The Design and Implementation of Responsive Web Page Based on HTML5 and CSS3

Nian Li[1]
School of Computer Science, Wuhan Donghu University
Wuhan, China
43370279@qq.com

Bo Zhang[2,*]
School of Computer Science, Wuhan Donghu University
Wuhan, China
*Corresponding author's e-mail: bob.cheung@ovspark.com

***Abstract*—The responsive web design solves the compatibility problems of web pages displayed at different resolutions, different platforms, and different screen sizes, and also brings high-quality experience to users. Based on the research on responsive web design, and related technologies of HTML5 and CSS3, this paper expounds the design ideas and key technologies of responsive design with a responsive enterprise website. Response web design based on HTML5 and CSS3 has proved to be feasible and effective.**

Keywords- responsive design; HTML5; CSS3; media query

I. INTRODUCTION

The Internet has entered the Web 2.0 era. At the same time, with the development of mobile communication technology, more and more smart mobile terminals have been widely used in various industries, which has prompted Internet applications to adapt to the needs of mobile terminals. Traditional websites are designed for PCs. The design of such websites can not adapt to mobile phones or other mobile device interfaces. In order to make mobile application devices achieve the best display effect, special web pages are usually designed according to the display characteristics of the device itself. Therefore, it has become a hot research topic to make the mobile devices normally display traditional web pages and improve user experience.

In this paper, we study the responsive web page design technology based on HTML5 and CSS3. Firstly, this paper analyzes the basic idea of responsive web page design, the process and key technologies of the responsive web page development. On this basis, we present a development example of a responsive enterprise website. The website can adjust the page layout by automatically detecting the screen size of the device, and can ensure that the page content is displayed normally on PC monitors, pads, mobile phones, and other devices of different resolutions. This design proposal has greatly enhanced the user's experience.

II. RESPONSE WEB DESIGN CONCEPT

The idea of responsive Web design development was first proposed by Ethan Marcotte in 2010. The core idea is to enable web pages to have cross-platform, adaptive, and other functions. They can adapt their own parameters, change layout forms, and adjust picture resolutions according to the screen sizes of different hardware devices or browser windows.

The core design idea of responsive web development is "mobile priority and progressive enhancement". "Mobile Priority" means that when designing a page, we fully consider the diversity of the size and resolution of the mobile terminal, and first design the page effect of the mobile terminal, so as to realize the layout of adaptive mobile terminal. Then the page effect on the PC side is taken into consideration, which is beneficial to enhance the efficiency of web development. "Progressive Enhancement" refers to the gradual conversion of page display from small size to large size under the premise of giving priority to mobile terminal devices. In the limited display space of small size, the content of the page should be highlighted, and the content performance should be simplified. With the size increasing and content unchanged, the performance of the content should be improved and making the page display better.

III. CORE TECHNOLOGIES

A. HTML5—Cross-platform language

The cross platform advantage of HTML5 has been shown in the era of mobile Internet, and it is the only cross platform language widely applicable to mainstream platforms such as PC, MAC, Android, Windows Phone, etc. This feature of HTML5 coincides with the cross platform in "responsive web design". The cross platform compatibility of HTML5 language makes it have unique advantages in responsive development.

B. CSS3 Media Query Module

In the past, developers needed to provide different codes for different devices to ensure the consistency of the effect of web pages. The responsive web page can recognize the screen width, adjust the layout structure and picture size adaptively according to the obtained parameters, and achieve the effect of "one-time design, universal use". At the same time, HTML5 and CSS3 provide technical support for responsive web design.

The media query module of CSS3 allows to add media query expressions to specify media types and select corresponding expressions according to different media types. The definition of media query given by W3C is: "media query

978-1-7281-5094-9/19/$31.00 ©2019 IEEE
DOI 10.1109/MLBDBI48998.2019.00084

contains media type and zero or more expressions to detect media characteristics. Width, height, and color are all features that can be used for media query. Using the media query function can adapt the web page to different devices without modifying the content itself."

CSS3 can be used flexibly to implement mobile Internet websites by using responsive design patterns. If the system or browser version of the terminal device supports it, CSS3 can realize the following functions:

- Adjust the picture specification adaptively according to the size of hardware display.
- Adjust the page layout adaptively according to the size of the hardware.
- Hide some unnecessary modules according to the size of hardware display.

Because of the scaling of responsive web pages, when users use small screen mobile devices for browsing, many pictures or content on the original large screen cannot be displayed in the small screen. At this time, we need to delete some content and ensure that the main content of the deleted page is in. In this way, it not only ensures the normal display of page effect, but also improves the page loading speed due to the decrease of page content.

C. *Fluid Grids*

The fluid grid makes the position of each layer have flexible characteristics. In a fluid grid layout, the method of pixel design will be changed to a percentage size or font proportion, which has the advantage that the layout can be adjusted automatically according to the obtained media query parameters.

