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# Template-based Web AR service rapid generation platform

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**Abstract.** With the development of the mobile network and the improvement of computing capability of intelligent terminals, Augmented Reality (AR), as a new computer vision technology, is gradually changing people's lives. It has been widely used in entertainment, education, industrial maintenance, exhibition, and other fields. However, the current AR applications are created primarily by professional developers who are proficient in using open API, SDK, and 3D modeling techniques, rather than ordinary users. To make it easier for ordinary users to create AR activities, this paper designs, and implements a template-based Web AR service generation platform. Users can quickly generate Web AR activities through personalized configurations on the proposed platform, which reduces the threshold for users to customize Web AR services.

## 1. Introduction

Augmented Reality (AR) is a new technology that seamlessly integrates real environments with virtual objects [1]. AR technology has developed rapidly in recent years, and various AR services are emerging one after another. Currently, there are three forms of AR services.

The first is equipped with specialized AR equipment [2], such as Microsoft's holographic glasses HoloLens, SONY's Morpheus helmet, which is an extremely heavy solution. On the one hand, the equipment is expensive and poorly portable, on the other hand, the content of an AR service is provided by the developer, and the ordinary user is the passive recipient of the service.

The second is AR APP applications based on smartphone terminal, such as Alipay's "Scan Fu Card", location-based augmented reality red packets, etc. Use the APP to call the smartphone camera to identify the physical world and superimpose the virtual information to achieve the purpose of augmented reality. In this mode, users need to download APP, applications, the promotion cost is relatively high, also, users can not customize the content of AR services too.

The third is the Web AR technology that has emerged in recent years, requiring only a generic Web browser to experience AR services [3]. The natural universality of the Web provides a convenient means of promotion for AR services and lays a foundation for the cross-platform dissemination and sharing of AR services.

With the development of Web 2.0, User Generated Services (UGS), User Generated Content (UGC) has gradually become the mainstream. Ordinary users are not only consumers of content, but also producers of content. However, at present, most of the AR activities can be produced by professional developers who are skilled in using open API, SDK, and the threshold is high, which makes it difficult for users to produce AR content. Based on the laboratory Web AR project, this paper builds a template-based Web AR service rapid generation management and control platform. Users can



customize their Web AR activities by selecting or uploading personalized content on the platform. It lowers the threshold for users to customize Web AR services, allowing users to be the consumers of AR content, and also to be the producer of AR content.

## **2. Demand analysis**

The rapid development of mobile Internet and smart terminal devices has made it possible for ordinary users to enjoy AR services. AR, with its immersive, interactive and imaginative user experience, has boomed in the last two years. However, most of the providers of AR services are companies, enterprises, and other specialized departments, so it is difficult for ordinary users to get involved in the production of AR services. In this project, we need to design a template-based management and control platform for the rapid generation of Web AR services, to reduce the threshold for the production of AR services. Depending on the needs of the project, the platform needs to have the following core functions:

- 1) Allows users to personalize configuration to customize AR services.
- 2) The platform provides a rich variety of Web AR activity templates.
- 3) Authority management: Platform permissions from large to small is the administrator, advertisers, merchants, users, the platform needs to provide different service according to different permissions of each role.

Users can select their favourite templates and customize their Web AR activities by selecting or uploading personalized content on the platform. Based on the template, the AR service can be personalized and quickly generated. Meanwhile, the template is dynamically added to ensure the diversity of the AR service. In this way, the user's operation in the AR service is simple and fast, at the same time, the user's individual needs can be well satisfied.

## **3. Technical introduction**

In recent years, with the rapid increase in demand for USG and platform services. There have been many emerging technologies and innovation about web platform development., the multi-layer Web framework based on the Browser / Server model is emerging. MVC contains three parts: Model, View, and Controller. These three layers are relatively independent, and each layer has a similar function. MVC fully decouples business development logic, greatly improving system development efficiency and maintainability, which allows MVC to adapt to the ever-changing complex business needs [4].

### *3.1. MVC Framework*

MVC has become the mainstream of Web programming because it ideally separates services, views, and controllers. With the continuous deepening of MVC research, the MVC framework has made great progress. At present, Struts, Struts2 and Spring MVC are outstanding MVC implementation frameworks.

