explicit reference to TL entries. Very few errors were found during this process. However, to obtain a large coverage we also use other sources when lemmas linked to multiple matches from Godefroy, TL, and/or DECT. If a lemma differ from one source to another, we create multiple entries and disambiguate them manually based on the definitions obtained from other resources. However if the lemma is the same we fuse their information.

Lexique de l’ancien français by Godefroy

We consider the Wikisource version of the Lexique de l’ancien français (Old French Lexicon). Figure 1 shows the online version used. This resource has already been made by applying OCR over the original text and then partially correcting it. It possesses a wide coverage albeit with ghost words and meanings. These ghost words are lexical units wrongly considered as such. Thus, we filtered it using the dedicated ghost words base named Base des mots fantômes [du Godefroy] dedicated to identify these entries and to clean them. Moreover, this lexicon covers up to the XV century, which is not Old French anymore but Middle French. This data being structured, we easily extracted citation forms, CATTEX PoS tags with additional gender if relevant, a definition, and the link to the corresponding page.

(result)

Morphology. Morphological features such as gender, number, person, tense and mood are extracted from Wiktionary entries in a semi-automatic way. Indeed, if the citation form is available we retrieve information automatically from sources. If it is not available we add it manually when possible.

Form variants are associated based on FROLEX entries.

3.3. Syntactic Information Addition.

We complete this morphological lexicon for Old French with syntactic information. To do so, we follow the Alexina conventions already used for the contemporary French morphological lexicon Lefff (Sagot, 2010). From Lefff we obtain different types of syntactic information such as redistri-

Finally, Table 5 presents 3 entries from OFrLex: "afiner", "afiner2" and "effiner". Those entries are Old French vari-
Table 2: Examples from Tobler-Lommatzsch entries index

| Lemma   | Haupt-eintrag | Wortart | Category | Variant | Source | Werk | Volume | Spalte | Zeile | IstVar. | Is a variant |
|---------|---------------|---------|----------|---------|--------|------|--------|--------|-------|---------|--------------|
| aatir   | v.            | atahir  | tl       | 1       | 31     | 37   | 0      |        |       |         |              |
| aair    | v.            | atahir  | tl       | 1       | 25     | 32   | 1      |        |       |         |              |
| aaisa   | s.f.          | s.      | tl       | 1       | 640    | 52   | 1      |        |       |         |              |
| aatiso  | s.f.          | s.      | tl       | 1       | 33     | 34   | 0      |        |       |         |              |

Table 3: Example from Tobler-Lommatzsch (OCR version) before (left panel) and after (right panel) partial correction. Bottom panel shows extracted structured entries

| Lemma   | Haupt-eintrag | Wortart | Category | Variant | Source | Werk | Volume | Spalte | Zeile | IstVar. | Is a variant |
|---------|---------------|---------|----------|---------|--------|------|--------|--------|-------|---------|--------------|
| calemine s. f. s. chalemine. | calemon s. m. | [Name eines Vogels: s. A. Delbouille, Rom. XXXI 366; A. Thomas, eb. XXXVI 25 260.] | | | | | | | | |
| calendre s. f. s. chalendre. | calende s. f. s. chalende. | [REW 1487 cafare; Godefroy VIII 30 (Compl.) 412a] | | | | | | | | |
| calemon s. m. | Name eines Vogels | [cit. (cf. calemon) vb. | | | | | | | | |
| calemon s. m. | Name eines Vogels | [cit. (cf. calemon) vb. | | | | | | | | |
| calemon NOMcom.m s.m | Name eines Vogels | [cit. (cf. calemon) vb. | | | | | | | | |
| calendre NOMcom.f s.f | | [cit. (cf. calemon) vb. | | | | | | | | |
| calemon NOMcom.m s.m | Name eines Vogels | [cit. (cf. calemon) vb. | | | | | | | | |
| calendre NOMcom.f s.f | | [cit. (cf. calemon) vb. | | | | | | | | |
| calemon NOMcom.m s.m | Name eines Vogels | [cit. (cf. calemon) vb. | | | | | | | | |
| calendre NOMcom.f s.f | | [cit. (cf. calemon) vb. | | | | | | | | |

