

METHOD AND APPARATUS OF MACHINE TRANSLATION, ELECTRONIC DEVICE AND STORAGE MEDIUM

TECHNICAL FIELD

5 **[0001]** The present disclosure relates to the technical field of language processing, and particularly relates to a method of machine translation, an apparatus of machine translation, an electronic device and a computer-readable storage medium.

BACKGROUND

10 **[0002]** Machine translation refers to a technology that automatically converts a text in a language into a text in another language by using computer technology.

[0003] In videos of films and teleplays, it might be the case that one complete sentence is divided into a plurality of shorter sentences that are presented in different frames. For example, regarding a complete sentence "AB", the first part "A" of the sentence is displayed in a frame 1, and the
15 second part "B" of the sentence is displayed in a frame 2. In other words, one sentence is divided into two subtitle texts, which are correspondingly displayed at different time stamps. As a result, when it is required to translate the subtitle text of the film, the contents of "A" and "B" are separately translated, which causes problems of inaccurate translation such as under-translation or over-translation.

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SUMMARY

[0004] In view of the above problem, the embodiments of the present disclosure are provided to provide a method of machine translation, and correspondingly an apparatus of machine translation, an electronic device and a computer-readable storage medium that overcome the above problem
25 or at least partially solve the above problem.

[0005] An embodiment of the present disclosure discloses a method of machine translation, wherein the method comprises:

[0006] determining a to-be-translated original text;

[0007] acquiring a last sentence of original text of the to-be-translated original text and a next
30 sentence of original text of the to-be-translated original text, and acquiring a last sentence of translated text that is obtained by translating the last sentence of original text based on a target language;

[0008] inputting the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text into an encoder to be encoded, to
35 obtain a corresponding encoding result;

[0009] inputting the encoding result into a decoder to be decoded, to obtain a corresponding decoding result; and

[0010] based on the decoding result, acquiring a target translated text of the to-be-translated original text with respect to the target language.

5 **[0011]** An embodiment of the present disclosure further discloses an apparatus of machine translation, wherein the apparatus comprises:

[0012] a first determining module configured for determining a to-be-translated original text;

[0013] a first acquiring module configured for acquiring a last sentence of original text of the to-be-translated original text and a next sentence of original text of the to-be-translated original text, and acquiring a last sentence of translated text that is obtained by translating the last sentence
10 of original text based on a target language;

[0014] a first encoding module configured for inputting the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text into an encoder to be encoded, to obtain a corresponding encoding result;

15 **[0015]** a first decoding module configured for inputting the encoding result into a decoder to be decoded, to obtain a corresponding decoding result; and

[0016] a second acquiring module configured for, based on the decoding result, acquiring a target translated text of the to-be-translated original text with respect to the target language.

[0017] An embodiment of the present disclosure further discloses an electronic device, wherein
20 the electronic device comprises a processor, a memory and a computer program that is stored in the memory and is executable in the processor, and the computer program, when executed by the processor, implements the method of machine translation stated above.

[0018] An embodiment of the present disclosure further discloses a computer-readable storage medium, wherein the computer-readable storage medium stores a computer program, and the
25 computer program, when executed by a processor, implements the method of machine translation stated above.

[0019] The embodiments of the present disclosure have the following advantages:

[0020] In the embodiments of the present disclosure, when machine translation is being performed to the to-be-translated original text, the process may comprise acquiring the last
30 sentence of original text of the to-be-translated original text and the next sentence of original text of the to-be-translated original text, acquiring the last sentence of translated text that is obtained by translating the last sentence of original text based on the target language, inputting those data together into the translation model, and processing by the encoder and the decoder sequentially, to determine the target translated text of the to-be-translated original text. By using the above method,
35 when a certain sentence of the original text is translated, not only the information contained by the

to-be-translated original text itself is taken into consideration, but also the information in the context of the to-be-translated original text is taken into consideration. Furthermore, the last sentence of translated text that was machine-translated is provided as information supplementation in the translation, and the target translated text of the to-be-translated original text is determined via the interaction of those data, which facilitates to express the transition and the linking between the sentences better in the translation, enables the translated text to be smoother, improves the accuracy and the fluency of the translation, and prevents problems of inaccurate translation such as under-translation or over-translation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. 1 is a flow chart of the steps of a method of machine translation according to an embodiment of the present disclosure;

[0022] FIG. 2 is a flow chart of the steps of another method of machine translation according to an embodiment of the present disclosure;

[0023] FIG. 3 is a schematic diagram of the process of the data processing of a method of machine translation according to an embodiment of the present disclosure;

[0024] FIG. 4 is a schematic diagram of the translation process of a method of machine translation according to an embodiment of the present disclosure; and

[0025] FIG. 5 is a structural block diagram of an apparatus of machine translation according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0026] In order to make the above purposes, features and advantages of the present disclosure more apparent and understandable, the present disclosure will be described in further detail below with reference to the drawings and the particular embodiments. Apparently, the described embodiments are merely certain embodiments of the present disclosure, rather than all of the embodiments. All of the other embodiments that a person skilled in the art obtains on the basis of the embodiments of the present disclosure fall within the protection scope of the present disclosure.

[0027] In machine-translation tasks, one complete sentence (longer text) might be cut into a plurality of shorter texts, and the shorter texts are individually separately translated. Such a translation mode causes that the translated texts lack part of the information in the original text (under-translation), or causes replicated translation of part of the information, which results in translation redundancy (over-translation). For example, if "别理我，我想静静" is translated into the English "leave me, let me alone", that is a normal translation. If that sentence is divided into

two parts of "别理我" and "我想静静", and the contents of the two parts are individually separately translated, they might be translated into "let me alone" and "I miss jingjing", and the translations are inaccurate. Additionally, they might be translated into "let me alone" and "leave me, let me alone", and the separate translation causes the replicated appearing of the "let me alone", which is over-translation. For example, if "他不知道从哪儿打听到了你的名号啊" is translated into the English "I don't know where he got your name", that is a normal translation. If that sentence is divided into two parts of "他不知道从哪儿" and "打听到了你的名号啊", and the contents of the two parts are individually separately translated, then they might be translated into "He doesn't know where" and "I got your name", in which the translations are inaccurate, and lack part of the information expressed by the original text, which is under-translation. As another example, if "同行能帮你解决梦娜斯酒庄和玫瑰酒庄资金链断层危机吗" is translated into the English "Can your peers help you solve the funding crisis at Monas Winery and Rose Winery", that is a normal translation. If, because of an objective cause, that sentence is divided into two parts of "同行能帮你解决梦娜斯酒庄" and "和玫瑰酒庄资金链断层危机吗", and the contents of the two parts are individually separately translated, they might be translated into "peers can help you solve the Monas Winery" and "And Rose Winery's funding crisis?", in which the translations are inaccurate, and have grammatical errors.

