

Comparison of Bootstrap and W3.CSS

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ABSTRACT

Nowadays, there are many device categories used to browse webpages on the Internet. Desktops, laptops, computers, smartphones, and tablets are known examples. Usage of mobile devices drastically changed requirements for the website development. A webpage that can provide an appropriate layout and content for visitors is needed. Bootstrap and W3.CSS are frameworks for modern website development. In this research, we characterize these two frameworks and compare their functionalities.

Categories and Subject Descriptors

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

General Terms

Languages

Keywords

HTML, CSS, Responsive, Grid Layout

1. INTRODUCTION

Bootstrap [1] and W3.CSS [2] are the frameworks that can produce modern webpages. Especially, these frameworks are good at making webpages suited for browsing by devices with displays of different sizes. Webpages with these features are known as responsive webpages. W3.CSS is younger than Bootstrap. Therefore W3.CSS is not well known. As a result of searching on GitHub [3] for each framework name, the keyword "bootstrap" gives 67,439 repository results. On the other hand, the keyword "w3.css" returns just 33 repository results. The search was done in August 2016. These two frameworks are compared in this study.

Studies [4] and [5] suggest the key features of responsive web design. They are:

- Flexible (fluid) grid,
- Flexible images, and
- CSS3 media queries.

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In our comparison, we consider these key features and some functions related to them.

2. RELATED WORK

Study [6] surveys current situation of the web development. They summarize main advantages of responsive websites: user-friendly, less maintenance, and no additional domain names.

Studies [4] and [7] mention that responsive web design has an advantage in terms of Search Engine Optimization (SEO). In this research, we also consider the mobile SEO for each framework.

Nowadays, Bootstrap is a main tool to develop responsive websites. W3.CSS is a new instrument for the same purposes. This study is the first attempt to compare these frameworks.

3. FRAMEWORKS

3.1 Bootstrap

Bootstrap is a framework utilizing HTML, CSS, and JavaScript to develop webpages. It was originally created by Twitter in 2010. It is an open source project. Beginning from version 2, it is capable to design responsive webpages. Now, Bootstrap 4 is being developed.

3.2 W3.CSS

W3.CSS is also a framework to develop webpages. In contrast to Bootstrap, W3.CSS doesn't need JavaScript. It uses only HTML and CSS technologies. The first version of W3.CSS was released in May 2015. It is inspired by Google Material Design since its first version.

4. MAIN FEATURES

4.1 Flexible Grid

Bootstrap and W3.CSS support a grid layout (flexible grid). Each framework can divide screen rows up to 12 virtual columns.

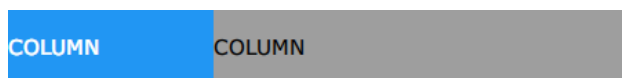
The following Bootstrap code divides a row whose width is the window size into 4/12 and 8/12. In this case, the number 4 in the class name col-xs-4 in the third div element indicates four twelfths and the number 8 in the class name col-xs-8 indicates eight twelfths

COLUMN	COLUMN
--------	--------

```
<div class="container-fluid">
  <div class="row">
    <div class="col-xs-4"
      style="background-color:blue;">
      <p>COLUMN</p>
    </div>

    <div class="col-xs-8"
      style="background-color:grey;">
      <p>COLUMN</p>
    </div>
  </div>
</div>
```

The following code in W3.CSS produces the same result as the aforementioned code in Bootstrap. In this situation, the class s4 in the second div element represents 4/12 and the class s8 represents 8/12.



```
<div class="w3-row">
  <div class="w3-col s4 w3-blue">
    <p>COLUMN</p>
  </div>

  <div class="w3-col s8 w3-grey">
    <p>COLUMN</p>
  </div>
</div>
```

W3.CSS has another way to divide a row. The following code divides a row into 1/3 and 2/3. The class w3-third in the second div element represents one third and the class w3-rest means the remaining part of the row width: two thirds of the row.

```
<div class="w3-row">
  <div class="w3-container w3-third w3-blue">
    <p>COLUMN</p>
  </div>

  <div class="w3-container w3-rest w3-grey">
    <p>COLUMN</p>
  </div>
</div>
```

4.2 Flexible Images

Flexible images are the function to fit the images into parent elements. If the size of the image is fixed, image is not displayed appropriately on various devices.

