

Research on Self-adaptive Algorithm in Self-adaptive Web System

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Abstract. With the development of Internet and Web technologies, Web system is quickly applied to all walks of life. At the same time, it produces a variety of different terminal types and different user demands. How to make the Web system adapt to the access of PC, smart phones, tablet computers and other devices with different hardware platforms and different browsers, so we have studied self-adaptive Web system, and designed a kind of self-adaptive algorithm. They have been applied to the system of independent learning platform .

Introduction

With the maturity of 4G mobile communication network and the expansion of smart phones, the number of people who use the mobile devices to browse Web is increasing rapidly ,and the user groups have expanded from PC terminal users to mobile terminal users. Thus, the current Web application system faces the following three problems, compatibility shortcoming,the extreme dependence on network and the server load capacity. Therefore, Web applications need definite adaptive capability urgently which can take the initiative to adjust their behavior and structure in order to provide good service.

Dynamic Characteristics Analysis of Self-adaptive Web Application System

Directing at current Web application system research, this section analyzes the dynamic characteristics of self-adaptive Web application system from four aspects.

Behavior. Requests from different terminals and browsers have different needs of user or the system itself Qos. Self-adaptive Web application can change its behavior at run-time, for example, a mobile terminal page can be reconstructed. Behavior changes are usually caused by the reconfiguration.

Functional Structure. To adapt to the current network environment, self-adaptive Web application system needs to adjust its functional structure, for example, adding or deleting a function component , which can change the topology of the SA.

Attribute. The changes of attribute is the main dynamic characteristic, such as the screen size of terminal device, browser version, online, offline and so on. When the system faces the terminal equipment and network conditions with different attributes, it needs to modify the application logic, which can trigger more adjustment of the behavior and structure.

Style. In general, When the self-adaptive Web applications happen dynamic changes, its style should remain unchanged, just allow to produce its "derivative" style on the basis of the original. For example, we can increase the number of server in the case of overload. Adjusting three layer structure for multilayer structure, request structure changes from 1 to 1 to 1 to N as well.

Designing Self-adaptive Algorithm

According to dynamic characteristics of self-adaptive Web application system, the self-adaptive strategy is designed as follows. When a client sends an HTTP request to the server through a browser , the request terminal type can be judged from the user-agent information that the server received. If it is a PC, call the style of the PC. If it is a mobile terminal, using the User-Agent string extractes the detail parameters in WURFL equipment database. Then, doing some adjustment for

different terminals, such as call the corresponding style, layout, view and function structure. Finally, returning the combination of dynamic pages to the client browser. Its working process is shown in Fig. 1.

