最小ユーザフィードバックのためのスニペット生成に関する考察

An Investigation of Snippet Generation for Minimum User Feedback

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This paper investigates the effect of snippet on users' relevance judgment for developing a snippet generation method that is suitable for minimum user feedback. Web search engine is becoming very useful tool in our daily life. One of the most important features of modern search engines is snippet, and a good web snippet technology will help users to find relevant pages immediately. Therefore, improving the quality of snippet is important for minimizing user feedback required for finding relevant pages. This paper investigates the effect of snippet on users' relevance judgment by comparing users' relevance judgment when snippet is provided and those without providing snippet. The result will contribute to the improvement of snippet generation method in terms of minimum user feedback.

1. Introduction

When we are going to use a web search engine to find out the information that we need, we care about two things. One is the time cost, and the other is the relevance degree of the information we found in terms of our information need. Snippet is a fragment of document that represents the contents of the document from the viewpoint of a query. It helps a user to easily make a judgment on whether or not to read the corresponding documents.

The concept of Minimum user feedback (MUF) [Okabe07] has been proposed, which aims at decreasing the cost of a user to find relevant information. Improving the quality of snippet is one of the important approaches for minimizing user feedback required for finding relevant pages. This paper investigates the effect of snippet on users' relevance judgment by comparing users' relevance judgment when snippet is provided and those without providing snippet. The result will contribute to the improvement of snippet generation method in terms of minimum user feedback.

2. Related Works

2.1 Snippet generation

There are a number of search engines on the Web, such as www.google.com, www.baidu.com and www.yahoo.com in recent year. Most of them have the similar interfaces for viewing the search results, which shows a title, URL and a snippet for each retrieved page. A snippet is an extracted fragment of a retrieved page, in which the keywords inputted as a query are usually highlighted. All of the presented information helps users to make decisions on whether or not to visit the corresponding page. Among them, a snippet is the most powerful clue for users to guess the content of the page.

In order to generate a snippet that is useful for users, it is important that how to pick out the fragments of a web page that reflects the major topics of the page. It is also important to generate query-oriented snippet, which reflect the contents of a page that relate with a user's query. Every web search engine has it own snippet generation algorithm. Typical algorithm calculates the score of sentences in a page according to the query, and the sentences with the highest score are chosen as a snippet. This algorithm is further divided into various algorithms based on a method and attributes used for score calculation.

One of the simple methods for score calculation is based on the terms in a given query. As a query consists of terms that reflect the user's search purpose, a sentence that contains the terms is expected to refer to the topic of interest. Takami [Takami07] has classified snippets into 4 types, for each of which appropriate word weighting scheme, such as TF, TF-DF, and TF-iDF, is proposed.

Li [Li07] has proposed a different algorithm from the above-mentioned, score-based algorithms, which employ the language model to determine the segment of a document that is suitable as a snippet. Xue [Xue06] has proposed image snippets, which extracts representative image from a page based on visual cue-based page segmentation and text-based similarity between query and the segments.

2.2 User behaviors using search engine

When a user obtains the retrieved result from a search engine, s/he has to decide on which pages to visit. As noted in Sec. 2.1, the page of the retrieved result contains various information that can be clues to determine that pages to be visited. If we know the users' behaviors on viewing the retrieved result page, we can improve the page design so that users can make their decisions with less effort.

From this viewpoint, users' behaviors of viewing web pages / retrieved result pages have been studied by many researchers [Cutrell07, Rodden07]. Recent trend is to track the users' eye movements using an eye-tracker device. Cutrell has analyzed the effect of various factors such as snippet length and the rank of the best result on users' viewing behavior. The experimental results show that the rank of the best result affects total time of performing a task, in particular for informational task. It is also

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shown that longer snippet increases total time but decreases click accuracy for performing a navigational task. On the other hand, longer snippet decreases total time but increases click accuracy for performing an informational task.

Rodden [Rodden07] has explored the relationship between mouse movements and eye movements when performing a search task with using Google. Various interesting patterns, such as keeping the mouse still while reading, and using the mouse as a reading aid are observed.

3. Experiments on effects of snippet on user's relevance feedback

3.1 Outline of experiment

Experiments are performed to compare users' relevance judgment when snippet is provided and those without providing snippet. As for target document set and queries, NTCIR-5 CLIR collection [1] used. Mainichi Daily News 2000-2001 (English-language newspaper of Japan's Mainichi Newspapers) is used as the document set, for which the following 3 topics are used in the experiment: 011 (Ichiro's first year in Major League), 037 (percentage supporting the Mori Cabinet in 2001), 041 (food poisoning problem by Snow Brand dairy products). For each query, the following number of documents is selected from the document set, for each of which a participant judges the relevance degree to the query with 4 levels: S (high relevant), A (relevant), B (partially relevant), C (irrelevant).

- #011: S=5, A=5, B=5, C=5 (Total=20 documents)
- #037: S=5, A=5, B=0, C=10 (Total=20 documents)
- #041: S=2, A=8, B=4, C=6 (Total=20 documents)

In the experiment of each topic, a brief description of the topic is displayed, and then the information about a document, either snippet of full text, is displayed one by one. When a snippet is generated, terms in CONC field (specifying keywords relevant to whole topic) are extracted, and the score of a sentence in a document is calculated based on the number of the terms appeared in it.

The presented order and displayed information (snippet / full text) of a document is randomly determined. Among the 20 documents, snippets and full text are selected for 10 documents, respectively. When a snippet is displayed, a participant can also see the full text, which is displayed in a different page.

3.2 Experimental results

Although the experiment is currently in progress, we have obtained 25 results from 8 participants so far, which include 10 results for topic #011, 7 for #037, and 8 for #041.

Table shows the summary of experimental results, which include average time spent on judging each document, rigid and relaxed precisions for each task. The results are divided into 3 cases: the case when a snippet is presented and participants made decision without reading full text (Snippet), when snippet is presented and participants also read full text (Snippet+Text), and when full text is presented (Text). Rigid precision is calculated when S and A are regarded as relevant, whereas relaxed precision is calculated when S, A, and B are regarded as relevant. The experimental results show that when participant read only snippets, the judgment time is drastically reduced while the degradation of precision is small compared with full text is presented. It is also noted that the number of the case when a snippet is presented is 250, among which the number of times participants also read full text is only 36. In the future work, it should be investigated when a participant want to read not only a snippet but also full text of a document.

Table 1. Summary of experimental results

Topic		011	037	041
Snippet	Time (s)	23.8	18.7	17.5
	P(rigid)	48.9	60.4	60.3
	P(relaxed)	80.6	83.0	84.9
Snippet+Text	Time (s)	81.1	60.9	73.1
	P(rigid)	58.3	64.7	57.1
	P(relaxed)	91.7	82.4	57.1
Text	Time (s)	67.0	63.4	39.7
	P(rigid)	57	70	70
	P(relaxed)	92	90	91.3

4. Conclusions

In this paper, the effect of snippet on users' relevance judgment is investigated. The experiment is performed to compare users' relevance judgment when snippet is provided and those without providing snippet. Experimental results show a snippet can help participants to save their judgment time without serious degradation of precision. Future works include the collection of more experimental results from many participants as well as more detailed analysis of the results. Based on the analysis of the results, we also plan to improve the quality of snippet from the viewpoint of minimizing user feedback.

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