

The Implementation of Student Logistics Management System Based on Responsive Design

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Abstract. Along with the development of times, the traditional way of management system in universities has become increasingly difficult to meet the needs of teaching staff and students. Traditional web design works for PC, while since mobile is becoming more and more popular, mobile terminal web design is gradually becoming the mainstream of web design. But, to develop web for PC side and to mobile terminals with different screen size and resolution, respectively, the adaptation multi terminal will become a troublesome thing. The responsive design is a solution to adapt web page for multiple devices. In this paper, we design and implement a logistics management system for Shanghai Jianqiao University which aims to the mobile and information management. There are three subsystems which are agency fees management subsystem, lost and found subsystem and dormitory scoring subsystem. We use the most popular bootstrap framework based on responsive layout to gain both the mobile terminal and the PC side perfect visiting experience.

Keywords: Index Terms—Responsive; mobile; logistics management; Bootstrap.

1. Introduction

Logistics management system in university involves in property management subsystem, diet and accommodation management subsystem, etc. While the traditional logistics management system is of low level of information technology, and there's no or less integration between various subsystems. Nowadays, many universities put great efforts in the use of smart card to integrate different subsystem's information; some universities even achieve card recharge by mobile. But in other aspects, such as water and electricity query and payment, lost and found, mainly rely on human resources [1]. In addition, traditional management system works on PC side, with the widely spreading mobile devices; management system's transferring to mobile devices is the general trend.

According to traditional web design procedures, to meet the mainstream browser's needs is of great importance, and then we may think about the compatibility of different browsers. But once we take into account mobile devices, a lot of work is required because mobile phones and tablet PCs come in different sizes and resolutions. If we design a specific web page for specific equipment, then we need to spend lots of energy in repeated job.

Thanks to the emergence of HTML5, CSS3 and the development of media technology, the front end page design becomes easier. Also, there comes responsive web design to solve the widely variety of browser resolution and different mobile devices [2].

2. Overview of responsive web design and Bootstrap

2.1 Responsive Web Design

Ethan Marcotte once talked about web design [3], that usually it won't take a long time to make a website, but due to the constant changes in demand, it is likely that the design of this site will be changed in one or two years.

In old times when smart phones and mobile devices are not so popular, we can design a specific mobile terminal webpage for specific device. For example, mobile device can access URL from wap.sina.com to 3g.sina.com, and to the present m.sina.com. But with the rapid emergence of mobile devices, the traditional way has been unable to meet the different devices' needs, because the unity of

cell phones is not as good as the computers'. There're two operating systems in mobile devices, Android and iOS. For iOS, there are different types of iPhones and iPads on sale; while for Android, the major manufacturers have their own different product lines and equipment types. Thus, the size and screen resolution of mobile device is totally different. There are at least 10 different mainstream device resolutions for Android and iOS devices.

We hope to design a website which can adapt to a variety of different equipment resolutions, which is called responsive web design.

2.2 Bootstrap

Bootstrap is a HTML, CSS and JS framework for the development of responsive layout, mobile device priority web project [4, 5].

The principle of Bootstrap is to adopt the grid system to support responsive layout [6, 7]. There's a container in the outermost, which will vary with different equipments; and grid system exists in the container and follow the changes of container, thus the website layout according to different devices is reached. Website content is in the grid system, so the content changes with the grid system. So the website can automatically adapt to equipments with different size and different resolution.

Bootstrap is a responsive CSS which can adapt to desktop, tablet PCs and mobile phones [8]. In this paper we use Bootstrap to design a logistics management system for Shanghai Jianqiao University, which involves agency fees management subsystem, lost and found subsystem and dormitory scoring subsystem.

3. Designs for multiple devices

3.1 Designs Mainly for PC

According to demand analysis, the agency fee management subsystem, lost and found subsystem's backend and dormitory scoring subsystem's backend need to fit with PC terminal first. Because computers have large screens with high resolutions, so PCs are suitable to carry out the office staff which needs to show more complex content, the layout can be more compact.

This subsystem does not demand much for mobile terminals, but in some cases, the use of cell phone operation is necessary. Responsive web design can achieve this effect easily. Figure 1 and 2 are web designed for PC and display effect on mobile phone.

The screenshot displays a web interface for a dormitory scoring system. At the top, there is a navigation bar with links: 系统 (System), 主页 (Home), 日历 (Calendar), 统计 (Statistics), and 用户 (User). The '统计' (Statistics) link is currently selected. Below the navigation bar, there is a search form with several dropdown menus and buttons. The form includes fields for '学年' (Academic Year), '学期' (Semester), '时间' (Time), '区域' (Area), '楼' (Building), and '楼层' (Floor). Each field has a dropdown menu with a placeholder text like '选择学年' (Select Academic Year). Below the form, there are two buttons: '搜索' (Search) and '重置' (Reset). Below the search form, there is a table titled '综合统计结果' (Comprehensive Statistical Results). The table has columns for 'id', '区域' (Area), '楼' (Building), '楼层' (Floor), '房间' (Room), '统计周期' (Statistical Period), and '统计分数' (Statistical Score).

