A Web Browsing System based on Adaptive Presentation of Web Contents for Cellular Phones

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Mobile users can browse web pages designed for desktop PCs.

[Problems]
- Small screen
- Poor interfaces
Web Page Structure

Web page is composed of different components.
Component = Information block

- Search form
- Site directory
- News
Two Step for Browsing

How to Browse

1. Find an objective component
2. Read within the Component in detail
How to Browse

1. Find an objective component
2. Read within the Component in detail
A Web browsing system based on Adaptive Presentation of Web Contents for Cellular Phone

- Display the overview of a page
  - Reduce scroll to find an objective component
- Present the component adapted to its characteristics
  - Reduce scroll to read the component
Components have common characteristics according to their contents.

From 15 typical Web sites, found components classification

- **Text**
- **Text&Image**
- **Image**
- **Link&Image**
- **Vertical link set**
- **Vertical&horizontal link set**

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Institute for Higher Education Research and Practice, represented by the vice president of Osaka University, operates the classes and manages the curriculum of all liberal arts and sciences programs. The classes and the curriculum are composed by required subjects of freshman and sophomore, such as basic subjects of major courses and subjects of liberal arts and sciences common to all faculties. Almost all the classes are given on the Toyonaka campus.

Osaka University’s beginnings are to be traced to “Teijyodo” (founded in 1839) and “Kokochido” (founded in 1724). Osaka University has collections in excess of 1.6 million relating to arts and sciences and education, which are dispersed throughout the various University facilities and are not easily accessible.

Museum of Osaka University will catalogue and preserve these primary materials, allow access to the public, and carry out research and general education not only in Osaka University but
Components have common characteristics according to their contents.

From 15 typical Web sites, found components classification

- Text
- Text&Image
- Image
- Link&Image
- Vertical link set
- Vertical&horizontal link set
Components have common characteristics according to their contents.

From 15 typical Web sites, found 6 components classification:

- **Text**
- **Text/Image**
- **Image**
- **Link/Image**
- **Vertical link set**
- **Vertical&horizontal link set**
Users' reading behaviors change according to components' class.

[Example]

- Text&Image
  → looks at images as well as reading texts
- Vertical link set
  → searches and selects link

By adaptively presenting a component according to the users' reading behavior, scroll operations can be reduced.
[Purpose]
Determine how to present a component according to its class.

<table>
<thead>
<tr>
<th>Component’s class</th>
<th>Result</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>×</td>
<td>Reading speed differs among individuals</td>
</tr>
<tr>
<td>Text&amp;Image</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Image</td>
<td></td>
<td>Zigzag scroll is hard to read components.</td>
</tr>
<tr>
<td>Link set</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Differences in the style for searching links]
/ Thoroughly read each text associated with a link
/ Skim through the component
System Design

- Overview
- Adaptive presentation of component

- URL
- Screenshot
- Information on components

- Extract components
- Determine components’ classes
Adaptive Presentation

[Text component]

Users read “Text components” by scrolling manually.

By “Jump” function, reduce scroll operations.
Adaptive presentation

[Image component]

- Presented by auto-scrolling
- Zoomed out to prevent zigzag scroll
Adaptive presentation

[Text&Image component]

- Users read by scrolling manually.
- Switch over images within the components by pressing a key.
Adaptive presentation

[Link set component]

- Link&Image
- Vertical link set
- Vertical&horizontal link set

- Reduce scroll operations by auto-scrolling.
- Determine the speed and zoom ratio according to contents of the component.
Conclusion

We designed and implemented adaptive presentation system of Web contents for Web browsing using cellular phones.

Overview

Present components according to their class

[Future Work]

User experiments

Verify an appropriate speed for auto-scrolling
Adaptive presentation

[Decision of auto-scrolling speed]

\[
Speed = \frac{\alpha \text{(the number of characters human can recognize per 1 sec)}}{ID \text{(the number of characters per unit area)} \times Breadth}
\]

\[
Breadth = \begin{cases} 
\text{component's Width (Vertical scrolling)} \\
\text{component's Height (Horizontal scrolling)} 
\end{cases}
\]

Comfortable speed is different each of component’s class and user’s reading style.

→ A user selects appropriate \( \alpha \) value.

❖ Thoroughly reading link texts
❖ Skimming through the component
Web page are partitioned into small blocks.

Using HTML DOM Tree

Objective size of component : 1~5 times of display
Decision of components’ classes
Preliminary Experiment

[Purpose]
Determine how to present a component according to its class.

[Settings]
- 16 subjects selected the best pattern for auto-scrolling for each component class.
  - Speed
  - Zoom ratio
- Experimental system determines a scroll path
System Design

- **Client**
  - URL
  - Screenshot
  - Information on components

- **Server**
  - URL
  - WWW

- **Overview**
- **Adaptive presentation of component**

- **Extract components**
- **Determine components’ classes**
When a user selects a component from overview, that area is zoomed in.

→Reduce scroll operations to find a component

However…

✔ Did not focus on reducing complicated scroll operations to read *within* components.