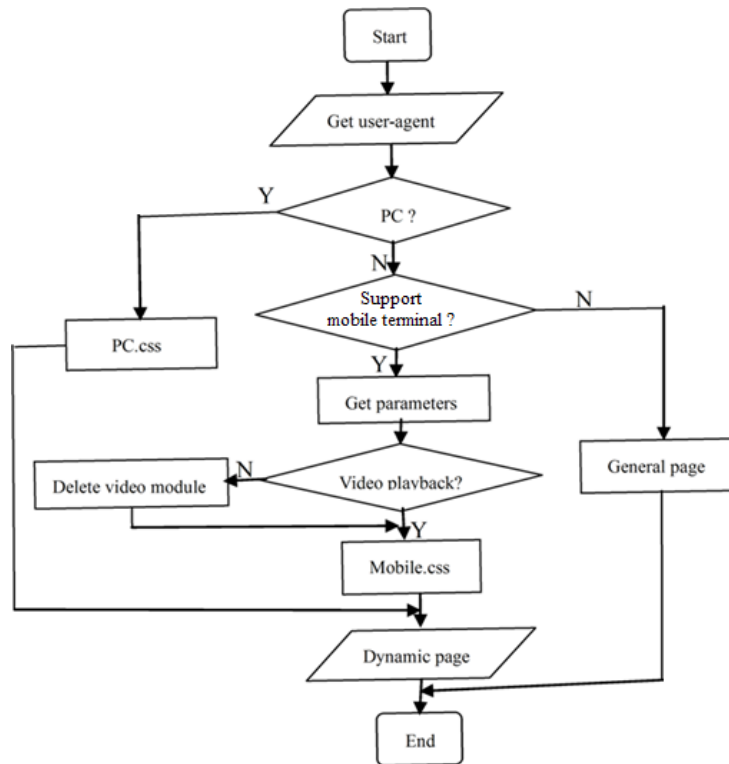


Fig. 1 Working process of self-adaptive module

The key to realize the above work flow is to parse the terminal equipment correctly. The terminal that can't be parsed will call general page. HTTP message is the common method to obtain client information. By user-agent header that received by server the system can obtain much information, such as equipment type, operating system type and version, browser name and version. The user-agent information of common browser is shown in Table 1.

Table 1 User-agent String

Device/Browser	User-Agent
Android	Mozilla/5.0 (Linux; U; Android 2.3.5; en - us; Nexus One Build/FRF91)
	AppleWebKit/533.1 (KHTML, like Gecko) Version/4.0 Mobile Safari/533.1
iPhone	Mozilla/5.0 (iPhone; U; CPU iPhone OS 5_0 like Mac OS X) AppleWebKit/ 534.46 (KHTML, like Gecko) Mobile/9A334 Safari/ 7534.48.3
MS IE9	Mozilla/5.0 (compatible; MSIE 9.0; Windows NT 6.1; Trident/5.0)
Firefox	Mozilla/5.0 (Windows NT 6.1; rv : 27.0) Gecko/20100101 Firefox/27.0
Google Chrome	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_6_8) AppleWebKit/535.7
	(KHTML, like Gecko) Chrome/33.0.1750.149 Safari/535.7

From the table, we can find that by using the user-agent string, we can get the type and version information of operating system and browser running in terminal, and judge the terminal type. But the products of mobile terminal is various. Specific parameters is various. Only by user-agent, we can't get the detailed parameters of mobile devices. WURFL is the open source repository of device description, which is stored all the technical parameters of mobile phones in XML format. At the same time, it is used in the back-end of mobile web site of Google and Facebook. After getting the information of user-agent, the system can get detailed parameters of the terminal by querying

WURFL database. When the terminal type is parsed correctly, the system can adjust the page and function. Finally, it combines them into dynamic page and returns it to the client browser.

Below is the main parameters of Huawei mobile phone C8650 in the wurfl.XML file.

```
<device id="huawei_c8650_ver1" user_agent="Mozilla/5.0 (Linux; U; Android 2.3.3; zh-cn; C8650 Build/HuaweiC8650) AppleWebKit/525.10+ (KHTML, like Gecko) Version/3.0.4 Mobile Safari/523.12.2" fall_back="generic_android_ver2_3" actual_device_root="true">
```

```
  <group id="product_info">
    <capability name="model_name" value="C8650"/>
    <capability name="brand_name" value="Huawei"/>
    <capability name="release_date" value="2012_march"/>
  </group>
  <group id="display">
    <capability name="columns" value="20"/>
    <capability name="physical_screen_width" value="50"/>
    <capability name="rows" value="10"/>
    <capability name="resolution_width" value="320"/>
    <capability name="resolution_height" value="480"/>
  </group>
```

```
</device>
```

Every < device > tag means a wireless device. There are a lot of < group > tag in each < device >. it contains the detailed parameters of corresponding equipment.

Through above analysis, we describe the self-adaptive algorithm as follows.

```
Input User Agent=> ua
If ua includes "Windows" string
  call PC style pc.css;
  produce dynamic page and output to the client browser;
Else if ua contains some strings of Android,iPhone, iPad or other mobile terminal
  according to it get some parameters from wurfl.xml
  screen_size: resolution_width×resolution_height,
  videoformat: full_flash_support, streaming_mp4,
  .....;
  //adjust the page content by screen size;
  If video format is empty, delete the video module;
  call the mobile.css;
  produce dynamic page and output to the client browser;
endif
Else if the client can't be identified
  turn to the general page and output it to client browser ;
Endif
```

Conclusion

In this paper, considering the existing problem of current Web application system and its dynamic features, we have designed a kind of self-adaptive algorithm. In development of the system of independent learning platform, we realize and test the self-adaptive algorithm, which gains good effect. We will introduce them in latter paper.

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