

Translation Exercise Assistant: Automated Generation of Translation Exercises for Native-Arabic Speakers Learning English

Jill Burstein
Educational Testing Service
Princeton, NJ 08541
jburstein@ets.org

Daniel Marcu
Language Weaver, Inc
Marina del Rey, CA 90292
dmarcu@languageweaver.com

1. Introduction

Machine translation has clearly entered into the marketplace as a helpful technology. Commercial applications are used on the internet for automatic translation of web pages and news articles. In the business environment, companies offer software that performs automatic translations of web sites for localization purposes, and translations of business documents (e.g., memo and e-mails). With regard to education, research using machine translation for language learning tools has been of interest since the early 1990's (Anderson, 1993, Richmond, 1994, and Yasuda, 2004), though little has been developed. Very recently, Microsoft introduced a product called *Writing Wizard* that uses machine translation to assist with business writing for native Chinese speakers. To our knowledge, this is currently the only deployed education-based tool that uses machine translation.

Currently, all writing-based English language learning (ELL) writing-based products and services at Educational Testing Service rely on e-rater automated essay scoring and the *Critique* writing analysis tool capabilities (Burstein, Chodorow, and Leacock, 2004). In trying to build on a portfolio of innovative products and services, we have explored using machine translation toward the development of new ELL-based capabilities. We have developed a prototype system for automatically generating translation exercises in Arabic --- the *Translation Exercise Assistant*.

Translation exercises are one kind of task that teachers can offer to give students practice with specific grammatical structures in English. Our hypothesis is that teachers could use such a tool to help them create exercises for the

classroom, homework, or quizzes. The idea behind our prototype is a capability that can be used either by classroom teachers to help them generate sentence-based translation exercises from an infinite number of Arabic language texts of their choice. The capability might be integrated into a larger English language learning application. In this latter application, these translation exercises could be created by classroom teachers for the class or for individuals who may need extra help with particular grammatical structures in English. Another potential use of this system that has been discussed is to use it in ESL classrooms in the United States, to allow teachers to offer exercises in students' native language, especially for students who are competent in their own language, but only beginners in English.

We had two primary goals in mind in developing our prototype. First, we wanted to evaluate how well the machine translation capability itself would work with this application. In other words, how useful were the system outputs that are based on the machine translations? We also wanted to know to what extent this kind of tool facilitated the task of creating translation exercise items. So, how much time is involved for a teacher to manually create these kinds of items versus using the exercise assistant tool to create them? Manually creating such an item involves searching through numerous reference sources (e.g., paper or web-based version of newspapers), finding sentences with the relevant grammatical structure in the source language (Arabic), and then manually producing an English translation that can be used as an answer key.

To evaluate these aspects, we implemented a graphical user interface that offered our two users the ability to create sets of translation

exercise items for six pre-selected, grammatical structures. For each structure the system automatically identified and offered a set of 200 system-selected potential sentences per category. For the exercise creation task, we collected timing information that told us how long it took users to create 3 exercises of 10 sentences each, for each category. In addition, users rated a set of up to 200 Arabic sentences with regard to if they were usable as translation exercise items, so that we could gauge the proportion of sentences selected by the application. These were the sentences that remained in the set of 200 because they were not selected for an exercise. Two teachers participated in the evaluation of our prototype. One of the users also did the task manually.

2. Translation Exercise Selection

2.1 Data Sets

The source of the data was Arabic English Parallel News Part 1 and the Multiple Translation Arabic Part 1 corpus from the Linguistic Data Consortium.¹ Across these data sets we had access to about 45,000 Arabic sentences from Arabic journalistic texts taken from Ummah Press Service, Xinhua News and the AFP News Service available for this research. We used approximately 10,000 of these Arabic sentences for system development, and selected sentences from the remaining Arabic sentences for use with the interface.²

2.2 System Description

We used Language Weaver's³ Arabic-to-English system to translate the Arabic sentences in the data sets. We built a module to find the relevant grammatical structures in the English translations. This module first passes the English

translation to a part-of-speech tagger that assigns a part-of-speech to each word in the sentence. Another module identifies regular expressions for the relevant part-of-speech sequences in the sentences, corresponding to one of these six grammatical structures: a) *subject-verb agreement*, b) *complex verbs*, c) *phrasal verbs*, d) *nominal compounds*, e) *prepositions*, and f) *adjective modifier phrases*. When the appropriate pattern was found in the English translation, the well-formed Arabic sentence that corresponds to that translation is added to the set of potential translation exercise sentence candidates in the interface.

2.3 Results

The outcome of the evaluation indicated that between 98% and 100% of automatically-generated sentence-based translation items were selected by both users as usable for translation items. In addition, the time involved to create the exercises using the tool was 2.6 times faster than doing the task manually.

References

- Anderson, Don D. (1995) "Machine Translation as a Tool in Second Language Learning", *CALICO Journal* 13.1, 68-97.
- Burstein, J., Chodorow, M., & Leacock, C. (2004). Automated essay evaluation: The Criterion online writing service. *AI Magazine*, 25(3), 27-36.
- Johnson, Rod (1993) "MT Technology and Computer-Aided Language Learning", in Sergei Nirenburg (ed.) *Progress in Machine Translation*, Amsterdam: IOS and Tokyo: Ohmsha, pages 286-287.
- Richmond, Ian M. (1994) "Doing it backwards: Using translation software to teach target-language grammaticality", *Computer Assisted Language Learning* 7, 65-78.
- Yasuda, K. Sugaya F., Sumita E, Takezawa T., Kikui G., Yamamoto, S. (2004). Automatic Measuring of English Language Proficiency using MT Evaluation Technology. *Proceedings of e-Learning workshop, COLING 2004*, Geneva, Switzerland.

¹ The LDC reference numbers for these corpora are: LDC2004T18 and LDC2003T18.

² To avoid producing sentences with overly complicated structures, we applied two constraints to the English translation: 1) it contained 20 words or less, and 2) it contained only a single sentence.

³ See <http://www.languageweaver.com>.