Fig. 1 Web designed for PC



Fig. 2 Web display effect on mobile phone



Fig. 3 Web Designed for mobile

3.2 Designs for Mobiles

The lost and found front end mainly works on mobiles, so the function requires adaptation to different mobile phone terminals.

Mobile phone is characterized in that the screen is small, but with high resolution. To design for small screen, the webpage design must be extremely simple, only show the necessary content. Sidebars are located below the main contents, or there's a button which can exhale sidebars to choose main functions. To design for screens with high resolution, we need to use pictures with high resolution. Figure 3 shows a web page for mobiles.

3.3 Designs for Tablet PC

Shanghai Jianqiao University is expected to purchase a number of tablet PCs to use in dormitory scoring subsystem. So the design for this subsystem is mainly for tablet PC, and takes into mobiles and computer terminal into consideration.

Tablet PC is a mobile device between mobile phone and PC. Tablet is characterized in relatively large screen, compared to the phone, so tablet can show a lot content without worrying about the size of the screen. And, as landscape mode of tablet is more convenient, the design is mainly for landscape mode, as shown in figure 4.

3.4 Implementation of Responsive Design with Bootstrap

Bootstrap is a front end frame for responsive design, which uses grid system to achieve adaptive layout to different devices. Grid system uses a series of rows and columns to create webpage layout, and the contents are located in the grid. In the grid system, rows must be included in .container (fixed width) or .container-fluid (100% width) to get proper alignment and padding. The content of the site should be placed in the column, and, only the column can be the direct child as the row.

In grid system, we can select column type according to different devices. A variety of column types can adapt from mobile phones to PC and other devices.

4. Tips in database design

The three subsystems retrieve the teaching staff data from personnel management system and the students' data from the academic system. The personnel system and the academic system of Jianqiao University are two different systems which use Server SQL. We developed logistics management system with Mysql database; obviously, these systems cannot synchronize data directly. Considering that multiple systems frequently access to the database will decrease database performance; furthermore, for data security, we establish a separate public database as an intermediate database, as

shown in Figure 5. We also use the Redis cache to slow down the amount of concurrent access to the database, to improve the response time.

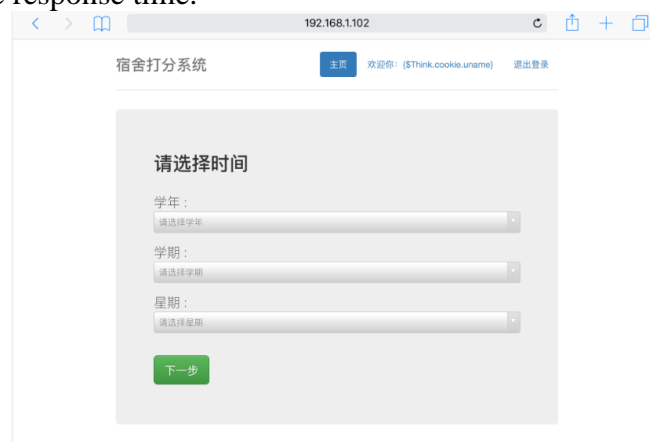


Fig. 4 Web designed for tablet PC

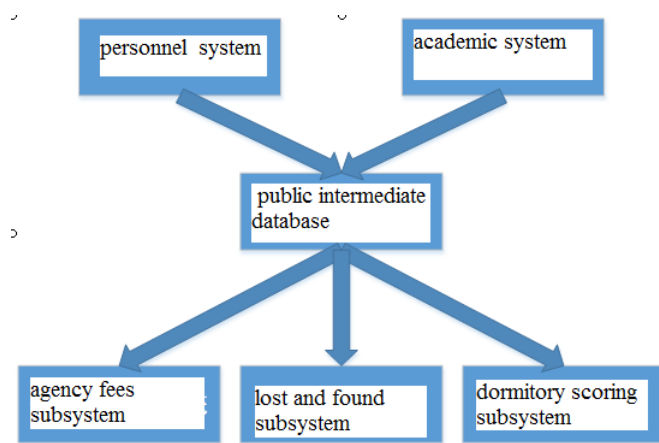


Fig. 5 Public intermediate database

5. Conclusion

In this paper, we design and implement a logistics management system for Shanghai Jianqiao University. There are three subsystems which are agency fees subsystem mainly on PCs, lost and found subsystem mainly on mobile phones, and dormitory scoring subsystem mainly on tablets. We use bootstrap framework to gain responsive website design for multiple devices.

The experimental results show that the responsive design can provide a more comfortable interface and a friendlier user experience for users with different devices.

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