

Developing Google Chrome Extensions: Case Study

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ABSTRACT

There are many Web browsers on the Internet. Although any OS has a pre-installed browser, some people use another. They choose more functional and convenient browsers. A browser extension is a key feature which enhances its functionality. In this paper, we review publications on browser extensions and fundamental issues on the Google Chrome extension.

Categories and Subject Descriptors

H.3.5 [Online Information Services]: Web-based services

General Terms

Languages, Algorithms

Keywords

browser extension, Google Chrome, Context Menus

1. INTRODUCTION

A browser extension is a small software that extends its capability by adding a certain function. The value of browser extensions is growing with the growing number of webapps. Webapps use browsers as a UI. Almost all browsers have their extensions. A new version of Microsoft Windows – Windows 10 – will finally have a browser that supports extensions.

Recently, smart device apps are gaining popularity. Browser extensions will attract many web developers in the near future. There are some app markets for smart devices such as App Store and Google Play. There are several markets that distribute browser extensions such as Chrome Web Store. As Microsoft launches Windows 10 with a new browser, marked by extension functionality, it gets more value.

2. BROWSER EXTENTIONS

A browser extension adds a new value to the browser. There are many browser extensions. For example, a certain browser extension enables us to look for a word or text selected on the web page in an online dictionary. The browser extension is also called plug-in or add-on. The Table 1 shows worldwide browser

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share in the past year and information about extensions.

Table 1. List of widely known browsers


product	YTD share [7]	support extensions?	extension made of
Google Chrome	48 %	Yes	HTML, CSS, JavaScript [4]
Internet Explorer	19.44 %	No	-
Mozilla Firefox	16.8 %	Yes	HTML, CSS, JavaScript, XUL [5]
Safari	10.52 %	Yes	HTML, CSS, JavaScript [6]
Opera	1.53 %	Yes	mostly the same as Google Chrome [1]
Microsoft Edge	-	to-be	-

3. GOOGLE CHROME EXTENSIONS

3.1 Extension Types

Google Chrome is one of the famous web browsers. It has many extensions in the Chrome Web Store [3]. Let us consider a Google Chrome extension as an example because of its largest share of the browser. Google Chrome extensions are classified into several types of extensions. The description of these types are given further.

3.1.1 Browser Action

Browser Action is one of the extensions. Its icon () locates next to 3-lined button (see Figure 1). One can click the icon to have the extension doing something.

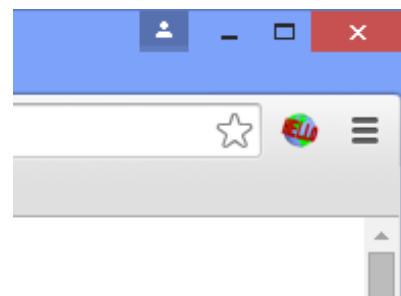



Figure 1. Browser Action

3.1.2 Page Action

Page Action icon () can be found next to the star icon on the address bar (see Figure 2). Unlike Browser Action icon, the Page Action icon is not always visible. It is visible under the specific condition. While the icon is visible, the extension can work. For example, the web page, which the browser displaying, belongs to a specific domain. To create a Page Action, we can use chrome.pageAction API provided by Chrome.

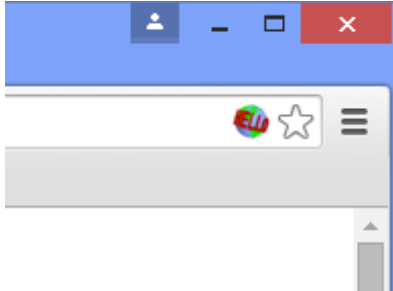


Figure 2. Page Action

3.1.3 Content Scripts

Content Scripts run JavaScript code automatically on a web page. They work in the background, thus they do not have an icon on the UI of Google Chrome.

3.1.4 Context Menus

Context Menus insert items to the context menu. A context menu is a small menu which is displayed near the cursor in response to the mouse right-click. To add items to the context menu, we can use the chrome.contextMenus API.

3.2 Example of the Basic Extension

We illustrate the features of Context Menus with an example. We created an extension by referring to the programming learning site [1]. This illustrative example can search on the University of Aizu Official Website [8] for the selected text. This example is able to search on online shopping sites, SNS, online dictionaries. This extension runs on a Google Chrome. The extension consists of only three files – manifest.json, background.js, and iconimg_16x16.png.

manifest.json is a manifest file. They describe the extension and associates its resources (such as background.js) with the extension. It is written in JSON format. JSON can be considered as an associative array. It is similar to an object in JavaScript. The content of manifest.json is presented below.

```
{
  "name": "u aizuSearch",
  "version": "0.1",
  "manifest_version": 2,
```

```
  "description": "Search for selected text on the
  University of Aizu Official Site.",
```

```
  "permissions": [
    "tabs", "http://*/*", "contextMenus"
  ],
  "icons": {
    "16": "iconimg_16x16.png"
  },
  "background": {
    "scripts": ["background.js"]
  }
}
```

In manifest.json, there are some properties regarding the extension such as "name", "version", and "permissions". This information is required for manifest.json to use a function of Google Chrome, declarations of permission.

background.js is a JavaScript file. It describes what the extension does. The discussed extension has a very simple behavior. The background.js file is given below.

```
chrome.contextMenus.create({
  "title": "Search for '%s' on the University of
  Aizu Official Site",
  "type": "normal",
  "contexts": ["selection"],
  "onclick":
    function(info) {
      var url =
        'http://www.u aizu.ac.jp/e search.html?q=' +
        encodeURIComponent(info.selectionText);

      chrome.tabs.create({url: url});
    }
})
```

We explain how background.js behaves. chrome.contextMenus API is used in the background.js. When the user selects a text on the web page and right clicks it, Google Chrome displays the context menu including the item of the extension (see Figure 3). Then, the extension can get the selected text in the parameter "selectionText" via the object "info". After that, the extension assembles URL that searches the university site and opens a new tab with it. Finally the user gets a search result page opened in a new tab in this way.

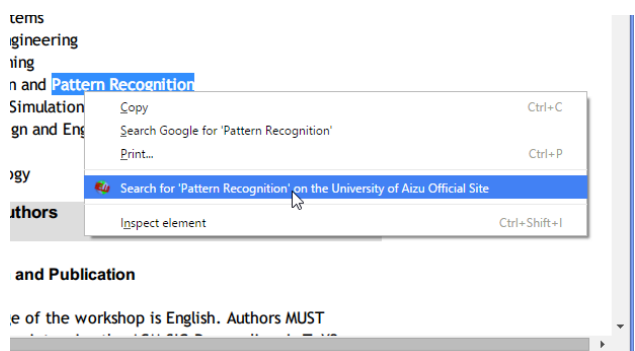


Figure 3. Context Menu example

iconing_16x16.png is an image file used as an icon (see Figure 4). If an extension is either the Browser Action or Page Action, the image will appear on the UI of Google Chrome. Figure 4 is reprinted from the material on official website of Google Chrome extension for developers [4].



Figure 4. Image used as icon

3.3 How to Create Extensions

An extension needs a JSON file, JavaScript, HTML, and CSS if necessary. A creator for the Google Chrome extension should be familiar with these languages. An experienced web developer can easily create extensions. One can refer to the reference manual for Google Chrome extension [4]. We can begin to create it with the text editor and Google Chrome for free.

4. CONCLUSION

Creating browser extensions is not so difficult. If one is unfamiliar with browser extensions, the best strategy is to check web resources such as Chrome Web Store [3] and others. Many web browsers are cross-platform. Browser extensions are cross-platform too. It can improve productivity of web developers.

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