A Analyses with Reverse Directions

Type		English⇒Chinese			French⇒English			Japanese⇒English		
		Count	Attri.	△	Count	Attri.	△	Count	Attri.	△
Content	Noun	0.313	0.338	*+7.99%*	0.323	0.313	*-3.10%*	0.426	0.377	*-11.50%*
	Verb	0.132	0.127	*-3.79%*	0.172	0.160	*-6.98%*	0.091	0.085	*-6.59%*
	Adj.	0.091	0.094	*+3.30%*	0.078	0.077	*-1.28%*	0.014	0.012	*-14.29%*
	Total	0.536	0.559	*+4.29%*	0.572	0.551	*-3.67%*	0.531	0.473	*-10.92%*
Content-Free	Prep.	0.133	0.129	*-3.01%*	0.116	0.125	*+7.76%*	-	-	-
	Dete.	0.122	0.113	*-7.38%*	0.123	0.126	*+2.44%*	-	-	-
	Punc.	0.088	0.078	*-11.36%*	0.076	0.084	*+10.53%*	0.091	0.122	*+34.07%*
	Others	0.121	0.121	*0.00%*	0.113	0.114	*+0.88%*	0.377	0.405	*+7.43%*
	Total	0.464	0.441	*-4.96%*	0.428	0.449	*+4.91%*	0.469	0.527	*+12.37%*

Table 1: Distribution of syntactic categories with reverse directions based on word count ("Count") and *Attribution* importance ("Attri."). "△" denotes relative change over the count-based distribution.

Fertility	English⇒Chinese			French⇒English			Japanese⇒English		
	Count	Attri.	△	Count	Attri.	△	Count	Attri.	△
≥ 2	0.091	0.106	*+16.48%*	0.088	0.094	*+6.82%*	0.079	0.085	*+7.59%*
1	0.616	0.629	*+2.11%*	0.707	0.721	*+1.98%*	0.513	0.520	*+1.36%*
$(0, 1)$	0.083	0.077	*-7.23%*	0.102	0.094	*-7.84%*	0.086	0.097	*+12.79%*
0	0.210	0.187	*-10.95%*	0.103	0.092	*-10.68%*	0.322	0.298	*-7.45%*

Table 2: Distributions of word fertility and relative changes with reverse directions.

We analyze the distribution of syntactic categories and word fertility on the same language pairs with reverse directions, i.e., English⇒Chinese, French⇒English, and Japanese⇒English. The results are shown in Table 1 and Table 2 respectively, where we observe similar findings as before. We use the Stanford POS tagger to parse the English and French input sentences, and use the Kytea[1] to parse the Japanese input sentences.

Syntactic Categories On English⇒Chinese, *content* words are more important than *content-free* words, while the situation is reversed on both French⇒English and Japanese⇒English translations. Since there is no clear boundary between Preposition/Determiner and other categories in Japanese, we set both categories to be none. Similarly, Punctuation is more important on Japanese⇒English, which is in line with the finding on English⇒Japanese. Overall speaking, it might indicate that the Syntactic distribution with word importance is language-pair related instead of the direction.

Word Fertility The word fertility also shows similar trend as the previously reported results, where one-to-many fertility is more important and null-aligned fertility is less important. Interestingly, many-to-one fertility shows an increasing trend on Japanese⇒English translation, but the proportion is relatively small.

In summary, the findings on language pairs with reverse directions still agree with the findings in the paper, which further confirms the generality of our experimental findings.

[1] http://www.phontron.com/kytea/