[0028] One of the core concepts of the embodiments of the present disclosure is that, when machine translation is being performed to the to-be-translated original text, the process may comprise acquiring the last sentence of original text of the to-be-translated original text and the next sentence of original text of the to-be-translated original text, acquiring the last sentence of translated text that is obtained by translating the last sentence of original text based on the target language, inputting those data together into the translation model, and processing by the encoder and the decoder sequentially, to determine the target translated text of the to-be-translated original text. By using the above method, when a certain sentence of the original text is translated, not only the information contained by the to-be-translated original text itself is taken into consideration, but also the information in the context of the to-be-translated original text is taken into consideration. Furthermore, the last sentence of translated text that was machine-translated is provided as information supplementation in the translation, and the target translated text of the to-be-translated original text is determined via the interaction of those data, which facilitates to express the transition and the linking between the sentences better in the translation, enables the translated text

to be smoother, improves the accuracy and the fluency of the translation, and prevents problems of inaccurate translation such as under-translation or over-translation.

[0029] Referring to FIG. 1, it shows a flow chart of the steps of a method of machine translation according to an embodiment of the present disclosure. That may particularly comprise the following steps:

[0030] Step 101: determining a to-be-translated original text.

[0031] The method of machine translation according to the embodiments of the present disclosure may be applied to a terminal device provided with a translation model. The terminal device may be a desktop computer, a notebook computer, a tablet personal computer, a smartphone and so on, and may perform human-machine interaction with the user via an inputting device such as a keyboard, a virtual keyboard, a touchpad, a touch screen and a voice-controlled device.

[0032] The to-be-translated original text may be an English text, a Chinese text or a text in another natural language.

[0033] Step 102: acquiring a last sentence of original text of the to-be-translated original text and a next sentence of original text of the to-be-translated original text, and acquiring a last sentence of translated text that is obtained by translating the last sentence of original text based on a target language.

[0034] In an embodiment of the present disclosure, when the to-be-translated original text is being translated, it is required to acquire its context information (the last sentence of original text and the next sentence of original text), and it is further required to acquire the translated text that is obtained by performing machine-translation to the last sentence of original text, i.e., the last sentence of translated text.

[0035] Step 103: inputting the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text into an encoder to be encoded, to obtain a corresponding encoding result.

[0036] The translation model contains an encoder and a decoder. As an example, the translation model may be the Transformer model. The Transformer model is a neural network model based on the self-attention mechanism, and is used to process sequence data. The Transformer model comprises a plurality of layers of encoders and decoders, and each of the layers is formed by a plurality of attention-mechanism modules and feedforward-neural-network modules. The encoder is used to encode the inputted sequence data into a high-dimension characteristic-vector representation. The decoder is used to decode the vector representation into the target sequence data. In the present disclosure, the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text are inputted into the encoder with a certain input format, to be used as the sequence data inputted into the encoder, and

the outputted encoding result is the corresponding high-dimension characteristic-vector representation.

[0037] In the embodiments of the present disclosure, the input format of the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text when they are inputted into the translation model may be expressed as:

[0038] tgt last sentence, src last sentence, src and src next sentence;

[0039] wherein tgt last sentence represents the last sentence of translated text; src last sentence represents the last sentence of original text; src represents the to-be-translated original text; and src next sentence represents the next sentence of original text.

[0040] In the encoding processing using the encoder, when each of the to-be-translated processed units in the to-be-translated original text is encoded (the to-be-translated original text may undergo a word-dividing processing, to obtain a plurality of divided words (i.e., the processed units) that form the to-be-translated original text), the information contained by the processed units of the inputted contents can be taken into consideration sufficiently (the last sentence of original text, the next sentence of original text and the last sentence of translated text may undergo word-dividing processing individually, to obtain multiple processed units forming the last sentence of original text, multiple processed units forming the next sentence of original text and multiple processed units forming the last sentence of translated text), and, by referring to the information, the to-be-translated processed unit is encoded into the corresponding processed-unit semantic-feature encoded text. Subsequently, the processed-unit semantic-feature encoded texts may be stitched, to obtain the semantic-feature encoded vector of the to-be-translated original text, as the encoding result outputted by the encoder. The semantic-feature encoded vector does not only contain the words and the grammatical information of the to-be-translated original text, but also contains the context information and the semantic information, which realizes the extraction of more comprehensive context information, and can improve the quality and the accuracy of the translation.

[0041] Particularly, regarding texts in different natural languages, the types of the processed units obtained by the word-dividing processing are different. For example, regarding a Chinese text, the word-dividing processing can obtain multiple characters and/or words. Regarding an English text, the word-dividing processing can obtain multiple words. Regarding a text in another language, the word-dividing processing obtains the basic processed language unit corresponding to that language.

[0042] Step 104: inputting the encoding result into a decoder to be decoded, to obtain a corresponding decoding result.

[0043] In the decoding processing using the decoder, the to-be-translated-original-text encoded text is acquired from the encoding result, wherein the to-be-translated-original-text encoded text is obtained by encoding based on each of the to-be-translated processed units in the to-be-translated original text, to obtain the to-be-translated-processed-unit encoded texts corresponding to the to-be-translated processed units, and the to-be-translated-processed-unit encoded texts are stitched. Regarding each of the to-be-translated-processed-unit encoded texts in the to-be-translated-original-text encoded text, the to-be-translated-processed-unit encoded text may be translated by referring to the last-sentence-of-original-text encoded text, the next-sentence-of-original-text encoded text, the last-sentence-of-translated-text encoded text, and the to-be-translated-processed-unit encoded text preceding the to-be-translated-processed-unit encoded text in the to-be-translated-original-text encoded text, to generate a translated processed-unit text of the to-be-translated-processed-unit encoded text, and subsequently the translated processed-unit texts are stitched, to obtain the candidate translated text of the to-be-translated original text, as the decoding result outputted by the decoder. Accordingly, the translation model can more completely comprehend the context information, to improve the accuracy and the fluency of the translation.

[0044] Step 105: based on the decoding result, acquiring a target translated text of the to-be-translated original text with respect to the target language.

[0045] The target translated text refers to the final translation result that is obtained by performing machine translation to the text content of the to-be-translated original text.

[0046] In conclusion, in the embodiments of the present disclosure, when machine translation is being performed to the to-be-translated original text, the process may comprise acquiring the last sentence of original text of the to-be-translated original text and the next sentence of original text of the to-be-translated original text, acquiring the last sentence of translated text that is obtained by translating the last sentence of original text based on the target language, inputting those data together into the translation model, and processing by the encoder and the decoder sequentially, to determine the target translated text of the to-be-translated original text. By using the above method, when a certain sentence of the original text is translated, not only the information contained by the to-be-translated original text itself is taken into consideration, but also the information in the context of the to-be-translated original text is taken into consideration. Furthermore, the last sentence of translated text that was machine-translated is provided as information supplementation in the translation, and the target translated text of the to-be-translated original text is determined via the interaction of those data, which facilitates to express the transition and the linking between the sentences better in the translation, enables the translated text to be smoother, improves the accuracy and the fluency of the translation, and prevents problems of inaccurate translation such as under-translation or over-translation.

