Field Experiments of Real-Time Foreign News Distribution Powered by MT

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Abstract

Field experiments on a foreign news distribution system using two key technologies are reported. The first technology is a summarization component, which is used for generating news headlines. This component is a transformer-based abstractive text summarization system which is trained to output headlines from the leading sentences of news articles. The second technology is machine translation (MT), which enables users to read foreign news articles in their mother language. Since the system uses MT, users can immediately access the latest foreign news. 139 Japanese LINE users participated in the field experiments for two weeks, viewing about 40,000 articles which had been translated from English to Japanese. We carried out surveys both during and after the experiments. According to the results, 79.3% of users evaluated the headlines as adequate, while 74.7% of users evaluated the automatically translated articles as intelligible. According to the post-experiment survey, 59.7% of users wished to continue using the system; 11.5% of users did not. We also report several statistics of the experiments.

1. Introduction

Due to economic globalization, quick distribution of foreign news is becoming increasingly important. There are two important aspects of foreign news. One is freshness, which can help readers make economic decisions; for example, overseas trends must be grasped quickly in order to make investment decisions. The other aspect is accuracy, since wrong information

could cause readers to make wrong decisions. Regarding freshness, ICT technologies such as mobile networks, mobile devices and SNS enable users to access the latest news. However, it still takes time to distribute foreign news because the translation process is done manually. Meanwhile, machine translation (MT) has drastically improved in recent years. For translation between language in the same or close family, some systems show a comparable performance with human translators.

This paper introduces a real-time foreign news distribution system which incorporates MT, and shows the results of field experiments for the language pair of Japanese and English. Since these languages are of completely different families, even the latest MT systems produce translation errors. To help understand of the news correctly, the distribution system has a function to request post-editing by human translators.

Section 2 introduces the natural language technologies used for the proposed news distribution system. Section 3 shows the configuration of the system. Section 4 explains the field experiments and shows their results. Finally, section 5 provides some conclusions.

2. System components

The news distribution features two key technologies: MT which enables users to read foreign news articles in their mother language, and a text summarization function which generates news headline. These technologies are outlined below.

2.1. Machine Translation

The MT system (Mino, 2020) used for this research is a transformer-based encoder-decoder model (Vaswani, 2017). We constructed different types of parallel news corpora to develop our MT system. The primary corpus was built by manually translating Japanese news articles. The remaining corpora were respectively constructed by different approaches: an automatic sentence alignment method between Japanese and English news articles; post-editing of the aligned news articles manually; and a back-translation technique (Sennrich et al., 2016) to leverage monolingual news articles. To exploit multiple corpora with different features, we extend a domain-adaptation method by using multiple tags to train an NMT model effectively. This improves the translation quality of the MT system.

2.2. Headline Generation using Text Summarization Technology

2.2.1. Text Summarization Technology

The text summarization method used for our research is a transformer-based abstractive text summarization method (Matsumaru, 2020), which is trained to output headlines from the leading sentences of news articles. Using this method, the text summarization system for our news distribution system was trained on the corpus provided by Jiji Press Ltd.

2.2.2. Headline Generation in Target Language

News headlines are very important in news distribution, because most readers decide whether to read the full news articles or not based on their headlines.

As shown in Fig. 1, given a pair of a news headline and an article in the source language, there are several ways to generate a headline in the target language. The first way is to apply direct machine translation to the source-language headline. This method only requires MT, which was explained in the previous subsection. The second way applies text summarization to generate a headline in the source language, then MT to translate the generated headline to the target language. The third way is the reverse of the second way: it uses MT to translate the whole article first, then text summarization to generate the headline in the target language.

To compare these methods, we carried out evaluation experiments using BLEU score (Papineni, 2002) as an evaluation metric. Since news headlines normally contain only a few words, we adjusted the maximum *n*-gram length to 2 to calculate the BLEU score.

Figure 2 shows the evaluation results of the headline generation experiments. Here, the translation direction is English to Japanese. As shown in the figure, the third way gives the best results in terms of the BLEU score. Considering these results, our foreign news distribution system automatically translates articles first, then applies text summarization to generate headlines.

