

COMP390C - Directed Studies III (Honors Study Track)

Final Report

A New Mobile Search Engine Interface

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1. Opportunity for a Mobile Search Engine

The growth of the usage of Internet from mobile phones is increasing. In 2009, the worldwide market of mobile phone with touch screen has doubled to 184 million units [1]. The global mobile Internet usage grew from 0.4% to 1.2% from 2008 to 2009 [2]. The increased usage of mobile Internet has driven the number of search query from mobile phones.

With the increasing number of touch screen-enabled phones and the corresponding number of search query made on such devices, there is a need for a better user interface for searching the web on a touch screen.

2. Product – MSearch

In this project, I have developed a new mobile search engine interface which aims to provide users a non-obstructive experience. The interface is reversible and results are displayed visually. The new search engine is developed as a web application that achieves compatibility across different devices and different platforms.

The interface combines visual search, text search and among the best practices of many search engines. These features are put in a form that is touch screen-friendly. The new search engine interface is developed specifically for the iPhone because its browser (WebKit) is the best standard-compliance browser [8] and also iPhone is the most popular smart phone [3].



Figure 1. Front interface of MSearch.

3. Feature of the Product

3.1. Thumbnails of Webpages

The thumbnails of webpages allow users to get a glimpse of the webpage without actually browsing and waiting for the phone to load the web site. Having the thumbnail is particularly important for users who are looking for a particular type of visual data such as table and chart, which could not be shown only by words. Also the thumbnails could show the design of the web site without requiring the user to actually go to the web site. To save screen real estate, only the top of the webpage is shown.



Figure 2. Thumbnails of webpages are displayed along with a text excerpt.

3.2. Endless Scroll for Search Result

Endless scroll for search result enables users to view more search results without tapping the “next page” button. Users only have to focus on the search result and will not be interrupted. More results are loaded by AJAX when the user scrolls to the bottom of the page. The action is also reversible as the user can just scroll back to the top of the page.

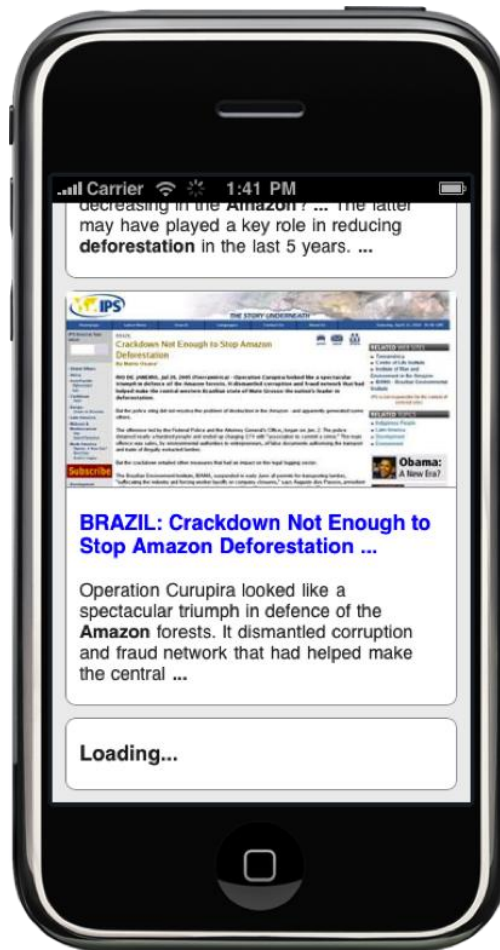


Figure 3. MSearch will be triggered to load more search results when a user scrolls to the bottom of the page.

3.3. Refined Search for Search Query

Typing on a touch screen may not be as comfortable as on a real keyboard. The search engine automatically suggests refined search queries for the users to minimize typing. It is implemented by swiping the screen to the right or to the left.