D. *Flexible Images*

"Flexible Images" means that the size of pictures is variable. For example, the size of a picture is 600px*600px. According to the characteristics of flexible layout, it can be expressed as the size of 100%. When the proportion of the container changes on different size displays, the picture will also be resized to fit the container. So, we can make sure that the picture can adjust its own size adaptively on different sizes meida, and realize the responsive change of web pages.

IV. WEB DESING AND IMPLEMENTATION

A. *Layout Design*

In this paper, we have designed a responsive enterprise website, which needs to be able to adapt to all kinds of mobile devices such as PCs and pads, and at the same time, it needs to have a beautiful and generous interface. The home page of the website is divided into seven modules: #header wrap(logo), #main navigation, #layerslider, #home-intro, #feature-block, #intro-features and #copyrights. The specific layout is shown in Figure 1:

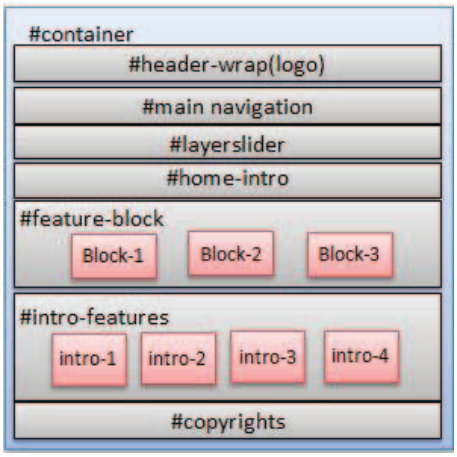

Figure 1. Layout on PCs

In the small-scale mobile terminal, the page layout will be adjusted as follows, which is shown in Figure 2 and Figure 3.

- Fold the navigation bar into a pull-down menu.
- Adjust the size of picture to being suitable for the mobile device.
- Font should be reduced appropriately.
- The width of columns in the block "#feature-block" and"#intro-features" is automatically adjusted to 100%.

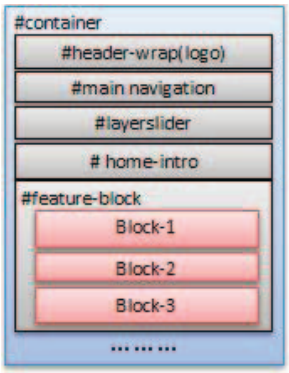

Figure 2. #feature-block on mobile devices

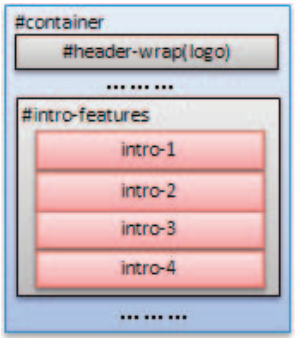

Figure 3. #intro-features on mobile devices

B. *Viewport Design*

HTML5 adds the viewport parameter to get the width of devices, and also prevents users from zooming the page by fixing the viewport size. Viewport provides effective data information for responsive web page design. The specific design method is to set the following code at the head of the page:

<meta name="viewport" content= "width=device-width, initial-scale=1, maximum-scale=1">

C. *Media query Design*

Three different media query functions are set up in this website, which are suitable for PC terminal with window width between 768px-959px, 480px-767px and 320px-479px. The original navigation bar on the mobile terminal device will be set as invisible, and the menu will be placed in a pull-down folding effect by setting "select" label in the form control. The key media query codes are as follows:

1) When the visual area of browser is between 768px and 959px, it is suitable for PCs.

@media only screen and (min-width: 768px) and (max-width: 959px) {

#container{width: 794px;}

.container {width: 714px;}

}

2) When the visual area of browser is between 480px and 767px, it is suitable for pads.

@media only screen and (min-width: 480px) and (max-width: 767px) {

#container{ width: 440px;}

.container {width: 400px;}

#main-navigation ul{display: none;}

#main-navigation select{margin: 30px 70px; width:300px;}

.after-nav-info{width:100%;

text-align: center;}

#logo{text-align: center; width:100%;

float: left;}

}

3) When the visual area of browser is between 320px and 479px, it is suitable for mobile phones.

@media only screen and (min-width: 320px) and (max-width: 479px) {

#container{ width: 300px;}

.container {width:260px;}

……}

D. *Flexible Design*

The flexible design concept of this website is mainly reflected in the font size, image size, padding and margin values. All parameter values are relative size, i.e. percentage or em, which will automatically adjust the pixel value according to the size of the browser or the size of device. This reduces the complexity of the code and improves the user experience. The key codes are as follows:

.icon-large:before{vertical-align:-10%; font-size:1.3em;}

[class*="icon-"].icon-fixed-width{width:1.14em;

text-align:right;padding-right:0.28em;}

In addition, we should pay attention to the clarity of the image after zooming in the flexible design. Sometimes it is necessary to make some specific small pictures to match the mobile device, otherwise some pictures may be distorted outside of the automatic scaling. The pictures of slider module #layerslider in this website is set with two different sizes. In the media query, different sizes picture will be selected according to different devices.