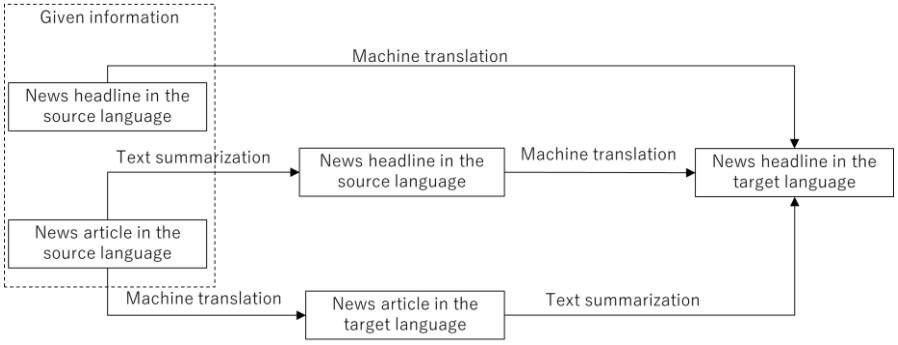

Figure 1. Method of generating headlines in the target language.

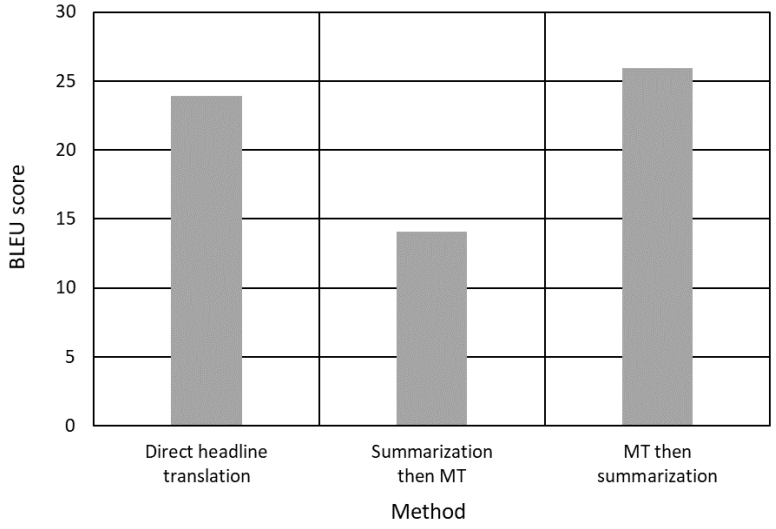

Figure 2. Evaluation results of headline generation methods.

3. Foreign News Distribution System

This section explains the foreign news distribution system which we developed. Figure 3 shows the system configuration. As shown in the figure, the system distributes news via the LINE[1] app, which has the highest market share in Japan among messaging apps. The original news information is provided in the format of XML files from a news article server operated by Jiji Press Ltd. The contents processing block in the figure includes news article extraction from XML files. Then, the news distribution server interacts with MT and headline generation servers to obtain headlines and articles in the target language.

The system distributes the translated headlines and links of machine translated articles as LINE messages. The users can set the distribution frequency (1 to 12 hours) and preferred news categories from 10 kinds including politics, economy and sports. Excluding breaking news, the news distribution server controls the distributed articles, timing and order according to users' preferences. For breaking news, the system distributes the news as soon as possible regardless of preferences. If users cannot understand the MT-generated news articles, they can request manual post-edit via the LINE app. Figure 4 shows screenshot of the news distribution system on the LINE app. By clicking on a headline sent as a LINE message, the user can read the translated article in full.

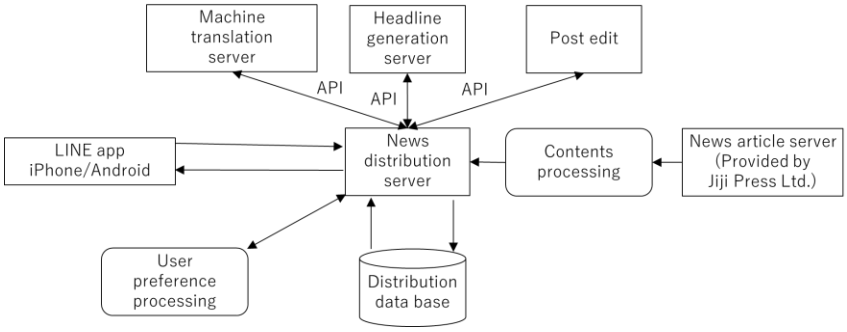

Figure 3. System configuration of the news distribution system.