4. Lexicon Enrichment

Once created, the lexicon is not reliable enough to be used as a reference source of information for Old French. We need to enrich it and validate it by Old French or diachrony specialists. However, the manual process is long and tedious especially when it comes to enrich the lexicon by decreasing the silence rate. This is why we first automatically enrich the lexicon before planning on the validation phase. The objective is now to obtain additional information for the lexicon. We derive from Siklósi (2016) by being stricter: the user interface (UI) only allows to dispatch additional information. Plus, we focus on variant candidates for a non spoken language. This is why this additional information is not necessarily expected to be correct. We make the following hypothesis: it is easier and faster to correct or validate some information and errors than trying to find missing values from scratch, especially when dealing with a non living language with relatively few experts and resources.

4.1. Information from variants

Valency Valency information was initially obtained from Leff for verbs that were considered syntactically similar, or by manual insertion (see Section 3.2.). Nevertheless, not all verbs were covered and other categories were not taken into account in the process. This is why we computed valency information from the variants found for each entry. In fine valency can come from the manual valency inserted (something that, as of now, we have only done for several verbs), the gloss, the pseudo-gloss, Godefroy or Tobler definitions, or from itself (e.g. if it is directly available in DECT).

Lemmas When a lemma is missing, we compute candidate lemmas by analysing variants in a two-way fashion by...
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In our methodology we need to distinguish inflectional forms ($f$) with lexemes ($L$), the former are obtained from raw text while the latter are extracted from OFrLex lexicon. To obtain a lexeme embedding ($e(L)$), we apply the FastText model trained on the raw text corpus made of inflectional forms ($ft(f)$). We then make the average of the form embeddings from the lexeme, weighted by the occurrences of each form with the same the PoS tag ($p$) as the lexeme. The weighted average has recently been demonstrated to be a good approach to obtain meta-embeddings (Coates and Bollegala, 2018). Here we apply this logic while taking into account occurrences per PoS tag. This is formalised in Equation 1.

$$e(L) = \frac{\sum_{f \in F(L)} ft(f) \cdot \text{occ}(f)}{\sum_{f \in F(L)} \text{occ}(f, p)}$$  

We use the set of lexeme embeddings obtained using equation 1 as an input for clustering. We cluster this lexeme embedding space using Spectral Clustering (Ng et al., 2002). As for the hyper-parameters we set a Gaussian kernel, a gamma of 0.7 and discretisation to assign clusters. Moreover, we do not use eigenvalue decomposition strategy and set the number of targeted clusters as 20, according to the number of PoS tags ($n$; $n$ distinct PoS tags). These predicted clusters are meant to be used as an additional verification for pseudo-synonyms, but cannot be evaluated as we do not possess gold labels for them. Once we have the lexeme embeddings and their predicted cluster, we can obtain the nearest neighbours for each lexeme. Given a lexeme, we take all the other lexemes with the same PoS tag and that share the same cluster. We then compute the cosine distance between their embeddings (equation 2). This process is formalised in equation 3 where $C(L_i)$ is the cluster for the given lexeme.

$$K(e_i, e_j) = \frac{e_i \cdot e_j}{||e_i|| \cdot ||e_j||}$$  

$$C(L) = \text{argmax}_C \sum_{e \in C} \text{occ}(e, L)$$

Table 5: OFrLex syntactic information: entries with one more explicit version ("effiner")

Table 6: Data used for candidates

We start by using the raw texts as input to train a FastText model (Joulin et al., 2017) using the Gensim implementation. First, we need to take into account morphological information about the words with their inflections. Formal similarity could be used externally but the bag of n-grams used in this model is already dedicated to this. Second, we do possess relatively small data (see Table 6) in comparison to other languages with a lot of resources. Thus, we cannot use latest models such as Bert (Devlin et al., 2019) or ELMo (Peters et al., 2018) which require a large amount of data. In fact, we tried both architectures of Word2Vec (Mikolov et al., 2013) with inconclusive results.

