A Multidialectal Parallel Corpus of Arabic

Houda Bouamor\textsuperscript{1}, Nizar Habash\textsuperscript{2} and Kemal Oflazer\textsuperscript{1}

\textsuperscript{1}Carnegie Mellon University in Qatar
hbouamor@qatar.cmu.edu, ko@cs.cmu.edu
\textsuperscript{2}Center for Computational Learning Systems, Columbia University
habash@ccls.columbia.edu

Abstract
The daily spoken variety of Arabic is often termed the colloquial or dialect form of Arabic. There are many Arabic dialects across the Arab World and within other Arabic speaking communities. These dialects vary widely from region to region and to a lesser extent from city to city in each region. The dialects are not standardized, they are not taught, and they do not have official status. However they are the primary vehicles of communication (face-to-face and recently, online) and have a large presence in the arts as well. In this paper, we present the first multidialectal Arabic parallel corpus, a collection of 2,000 sentences in Standard Arabic, Egyptian, Tunisian, Jordanian, Palestinian and Syrian Arabic, in addition to English. Such parallel data does not exist naturally, which makes this corpus a very valuable resource that has many potential applications such as Arabic dialect identification and machine translation.

Keywords: Arabic, Dialects, Parallel Corpus

1. Introduction

The Arabic language today is a collection of variants (i.e., dialects) that are historically related to Classical Arabic, but are the product of intense interaction among the various historical dialects of Classical Arabic, the pre-Islamic local languages in the Arab World (such as Coptic, Berber and Syriac), neighboring languages (such as Persian, Turkish and Spanish) and colonial era languages (such as Italian, French and English). Dialects of Arabic (DA) vary among themselves and the Modern Standard Arabic (MSA) variety, which is the language of media and education across the Arab World. The differences are not only lexical, but also phonological, morphological and to lesser degree syntactic. There are numerous linguistic studies in Arabic dialects, with the comparative studies being limited to small scale and old laborious field method techniques of information collection (Brustad, 2000).

In the context of natural language processing (NLP), some Arabic dialects have started receiving increasing attention, particularly in the context of machine translation (Zbib et al., 2012; Salloum and Habash, 2013) and in terms of basic enabling technologies (Habash et al., 2012b; Habash et al., 2013; Pasha et al., 2014). However, the focus is on a small number of iconic dialects, (e.g., Cairene Arabic). In this paper, we present the first multidialectal Arabic parallel corpus, a collection of 2,000 sentences in Standard Arabic, Egyptian, Tunisian, Jordanian, Palestinian and Syrian Arabic, in addition to English. Since such parallel data does not exist naturally (unlike parallel news, e.g.) this is a very valuable resource that has many potential applications such as Arabic dialect identification and machine translation.

The remainder of this paper is organized as follows. Section 2 discusses the differences between MSA and DA and within DAs. In Section 3, we review the main previous efforts for building dialectal resources. Our approach for building the multidialectal parallel corpus is explained in Section 4. Section 5 presents some preliminary corpus analysis and statistics. Finally, we conclude and describe our future work in Section 6.

2. Arabic Dialect Variation

While MSA is the shared official language of culture, media and education from Morocco to the Gulf countries, it is not the native language of any speakers of Arabic. Most native speakers of Arabic are unable to produce sustained spontaneous discourse in MSA; in unscripted situations where spoken MSA would normally be required (such as talk shows on TV), speakers usually resort to repeated code-switching between their dialect and MSA (Abu-Melhim, 1991; Bassiouney, 2009). Arabic dialects are often classified regionally (as Egyptian, North African, Levantine,
Arabic is a morphologically complex language that combines a rich inflectional morphology with a highly ambiguous orthography, which poses many challenges for NLP (Habash, 2010). These features are shared by DA and MSA. The differences between MSA and DAs have often been compared to Latin and the Romance languages (Habash, 2006). Arabic dialects differ phonologically, lexically, and morphologically from one another and from MSA (Watson, 2007).

**Phonology** An example of phonological differences is in the pronunciation of dialectal words whose MSA cognate has the letter Qaf (ق). It is often observed that in Tunisian Arabic, this consonant appears as /qa/ (similar to MSA), while in Egyptian and Levantine Arabic it is /la/ (glottal stop) and in Gulf Arabic it is /la/ (Haeri, 1991; Habash, 2010).

**Orthography** While MSA has an established standard orthography, the dialects do not. Often people write words reflecting the phonology or the history (etymology) of these words. DAs are sometimes written in Roman script (Darwish, 2013). In the context of NLP, a conventional orthography for DA (CODA) has been proposed and instantiated for Egyptian Arabic by Habash et al. (2012a) and was later extended to Tunisian Arabic (Zribi et al., 2014).