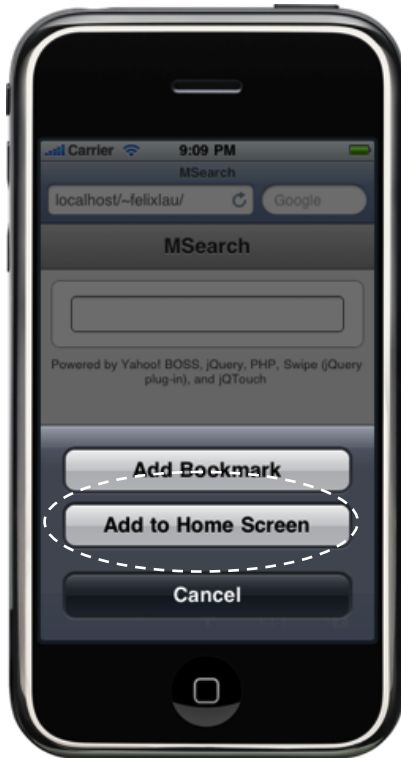


Figure 4. Refined search result is loaded when a user swipes horizontally.

4. Demonstration of MSearch

To fully illustrate the user experience of the search engine, an example search of “amazon deforestation” using MSearch is demonstrated below.

4.1 Assessing MSearch



Step 1a. Navigate to the webpage of MSearch and add it to the iPhone homepage.



Step 1b. Tap the “MSearch” icon to launch the web application.



Step 1c. Wait while the application loads.

4.2 Input Search Query and Scrolling Through the Result



Step 2a. Input query into the interface. Spelling is automatically corrected.



Step 2b. When the user scrolls down to the bottom of the page, more search results are dynamically appended.

4.3 Reviewing Refined Search Result



Step 3a. Swipe right to review refined search result

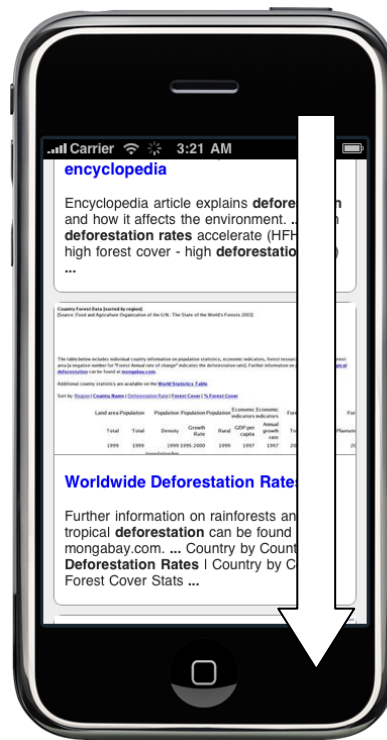


Step 3b. Search result of "amazon deforestation brazil" is shown

4.4 Choosing the Best Search Result



Step 4a. Swipe right to display another refined search result



Step 4b. Scroll down to compare different search results to choose the best one

5. Comparison of MSearch with Some Existing Solution

There are many implementations of mobile search engines but many of them are not built in mind with touch screen as an input.

5.1 Google Mobile Search

Being the most popular search engine [4], Google has developed various tools specified to mobile phones including its search service. Its Google Mobile Search [5] is one of the mobile services. Google Mobile Search has a similar interface as the desktop version but with several phone-specific enhancements, for example, location-based search.

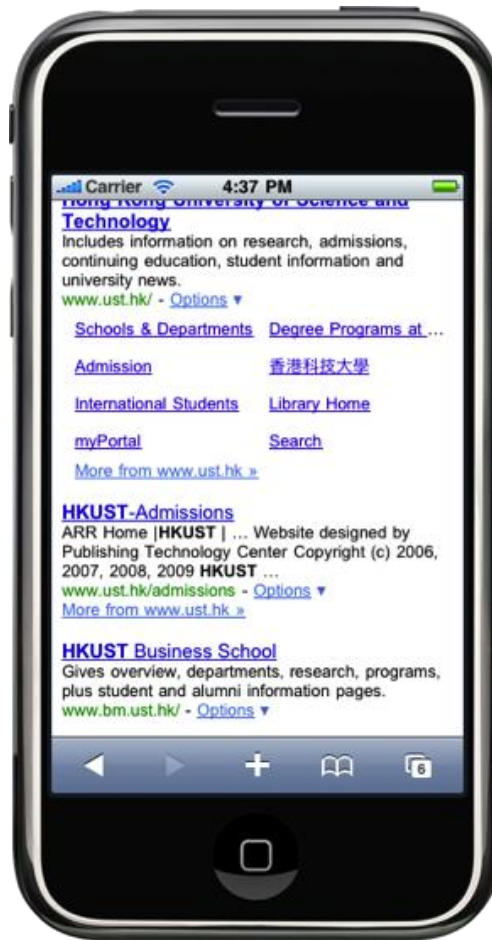


Figure 5. Google Mobile Search Result on iPhone for the Search String “HKUST”

