Responsive Web Design Mode and Application

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***Abstract*—Responsive web design have receive a popular attention in recent years because of they can meet a variety of internet terminals resolution. This paper will discuss how to use Media Queries, Bootstrap responsive navigation, and layout of streaming technology to achieve responsive web design. And make a rational analysis about responsive web development at the present stage.**

Keywords- Responsive, Flow layout, Media Queries, Bootstrap

I. INTRODUCTION

With the rapid development of mobile Internet, Internet terminals are increasingly designed in many ways, the screen size of the device meets the different needs of users, but the size of the site is impossible to design a dedicated interface for each device. Therefore, responsive web design get progressively generate and more widely used. Responsive Web Design (Responsive Web Design, RWD), integrate three kinds of existing development skills (flexible network pattern, flexible pictures, media and media inquiries) and named responsive Web design. Its essence is to design a web content display mechanism in perfect layout for any device. Responsive design is not only changing the page-layout based on the size of the viewport, but also to subvert the whole methods from the current design. Formerly, web designers fixed width design for the desktop computer, then zoomed out and rearranged content for the small screen . Design and Development of the web page should make an appropriate response and adjustment according to user's system platform, screen size, screen orientation and so on. That means no matter what screen size of the device is being used, we should be able to switch the page resolution, picture size and related scripting capabilities automatically, so as to adapt to different devices.

II. CURRENT SITUATION ANALYSIS

Most Web pages used a design method called “waterfall model”. It starts with analyzing the system requirements, and then set out to design the front-end and background, finally evaluate and implement. Linear nature is the main feature of “waterfall model”. The whole process of the design is developed by a series of sequential stages which promote the work just along a single direction.

And in the website building process, "responsive design" use a same set of codes to make web content properly displayed on the PC, tablet and smart-phone browsers. Now, more and more web developers want to meet all of the operating environments by building a flexible website.

Through different development process, we can know that, besides designing in accordance with the standard desktop browser, “waterfall model” almost did not consider any other design and development environment, which have become its biggest drawback. While "responsive design" have taken these cross-platform issues into account from the beginning, so that it can complete pre-patterned framework, design and testing in more detail. But these works have been omitted in “waterfall model” precisely. Once the website design based on response design completed, it will be presented on the PC, mobile devices and tablet computers in appropriate way.

Of course, as one of the most popular front-end website development technologies in recent years, “responsive design” have became more in-depth with continually exploration, while some practical problems appeared during so many designers have applied this technology on their website.

A. Main advantages

- User-friendly: more and more mobile devices enhance the user experience. Obviously, responsive Web design have provided users a friendly Web interface, because it can be adapted to almost all devices' screen.
- Less Maintenance: Develop a responsive website, maintenance costs will be minimal, because it has only one layout which can work on all types of equipment and significantly reduce the workload. To explore a separate mobile site, actually two separate sites, designers need to maintain the two sites at the same time, and what's more tedious is that the data are not synchronize between two sites.
- No additional domain names: If you use responsive websites, it’s will be only one site. But if you are using a mobile website, there are two sites, you need to configure an additional separate domain.

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B. Problems

- So many code pages cause files increased which affect loading speed obviously. In order to fit different devices, responsive design requires a lot of specialized CSS and JavaScript codes, which affects the page loading speed.
- Generally in response design, pictures, videos and other resources are uniform loading. It resulted that when loading on a low resolution device with pictures or videos which display requirements are higher than the device's specifications, unnecessary flow will waste and load speed will be impacted.
- In recent years, responsive design's application rate are low to large portal or e-commerce websites. Because the basic principle of "responsive design" is giving users same content even on different devices (such as deleting some content on low resolution devices). And there are so many single web pages on large portal or e-commerce websites. When reducing on low-resolution devices as well as ensuring the content can be browsed by whole, the page will be stretched inevitably, increasing the difficulty of browsing.

III. IMPLEMENTATION

This paper discusses the use of the Media Queries, Bootstrap responsive navigation, and Flow layout (defined web content width by percentage) and other technologies to achieve responsive web design.

First, we should introduce a line of code to the head tag:

<meta name="viewport" content="width=device-width, initial-scale=1, maximum-scale=1, user-scalable=no">

This is a description of the viewport, most mobile browsers will enlarge the width of the HTML page's view (viewport) to comply with the screen resolution. Use meta tag to reset the view. Here the setting means that using device's width as view width and prohibiting the initial scaling width. Default scaling is 1.

A. Media Queries

Media Queries module of CSS3 is the core elements of responsive design, we can set the CSS styles for the device according to the characteristics of the display. Use a few lines of codes, we can change the contents of the page displayed according to the width of the viewport, screen ratio, device orientation (landscape or portrait) or other features.

There are many kinds of media properties. But responsive design mainly use characteristics which can judge screen size like max-width or min-width and judge the orientation of device like feature of orientation. Setting CSS styles through the different screen sizes range, you can define the display of all devices in a CSS style sheet. How meticulous the range have been delineated will decide the compatible breadth of responsive design devices.

If a terminal's resolution is less than 980px, the code is:

@meadia screen and （max-width：980px）{}；

If set a views which are compatible with iPad and iPhone , the code is:

/**iPad**/

@media only screen and (min-width:768px) and (max-width:1024px){}

/*iPhone*/

@media only screen and (min-width:320px) and (max-width:767px){}

B. Bootstrap responsive navigation

Bootstrap , launched by Twitter , is an open source package for front-end development . It is also a CSS / HTML framework. Bootstrap offers an elegant specification of HTML and CSS , which is written by Less , a kind of dynamic CSS language . It will unite the nature of elements which have been already defined and provide for users to calling , that's what make the front-end Web development greatly facilitated. The response navigation which developed on the basis of the bootstrap, is a small JavaScript plugin and only 1.7KB after compression, we can create switchable navigation for the small screen. It supports touch screen and CSS3 transition effects, with very good performance. And it also supports transition from height: 0 to height: auto, which is rarely achieved in CSS3 transition effects.