[0047] As an example, assuming that the last sentence of original text is "别理我", the to-be-translated original text is "我想静静", the next sentence of original text is "好吗", and the last sentence is translated into "leave me", the context of the "静静" in the to-be-translated original text required to be translated is "我想静静", but, regarding the translation that is added the above

5 information, the context of "静静" is "<leave me>,<别理我>,<我想静静>,<好吗>". Not only the current to-be-translated sentence is taken into consideration, but also the influence on the current translation by the neighboring sentences is taken into consideration, whereby the sufficient context information results in a higher probability with which the "我想静静" is translated into "let me alone", rather than "I miss jingjing" (the context information is sufficiently taken into consideration,

10 to ensure the smoothness of the sentences, whereby the probability with which "I miss jingjing" appears is reduced, which prevents inaccurate translation) or "leave me, let me alone" (because the last sentence of the translation has already had "leave me", so as to ensure the accuracy of the grammar, the probability with which the "leave me" repeatedly appears here is reduced, thereby reducing translation redundancy, and preventing over-translation). Likewise, in certain cases,

15 dividing a certain to-be-translated sentence into two parts and individually separately translating the contents of the two parts might cause under-translation. However, by using the technical solution of the present disclosure, by translating by sufficiently taking into consideration the context information, under-translation can be effectively prevented.

[0048] Referring to FIG. 2, FIG. 2 shows a flow chart of the steps of another method of machine translation according to an embodiment of the present disclosure. That may particularly comprise

20 the following steps:

[0049] Step 201: determining a to-be-translated original text.

[0050] Step 202: acquiring a last sentence of original text of the to-be-translated original text and a next sentence of original text of the to-be-translated original text, and acquiring a last

25 sentence of translated text that is obtained by translating the last sentence of original text based on a target language.

[0051] In some special cases, for example, if the to-be-translated original text does not have the last sentence of original text (in which case it does not have the last sentence of translated text), or the to-be-translated original text does not have the next sentence of original text, a null character string (i.e., " ") may be used to represent the missing content. Particularly, if the to-be-translated

30 original text is the first sentence, or, in other words, the to-be-translated original text does not have the last sentence of original text, a null character string (i.e., " ") may be used to represent the last

sentence of original text, and a null character string (i.e., " ") may be used to represent the last sentence of translated text. Additionally, if the to-be-translated original text is the end sentence, or, in other words, the to-be-translated original text does not have the next sentence of original text, a null character string (i.e., " ") may be used to represent the next sentence of original text.

5 **[0052]** Taking the case as an example in which the embodiments of the present disclosure are applied to the scene of the subtitle translation of a video, the method may comprise acquiring a to-be-translated subtitle text with a current time stamp, acquiring the subtitle text with the last time stamp and the subtitle text with the next time stamp, and acquiring a translated subtitle text with the last time stamp that is obtained by translating the subtitle text with the last time stamp.

10 **[0053]** In an embodiment, the method of machine translation according to the present disclosure may be used to translate the subtitles in a video. In a video, one subtitle text might correspond to one or more video frames, and the subtitle text has the corresponding displaying time stamp, wherein the displaying time stamp specifies the starting displaying time and the ending displaying time of each other subtitle text, to ensure that the subtitles and the video are synchronous.

15 Therefore, if the to-be-translated original text is a to-be-translated subtitle text with a current time stamp, then the corresponding last sentence of original text is the subtitle text with the last time stamp, the next sentence of original text is the subtitle text with the next time stamp, and the last sentence of translated text is the translated subtitle text with the last time stamp.

[0054] Step 203: for each of to-be-translated processed units in the to-be-translated original text, by referring to the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text, encoding the to-be-translated processed unit, to generate a processed-unit semantic-feature encoded text corresponding to the to-be-translated processed unit.

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[0055] Step 204: stitching the processed-unit semantic-feature encoded texts, to obtain a semantic-feature encoded vector of the to-be-translated original text, to be used as the encoding result of the encoder.

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[0056] The to-be-translated processed unit in the to-be-translated original text refers to the basic processed unit in a text. Texts in different natural languages may correspond to different processed units. For example, regarding a Chinese text, the processed unit corresponding to it may be one character and/or word. Regarding an English text, the processed unit corresponding to it may be one word. Particularly, the processed unit may be expressed as "token" in the translation model.

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[0057] In natural language processing, decomposing a sentence into smaller units (token) is a very important step. That is because machine-learning models cannot directly comprehend the whole sentence, and they require decomposing the sentences into smaller parts to process. For

example, the English sentence "The cat sat on the mat" may be cut into tokens of "The", "cat", "sat", "on", "the" and "mat".

[0058] In an embodiment of the present disclosure, regarding each of the to-be-translated processed units in the to-be-translated original text, a sufficient information interaction between the to-be-translated processed unit and the processed units of the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text may be performed, so as to, according to the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text, generate the processed-unit semantic-feature encoded text corresponding to that to-be-translated processed unit. The processed-unit semantic-feature encoded text contains the context information and the semantic information of the processed unit.

[0059] In an alternative embodiment of the present disclosure, in the step 203, the step of, for each of the to-be-translated processed units in the to-be-translated original text, by referring to the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text, encoding the to-be-translated processed unit, to generate the processed-unit semantic-feature encoded text corresponding to the to-be-translated processed unit may particularly comprise the following sub-steps:

[0060] encoding each of the to-be-translated processed units in the to-be-translated original text, to obtain to-be-translated-processed-unit encoded texts corresponding to the to-be-translated processed units, and stitching the to-be-translated-processed-unit encoded texts, to obtain a to-be-translated-original-text encoded text corresponding to the to-be-translated original text;

[0061] encoding the last sentence of original text, to obtain a last-sentence-of-original-text encoded text of the last sentence of original text;

[0062] encoding the next sentence of original text, to obtain a next-sentence-of-original-text encoded text corresponding to the next sentence of original text;

[0063] encoding the last sentence of translated text, to obtain a last-sentence-of-translated-text encoded text corresponding to the last sentence of translated text; and

[0064] for each of the to-be-translated-processed-unit encoded texts, based on the to-be-translated-processed-unit encoded text, the to-be-translated-original-text encoded text, the last-sentence-of-original-text encoded text, the next-sentence-of-original-text encoded text and the last-sentence-of-translated-text encoded text, generating a processed-unit semantic-feature encoded vector corresponding to the to-be-translated-processed-unit encoded text, to be used as the processed-unit semantic-feature encoded text of the corresponding to-be-translated processed unit.