Product/Feature	Google Mobile Search	MSearch
Reversibility	No. (Go back to previous page)	Yes. Users scroll upwards/downwards for more results without a page reload.
Visual Cues	No.	Yes. Thumbnails of webpage.
Easy Ways For Refining Query	No. (Enter another search query) (Refine queries are listed at the button of the search result)	Yes. Users swipe left and right for results of related query.
Ways to Display Result	List with excerpt (text) of the webpage.	List of results with thumbnails of webpage and excerpt of the webpage.

The mobile version of Google Search presents a familiar interface, which could reduce the learning curve. However, the links and information are too crowded in the screen, so users would find difficulties in identifying the desired webpage. Also since touching is not as precise as pointing (by mouse cursor), users may tap on the wrong hyperlink and not easily able to go to the desired webpage.

5.2. Slide-Film Interface

Slide-Film is concept interface developed in 2008 at Waseda University, Japan [6]. Slide-Film displays the search result through the metaphor of a stack of cards. The detail of each search result is displayed on the card and users flip through the cards one by one to review the search result.



Figure 6. Slide-Film Interface puts the search results on a stack of card and users flips through these cards to review the results

Product/Feature	Slide-Film	MSearch
Reversibility	Yes. Users flips through the “cards” for results.	Yes. Users scroll upwards/downwards for more results without a page reload.
Visual Cues	No.	Yes. Thumbnails of webpage
Easy Ways For Refining Query	No. (Enter another search query)	Yes. Users swipe left and right for results of related queries.
Ways to Display Result	Cards. Each result with text excerpt of the webpage is listed on each card	List of results with thumbnails of webpage and excerpt of the webpage

MSearch possesses the same advantages that Slide-Film has. For example, both of them have reversible interfaces. However, the metaphor of Slide-Film is more intuitive to users [6] although efficiency is compromised, as results are displayed one by one.

5.3 Taptu

Taptu is a commercial mobile search engine that indexes only touch-friendly web sites since 2008 [7]. Results are put into different categories that could help users to search for desired sources.

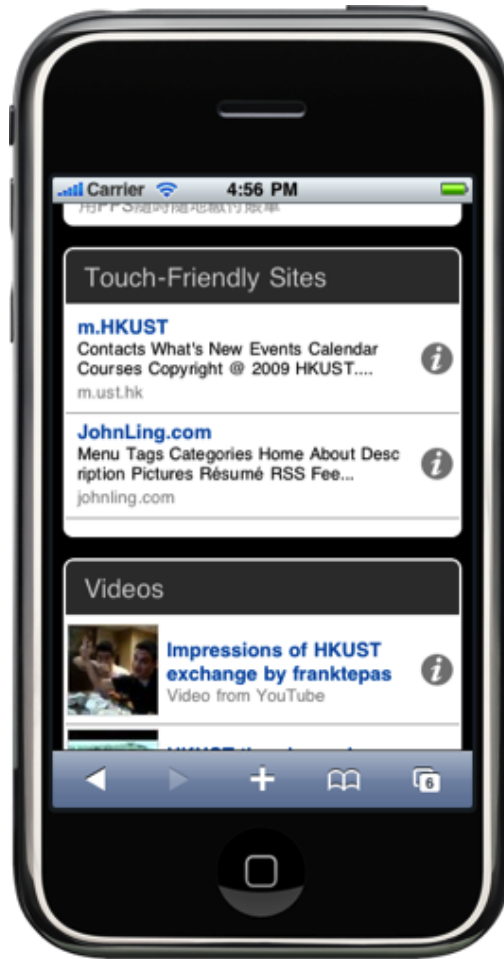


Figure 7. Taptu Mobile Search Engine for the Search String “HKUST”

Product/Feature	<i>Taptu</i>	<i>MSearch</i>
Reversibility	No.	Yes. Users scroll upwards/downwards for more results without a page reload.
Visual Cues	No.	Yes. Thumbnails of webpage.
Easy Ways For Refining Query	No. (Enter another search query)	Yes. Users swipe left and right for results of related query.
Ways to Display Result	Categorized list with excerpt of the webpage.	List of results with thumbnails of webpage and excerpt of the webpage.