First, setting in CSS:

html , body{min-width:1333px}

It will set the minimum width of the page as same as the users' device own resolution, so the page will not deform. Min-width is the property of CSS2, so compatibility is good. Then, CSS responsive documents haven't joined the default of Bootstrap, so it should be introduced into the header file on the basis of <meta> have been to:

<link href="assets/css/bootstrap-responsive.css" rel="stylesheet">

So that, in this way, we can use bootstrap to achieve responsive navigation.

C. Flow layout(defined web content width by percentage)

When a user narrow the browser window , often find that a part of the contents in the original page can not be displayed in the browser. To view this part, users need to operate the horizontal or vertical scroll bar that appears in browser. This not only causes inconvenience to browse the web, but also have difficulties in printing on different sizes of paper. There are two key points of flow layout: first, all involved DIV modules in the layout are set to float: left; Second, widths are expressed by percentage. For example, we defined a CSS rule: div#content {width:70%;}. That means div # content width is 70% of the width of its parent element. Thus, when the browser window is resized, div # content width will change.

Making examples according to above method are as follows:

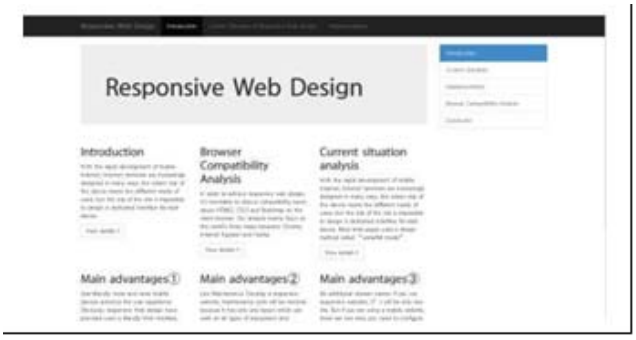

Figure 1. PC 1280*1024

Figure 2. iPad 2048*1536

Figure 3. iPhone 640*1136

IV. BROWSER COMPATIBILITY ANALYSIS

In order to achieve responsive web design, it's inevitable to discuss compatibility issues about HTML5, CSS3 and Bootstrap on the client browser .Our analysis mainly focus on the world's three major browsers: Chrome, Internet Explorer and Firefox.

Overall, Bootstrap almost supports all latest versions of browsers. In the Windows platform, it supports Internet Explorer 8-11. Bootstrap's compatibility also performed well in Chrome(Linux version), Firefox(Linux version) and Internet Explorer 7 , although not its official support. More detail information are in the following table:

TABLE I. TABLE TYPE STYLES

	Chrome	*Firefox*	*Internet Explorc*	*Opera*	*Safari*
Android	√	√	N/A	×	N/A
iOS	√	N/A	N/A	×	√
Mac OS X	√	√	N/A	√	√
Windows	√	√	√	√	×

√--Compatible ×--Incompatible N/A--Not Applicable

However, some CSS3 and HTML5 properties can not show good compatibility on Internet Explorer 8 and 9. For example:

TABLE II. CSS PROPERTY COMPATIBILITY

CSS Property	*Internet Explorc 8*	*Internet Explorc 9*
border-radius	×	√
box-shadow	×	√
transform	×	√
transition	×	×
placcholder	×	×

√--Compatible ×--Incompatible N/A--Not Applicable

In addition, in order to support Media Queries , Internet Explorer 8 need coordinate with Respond.js.

Bsie, a kind of IE6 compatibility library belongs to Bootstrap, make up the pity that caused by IE6 incompatibility issue. Currently, Bise support most properties of bootstrap on IE6, but there also have some properties that couldn't support. Bise Usage: First ,introduced CSS file to <head> tag , and then introduced Bise CSS patch file:

<link rel="stylesheet" type="text/css" href="boostrap/css/boostrap-ie6.css">

<link rel="stylesheet"type="text/css"href="boostrap/css/ie.css0">

Finally add JavaScript file and Bise JavaScript patch file to the end of HTML document.

Overall, responsive web which used Bootstrap to achieve usually have better compatibility for browser.

V. CONCLUSION

The web, based on responsive design, can adapt to the environment of browsing device automatically and independent of the device itself . It largely avoid iterative development which caused by the differences between browsing equipment. Not only improve the efficiency, save a lot of manpower and material resources, but also ensure the

consistency of view pages between desktop output devices and mobile terminals.

Of course, we cannot agree that responsive web is the best solution to all the problems of design and content services. As same as web design in the past, a project's specific circumstances (such as budget, target users, and site uses) determine its way of implementation. According to the experiences we already have, if your budget is limited or not feasible to develop a mobile website, comparing with standard fixed-width design, responsive design always provide a better and non-discriminatory users' experience . Following the principle of giving priority to moving, the first interface is usually designed for mobile devices and then make PC as an extension. So, mobile terminals don't load extra resources, don't redraw the pages of different style in PC terminals, which may affect the performance of the PC.

You can use the method described in this paper, transforming the web site that has already existed, satisfying users' different devices by achieving responsive web design.

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