Development and Evaluation of a Multimedia Collocation Retrieval System for Language e-Learning as Contrasted to Conventional Learning Environment

Sangmok Lee (sangmok@lbc21.jp)
Graduate School of International Cultural Studies, Tohoku University, 41 Kawauchi Aobaku
Sendai, 980-8576 Japan

Shigeru Sato (satos@lbc21.jp)
Graduate School of International Cultural Studies, Tohoku University, 41 Kawauchi Aobaku
Sendai, 980-8576 Japan

Introduction

Importance of collocation in efficient language learning is well recognized in the domain of second language education. In recent years investigations in brain science shows that retrieving from mental lexicon words acquired in conventional text-based learning is significantly slower on the scene of actual setting than those obtained in situation-based learning[1].

This paper adopts a broader definition of collocation in the web-based computer-aided multimedia language learning environment, and reports on an attempt of developing Multimedia Collocation Retrieval System ('*MultiCoReS*,' hereafter). for the learners of a second language, based on the mass supply of multimedia contents currently available on the web[2,3]. Our definition of multimedia collocation is based on the text data combined with speech and video information recorded synchronous to the text data; namely, collocation in the multimedia context. We argue that this broader definition of collocation entails the entire setting for the use of a particular expression that not only includes lexical and semantic usage but also supplies in multimedia format the paralinguistic context where it is actually uttered. This paper is also a novel attempt to effectively apply MPEG-7 technologies to retrieval of multimedia contents in language learning, enabling the user to facilitate the system and data portability.

In order to clarify the effect of learning with *MultiCoReS* with a collocation database for learners of Japanese, we also report on a preliminary evaluation experiment using 10 Korean learners with the results that significant difference in the test performance were yet to be found between the two groups, i.e., one using *MultiCoReS*, and the other using conventional text-based method. The experiment with larger number of subjects is now underway.

Building a Multimedia Corpus

The Multimedia corpus we used in our present experiment comprises TV programs, where subtitle information and its synchronous speech-video data were manually captured to compile a corpus for the present experiment. The programs are TV news, documentaries, dramas, entertainment shows, commercials, whose durations are ten hours for each category and fifty hours in total.

In order to locate a particular collocation expression, manual intake, using the attached time scale, visually locates the needed portion watching the closed subtitle data as shown in Figure 1.

MPEG-7 Based Collocation Retrieval

There has been a variety of attempts in improving search methods for image contents in accordance with the speed of the processor. One adopted today is the annotation search, and the other contents search[4]. We utilize the former for the search for lexical/semantic information synchronized to image data, but in contrast, the latter is used to search for the image contents. Figure 2 is a schematic diagram for image data search in MPEG-7.

Collocation Retrieval from Text: Figure 3 is a flow diagram of a system of text/speech collocation retrieval referring to speech files for their replay. In response to an input of search conditions by the learner the system returns an HTML file with reference to a corresponding speech wave file.

Text collocation emerges in the co-occurrence of words that are either physically adjacent to one another or placed discontinuously in a phrase/sentence. In order to deal with the discontinuity encountered in learning Japanese, wild cards are available.

Retrieval of Multimedia/Text Collocation: Figure 4 is a diagram of the multimedia collocation retrieval system in a