Although Taptu is specifically for touch screen devices, the feature that filters out non-touch-friendly web sites is a double-sided blade - while users can get a better browsing experience, search results are limited to touch screen-friendly web sites.

6. Implementation

6.1 Web Application on iPhone

iPhone's browser (WebKit) follows strictly to the latest web standard [8] and hence advanced web applications can be developed. Web application can be added to the homepage of iPhone and have a look and feel similar to a native application. Web application on the "home screen" of iPhone has an icon, splash screen, and does not display the browser's control toolbar. Users do not need to install or update the application as the application is on the Internet so web application could potentially increase users' adoption rate. Also users who have other smart phones with WebKit-based browser could also use the same application, unlike native application which has to be recompiled in different operating systems.

6.2 HTML, CSS and jQuery

MSearch depends heavily on jQuery to simplify the AJAX retrieval of data and allows simple animation. It also leverages on jQTouch (a iPhone specific plug-in for jQuery) for its swipe gesture. HTML and CSS, together with jQuery and PHP, are used to separate the data control and interface. Different interfaces could be linked to the data control easily.

6.3 Yahoo! BOSS and PHP

Search results are retrieved through Yahoo! BOSS (Build your own Search Service) [9]. The Representational State Transfer-style (RESTful) web service [10] allows MSearch to request for a search query through the URL and retrieve the search result (e.g. title, description and related search query) through JSON or XML which can be easily converted to an array in PHP.