[0065] In an alternative embodiment of the present disclosure, the step of encoding the last sentence of original text, to obtain the last-sentence-of-original-text encoded text of the last sentence of original text may particularly comprise the following sub-steps:

[0066] performing word-dividing processing to the last sentence of original text, to obtain multiple last-sentence-of-original-text processed units forming the last sentence of original text; and

[0067] encoding each of the last-sentence-of-original-text processed units, and stitching the encoded texts of the last-sentence-of-original-text processed units that are obtained by the encoding, to obtain the last-sentence-of-original-text encoded text;

[0068] the step of encoding the next sentence of original text, to obtain the next-sentence-of-original-text encoded text corresponding to the next sentence of original text may particularly comprise the following sub-steps:

[0069] performing word-dividing processing to the next sentence of original text, to obtain multiple next-sentence-of-original-text processed units forming the next sentence of original text; and

[0070] encoding each of the next-sentence-of-original-text processed units, and stitching the encoded texts of the next-sentence-of-original-text processed units that are obtained by the encoding, to obtain the next-sentence-of-original-text encoded text; and

[0071] the step of encoding the last sentence of translated text, to obtain the last-sentence-of-translated-text encoded text corresponding to the last sentence of translated text may particularly comprise the following sub-steps:

[0072] performing word-dividing processing to the last sentence of translated text, to obtain multiple last-sentence-of-translated-text processed units forming the last sentence of translated text; and

[0073] encoding each of the last-sentence-of-translated-text processed units, and stitching the encoded texts of the last-sentence-of-translated-text processed units that are obtained by the encoding, to obtain the last-sentence-of-translated-text encoded text.

[0074] As an example, assuming that the to-be-translated original text undergoes word-dividing processing to obtain 16 tokens, then the output of the encoder contains a token vector corresponding to the 16 tokens (i.e., the processed-unit semantic-feature encoded text). Each of the inputted tokens is converted into one vector, and the vector catches the complicated meaning of the corresponding inputted token in its context.

[0075] In the Transformer model in the prior art, the encoder merely processes the current to-be-translated original text (src). It does not take into consideration the last sentence of original text (src last sentence) or the next sentence of original text (src next sentence) of the to-be-translated

original text, and does not take into consideration the last sentence of translated text that is obtained by translating the last sentence of original text based on the target language (tgt last sentence).

[0076] In the present disclosure, the inputted data that are processed by the encoder include the last sentence of translated text in the target language (tgt last sentence), the last sentence of original text in the source language (src last sentence), the current to-be-translated original text in the source language (src) and the next sentence of original text in the source language (src next sentence). That means that each of the tokens does not only interact with the other tokens in the current to-be-translated original text, but also interacts with the tokens of the neighboring last sentence of original text in the source language, the neighboring next sentence of original text in the source language and the last sentence of translated text in the target language, to generate by information interaction the token vector representing the semantic feature of that token.

[0077] Step 205: extracting the to-be-translated-original-text encoded text from the semantic-feature encoded vector.

[0078] Step 206: for each of the to-be-translated-processed-unit encoded texts in the to-be-translated-original-text encoded text, by referring to the last-sentence-of-original-text encoded text, the next-sentence-of-original-text encoded text, the last-sentence-of-translated-text encoded text, and a to-be-translated-processed-unit encoded text preceding the to-be-translated-processed-unit encoded text in the to-be-translated-original-text encoded text, translating the to-be-translated-processed-unit encoded text, to generate a translated processed-unit text of the to-be-translated-processed-unit encoded text.

[0079] Step 207: stitching the translated processed-unit texts, to obtain a candidate translated text of the to-be-translated original text, to be used as the decoding result of the decoder.

[0080] The masking operation in the translation model refers to hiding some of the token encoded texts that are obtained by the encoding, whereby the model, in decoding, cannot see those inputted token encoded texts. In other words, when the model is translating, the masked content cannot be displayed and seen.

[0081] At the encoding stage, the to-be-translated original text that is required to be translated has already performed the information interaction with its context, and the encoded token vector has been obtained. The token vector outputted by the encoder is required to be processed by the decoder of the model, to obtain the required translation result. The token vector contains the to-be-translated-original-text encoded text, the last-sentence-of-original-text encoded text, the next-sentence-of-original-text encoded text and the last-sentence-of-translated-text encoded text, and the to-be-translated-original-text encoded text, the last-sentence-of-original-text encoded text, the next-sentence-of-original-text encoded text and the last-sentence-of-translated-text encoded text individually contain the respective token encoded texts. At the decoding stage, when each of the

to-be-translated-processed-unit encoded texts in the to-be-translated-original-text encoded text undergoes decoding translation processing, the token encoded texts of the four parts, the last-sentence-of-translated-text encoded text, the last-sentence-of-original-text encoded text, the to-be-translated-processed-unit encoded text preceding the to-be-translated-processed-unit encoded text in the to-be-translated-original-text encoded text, and the next-sentence-of-original-text encoded text, do not undergo the masking operation, but merely the to-be-translated-processed-unit encoded text subsequent to the to-be-translated-processed-unit encoded text in the to-be-translated-original-text encoded text undergoes the masking operation. The decoder, when generating each of the words, can see all of the information of the parts that are not masked, whereby the to-be-translated-processed-unit encoded text can be translated by referring to the part of the information that is not masked.

[0082] Step 208: based on the decoding result, acquiring a target translated text of the to-be-translated original text with respect to the target language.

[0083] Referring to FIG. 3, FIG. 3 is a schematic diagram of the process of the data processing of a method of machine translation according to an embodiment of the present disclosure. The particular process comprises the following:

[0084] Firstly, the to-be-translated original text, the last sentence of original text of the to-be-translated original text, the next sentence of original text of the to-be-translated original text, and the last sentence of translated text of the last sentence of original text are inputted to the translation model.

[0085] Secondly, the encoder in the translation model performs the encoding processing to the inputted contents, and performs word-dividing processing to the to-be-translated original text, to obtain the multiple to-be-translated processed units forming the to-be-translated original text; for each of the to-be-translated processed units in the to-be-translated original text, by referring to the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text, encodes the to-be-translated processed unit, to generate the processed-unit semantic-feature encoded text corresponding to that to-be-translated processed unit; and stitches the processed-unit semantic-feature encoded texts, to obtain the semantic-feature encoded vector of the to-be-translated original text, to be used as the encoding result of the encoder.

In other words, each of the inputted tokens can be encoded into the correspondingly token vector.

[0086] Thirdly, before the decoding processing to the outputted encoding result, it is required to perform the masking operation. For the masking operation, it is required to determine the contents required to be masked and the contents not required to be masked. In the present disclosure, regarding the to-be-translated-processed-unit encoded text that is to be processed currently, the token encoded texts of the four parts corresponding to the to-be-translated-processed-unit encoded

text, the last-sentence-of-translated-text encoded text, the last-sentence-of-original-text encoded text, the to-be-translated-processed-unit encoded text preceding the to-be-translated-processed-unit encoded text in the to-be-translated-original-text encoded text, and the next-sentence-of-original-text encoded text, do not undergo the masking operation, but merely the to-be-translated-processed-unit encoded text that has not been processed in the to-be-translated-original-text encoded text subsequent to the to-be-translated-processed-unit encoded text undergoes the masking operation. The to-be-translated-processed-unit encoded text that is to be processed currently can perform sufficient information interaction with the above-described part that is not masked.

