A Lifelong Learning Support System on Multimedia Networks

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1 Introduction
In Japan, there has been a rise in demand for lifelong learning due to an increase in national income, average life expectancy and leisure time. On the Internet, research and development in remote educational systems is prospering which can satisfy the characteristics of the learner’s demands.

In the remote educational system, when there are few participants to a certain study, the creation cost of the teaching-material contents becomes high-priced. For this reason, it is difficult to enrich teaching-material contents in all fields of the remote educational system for lifelong learning with a wide range of study fields. On the other hand, the Internet offers many Web pages which can be studied. But the information on the Internet is expanding rapidly, and it is becoming increasingly difficult for us to select required material from this vast information network[1].

We have used the "Kochi-ken multimedia model deployment project" [2] and are building the model which circulates teaching-material contents efficiently. The Kochi-ken multimedia model deployment project has the following four technical elements: (1) A multimedia teaching-materials transmission system [3],[4] (2) An asymmetric communication network system using satellite communication [5] (3) A personalized information navigator[6] (4) An image collaboration system[7]

The multimedia teaching-materials transmission system commissioned the local volunteer creation of the teaching-material contents which used the Web template and realized curtailment of cost. However, the system has few fields of the teaching-material contents which can actually be offered. The number of contents for every field is also restricted. On the other hand, the index is not shown clearly, lifelong learning is difficult for a person with no opportunity to study.

Based on these problems, we created a personalized information navigator using Web teaching materials by way of trial.

2 The new prototype of a personalized information navigator
A personalized information navigator of Kochi Prefecture handles the contents distributed in a satellite. In the new prototype system we created the Web teaching materials on the Internet are used in order to aim at shortage of teaching-material contents and expansion of a field. With the information filtering technology using the contents profile of the Web teaching materials and a learner’s individual profile, the Web teaching materials suitable for learners are offered. we propose a three-step filtering system using three filters, in order to offer the Web teaching materials suitable for the individual learner.

This comprises of:(1) a registration filter, (2) an individual filter, and (3) a basic filter in a three-step filtering system. A registration filter is a filter which checks whether the URL is the justification and the detrimental website of the URL, and performs decision of the registration, in case a learner registers the URL of Web teaching materials. An individual filter is a filter which extracts the Web teaching materials suitable for a learner. A basic filter is a filter which extracts the whole student’s study tendency. In this study, “the rate of learner action”[9] of data social-life-survey is used as a study tendency of lifelong learning.

This system consists of a Server Client. The function of a prototype system has Registration of the URL, Offering URL, and Feedback processing. Registration of the URL is a function which checks the justification and the detrimental website of the URL, and performs registration of the registration, in case a learner registers the URL of Web teaching materials. An individual filter is a filter which extracts the Web teaching materials suitable for a learner. A basic filter is a filter which extracts the whole student’s study tendency. In this study, “the rate of learner action”[9] of data social-life-survey is used as a study tendency of lifelong learning.

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In weighting a category, the user of this system carries out the category chosen when creating an individual profile. For example, when a user in their 20's chooses English, the process adds one to the 20’s category of “English”, and performs weighting to the 20's category of the higher rank category. In weighting to the URL, to the URL which the student judged to conform, positive weighting is performed, and when incongruent, negative weighting is performed conversely.

Feedback processing leaves the individual filter the history of a conformity judging of the learner to each URL. The history is used in order to extract the feature of the Web teaching materials which are processed by the individual filter and then matched to the learner. The individual filter uses the TF-IDF (Term Frequency-Inverse Document Frequency) method as the extraction technique[8].

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3 Evaluation of the prototype system

We experimented in evaluations of the prototype system in order to investigate whether the Web teaching materials based on the study tendency of a certain generation were satisfactory for the other learners of the same generation. For this we used 5 subjects from the 10’s category and 27 subjects from the 20’s category.

For the evaluation methods, we compared the prototype system with the retrieval by keyword of “Yahoo Japan”. The number of the URL of this system and Yahoo to evaluate is 10. If a subject is satisfied for the URL, 1 point is added to the URL. 0.5 points are added if a subject is partly satisfied for the URL. If a subject is not satisfied for the URL, no points are added. The maximum sum total value of the degree of conformity to Web teaching materials is 10 points. Evaluation items consist of two items of [English] and [Foreign language] with the highest study trend being seen in the 20’s category. The number of the URL of [Foreign language] detected by Yahoo is 397, the number of [English] is 1283. The number of [Foreign language] registered at this system is 94, the number of [English] is 83.

3.1 The result of evaluation experiments and consideration

(1) Comparison between the prototype system and Yahoo Japan

The evaluation experiment by comparison of this system and Yahoo was conducted on 3 subjects from the 20’s category about the degree of conformity of [Foreign language] and [English]. Consequently, the system with the best results can be seen in Table 1.

(2) First Feedback processing to the basic filter

Based on the experiment results of Table 1, Feedback processing performed weighting to the URLs of [English] of which three subjects were judged to be conforming. Then the display order was re-arranged, and this system exposed the same URLs to the same subjects again. Consequently, the average value of [English] was low at 4.7.

(3) Feedback processing to the individual filter

To the URLs of [English] judged to be conforming from the results of (2), the TF-IDF method was used, and the results which performed filtering processing are shown in Table 2.

The URL containing the keywords extracted by the TF-IDF method did not exist in the other URLs. Therefore, this feedback processing could only offer a few URLs. However, the URLs offered were matched with all subjects.

(4) Second Feedback processing to the basic filter

Based on the experiment results of Table 1, positive weighting was performed on the URLs judged to be conforming, and negative weighting was performed on the URLs judged to be incongruent. They were then subjected to the new participants(20’s:24, 10’s:5). Consequently, the average value of the degree of conformity of [English] from the 20’s category showed 5.5. Moreover, in the items of a conformity judging, the incongruent rate of Table 1 is decreasing at the rate of 24% to 31% at this time. On the other hand, the average value of [English] from the 10’s category showed 4.5. Thus, we can suggest the validity of this system which presents the Web teaching materials suitable for a certain generation.

4 Conclusion

In this paper, in order to solve the problems of a lifelong learning support system, we collected the URLs of Web teaching materials, and proposed a three-step filtering system and feedback processing system as the technique of extracting URLs suitable for the individual from collected URLs. Furthermore, we developed a prototype system and conducted an evaluation experiment. Consequently, as compared with the prototype system and the similar search engine, suitability for conformity was high, and it was shown that URLs which were further suitable for the individual can be offered by feedback processing. From this, we can conclude that the developed prototype system was able to show that the problems and subjects of a lifelong learning support system were solvable.

References