**Morphology** Morphological differences are quite common. One example is the future marker particle which appears as +س sa or سوف sawfa in MSA, +اح Ha or راح rah in Levantine dialects, +ح ha in Egyptian and حا ba in Tunisian. This together with variation in the templatic morphology make the forms of some verbs rather different: e.g., ‘I will write’ is تأكَّب Haaktiv (Palestinian), هكتب haktiv (Egyptian) and يكتب baaktiv (Tunisian).

**Lexicon** The number of lexical differences is quite significant. The following are a few examples (Habash et al., 2012a): Egyptian بس bas ‘only’, ترابزه ‘table’, مرات mirAt ‘of’ and دول dow ‘the’, correspond to MSA طاولة faqaT, زوارة zawjah and هولأ hawlaA, respectively. For comparison, the OOV forms of the above words are بس bas (like EGY), طاولة Tawilih (closer to MSA), مرات and دول حدول hadawl.

**Syntax** Comparative studies of several Arabic dialects suggest that the syntactic differences between the dialects are minor. For example, negation may be realized differently (لم ma, مش mish, مو muw, لا lA, ل lam, etc.) but its syntactic distribution is to a large extent uniform across varieties (Benmamoun, 2012).

3. **Related work**

Much work has been done in the context of standard Arabic NLP (Habash, 2010). There are lots of parallel and monolingual data collections, richly annotated collections (e.g., treebanks), sophisticated tools for morphological analysis and disambiguation, syntactic parsing, etc. (Habash, 2010). Efforts to create resources for Dialectal Arabic (DA) have been limited to a small number of major dialects (Diab and Habash, 2007; Habash et al., 2013; Pasha et al., 2014).

Several researchers have explored the idea of exploiting existing MSA rich resources to build tools for DA NLP. Al-Sabbagh and Girju (2010) described an approach of mining the web to build a DA-to-MSA lexicon. Chiang et al. (2006) built syntactic parsers for DA trained on MSA treebanks. Similarly Sawaf (2010), Sajjad et al. (2013) and Salloum and Habash (2013) translated dialectal Arabic to MSA as a bridge to translate to English. Boujelbane et al. (2013) built a bilingual dictionary using explicit knowledge about the relation between Tunisian Arabic and MSA.

Crowdsourcing to build specific resources (e.g., parallel data for translation) for a specific dialect has also been successful (Zbib et al., 2012). Some efforts on dialect identification at the regional level have been done (Habash et al., 2008; Elfordy and Diab, 2013; Zaidan and Callison-Burch, 2013). In the context of DA-to-English SMT, Riesa and Yarowsky (2006) presented a supervised algorithm for online morpheme segmentation on DA that cut the OOVs by half. Zaidan and Callison-Burch (2011) crawled the websites of three Arabic Newspapers and extracted reader commentary on their articles to build the Arabic Online Commentary dataset. They also collected crowd-driven dialectal annotations on Arabic sentences using Mechanical Turk. More recently,
Zbib et al. (2012) demonstrated a crowd-sourcing solution to translating sentences from Egyptian and Levantine into English, and thus built two bilingual corpora. The dialectal sentences were selected from a large corpus of Arabic web text. They argued that differences in genre between MSA and DA make bridging through MSA of limited value.

4. Approach

In addition to Standard Arabic (MSA) and English (EN), our corpus covers five dialects: Egyptian (EG), Tunisian (TN), Syrian (SY), Jordanian (JO) and Palestinian (PA). The last three dialects represent the Levantine group of Arabic dialects. In the future, we plan to expand this effort to other dialects.

In order to build our corpus, four translators (native speakers of Palestinian, Syrian, Jordanian and Tunisian) were asked to translate 2,000 sentences written in Egyptian into their dialects. Egyptian was chosen as a starting point because it is the most widely understood and used dialect throughout the Arab world. The Egyptian media industry has traditionally played a dominant role in the Arab world. A large number of cinema productions, television dramas and comedies have since long familiarized Arab audiences with the Egyptian dialect. A fifth translator (who happened to be Egyptian) was asked to translate the same text to MSA.

The sentences are selected from the Egyptian part of the Egyptian-English corpus built by Zbib et al. (2012). This corpus was translated to English by professional translators hired on MTurk. Since our translators saw the sentences out of context, we provided them with the equivalent ones in English to help disambiguate some readings if necessary.

Every translator was asked to: (a) read the sentences carefully and simply translate them without adding any new information; (b) avoid word by word translation; and (c) be consistent in their orthographic choices and avoid Roman script writing. We asked the translators to be internally consistent in spelling words since there is no standard orthography available for Arabic dialects at this time and we wanted to minimize unnecessary sparsity. We did not provide them with any orthographic guidelines (other than the request for internal consistency). A different approach would have been to collect the dialectal sentences in Arabic script following a general conventional orthography for DA such as CODA. However CODA guidelines at this time only cover Egyptian and Tunisian (Habash et al., 2012a; Zribi et al., 2014).