[0087] As an example, assuming that the to-be-translated-original-text encoded text that is to be processed currently is "ABCDE", the last-sentence-of-original-text encoded text is "FGH", the next-sentence-of-original-text encoded text is "XYY", and the last-sentence-of-translated-text encoded text is "RTP", when the to-be-translated-processed-unit encoded text "C" in the to-be-translated-original-text encoded text "ABCDE" is decoded and translated, merely the to-be-translated-processed-unit encoded text "DE" subsequent to the to-be-translated-processed-unit encoded text "C" in the to-be-translated-original-text encoded text "ABCDE" is masked, and the other parts are not masked. Subsequently, the to-be-translated-processed-unit encoded text "C" may be translated by referring to the last-sentence-of-original-text encoded text "FGH", the next-sentence-of-original-text encoded text "XYY", the last-sentence-of-translated-text encoded text "RTP" and the to-be-translated-processed-unit encoded text "AB" preceding the to-be-translated-processed-unit encoded text "C" in the to-be-translated-original-text encoded text "ABCDE". Particularly, it is assumed that the to-be-translated original text is "我喜欢吃苹果", and it is required to translate that text into English. In the translating process, the translation model translates word by word. When the translating starts, the model can merely see the first word, i.e., "我", and it cannot see the following words, such as "喜欢", "吃" and "苹果". Therefore, at this stage, the model can merely predict the translation in English of the first word according to the already known word "我", for example, "I". After the first word has been translated, the next word is seen, which is "喜欢". At this stage, the model has already know "I", and knows that the current word is "喜欢", but it still cannot see "吃" and "苹果". Therefore, it is required to predict the translation in English of the next word based on the "I" and the "喜欢", which might be "like". That process continuously proceeds, till the whole sentence has been completely translated. In that process, each time the next word is predicted, the model can merely see the words that have already

been translated and the current word, and cannot see the following words that have not been translated, which is the so-called "masking operation". Regarding the original text in the context and the part that has already been translated, they are not masked, because those data are already known in the practical translation process, and can be used to improve the accuracy of the translation. Those parts of data may be used by the decoder, thereby sufficiently acquiring the context information in the translation generation.

[0088] Fourthly, after the masking operation, the decoder in the translation model may perform the decoding operation; for each of the to-be-translated-processed-unit encoded texts in the to-be-translated-original-text encoded text, by referring to the last-sentence-of-original-text encoded text, the next-sentence-of-original-text encoded text, the last-sentence-of-translated-text encoded text, and the to-be-translated-processed-unit encoded text preceding the to-be-translated-processed-unit encoded text in the to-be-translated-original-text encoded text, translate the to-be-translated-processed-unit encoded text, to generate a translated processed-unit text of the to-be-translated-processed-unit encoded text; and subsequently stitch the translated processed-unit texts, to obtain a candidate translated text of the to-be-translated original text, to be used as the decoding result of the decoder.

[0089] Fifthly, based on the decoding result, a target translated text of the to-be-translated original text with respect to the target language is acquired, and the target translated text is outputted.

[0090] In an alternative embodiment of the present disclosure, the encoding result contains the to-be-translated-original-text encoded text obtained after the encoding processing, the decoding result contains a plurality of candidate translated texts obtained after the decoding processing, and, in the step 207, the step of, based on the decoding result, acquiring the target translated text of the to-be-translated original text with respect to the target language may particularly comprise the following sub-steps:

[0091] based on a cosine similarity algorithm, calculating text similarities between the to-be-translated-original-text encoded text and the candidate translated texts, to obtain a plurality of text similarities; and

[0092] based on the plurality of text similarities, selecting the target translated text of the to-be-translated original text from the plurality of candidate translated texts.

[0093] The calculation of the text similarities may be performed by using a pre-trained multi-language encoder, and the text similarities may be calculated by using cosine similarity, wherein the calculation formula is as follows:

[0094]
$$\text{Cosine Similarity} = \frac{\vec{A} \cdot \vec{B}}{||\vec{A}|| \times ||\vec{B}||}$$

[0095] wherein $\vec{A}$ and $\vec{B}$ represent, respectively, the to-be-translated-original-text encoded text obtained by processing the to-be-translated original text by using the encoder, and the plurality of candidate translated texts obtained after the decoding processing by the decoder, " $\cdot$ " represents the dot product of the vectors, and $\|\vec{A}\|$ and $\|\vec{B}\|$ represent the modular lengths of the vectors.

5 **[0096]** In an alternative embodiment of the present disclosure, the step of, based on the plurality of text similarities, selecting the target translated text of the to-be-translated original text from the plurality of candidate translated texts may particularly comprise the following sub-steps:

[0097] if a terminology text exists in the to-be-translated original text, determining whether a corresponding translated terminology text exists among the plurality of candidate translated texts, and based on whether the corresponding translated terminology text exists, performing score assigning to the plurality of candidate translated texts, to obtain a plurality of first score values;

10 **[0098]** based on the plurality of text similarities, performing score assigning to the plurality of candidate translated texts, to obtain a plurality of second score values;

[0099] for each of the candidate translated texts, calculating a sum of the first score value and the second score value corresponding to the candidate translated text, to obtain a total score value of the candidate translated text; and

15 **[00100]** comparing the total score values of the candidate translated texts, and based on a comparison result, selecting from the plurality of candidate translated texts the candidate translated text having a highest total score value, to be used as the target translated text.

20 **[00101]** A terminology text refers to a text datum containing terminology. Terminology refers to the expression of the concepts and the knowledge in a specific field by using specialized words, and has the characteristics of high accuracy, high clarity and unified usage. Terminology is of vital importance in academic exchange, communication in specialized fields, and transmission of knowledge, and can accurately convey information, to prevent ambiguity and misunderstanding. The terms may be words that have specific modes of translation in specific contexts; for example, they may be scientific concepts, idioms, slangs, ancient poetry and so on.

25 **[00102]** In particular implementations, a multi-language terminology database may be pre-established. Word-dividing processing is performed to the to-be-translated original text by using a word-dividing tool, wherein the word-dividing tool is not only adapted for generic language processing, but also is optimized particularly with respect to terms such as idioms, slangs and ancient poetry. The divided words obtained by the processing are matched with the terms in the terminology database corresponding to the source language, and if the matching succeeds, that indicates that it has been detected that a terminology text exists in the to-be-translated original text.

[00103] Likewise, word-dividing processing may be performed to the candidate translated texts by using a word-dividing tool, the divided words obtained by the processing are matched with the terms in the terminology database corresponding to the target language, and if the matching succeeds, that indicates that it has been detected that a translated terminology text exists in the candidate translated texts.

