Multilingual Sentence Hiding and Displaying System for Digital Cartoon Images

Sang-Kwang Lee, Jinkyeong Kim, Ki-Young Kim, and Jin-Tae Oh

Electronics and Telecommunications Research Institute, Korea

E-mail : sklee@etri.re.kr

1. Introduction

There is a rising interest on webtoons as increasing number of portal sites provide webtoons. Furthermore, as the number of people who wish to read famous foreign cartoons through electronic media (computer, iPad and the like) gradually increased, the size of the market for viewing images through electronic media is expected to grow even more. As this market gets bigger, services providing images where sentences of various languages are displayed are drawing much attention. However, in order to provide such a service, sentences consisting of numerous languages have to be translated, and then the translated sentences have to be attached to their original images, which requires creating images as many as the number of the languages, and then these images have to be stored separately[1]. Therefore, a vast storage space is needed.

In addition, in the case of cartoons, a sentence expressed in at least one language is basically provided, but sentences of other languages must be translated by people, which could cause inconvenience.

Therefore, a purpose of this work is to provide a sentence hiding and displaying system whereby sentences expressed in a plurality of languages may be hidden in an image, and only the sentences expressed in a language corresponding to a user's request of among the sentences may be displayed on the image, thereby time and storage space needed to manufacture an image providing sentences expressed in various languages can be saved.

Furthermore, another purpose of the work is to provide a sentence hiding and displaying system, whereby translation may be performed automatically when necessary and the translated sentence may be hidden in an image, thereby saving time needed to manufacture an image providing sentences expressed in various languages.

2. The Proposed System

Figure 1 is a block diagram of a sentence hiding and displaying system. Referring to Figure 1, the sentence hiding and displaying system comprises an image creating interface, image creator, sentence display interface, and sentence extractor and displayer.
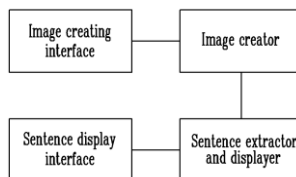

Figure 1. A block diagram of a sentence hiding and displaying system

The image creating interface receives an input of an information on an original image, a plurality of sentences corresponding to the original image, a location within the original image where the plurality of sentences are displayed, and a language that needs to be hidden, and then transmits the information to the image creator. Based on the received information, the image creator determines a sentence that needs to be hidden, and creates a hidden image based on the original image, location and sentence that needs to be hidden. The hidden image is then transmitted to the sentence extractor and displayer. The sentence display interface receives a piece of information on a language selected by a user, and transmits the language selected by the user to the sentence extractor and displayer. Based on the hidden image received from the image creator and the selected language received from the sentence display interface, the sentence extractor and displayer parses the location and the sentence that need to be hidden expressed in the selected language, and displays the sentence expressed in the selected language on the original image based on the location.
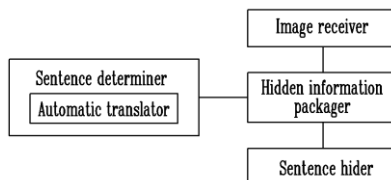

Figure 2. A block diagram of an image creator in a sentence hiding and displaying system

Figure 2 is a block diagram of an image creator in a sentence hiding and displaying. The image creator comprises an image receiver, sentence determiner, hidden information packager, and sentence hider.

The image receiver receives an input of an original image from the image creating interface, and transmits the received original image to the hidden information packager. The sentence determiner receives the plurality of sentences and the language that needs to be hidden and determines the sentence that needs to be hidden from the image creating interface. The hidden information packager packages the sentence that needs to be hidden received from the sentence determiner and the location received from the image creating interface, and creates a piece of hidden information. The sentence hider hides the hidden information received from the hidden information packager in the original image received from the image receiver, and creates a hidden image.

The sentence determiner comprises an automatic translator. The sentence determiner compares the language used in the plurality of sentences with the language that needs to be hidden, and determines the language that needs to be hidden but is not included in the languages used in the plurality of sentences as being a language that needs to be translated. In response to there being a language that needs to be translated, the sentence determiner transmits the

language that needs to be translated to the image creating interface, and may display that additional translation is needed depending on a setting. In the case of a normal cartoon, a sentence corresponding to all locations is provided at least in one language. For example, in webtoons posted on Korean portal websites, Korean is basically provided. Therefore, in response to there being a language that needs to be translated, the automatic translator may translate at least one part of the plurality of sentences (for example, basically provided sentence) into the language that needs to be translated. Herein, the sentence inputted from the image creating interface and the sentence created by translating the sentence in the automatic translator corresponds to the same location. In addition, since the automatic translator adds a serial code to the translated sentence, the sentence input in the image creating interface and the sentence translated in the automatic translator may be differentiated based on whether or not there is a serial code.

