

## Software

# Segmentation makes translation twice as fast

*Segmentation algorithms show promise in boosting both the speed and accuracy of simultaneous speech translation*

**A**n automated learning system developed by researchers in Japan that identifies the most accurate way to break down a sentence for simultaneous interpretation has cut waiting times in half compared to conventional methods<sup>1</sup>. The system can be used to improve the performance of speech translation software, including mobile apps.

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Traditional systems translate speech one sentence at a time, which means listeners have to wait until the end of a sentence before receiving the translation. To speed this up, researchers have proposed dividing sentences into smaller units, but finding appropriate dividing points has been tricky. Most suggestions are based on human intuition, such as detecting a pause in rhythm and intonation, or predicting the location of commas. However, these markers

can be confusing for automated systems. A quickening of speech or a dramatic pause for emphasis, for example, could reduce translation speed and accuracy.

Now, a team of researchers led by Graham Neubig, Yusuke Oda and Satoshi Nakamura at NAIST has developed a method that does not rely on heuristics. “In a way, the method was born out of frustration, since it was proving harder and harder to improve on existing methods,” says Neubig. “We basically let the computers come up with their own ideas.”

The researchers combined a greedy algorithm, a grouping strategy and dynamic programming to develop a system for computing the accuracy of different segmentation approaches and selecting the optimal translation breakdown. They then experimentally assessed their computational system using English-to-German and English-to-Japanese speech translation data.

The resulting translation speeds were two to three times faster than those of sen-

tence-based methods, while maintaining the same accuracy. In some cases, the accuracy was slightly improved — a surprising result since segmentation removes the context and flexibility afforded by sentence-scale translation. “Current machine translation systems are occasionally confused by longer sentences,” explains Neubig.

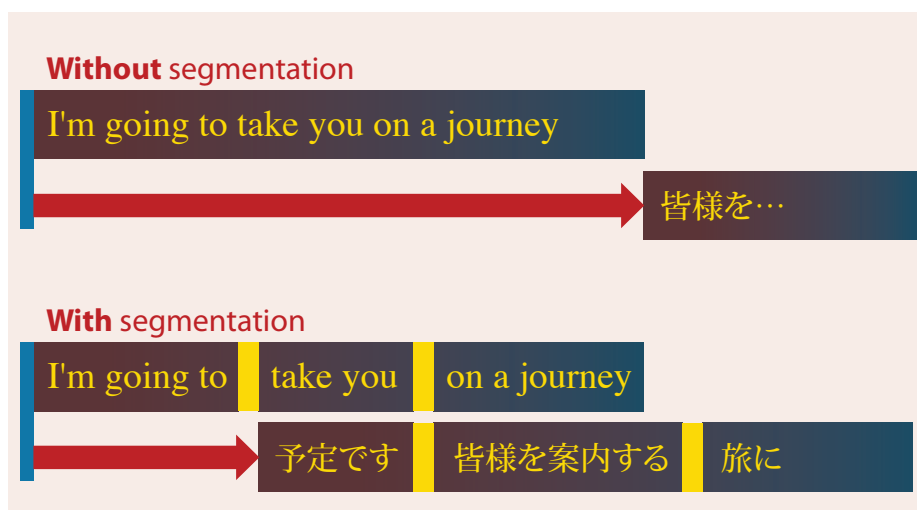
**“Human simultaneous interpreters are remarkably clever about guessing what the speaker is going to say in the future, and using these estimates to help improve the simultaneity of their interpretation.”**

His team is currently working on improving the machine-learning system by incorporating prediction techniques often employed by their real-life counterparts. “Human simultaneous interpreters are remarkably clever about guessing what the speaker is going to say in the future, and using these estimates to help improve the simultaneity of their interpretation.”

The research is well timed given the proliferation of real-time translation applications, such as the preview version of Skype Translator, and the introduction of automated systems in universities. Neubig hopes to apply the new technology to various situations. “Being able to translate faster, while maintaining a high level of accuracy, is essential to achieving smoother conversations or more complete understanding of lecture contents,” he says.

## Reference

1. Oda, Y., Neubig, G., Sakti, S., Toda, T. & Nakamura, S. Optimizing segmentation strategies for simultaneous speech translation. *Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (Short Papers)* 2, 551–556 (2014).



Segmenting sentences into smaller units can increase the speed of simultaneous translation technology.

More information about the group's research can be found at the Augmented Human Communication Laboratory webpage:  
[http://ahclab.naist.jp/index\\_en.html](http://ahclab.naist.jp/index_en.html)