[00104] In an embodiment of the present disclosure, if it has been detected that a terminology text exists in the to-be-translated original text, then it may be detected whether the translated terminology text corresponding to the terminology text exists among the candidate translated texts. If it exists, then the corresponding candidate translated text may be assigned a higher score, for example, assigned 1 point, to increase the total score of that candidate translated text. If it does not exist, then the corresponding candidate translated text may be assigned a lower score, for example, assigned 0 point. Furthermore, differentiated scoring may be performed according to the importances or the difficulties of the terms, to more accurately reflect the quality of the translation. The above-described method can ensure the readability and the fluency of the translation result, and, especially when a text content that has an extremely high requirement on the accuracy (for example, royalty wording) is processed, can further improve the overall fluency and integrity of the translation.

[00105] In the present disclosure, the to-be-translated-original-text encoded text and the candidate translated texts are converted into vector form representations, subsequently the similarity between two vectors is calculated by using the cosine similarity, wherein the values of the similarities obtained by the calculation are between 0 and 1, and the similarity values obtained by the calculation may be directly used as the score values of the text similarities of the corresponding candidate translated texts.

[00106] As shown in Table 1, table 1 reflects the score assigning of the candidate translated texts.

candidate translated text	text-similarity score value	term-existence score value	total score value
candidate translated text 1	0.85	1	1.85
candidate translated text 2	0.90	0	0.90
candidate translated text 3	0.80	1	1.80
candidate translated text 4	0.75	1	1.75

[00107] Table 1

[00108] It can be known from Table 1 that the candidate translated text 1 has the highest total score value. Therefore, the candidate translated text 1 is used as the target translated text.

[00109] In an alternative embodiment of the present disclosure, the translation model is obtained by:

[00110] acquiring training samples, wherein the training samples include a to-be-translated-original-text sample, a last-sentence-of-original-text sample of the to-be-translated-original-text sample, a next-sentence-of-original-text sample of the to-be-translated-original-text sample, a last-sentence-of-artificially-translated-text sample of the last-sentence-of-original-text sample and a target-artificially-translated-text sample of the to-be-translated-original-text sample; the last-sentence-of-artificially-translated-text sample is obtained by artificially translating the last-sentence-of-original-text sample based on the target language; and the target-artificially-translated-text sample is obtained by artificially translating the to-be-translated-original-text sample based on the target language;

[00111] inputting the to-be-translated-original-text sample, the last-sentence-of-original-text sample, the next-sentence-of-original-text sample and the last-sentence-of-artificially-translated-text sample into the encoder to be encoded, to obtain a corresponding encoding training result;

[00112] inputting the encoding training result into the decoder to be decoded, to obtain a corresponding decoding-result sample;

[00113] based on the decoding-result sample, determining a target-translated-text sample of the to-be-translated-original-text sample with respect to the target language;

[00114] calculating a loss value of the target-translated-text sample as compared with the target-artificially-translated-text sample; and

[00115] based on the loss value, adjusting parameters of the translation model, continuing to train the translation model, and when a training stopping condition is reached, stopping the training, to obtain the translation model.

[00116] In the embodiments of the present disclosure, the translation model is the Transformer model, the encoder and the decoder according to the present disclosure employ the encoders and the decoders in the Transformer model, and the Transformer model may be trained with the above-described steps to obtain the final translation model.

[00117] The calculation of the loss value may use a cross-entropy loss function. The process may comprise calculating the cross-entropy loss value of each of the translated-processed-unit-text samples in the target-translated-text sample, and subsequently summing the cross-entropy loss values of all of the translated-processed-unit-text samples, to obtain the total loss value of the whole target-translated-text sample. The target of the model training is to reduce the total loss value, i.e., increasing the accuracy of the translation.

[00118] The training stopping condition may be that the total loss value obtained by the calculation no longer decreases or has reached a set threshold of the total loss, and then it may be considered that the translation requirements have been satisfied, and the training is stopped.

[00119] The translating system according to the present disclosure may be formed by three main modules, i.e., a data pre-processing module, an algorithm integrating module and a translated-text generating module. As shown in FIG. 4, FIG. 4 is a schematic diagram of the translation process of a method of machine translation according to an embodiment of the present disclosure. The particular process comprises the following:

[00120] In S401, the data pre-processing module pre-processes the inputted to-be-translated original texts, to add the context information to each of the to-be-translated original texts (the last sentence of original text and the next sentence of original text), and give the corresponding information of the previously translated text (the last sentence of translated text).

[00121] In S402, data initialization is performed to the pre-processed data, to form the processed units.

[00122] In S403, the algorithm integrating module comprises the encoder and the decoder. The encoder, when performing the data processing, for each of the to-be-translated processed units in the to-be-translated original text, by referring to the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text, encodes the to-be-translated processed unit, to generate the processed-unit semantic-feature encoded text corresponding to that to-be-translated processed unit; and stitches the processed-unit semantic-feature encoded texts, to obtain the semantic-feature encoded vector of the to-be-translated original text, to be used as the encoding result of the encoder. The encoding result generated by the encoder undergoes decoding processing by the decoder to obtain the decoding result containing a plurality of candidate translated texts. In the decoding process, for each of the to-be-translated-processed-unit encoded texts in the to-be-translated-original-text encoded text, by referring to the last-sentence-of-original-text encoded text, the next-sentence-of-original-text encoded text, the last-sentence-of-translated-text encoded text, and the to-be-translated-processed-unit encoded text preceding the to-be-translated-processed-unit encoded text in the to-be-translated-original-text encoded text, the to-be-translated-processed-unit encoded text is translated, to generate the translated processed-unit text of the to-be-translated-processed-unit encoded text; and the translated processed-unit texts are stitched, to obtain a candidate translated text of the to-be-translated original text, to be used as the decoding result of the decoder.

[00123] In S404, by using the translated-text generating module, the text similarities between the to-be-translated-original-text encoded text and the candidate translated texts are calculated, and the text-similarity score values are determined. Moreover, the term-existence score values are

determined, which comprises: if it has been detected that a terminology text exists in the to-be-translated original text, then detecting whether the translated terminology text corresponding to the terminology text exists among the candidate translated texts; and if it exists, then assigning the corresponding candidate translated text with a higher score. The target translated text is selected from the candidate translated texts based on the text-similarity score values and the term-existence score values, to complete the whole translating process.