E. *Responsive Web Page Instance*

The enterprise website in this paper can automatically adapt to the size of the user's device; the website can recognize the screen width, automatically adopt the appropriate resolution and display mode, so as to achieve the best user experience. The home page display effect of PCs and mobiles are shown in Figure 4 and Figure 5:

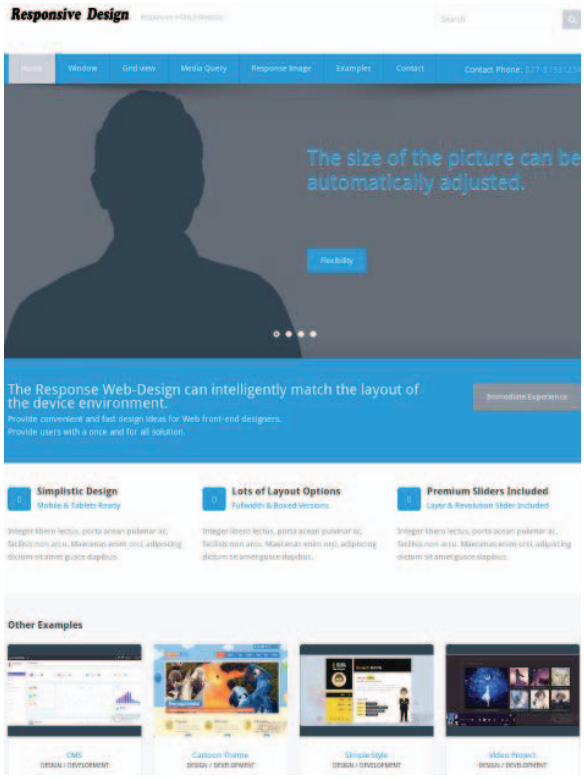

Figure 4. Display effect on PCs

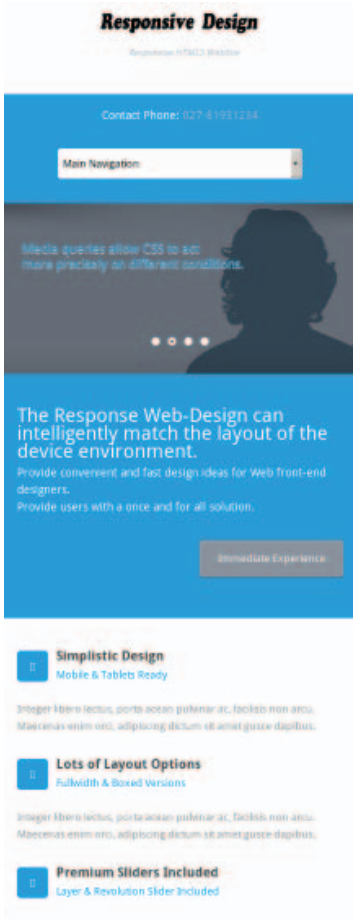

Figure 5. Display effect on mobile devices

V. CONCLUSIONS

In this paper, the effectiveness and feasibility of responsive web design is verified by a real case. The responsive enterprise developed based on HTML5 and CSS3 can automatically adapt to various resolutions of PCs and different sizes of mobiles, fully reflecting the characteristics of "one-time design, universal use ". For developers, it is more efficient and convenient to update, which can effectively reduce the cost of time and labor. For users, no matter in PCs, pads or mobile phones, they can see websites with the same style and content, and get a better user experience.

ACKNOWLEDGMENT

This paper was co-supported by the Foundation for Scientific Research Project of Education Department of Hubei Province under grant B2019272. Thanks for the support of Wuhan Donghu University. Thank you for providing the experimental platform in Hubei Education Department and Wuhan Donghu University. We have completed the implementation of the algorithm on this platform and the experimental data is presented.

REFERENCES

[1] J Mazzei.Responsive Web Design[J]. Business NH Magazine, 2012, 9(6): 22-23.

[2] Ethan Marcotte. Responsive Web Design [EB/OL].http://www.alistapart.com/ articles/ responsive-Web-design/2010-05-25.

[3] Tim.Kadlec, "Implementing Responsive design" [M], 1st ed. New riders Berkley, 2012 60-100.

[4] C R Venkatesh. Infographic: Responsive Web Design [J/OL]. http://www.Artofdeveloping.com/2012/09/infographic-responsive Web-design.html, 2012-08-29.

[5] S Mohorovi ci c. Implementing Responsive Web Design for Enhanced Web Presence[C]. Information & Communication Technology Electronics & Microelectronics (MIPRO), 2013,36th International Convention on IEEE, 2013: 1206-1210.

[6] M Chowdhary. Responsive Web Design Will Be Expected on All Devices[J/OL].http://multichannelmerchant.com/crosschannel/responsive-Webdesign-will-be-expected-on-all-devices-15092012/, 2012-09-15.