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$$K(e_i, e_j) = \frac{e_i \cdot e_j}{||e_i|| \cdot ||e_j||}$$  

$$C(L) = \text{argmax}_C \sum_{e \in C} \text{occ}(e, L)$$
\[ \forall L_i, \forall L_j \in C(L_i), d(L_i, L_j) = 1 - K(\textbf{e}(L_i), \textbf{e}(L_j)) \]

Finally, nearest neighbours (nn) are obtained by keeping the lexeme with the minimum cosine distance with the targeted lexeme \(d(L_i, L_j)\), visible in Equation 4. The resulted nearest neighbour is controlled by the clustering, the formal similarity induced by the bag of n-grams, and the lexemes’ PoS tag. Because it is not exactly a nearest neighbour nor a variant, we name it pseudo-synonym.

\[ \text{nn}(L_i) = \arg \min_{L_j \in C(L_i), j \neq i} d(L_i, L_j) \]  

(4)

By applying this methodology we get a pseudo-synonym for 15,041 lexemes out of 54,087. Thus, only 27.81% of lexemes obtain a pseudo-synonym, i.e. a candidate for possible source information retrieval. These pseudo-synonyms are then used as propositions for the validator. It is not an easy task to automatically evaluate these pseudo-synonyms but we try to give a glimpse of its quality and usage by taking 10 random pseudo-synonyms found and verifying manually their soundness. For each pseudo-synonym we want to know if it is a probable variant or if it already exists as a variant in OFrLex. Table 7 shows this information in the first two columns, followed by the UPoS, the source lexeme from which we want to find pseudo-synonyms, and the pseudo-synonym (v1) followed by nested pseudo-synonym, i.e., pseudo-synonym of the preceding pseudo-synonym.

The first pseudo-synonyms are voutroillier and voutroier for the lexeme vueltriller (i.e. se vautrer – to wallow –). This pseudo-synonym is a correct candidate for information extraction as this variant occurrence is already known from OFrLex and was extracted from TL. The second, menestralie for the lexeme menestraucie (i.e. act of production of a minstrel) is a new graphical variant which we can verify by manually looking at the definition of menestraucie from DMF which reports them. Plus, they follow the same genre and valency. For the lexeme auberc haubert (coat of chain mail) multiple spelling variants can be found as reported in the Littré\(^{15}\), this pseudo-synonym is a correct candidate for information dispatchment.

We apply the same manual checking for each one and showed that 60% are correct in this small non representative subset. However, among the 4 ones that we do not seem to find any proof for, two pseudo-synonyms are good candidates considering their form (gaagnier) or the quite similar definitions (mas is related to arable ground where massiz and masseiz define something made of the same material).

In any case, we use the pseudo-synonyms as a support (proposition) for validators to find or discover new variants and finally enrich the lexicon, and not to directly insert it in OFrLex without validation.

5. Distribution and Improvements

Language resources used to create OFrLex are either free (DMF is free for non commercial usage), from public domain (Godefroy’s lexicon and dictionary), or follow a copy left pattern - BFM, SRCMF, FROLEX and Wiktionary follow a CC BY-NC-SA\(^{16}\)). Hence, we follow the same licence and distribute OFrLex from its git repository: https://gitlab.inria.fr/almanach/alexina/ofrlex. The OFrLex repository possesses files for the intentional lexicon (Alexina\(^{16}\) format) and the extensional lexicon. The latter is the ready-to-use lexicon with all entries and their inflected forms automatically derived from the set of inflectional rules contained in the intensional lexicon. Table 8 shows an example for the "afiner" entry in the intensional lexicon and 2 of the many inflected forms derived from it for the extensional lexicon.