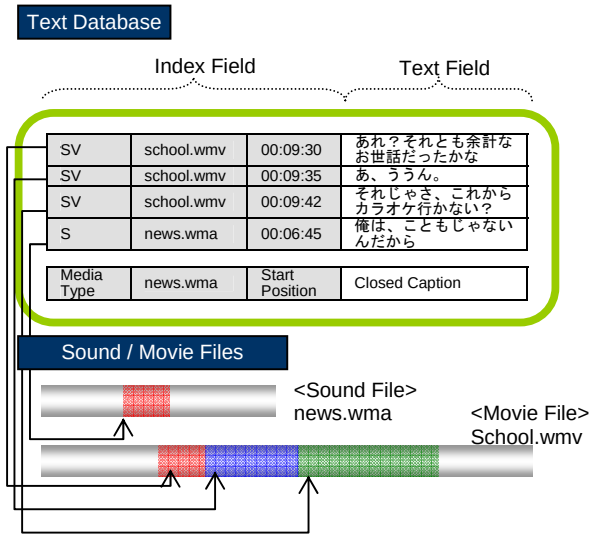

Figure 1: Collocation Retrieval from Multimedia Database

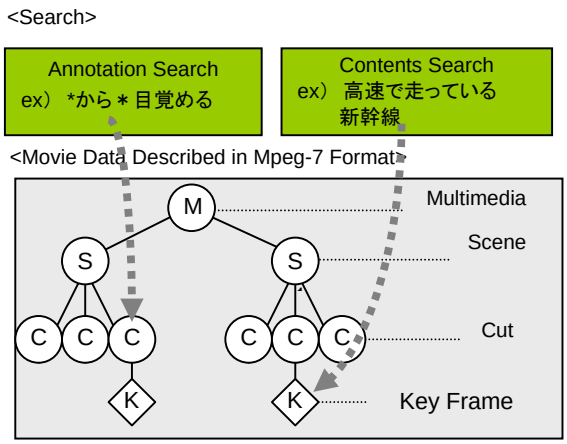

Figure 2 : MPEG-7 File Type and Contents Search

server-client environment, where the server administers the database, retrieves collocation information, and analyses the results. The relational database comprises video with subtitles, and supplies data at the request from the client. The client, on the other hand, makes collocation query, displays retrieval and analysis results, and replays video and speech files.

Evaluation

In order to see the effect of learning Japanese collocations in this multimedia environment, we performed an evaluation experiment with a group of 30 Korean learners of Japanese and investigated into whether presentation of video /audio information promotes recollection of the word in question. The subjects were divided into two groups of 15 subjects in each; Group A used MultiCoRes to learn the words, whereas Group B learned the words using conventional written textbook which is the hardcopy of the closed caption data presented to Group A. The results did not show a significant difference in use/non-use of MultiCoRes in learning and memorizing word meanings. The lack of statistical significance could be attributed to this test having measured the scores in correct identification of individual word meanings. Word meanings given in the multimedia collocation context are not those in dictionary entries, but descriptions simulating word meanings in actual communication situations. The implication that situation-based and text-based understandings of meanings induce separate cerebral representations [1] should also call for whatever differences may be gained in these separate learning modes.

Conclusions

The present paper started with the extended concept of multimedia collocation, and reported on the development and evaluation of multimedia collocation retrieval system (*MultiCoReS*) for learners of Japanese in an on-demand real-time server-client environment.

We also proposed application of a novel image search technology in the multimedia collocation database, expecting that the use of this system promotes understanding and memorization of words in actual setting for learners of Japanese, and that this system enabling the user to search the video-speech-text multi-channel collocation database will be a powerful tool for language learning.

Acknowledgments

The research was supported in part by the MEXT/Tohoku University 21st Century COE Program in Language, Brain and Cognition, and in part by the Tohoku University

References

[1] Jeong H. et al.: Situation-based and text-based learning of foreign language: an fMRI study. *Proc. The Society for Neuroscience 35th Annual Meeting*,CD Publicattion (2005)
[2] Lee, S. and S. Sato: Development of multimedia collocation information search system for learners of Japanese, *Proc. 9th Annual Meeting of ANLP*, pp.137-140 (2003)
[3] http://workstation.lbc21.jp/multicores
[4] Day, N.: MPEG-7: Daring to describe multimedia contents. *XML Journal*, 1, 6, pp.24-27 (2000)

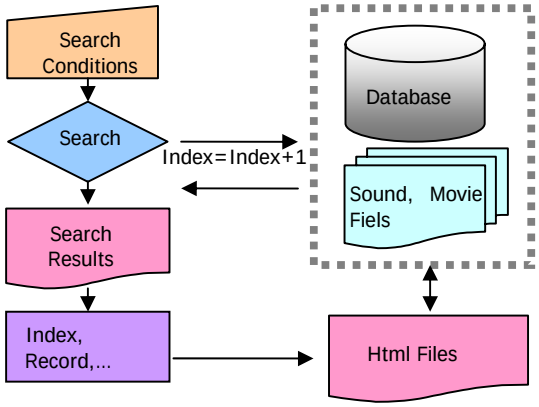

Figure 3: Flowchart of Collocation Search Processing

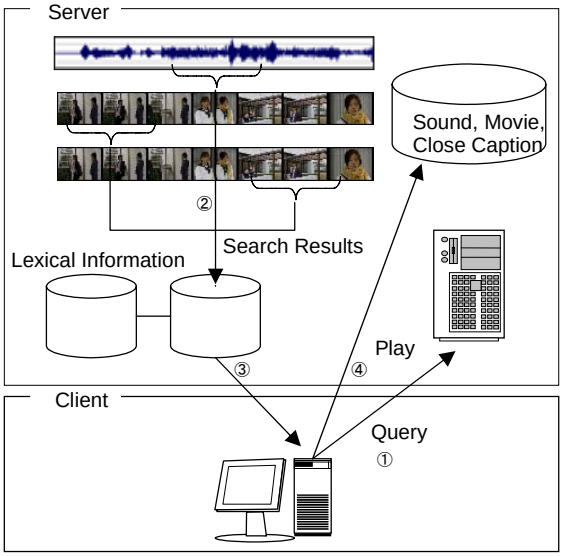

Figure 4 : Multimedia Collocation Retrieval System