Improving Localization Processes with the Language Grid

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1. Introduction

Machine translation technologies have been developing during the past years. However, the gap between human and machine translators remains huge. On the one hand, machine translators always have limitations in translation qualities. On the other hand, bilingual human translators are not available everywhere for any purpose at any time in the real world, while the cost of translations of highly-trained bilingual individuals are always high in both labor and time. To address the above problem, approaches of collaborative translation by human and machine translators have been studied in previous research. Although most of the previous studies show the possibility of combining human and machine translators for multilingual communication [1], there is little consideration of how to support such approaches for localization processes that require high business qualities in the real world.

This research aims at improving localization processes based on the collaboration of human and machine translators by using the Language Grid [2] that we have developed, which is a service-oriented intelligence platform for language services. We propose localization processes by human and machine translators. Besides bilingual roles, monolingual roles are induced into the proposed localization processes since monolingual translators are usually more available and cost less than bilingual roles.

By applying the proposed localization processes on the Language Grid, we expect that (1) combining monolingual roles and dictionary services improves the translation quality of machine translators, and (2) collaboration of human and machine translators reduces translation cost comparing with absolute bilingual human translations. To testify the hypotheses, we conduct experiments to compare the translation qualities and costs using several translation processes, including absolute machine translation processes, absolute human translation processes and translation processes by human and machine translators.

2. Localization Processes with the Language Grid

To provide flexible language services for improving the localization processes, we develop the Language

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Grid, which collects language resources from the Internet, universities, research labs and companies. Language resources are wrapped as Web services by standard interface including machine translation services, dictionary services and so on. Using the atomic Web services, we have also developed a series of composite services like machine translation service combined with dictionary and so on. Moreover, it is also possible to combine human tasks into the composite translation services on the Language Grid.

In this research, we combine human and machine translators for improving localization processes, where human roles are induced to process machine translation results. Figure 1 shows the localization process that combines machine translator, monolingual human tasks and bilingual human tasks. The machine translator in the process indicates the composite machine translation service combined with dictionaries that is provided by the Language Grid. Monolingual human roles are induced to revise the translation results of the machine translators, while bilingual human roles are induces to check the revision results and also translate the contents that cannot be revised by the monolingual revisers.
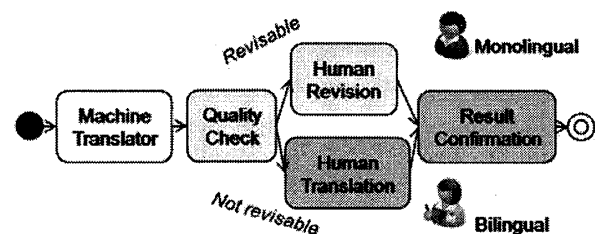

Figure 1 Localization process by human and machine translation services provided by the Language Grid

3. Experiments

To observe the effects of localization processes by human and machine translators on the Language Grid, we conduct experiments by comparing several processes for Japanese-Chinese localization.

Translation quality measurement. Translations were evaluated on the basis of adequacy and fluency in previous reports [3]. Adequacy refers to the degree to which the translation communicates information present in the original, while fluency refers to the degree to which the translation is well-formed according to the grammar of the target language. In this research, we use the two dimensions to evaluate the quality of translations with a five-level score for

each dimension with 1 is the worst and 5 the best.

Processes. We use following processes in this experiment. *MT* is an atomic machine translation service. *MT+Dic* is a composite translation service with dictionary. *MT+Human 1* is a translation process that combines composite machine translation and monolingual human reviser only, and *MT+Human 2* is the localization process described in Fig. 1. *Human* is an absolute human process.

Process instances. For each process, we run 17 process instances to translate each Japanese sentence in one instance. The Japanese sentences are from a description manual for a digital camera in a Japanese company, with the average sentence length of 42 Japanese characters.

Language services. Main language services used in our experiments are provided in the Language Grid by wrapping language resources including J-Server Japanese-Chinese machine translation service provided by Kodensha Co., Ltd, Mecab Japanese morphological analysis service provided by NTT Communication Science Laboratories, a user Japanese-Chinese dictionary service for digital cameras which covers 18.75% words in the Japanese sentences for execution. Human tasks in the experiments are conducted by a Japanese-Chinese bilingual translator and a Chinese monolingual reviser with the cost of US$30 and US$15 per hour respectively.

4. Analysis

Table 1 shows the experimental results on average fluency and adequacy of translation result, and cost and duration for each process in this experiment. To testify our hypotheses, we analyze the results in the following two aspects.

Table 1 Average fluency and adequacy of translation result, cost and duration of different processes

Processes	Fluency/ Adequacy	Cost	Duration
MT	2.8/3.0	US$ 1	0.5 min
MT+Dic	3.2/3.7	US $ 3	1 min
MT+Human 1	4.5/4.4	US $ 8	21 min
MT+Human 2	5.0/5.0	US $ 16	37 min
Human	5.0/5.0	US $ 20	40 min

Translation quality. The experiment result shows that the machine translation quality *MT* is limited and cannot meet the requirements for localization processes. However, it can be improved by using composite translating service by combing dictionaries and other services in *MT+Dic*. In *MT+Human 1*, by combining monolingual reviser and composite translation service, the translation quality can be further improved. In one word, the results give evidence to support our first expectation that combining monolingual roles and dictionary services

improves the translation quality of machine translators.

Translation cost. The experiment results also show that composite processes by human and machine translator *MT+Human 1* and *MT+Human 2* can reduce the translation cost comparing with the human translation process *Human*. However, the time duration of the processes including human roles do not significantly differ from each other since we simply add the execution duration of the machine translator and human tasks for all 17 process instances when computing the execution duration in *MT+Human 1* and *MT+Human 2*. However, if we consider the parallel execution of process instances and human tasks, the execution duration are expected to be reduced in the proposed localization process. In summary, the results give evidence to support our second expectation that localization process of human and machine translators reduces translation cost comparing with absolute bilingual human translations.

5. Conclusion

Possibility of combining human and machine translators has been discussed in previous research. However, practical efforts of how to support such approaches for professional translation in the real world are rarely reported. In this paper, we propose the approaches of improving localization processes by composing human tasks and machine translators based on the Language Grid. Further, we conduct experiments to compare the translation qualities and costs using several translation processes to show the effectiveness of our approach. The experiment results show that (1) combining monolingual roles and dictionary services improves the translation quality of machine translators, and (2) collaboration of human and machine translators reduces the cost comparing with the absolute bilingual human translation.

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