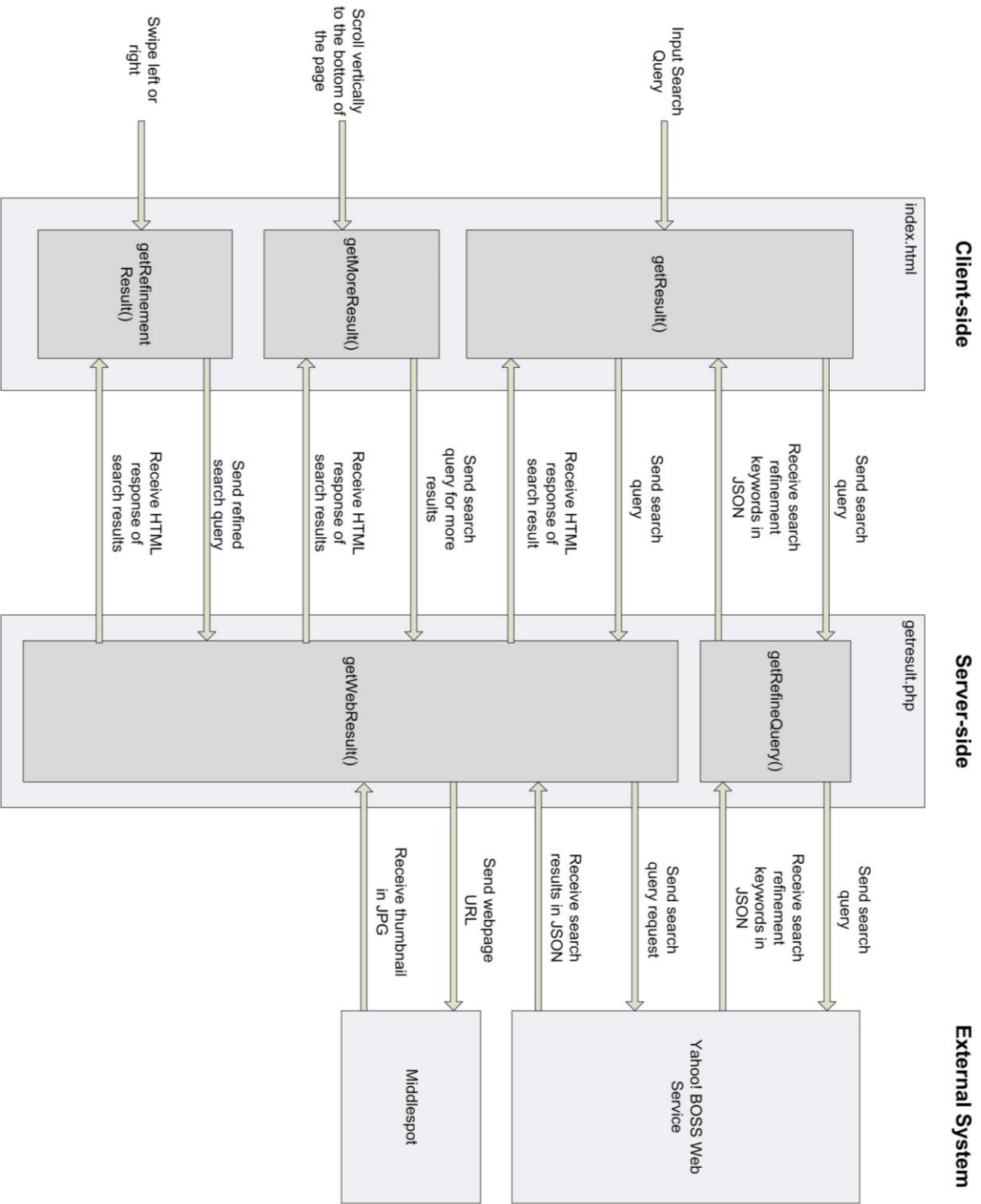


Figure 8. Flow of data in MSearch

7. Possible Improvements

7.1 Universal Smooth Horizontal Swipe

Due to the technical constraint of the swipe event in the iPhone's WebKit, if a swipe event is bound to a "div" in CSS, vertical scrolling will be disabled in such area. So it is not possible to allow both vertical scrolling (which the system handles) and horizontal scrolling for refined search (which the search interface handles) at the same time.

With regard to this constraint, the current implementation binds the horizontal swipe event to only the text area of the search result, which means normal vertical scrolling is allowed for the thumbnails area.

One of the alternatives to this implementation is to insert some blank space next to the actual search result. The webpage could load the refined search result once it detects the user swipe horizontally to the blank space (which the iPhone system handles). Although this alternative allows a smooth transition from the original result to the next refined result, vertical scrolling is heavily compromised. When the user swipes downwards or upwards, the swipe might not be absolutely vertical so that the browser will display part of the original result and the refined result. This situation is highly undesirable as scrolling upwards and downwards are common actions when browsing using touch screen device. Also the web application will be confused and will load the refined result that may not be intended by the user.

To overcome this limitation, the search engine could be rebuilt using native SDK (Cocoa Touch) [11] in which the limitation about swipe events does not exist.

7.2 Automated Generation of Webpage Thumbnails

Currently, thumbnails of webpages are dynamically generated by a private third party web service, Middlespot¹. Although this web service is able to generate thumbnails of a specific webpage, unlike many popular services that are only able to generate thumbnails of the root webpages, the speed of thumbnail generation is not high and so the generation of thumbnail is a major speed bottleneck of MSearch.

A smart algorithm, together with a local thumbnail generation server, could be developed to generate thumbnails according to search queries trend. The thumbnails could be cached so that the speed of loading the thumbnails is higher.

7.3 Bookmarkable URL

The current web implementation has a limit which the search result will disappear if the user goes to other external webpages because the search results are not saved. This issue is only limited to the web application implementation.

In web application, search result could be saved by encoding the search result and changing the navigational URL. This will lead to faster retrieval of thumbnails and smoother user experience.

¹ Middlespot (www.middlespot.com) is an online productivity tool to help users manage the search queries. Users could interpret their results more effectively by seeing their results as screenshots and text, and interrogate these results by panning and zooming in for more detail.

7.4 Location Based Search

As many mobile search queries are related to local businesses, a separate page to display location-based search results could be added. Ways to maintain the intuitiveness of the existing way to display result (horizontal swiping for refined results and vertical scrolling for more results) should be devised.

8. Appendix: Full-scale User Interface



Figure 9. Entering search query in MSearch.



Figure 10. Reviewing search results in MSearch.

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