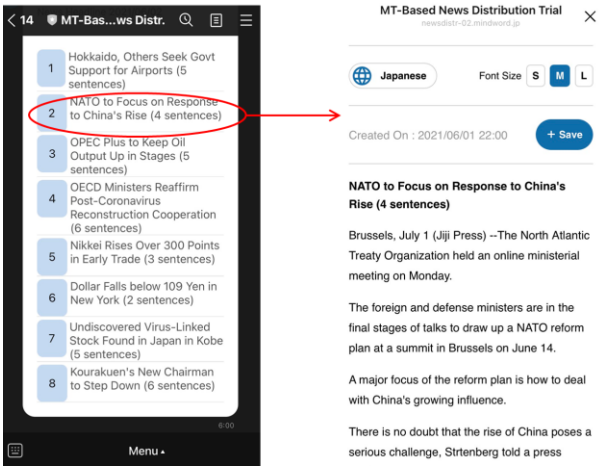

Figure 4. Screenshot of the news distribution system on LINE app.

[1] https://line.me/en/

4. Field Experiments

4.1. Experimental Settings

Field experiments were carried out on the developed system, with the participation of 139 Japanese LINE users during period of December 9 to 22, 2020. During this period, users viewed about 40,000 articles translated from English to Japanese. We carried out surveys both during and after the experiments.

4.2. Experimental Results

Table 1 shows the ratio of the distributed articles and post-edit requested articles aggregated by the 10 news categories. By comparing the distributed and post-edit requested ratio, the top three most frequently distributed categories tended to be requested the most. Especially, news in the politics category had a high ratio of post-edit requests. The average time to complete manual post-editing after user's request was 2 hours and 45 minutes. The survey showed that 88.9% of users felt the intelligibility of post-edited articles had been improved.

Figure 5 shows the results of the post-experiment survey on the quality of headline generation and article translation. According to the results, 79.3% of users evaluated headlines as adequate, while 74.7% of users evaluated automatically translated articles as intelligible. Another post-experiment survey revealed that 59.7% of users wished to continue using the foreign news distribution service, while 11.5% did not.

News category	Ratio of distributed articles	Ratio of post-edit requested articles
Politics	23.3%	**38.0%**
Economy	17.4%	**18.9%**
Sports	15.6%	**17.3%**
Health	14.5%	10.4%
Social	14.6%	10.0%
Culture	5.7%	2.4%
Dispute	5.8%	1.3%
Science	1.7%	1.1%
Local	1.2%	0.5%
Education	0.3%	0.1%

Table 1. Ratio of distributed news articles and post-edit requested articles.

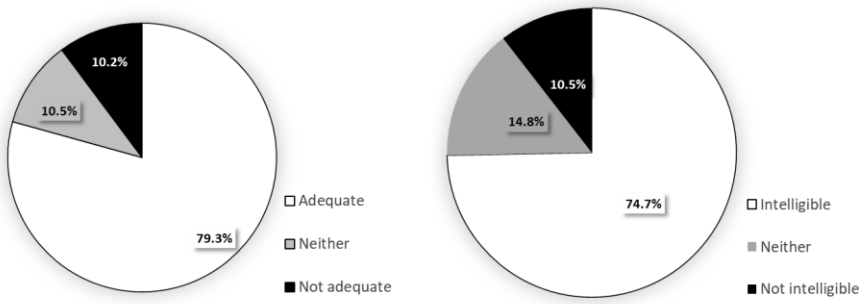

Figure 5. Results of survey on adequacy of headlines and intelligibility of translated articles.

5. Conclusions

We developed a foreign news distribution system that generates headlines and articles in the target language by using text summarization and MT technologies. The system handles English-to-Japanese translation of news articles, which are not easy to translate even for the s latest MT systems.

However, 74.7% of users evaluated the automatically translated articles as intelligible, while 79.3% of users evaluated the automatically generated headlines as adequate. The system also provides a function to request manual post-edit to resolve translation errors, which helps users to understand news articles correctly.

Acknowledgements

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