[00124] In conclusion, in the embodiments of the present disclosure, when machine translation is being performed to the to-be-translated original text, the process may comprise acquiring the last sentence of original text of the to-be-translated original text and the next sentence of original text of the to-be-translated original text, acquiring the last sentence of translated text that is obtained by translating the last sentence of original text based on the target language, inputting those data together into the translation model, and processing by the encoder and the decoder sequentially, to determine the target translated text of the to-be-translated original text. By using the above method, when a certain sentence of the original text is translated, not only the information contained by the to-be-translated original text itself is taken into consideration, but also the information in the context of the to-be-translated original text is taken into consideration. Furthermore, the last sentence of translated text that was machine-translated is provided as information supplementation in the translation, and the target translated text of the to-be-translated original text is determined via the interaction of those data, which facilitates to express the transition and the linking between the sentences better in the translation, enables the translated text to be smoother, improves the accuracy and the fluency of the translation, and prevents problems of inaccurate translation such as under-translation or over-translation.

[00125] It should be noted that, regarding the process embodiments, for brevity of the description, all of them are expressed as the combination of a series of actions, but a person skilled in the art should know that the embodiments of the present disclosure are not limited by the sequences of the actions that are described, because, according to the embodiments of the present disclosure, some of the steps may have other sequences or be performed simultaneously. Secondly, a person skilled in the art should also know that all of the embodiments described in the description are preferable embodiments, and not all of the actions that they involve are required by the embodiments of the present disclosure.

[00126] Referring to FIG. 5, FIG. 5 shows a structural block diagram of an apparatus of machine translation according to an embodiment of the present disclosure. That may particularly comprise the following modules:

[00127] a first determining module 501 configured for determining a to-be-translated original text;

[00128] a first acquiring module 502 configured for acquiring a last sentence of original text of the to-be-translated original text and a next sentence of original text of the to-be-translated original text, and acquiring a last sentence of translated text that is obtained by translating the last sentence of original text based on a target language;

5 **[00129]** a first encoding module 503 configured for inputting the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text into an encoder to be encoded, to obtain a corresponding encoding result;

[00130] a first decoding module 504 configured for inputting the encoding result into a decoder to be decoded, to obtain a corresponding decoding result; and

10 **[00131]** a second acquiring module 505 configured for, based on the decoding result, acquiring a target translated text of the to-be-translated original text with respect to the target language.

[00132] In conclusion, in the embodiments of the present disclosure, when machine translation is being performed to the to-be-translated original text, the process may comprise acquiring the last sentence of original text of the to-be-translated original text and the next sentence of original text
15 of the to-be-translated original text, acquiring the last sentence of translated text that is obtained by translating the last sentence of original text based on the target language, inputting those data together into the translation model, and processing by the encoder and the decoder sequentially, to determine the target translated text of the to-be-translated original text. By using the above method, when a certain sentence of the original text is translated, not only the information contained by the
20 to-be-translated original text itself is taken into consideration, but also the information in the context of the to-be-translated original text is taken into consideration. Furthermore, the last sentence of translated text that was machine-translated is provided as information supplementation in the translation, and the target translated text of the to-be-translated original text is determined via the interaction of those data, which facilitates to express the transition and the linking between
25 the sentences better in the translation, enables the translated text to be smoother, improves the accuracy and the fluency of the translation, and prevents problems of inaccurate translation such as under-translation or over-translation.

[00133] Regarding the device embodiments, because they are substantially similar to the process embodiments, they are described simply, and the related parts may refer to the description on the
30 process embodiments.

[00134] An embodiment of the present disclosure further provides an electronic device, wherein the electronic device comprises a processor, a memory and a computer program that is stored in the memory and is executable in the processor, and the computer program, when executed by the processor, implements the steps of the embodiments of the method of machine translation stated

above, to obtain the same technical effect, which, in order to avoid replication, is not discussed further herein.

[00135] An embodiment of the present disclosure further provides a computer-readable storage medium, wherein the computer-readable storage medium stores a computer program, and the computer program, when executed by a processor, implements the steps of the embodiments of the method of machine translation stated above, to obtain the same technical effect, which, in order to avoid replication, is not discussed further herein.

[00136] Regarding the device embodiments, because they are substantially similar to the process embodiments, they are described simply, and the related parts may refer to the description on the process embodiments.

[00137] The embodiments of the description are described in the mode of progression, each of the embodiments emphatically describes the differences from the other embodiments, and the same or similar parts of the embodiments may refer to each other.

[00138] A person skilled in the art should understand that the embodiments of the present disclosure may be provided as a method, a device, or a computer program product. Therefore, the embodiments of the present disclosure may take the form of a complete hardware embodiment, a complete software embodiment, or an embodiment combining software and hardware. Furthermore, the embodiments of the present disclosure may take the form of a computer program product implemented on one or more computer-usable storage media (including but not limited to a disk storage, a CD-ROM, an optical memory and so on) containing a computer-usable program code therein.

[00139] The embodiments of the present disclosure are described with reference to the flow charts and/or block diagrams of the method, the terminal device (system), and the computer program product according to the embodiments of the present disclosure. It should be understood that each flow and/or block in the flow charts and/or block diagrams, and combinations of the flows and/or blocks in the flow charts and/or block diagrams, may be implemented by a computer program instruction. The computer program instructions may be provided to a processor of a general-purpose computer, a special-purpose computer, an embedded processor, or another programmable data processing terminal device to generate a machine, so that a device for implementing the functions specified in one or more flows of the flow charts and/or one or more blocks of the block diagrams can be generated by instructions executed by the processor of the computers or the other programmable data processing terminal device.

[00140] The computer program instructions may also be stored in a computer-readable memory that can instruct the computers or the other programmable data processing terminal device to operate in a specific mode, so that the instructions stored in the computer-readable memory

generate an article comprising an instruction device, and the instruction device implements the functions specified in one or more flows of the flow charts and/or one or more blocks of the block diagrams.

[00141] The computer program instructions may also be loaded to the computers or the other programmable data processing terminal device, so that the computers or the other programmable data processing terminal device implement a series of operation steps to generate the computer-implemented processes, whereby the instructions executed in the computers or the other programmable data processing terminal device provide the steps for implementing the functions specified in one or more flows of the flow charts and/or one or more blocks of the block diagrams.

[00142] Although preferable embodiments of the embodiments of the present disclosure have been described, once a person skilled in the art has known the essential inventive concept, he may make further variations and modifications on those embodiments. Therefore, the appended claims are intended to be interpreted as including the preferable embodiments and all of the variations and modifications that fall within the scope of the embodiments of the present disclosure.

[00143] The method of machine translation, the apparatus of machine translation, the electronic device and the computer-readable storage medium according to the present disclosure have been described in detail above. The principle and the embodiments of the present disclosure are described herein with reference to the particular examples, and the description of the above embodiments is merely intended to facilitate to comprehend the method according to the present disclosure and its core concept. Moreover, for a person skilled in the art, according to the concept of the present disclosure, the particular embodiments and the range of application may be varied. In conclusion, the contents of the description should not be understood as limiting the present disclosure.