The following code is an example of Bootstrap enables the flexible image.

```

```

The same functionality in W3.CSS can be implemented as follows:

```
<div class="w3-container">
  
</div>
```

4.3 CSS3 Media Queries

Media queries are the functions written according to the CSS3 standard. They can vary the layout and contents to display based on the device's width. If the developer changes the layout according to the width without framework, media queries condition should be written. Meanwhile, each framework has concrete media queries condition by default.

The following code is excerpted from W3.CSS.

```

      :
1  @media only screen and (min-width:601px){
2  .w3-col.m1{width:8.33333%}
3  .w3-col.m2{width:16.66666%}
4  .w3-col.m3,.w3-quarter{width:24.99999%}
5  .w3-col.m4,.w3-third{width:33.33333%}
6  .w3-col.m5{width:41.66666%}
7  .w3-col.m6,.w3-half{width:49.99999%}
8  .w3-col.m7{width:58.33333%}
9  .w3-col.m8,.w3-twothird{width:66.66666%}
10 .w3-col.m9,.w3-threequarter{width:74.99999%}
11 .w3-col.m10{width:83.33333%}
12 .w3-col.m11{width:91.66666%}
13 .w3-col.m12{width:99.99999%}}
14 @media only screen and (min-width:993px){
15 .w3-col.l1{width:8.33333%}
16 .w3-col.l2{width:16.66666%}
      :

```

Line 1 to 13 mean that when the screen width is between 601px and 992px, each class (e.g. .w3-col.m1, .w3-quarter) is the specific width.

The grid layout is also used to make a responsive webpage. Screens presented in Figure 1 and 2 are generated from the same code using the grid layout. The code below divides a row into 2/12, 5/12, and 5/12 in W3.CSS. The functionality of grid layout in Bootstrap is almost same as in W3.CSS.

```
<div class="w3-row">
  <div class="w3-col m2 w3-light-grey">
    <p>COLUMN</p>
  </div>

  <div class="w3-col m5 w3-indigo">
    <p>COLUMN</p>
  </div>

  <div class="w3-col m5 w3-red">
    <p>COLUMN</p>
  </div>
</div>
```

Figure 1 simulates a computer's or tablet's wide display (≥ 601 px). Figure 2 simulates a smartphone's narrow screen (< 601 px).

When the webpage is seen by a narrow width display, the divided columns automatically form lines vertically. This behavior is useful to be seen by any display. The developer doesn't write complex code (e.g. media queries statement) any more to make a responsive webpage.

4.4 Mobile SEO

Mobile SEO [8] is website optimization especially for the mobile users. Google officially recommends responsive web design as the design pattern to optimize a website.

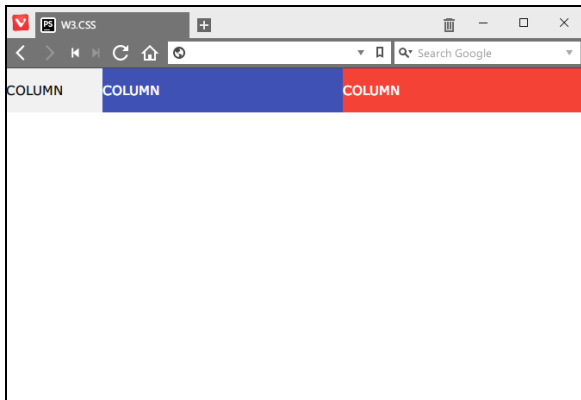


Figure 1. View of the wide display

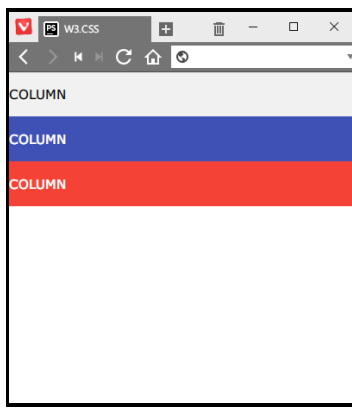


Figure 2. View of the narrow display

Google provides tool [9] to check whether the website is mobile friendly or not. We checked each framework by this tool. The result showed that each framework is regarded as a mobile friendly. Figure 3 shows the result of the test.