OfrLex is created semi-automatically and requires thorough validation by Old French specialists. In particular, we expect the valency information to be at least insufficient, and probably not very reliable yet. To deal with this issue and to facilitate validation, we developed a user interface dedicated to OFrLex edition and validation. All modifications made in the interface will be automatically integrated in future versions of OFrLex following the architecture shown in Figure 2. Fully automatic lexicon enrichment such as pseudo-synonyms (see Section 4.2.) and valency or variants information are indicated in the interface as "propositions." They are not fully integrated in the OFrLex source database but are visible for the annotator which can validate them, thereby triggering their integration. This relies on the distinction between 3 information types distinguished by colours: validated information, semi-automatic information, and propositions (with source/confidence indicator). This web interface also serves as a search engine (at the lexeme level) via the public API.

![Figure 2: User Interface architecture for OFrLex validation](image-url)
Table 7: Subset of random pseudo-synonyms for manual inspection.

| Variant | Existing | POS  | Lexeme       | v1           | v2           |
|---------|----------|------|--------------|---------------|--------------|
| True    | True     | VERB | voutillier   | voutroillier  | voutroilier  |
| True    | False    | NOUN | menestraucie | menestralie   |              |
| False   | False    | VERB | articuliser  | articuler     |              |
| True    | True     | NOUN | emblavère    | emblature     |              |
| False   | False    | NOUN | mediqué      | mediomatrique |              |
| True    | False    | VERB | foibloier    | forploier     |              |
| False   | False    | VERB | entreuvair   | entrevair     | massëiz      |

Table 8: OFrLex intensional and extensional examples

```
afiner1  v-er 100:Lemma;v:<Suj:cln|sn,Obj:(cla|sn)>;upos=VERB,cat=v;%actif
# <link src="TL" loc="TL:1:189:5+1:1224:51" entry="afiner1" ms="v." def="[intr.] enden || [mit pers. obj.] jem. den Garaus machen || [trans. mit sâchl obj.] beenden, zu Ende führen"/> <syntinfosource via="tldef" synttype="I"/>
```

```
afinent  v 100
pred="afiner___60674__1<Suj:cln|sn,Obj:(cla|clasn)>=",@pers,cat=v,upos=VERB,@pl.3.subj.prs.std
```

```
afiner1a v 100
pred="afiner___60674__1<Suj:cln|sn,Obj:(cla|clasn)>=",@pers,cat=v,upos=VERB,@sg.3.ind.fut.std
```

Table 9: PoS tagging accuracy scores on SRCMF-UD using alVWTagger combined with the initial OFrLex (v1) and the one currently under enrichment and validation (v1.2).

| Model               | Accuracy | Unknown words Accuracy |
|---------------------|----------|------------------------|
| alVWTagger          | 93.80    | 81.60                  |
| alVWTagger + OFrLex v1 | 94.80    | 85.70                  |
| alVWTagger + OFrLex v1.2 | 95.08    | 87.10                  |

6. Preliminary Usage

OFrLex after validation and enrichment using the interface. This led to an improvement in accuracy, both overall and on unknown words. These promising results motivate the need for an incremental validation phase helped by automatic suggestions. Of course, this represents only a small task and cannot be enough to fully take advantage of OFrLex which contains more information than just the PoS tags. However, it serves as a preliminary example of its use.

7. Future Work

In this paper we presented the creation process we used to build an Old French morphological and syntactic lexicon OFrLex from heterogeneous resources, along with the methodology used to enrich it, taking into account the fact that it is not a living language. The moment, morphological information is available for all categories, but closed categories will certainly require a thorough manual update. Syntactic information is mostly limited to verbs and is not very reliable at this point. Again, thorough manual work will be required to improve its quality and add syntactic information to nouns and adjectives. As shown in Section 5., the user interface is currently being used for the lexicon validation phase supported by multiple enrichment proposals, such as those described in Section 4.2.

Even if our preliminary results focused on part-of-speech tagging, we plan to also use parsebanking as a way to improve the lexicon. To do so, a meta-grammar for Old French parsing is under development (Regnault et al., 2019). It will rely on lexical information provided by OFrLex—most likely a new, improved version thereof—and will make it possible to incrementally improve the lexicon by analysing parsing outputs and parsing failures. OFrLex is available for everyone and future validation will yield new versions once the validation phase is done.
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