Goromi: To Browse Information on the Web, Not Web Pages
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ABSTRACT
Goromi is an interface for information on the Web. Most search engines display search results as a list of texts. A user selects the web page from the list, and views it through a browser. Goromi presents information on the Web more intuitively. It analyzes the search results returned from the search engine, and extracts keywords that are related to query keyword. Furthermore, images and blocks of text from the web pages are broken down and displayed graphically. By viewing these keywords and images, a user can literally “browse” information related to the query keyword. An interesting aspect of this program is that the user often finds unexpected information, and can research in a new direction not originally intended. Therefore, this program works as a discovery tool of information on the Web.

Categories and Subject Descriptors: H.5.2 [User Interfaces]: Graphical User Interfaces (GUI)

Additional Keywords and Phrases: Web Browser

INTRODUCTION
Today, search engines are the most common way to find information on the Web. The most widely used search engines, such as Yahoo or Google, show search results as a list of texts. To get the information about each page, a user reads title and summary of each page. Then by clicking on the link, a user opens the Web page and reads the information. This kind of text base interface has changed little since the birth of search engines. However, there have been various attempts to improve the search engine interface by displaying results graphically. Grokker [1] automatically categorizes search results, and shows them graphically. Kartoo [2] displays query results as an interactive map. Sites are represented by icons, and links between sites are displayed as threads.

Although these search engines are visually impressive, they are not widely used. There are two major drawbacks in these systems. First, although these search engines use some kind of clustering algorithm, they are not precise enough. Second, the goal of all such graphical search engines is to reach a certain Web page. Therefore, to get the information that is related to the query keyword, a user must open and browse each page. This is not a much of an improvement from a text based search engine interface.

Attempts have also been made in the field of media art. Fragmental Storm[3] shows images and words in the search results graphically. Although this approach is interesting since the user can view related information intuitively, the relation between the keyword and the images is difficult to recognize.

Goromi takes a different approach to the graphical representation of the search results. First, Goromi does not try to cluster search results. Rather it displays the keywords that frequently appear in the search results. This way, the user can see which words are commonly used with, or in other words “related to”, the query keyword.

Secondly, the main purpose of Goromi is not to assist the user to reach a certain Web page, but to break down the Web page text and images in the search results, and show them as floating images.

Figure 1 shows the screen image of Goromi. The query keyword is shown in center of the screen (in Figure 1, query keyword “Subway”) Keywords extracted from search re-
results are shown around it. Very brief summaries of result pages are shown on the left side of the screen. Images from the search result pages are shown on the right side of the screen. The summaries and images move vertically. So, although the display areas of the images, keywords, and summaries overlap, the user has no difficulty viewing them.

**GOROMI SYSTEM OVERVIEW**

Technically, Goromi is a Meta search engine. Query keywords are sent to Google via Google API. Titles and summaries in the search results are tagged using MontyLingua[4]. Then related keywords are extracted by ranking the appearance frequency of each word.

Web pages (html files) in the query results are then downloaded. By analyzing the Web page file, the URLs of the images are extracted. Goromi calculates the distance from the query keyword to each image by counting characters between them, and the closest images are downloaded and displayed.

Unlike other visual search engines, Goromi does not cluster search results. Instead, by showing related keywords and images, Goromi lets the user create the categories. In figure 1, a user can determine that there are two categories for the query keyword “Subway”, “Electric underground railway” and “Fast Food”.

By clicking on a related keyword, the user can add it as a query keyword, and start new search. For example, in Figure 1, if the user clicks “MTA” (abbreviation for “Metropolitan Transportation Authority”), Goromi begins a search with “Subway + MTA” as the query keywords, and the results are displayed. (Fig. 2)

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**EXAMPLE OF USE**

A study was conducted to observe how a user would handle Goromi. Four participants were asked to use Goromi as they wished. Their actions were recorded. Through this study, interesting observations regarding use were made. A typical operation log is shown in Table 1.

<table>
<thead>
<tr>
<th>No</th>
<th>Keyword</th>
<th>type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Julia</td>
<td>User input</td>
</tr>
<tr>
<td>2</td>
<td>Mandelbrot Julia</td>
<td>Manually selected</td>
</tr>
<tr>
<td>3</td>
<td>Fractal</td>
<td>Manually selected</td>
</tr>
<tr>
<td>4</td>
<td>Gallery Fractal</td>
<td>Manually selected</td>
</tr>
<tr>
<td>5</td>
<td>programs images</td>
<td>Randomly selected</td>
</tr>
<tr>
<td>6</td>
<td>Landscape</td>
<td>Manually selected</td>
</tr>
<tr>
<td>7</td>
<td>American Landscape</td>
<td>Manually selected</td>
</tr>
</tbody>
</table>

At first, the user inputted the keyword “Julia” hoping that image of “Julia Roberts” would be found. In addition to the originally intended “Roberts”, the word “Mandelbrot” was among the extracted keywords. The user then changed his mind and selected the keywords “Julia + Mandelbrot” to research fractal images. Once satisfied with fractal images, the user then selected two keywords randomly, and the keyword “Landscape” came up on the screen. Then the user continued searching for various landscape images.

Three out of four participants stated that they experienced a similar kind of sidetracking. By viewing the extracted keywords, they found other areas of interest in addition to the original objective. From these results, it was concluded that Goromi could be used as a discovery tool on the Web.

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**FUTURE WORK**

The next step will be using the knowledge base to extract “interesting” keywords from the search results. In the current version of Goromi, a stop word list is used to filter out unnecessary but frequently used words. However, the stop word list cannot sufficiently distinguish “interesting” keywords from “trivial” keywords. Combining a common sense knowledge base like ConceptNet[5] to Goromi may be effective in achieving such a filtering function.

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**REFERENCES**