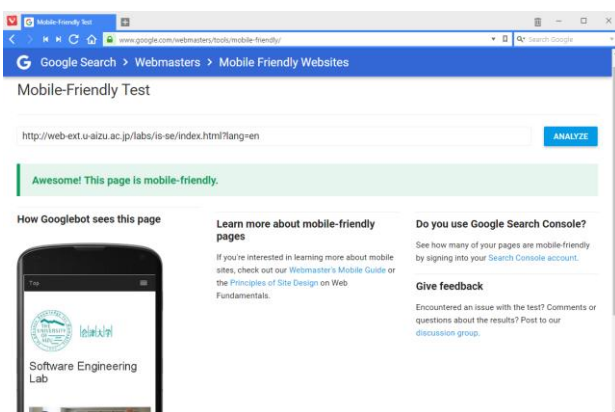


Figure 3. Result of Mobile-Friendly Test

4.5 Initialization

Each framework has the same way to deploy itself to the website. They are as follows:

- Add the link to the officially provided configuration file as link element;
- Download the configuration files to the user's site directly.

Table 1 illustrates characteristics of framework components.

Table 1. Frameworks: Characteristics of the files

	Bootstrap (v3.3.6) ¹	W3.CSS (v2.7)
File size	279 KB	28 KB
The number of files	16	1

In addition, Bootstrap requires jQuery to be installed. To use W3.CSS, only one file is needed as described above. It's a CSS style sheet file. We can say W3.CSS is much easier for the developer to arrange compared to Bootstrap.

4.6 Colors

Bootstrap has several classes to color texts or the background of the elements. For example, the class `text-danger` colors the texts in red color meaning dangerous.

```
<p class="text-danger">
  This text is dull red colored.
</p>
```

Likewise, the class `bg-warning` colors the background.

```
<p class="bg-warning">
  This background is dull yellow colored.
</p>
```

W3.CSS has several color classes in a form of `w3-COLOR`. The color palette like a Google Material Design is adopted. To color some elements, the developer only has to add the name of the color class to the class attribute. The following code is coloring p element.

```
<p class="w3-yellow">This is a paragraph.</p>
```

When the developer colors a text itself, `w3-text-COLOR` classes are used likewise.

```
<p class="w3-text-red">This text is red colored.</p>
```

4.7 Images

To decor the images, Bootstrap and W3.CSS have almost same functionality. The developer only has to add a specific class to the class attribute. This operation doesn't need time and effort.

¹ Bootstrap is distributed as one zip archive file.

The following code is in Bootstrap.

```


```



Figure 4. Rounded and circled images

The following code is in W3.CSS.

```


```

The only difference is the class name. Each framework generates the same result.

4.8 Tables

Making a table readable by using Bootstrap or W3.CSS is easy. Table 3 is an example without usage any framework or CSS function. Table 4 is the example of table created in Bootstrap.

Table 2. Example of table in HTML

No	Prefecture	Capital
1	Miyagi	Sendai
2	Yamagata	Yamagata
3	Fukushima	Fukushima

Table 3. Example of table created in Bootstrap

No	Prefecture	Capital
1	Miyagi	Sendai
2	Yamagata	Yamagata
3	Fukushima	Fukushima

To improve visualization of a table (see Table 4), the developer should add the specific class to the table element. When using Bootstrap, this class is as follow:

```
<table class="table table-striped">
```

To do this in W3.CSS, the developer has to write the table element as follow.

```
<table class="w3-table w3-striped">
```

Each framework has other classes to decor the tables.

5. CONCLUSION

Bootstrap and W3.CSS are modern web developing frameworks. Both frameworks provide similar functionality and easy to use to develop a webpage. Because W3.CSS is newer than Bootstrap, W3.CSS has some unique features to make a webpage viewable. Bootstrap is popular among the developers and there are many examples of its utilization in the GitHub repositories. A key advantage of W3.CSS is in the following: It does not need any extra tool for its functionality. It is simple from the point of view of requirements and easy to use.

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