5. Preliminary Data Analysis

Table 1 illustrates the translations for one sentence in the multidialectal Arabic corpus. This example highlights the many lexical and morphological differences among the different dialects. For example, the Egyptian expression 'and seriously' was translated into معنيد وwj in Syrian, and بلحق منجش nwSfh in Tunisian. The example shows, as well, that there are many shared words that, on their own, cannot disambiguate among the different dialects.
Table 2: Statistics on our corpus Arabic dialect corpus (a sample of 1,000 sentences for each dialect and MSA)

|       | EG  | SY  | JO  | PA  | TN  | MSA |
|-------|-----|-----|-----|-----|-----|-----|
| # tokens | 11,131 | 11,586 | 9,866 | 11,131 | 10,896 | 11,048 |
| # unique tokens | 4,588 | 4,167 | 4,055 | 3,675 | 4,483 | 4,436 |
| # tokens per sentence | 9.22 | 9.61 | 8.17 | 8.52 | 8.98 | 9.70 |

Table 3: Sentence pair average similarities using the Overlap Coefficient

|       | Raw Sentences | Orthographically Normalized Sentences |
|-------|---------------|--------------------------------------|
| MSA   | 39.12         | 44.64                                |
| TN    | 37.30         | 41.32                                |
| PA    | 43.42         | 50.29                                |
| JO    | 42.33         | 49.33                                |
| SY    | 44.66         | 53.81                                |

Table 4: Orthographically normalized sentence pair average similarities using the Overlap Coefficient

Table 2 provides various statistics for a sample of 1,000 sentences extracted from our multidialectal corpus.

To compare the similarity of the sentence pairs, we compute the Overlap Coefficient (OC), representing the percentage of lexical overlap between the vocabularies for each dialect pair $D_1$ and $D_2$. The OC is computed as follows:

$$OC = \frac{|D_1 \cap D_2|}{\min(|D_1|, |D_2|)}$$

We conducted a preliminary lexical analysis restricted to simple matches. The results are given in Table 3. It is important to note the high lexical overlap of Egyptian Arabic with the rest of dialects studied. This could be explained by the fact that the translations were originally obtained from Egyptian. We first observe that the MSA and Egyptian closeness is particularly high. The fact that the MSA translator is Egyptian possibly introduced a bias in the translation process which explains this higher degree of similarity (39.12). The other dialects are all less similar to MSA than Egyptian. Their overlap degree with MSA ranges from 26 to 28. If we focus on different dialects (without MSA), we notice that Tunisian has the least overlap with all other dialects. This is not surprising since Tunisian is a Western dialect, whereas Levantine (PA, JO, SY) and Egyptian are all Eastern dialects. The highest degree of similarity across these dialects seems to be within the Levantine family (Syrian and Jordanian). When we compare Levantine against Egyptian, we observe that the highest degree of similarity is between Syrian and Egyptian. This could be explained by the fact that the Syrian translator is currently living in Egypt, which might introduce a bias in the translation process. In the future, we plan to consider carefully such biasing factors when creating translations.

In order to study the impact of an orthographic normalization on the similarity degree between dialects, we compute the overlap coefficient on pairs of sentences in which all the Hamzated Alif forms ($\check{\text{A}}, \check{\text{\textcircled{A}}}, \check{\text{\textcircled{\textcircled{A}}}}$) are replaced by a bare Alif $\text{\textcircled{\textcircled{A}}}$, the Alif-Maqsura $\check{\text{\textcircled{Y}}}$ by Ya $\text{\textcircled{Y}}$ and the Ta-Marbuta $\check{\text{\textcircled{H}}}$ by Ha $\text{\textcircled{H}}$. Similarity results are reported in Table 4. It is important to notice that the normalization does not change anything in the similarity ranking, which suggests that the kind of orthography errors made by the translators are naturally distributed across the different corpora.

Figure 1 presents some additional examples of sentences from this corpus.
6. Conclusion and Future Work

We presented the first multidialectal Arabic parallel corpus, a collection of 2,000 sentences covering in addition to English and MSA, the Egyptian, Tunisian, Jordanian, Palestinian and Syrian Arabic dialects. The methodology we used relied on the familiarity of Egyptian Arabic to most other dialect speakers. A preliminary analysis of the data confirms known expectations about degrees of similarity between some of the dialects, but also points out to possible bias created by the choice of a specific dialect (in our case Egyptian) as the starting point.

We plan on extending the corpus in terms of size and number of dialects. We also plan to enrich it with additional annotations such as a CODA version, morphological tokenization, POS tagging and manual word alignments. Having all these rich annotations can be very helpful to supporting research in Arabic dialect NLP.

The corpus will be made freely available for research purposes.

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