The hidden information packager packages the sentence that needs to be hidden and the location in a particular format during packaging. The particular format will be explained hereinafter with reference to Figure 3.
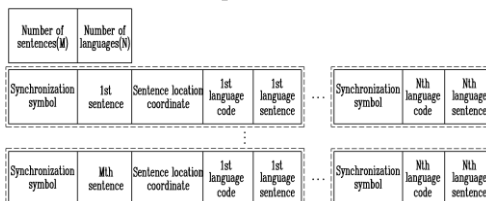
Number of sentences(M)	Number of languages(N)

Synchronization symbol	1st sentence	Sentence location coordinate	1st language code	1st language sentence	...	Synchronization symbol	Nth language code	Nth language sentence
Synchronization symbol	Mth sentence	Sentence location coordinate	1st language code	1st language sentence	...	Synchronization symbol	Nth language code	Nth language sentence

Figure 3. A format of a sentence that may be hidden by a sentence hiding and displaying system

Figure 3 is a view of a format of a sentence that may be hidden in a sentence hiding and displaying. The hidden information comprises an entire information storage and individual information storage. The entire information storage stores the number of sentences and the number of languages, and in the example illustrated in Figure 3, the number of the sentences and the number of the languages are shown as M and N, respectively. The individual information storage has an index (11 to MN), and comprises sentences expressed per index (1st language code to Nth language code) and a part for storing a synchronization code for differentiating different indexes. In the case of a general cartoon, a sentence corresponding to all locations is basically provided in one language. The individual information storage further comprises a part for storing basically provided sentences (1st sentence to Mth sentence) and sentence location coordinates for each sentence. The sentence location coordinate comprises a starting location, ending location and range, and the sentence location coordinate means the location within the original image where the plurality of sentences are displayed. In the example illustrated in Figure 3, the part storing the basically provided sentences and the sentence location coordinates regarding each sentence is included in the individual information storage, but this part may instead be included in the entire information storage. In Figure 3, the sentence location is hidden together with the sentences, but as it was explained above, the sentence location may be transmitted to the sentence extractor and displayer through an additional process.

Hidden image receiver

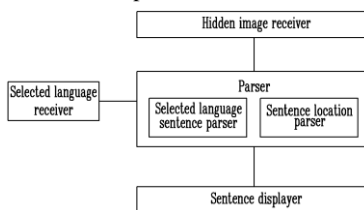| Selected language receiver	Parser
	Selected language sentence parser — Sentence location parser

Sentence displayer

Figure 4. A block diagram of a sentence extractor and displayer in a sentence hiding and displaying system

Figure 4 is a block diagram of a sentence extractor and displayer in a sentence hiding and displaying system. The sentence extractor and displayer comprises a hidden image receiver, selected language receiver, parser and sentence displayer. The hidden image receiver transmits the hidden image received from the image creator to the parser, and the selected language receiver transmits the language selected by the user received from the sentence display interface to the parser. The parser parses the hidden image, and extracts the original image, location, and sentence. Herein, the parser extracts only the sentences expressed in the selected language of among the sentences that need to be hidden. Sentence displayer displays the sentences expressed in the selected language on the original image based on the location extracted in the parser.

The parser comprises a selected language sentence parser and a sentence location parse. Referring to Figure 3, in the case where the language selected by the user corresponds to a kth language code, the selected language sentence parser extracts only the kth language sentence stored in the individual sentence storage. The sentence location parser extracts only the sentence location coordinate part from the individual information storage. Thereafter, the sentence displayer displays on the 1st to Mth coordinate of the original image extracted by the sentence location parser the 1st to Mth sentences expressed in the kth language code extracted by the selected language sentence parser. In the case of selecting a language corresponding to the kth language code, the user may view the image on which the 1st to Mth sentences are displayed.

3. Conclusions

This paper has an effect of providing a sentence hiding and displaying system whereby sentences expressed in a plurality of languages may be hidden in an image, and only the sentences expressed in a language corresponding to a user's request of among the sentences may be displayed on the image, thereby saving time and storage space needed to manufacture an image providing sentences expressed in various languages. In addition, the paper also has an effect of providing a sentence hiding and displaying system, whereby translation may be performed automatically when necessary and the translated sentence may be hidden in an image, thereby saving time needed to manufacture an image providing sentences expressed in various languages.

4. References

[1] TOONDRA (http://www.toondra.co/)