CLAIMS

1. A method of machine translation comprising:

determining a to-be-translated original text;

5 acquiring a last sentence of original text of the to-be-translated original text and a next sentence of original text of the to-be-translated original text, and acquiring a last sentence of translated text obtained by translating the last sentence of original text based on a target language;

10 inputting the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text into an encoder to be encoded, to obtain a corresponding encoding result;

inputting the encoding result into a decoder to be decoded, to obtain a corresponding decoding result; and

based on the decoding result, acquiring a target translated text of the to-be-translated original text with respect to the target language.

15 2. The method according to claim 1, wherein the step of inputting the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text into the encoder to be encoded, to obtain the corresponding encoding result comprises:

20 for each of to-be-translated processed units in the to-be-translated original text, by referring to the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text, encoding the to-be-translated processed unit, to generate a processed-unit semantic-feature encoded text corresponding to the to-be-translated processed unit; and

25 stitching the processed-unit semantic-feature encoded texts, to obtain a semantic-feature encoded vector of the to-be-translated original text, to be used as the encoding result of the encoder.

30 3. The method according to claim 2, wherein the step of, for each of the to-be-translated processed units in the to-be-translated original text, by referring to the to-be-translated original text, the last sentence of original text, the next sentence of original text and the last sentence of translated text, encoding the to-be-translated processed unit, to generate the processed-unit semantic-feature encoded text corresponding to the to-be-translated processed unit comprises:

encoding each of the to-be-translated processed units in the to-be-translated original text, to obtain to-be-translated-processed-unit encoded texts corresponding to the to-be-translated processed units, and stitching the to-be-translated-processed-unit encoded texts, to obtain a to-be-translated-original-text encoded text corresponding to the to-be-translated original text;

encoding the last sentence of original text, to obtain a last-sentence-of-original-text encoded text of the last sentence of original text;

encoding the next sentence of original text, to obtain a next-sentence-of-original-text encoded text corresponding to the next sentence of original text;

5 encoding the last sentence of translated text, to obtain a last-sentence-of-translated-text encoded text corresponding to the last sentence of translated text; and

for each of the to-be-translated-processed-unit encoded texts, based on the to-be-translated-processed-unit encoded text, the to-be-translated-original-text encoded text, the last-sentence-of-original-text encoded text, the next-sentence-of-original-text encoded text and the last-sentence-of-translated-text encoded text, generating a processed-unit semantic-feature encoded vector
10 corresponding to the to-be-translated-processed-unit encoded text, to be used as the processed-unit semantic-feature encoded text of the corresponding to-be-translated processed unit.

4. The method according to claim 3, wherein the step of inputting the encoding result into the decoder to be decoded, to obtain the corresponding decoding result comprises:

15 extracting the to-be-translated-original-text encoded text from the semantic-feature encoded vector;

for each of the to-be-translated-processed-unit encoded texts in the to-be-translated-original-text encoded text, by referring to the last-sentence-of-original-text encoded text, the next-sentence-of-original-text encoded text, the last-sentence-of-translated-text encoded text, and a to-be-translated-processed-unit encoded text preceding the to-be-translated-processed-unit encoded text
20 in the to-be-translated-original-text encoded text, translating the to-be-translated-processed-unit encoded text, to generate a translated processed-unit text of the to-be-translated-processed-unit encoded text; and

stitching the translated processed-unit texts, to obtain a candidate translated text of the to-be-translated original text, to be used as the decoding result of the decoder.
25

5. The method according to claim 1, wherein the encoding result contains the to-be-translated-original-text encoded text obtained after the encoding processing, the decoding result contains a plurality of instances of the candidate translated text obtained after the decoding processing, and the step of, based on the decoding result, acquiring the target translated text of the to-be-translated
30 original text with respect to the target language comprises:

based on a cosine similarity algorithm, calculating text similarities between the to-be-translated-original-text encoded text and the candidate translated texts, to obtain a plurality of text similarities; and

based on the plurality of text similarities, selecting the target translated text of the to-be-translated original text from the plurality of candidate translated texts.
35

6. The method according to claim 5, wherein the step of, based on the plurality of text similarities, selecting the target translated text of the to-be-translated original text from the plurality of candidate translated texts comprises:

if a terminology text exists in the to-be-translated original text, determining whether a corresponding translated terminology text exists among the plurality of candidate translated texts, and based on whether the corresponding translated terminology text exists, performing score assigning to the plurality of candidate translated texts, to obtain a plurality of first score values;

based on the plurality of text similarities, performing score assigning to the plurality of candidate translated texts, to obtain a plurality of second score values;

for each of the candidate translated texts, calculating a sum of the first score value and the second score value corresponding to the candidate translated text, to obtain a total score value of the candidate translated text; and

comparing the total score values of the candidate translated texts, and based on a comparison result, selecting from the plurality of candidate translated texts the candidate translated text having a highest total score value, to be used as the target translated text.

7. The method according to claim 1, wherein,

the to-be-translated original text is a subtitle text with a current time stamp;

the last sentence of original text of the to-be-translated original text is a subtitle text with a last time stamp;

the next sentence of original text of the to-be-translated original text is a subtitle text with a next time stamp; and

the last sentence of translated text is a translated subtitle text with the last time stamp that is obtained by translating the subtitle text with the last time stamp.

8. The method according to claim 1, wherein the encoder and the decoder are comprised by a pre-trained translation model, wherein the translation model is obtained by:

acquiring training samples, wherein the training samples include a to-be-translated-original-text sample, a last-sentence-of-original-text sample of the to-be-translated-original-text sample, a next-sentence-of-original-text sample of the to-be-translated-original-text sample, a last-sentence-of-artificially-translated-text sample of the last-sentence-of-original-text sample and a target-artificially-translated-text sample of the to-be-translated-original-text sample; the last-sentence-of-artificially-translated-text sample is obtained by artificially translating the last-sentence-of-original-text sample based on the target language; and the target-artificially-translated-text sample is obtained by artificially translating the to-be-translated-original-text sample based on the target language;

inputting the to-be-translated-original-text sample, the last-sentence-of-original-text sample, the next-sentence-of-original-text sample and the last-sentence-of-artificially-translated-text sample into the encoder to be encoded, to obtain a corresponding encoding training result;

5 inputting the encoding training result into the decoder to be decoded, to obtain a corresponding decoding-result sample;

 based on the decoding-result sample, determining a target-translated-text sample of the to-be-translated-original-text sample with respect to the target language;

 calculating a loss value of the target-translated-text sample as compared with the target-artificially-translated-text sample; and

10 based on the loss value, adjusting parameters of the translation model, continuing to train the translation model, and when a training stopping condition is reached, stopping the training, to obtain the translation model.

9. An electronic device, wherein the electronic device comprises a processor, a memory and a computer program that is stored in the memory and is executable in the processor, and the
15 computer program, when executed by the processor, implements the method of machine translation according to any one of claims 1-8.

10. A computer-readable storage medium, wherein the computer-readable storage medium stores a computer program, and the computer program, when executed by a processor, implements the method of machine translation according to any one of claims 1-8.

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