#### *3.1.1. Struts2*

Struts2 is a new generation of Struts framework, a new MVC framework that combines and merges Struts1 and WebWork technologies. [4]. The scope of it is a web framework that focuses on abstracting the day-to-day work and common problems of the web application domain, at the same time provide a platform to help quickly complete web application development. Web applications based on Struts2 can naturally implement MVC, and Struts2 focuses on providing assistance for development in various parts of MVC.

#### *3.1.2. Spring MVC*

Spring adds aspect-oriented programming (AOP) and control inversion (IOC) to MVC [5], which includes seven related modules. it is one of these modules, also, it is a lightweight implementation of spring MVC for building web service applications. And Spring MVC works as follows: the front requests HandlerMapping to look up the Handler, the processor adapter HandlerAdapter executes the Handler, the Handler executes the return to the processor adapter and returns the ModelAndView, and the view resolver returns to the front controller.

### 3.1.3. *The differences between Spring MVC and Struts2*

Struts2 is implemented by Filter, and Spring MVC is implemented by Servlet; Struts2 has its own interception Interceptor mechanism, Spring MVC uses independent AOP mode; Spring MVC implements zero configuration, due to method-based interception, there is a singleton mode bean injection loaded. Struts2 is a class-level interception. Each request corresponds to a new Action, and all property value injections need to be loaded. Therefore, Spring MVC development efficiency and performance are higher than Struts2; Struts2 is more in line with OOP programming ideas, Spring MVC is more cautious, expanding on servlets.

## 3.2. *Hibernate and Mybatis*

### 3.2.1 *Hibernate*

Hibernate is mainly used to implement mapping between Java objects and tables. In addition, it provides methods for querying and obtaining data, which can greatly reduce the time for manually processing SQL and JDBC data during development., it allows Java programmers to manipulate the database using object programming thinking as they wish. And it can be used in any situation where JDBC is used.

### 3.2.2 *Mybatis*

Mybatis is a java-based persistence layer framework, which encapsulates JDBC internally, and developer only need to focus on the SQL statement itself, without the effort to solve the complicated process of loading drivers, creating connections, and creating statements. Mybatis configures the various statements to be executed by xml or annotation and maps the dynamic parameters in the java object to generate the final executed SQL statement. Finally, Mybatis executes SQL and maps the result to java object framework.

## 4. **Implementation**

### 4.1. *Authority management*

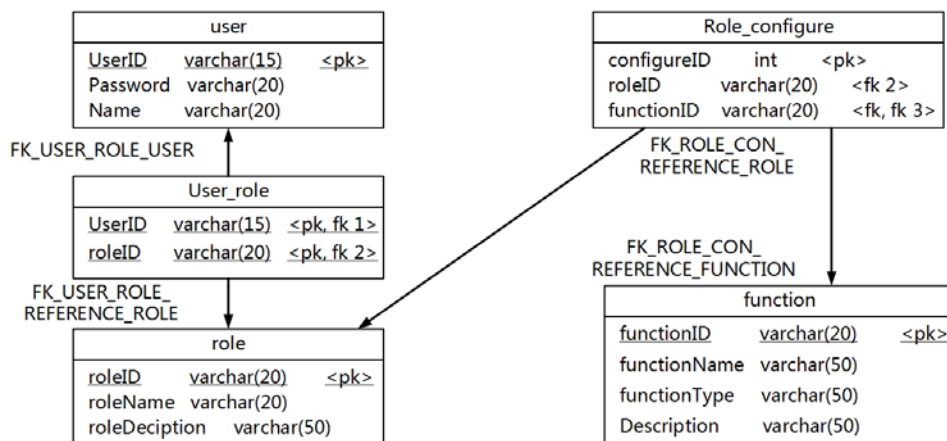
The platform has multiple users with different permissions in the actual application, and the permissions are from large to small, followed by administrators, advertisers, merchants, users. So, the first problem that the platform has to solve is how to manage permissions based on roles. There are usually three approaches to complete authority management: discretionary access control (DAC), mandatory access control (MAC), and role-based access control (RBAC) [7]. Since MAC and DAC have poor support for dynamic modification of permissions, we have chosen the RBAC authorization model here, and developed an instance of authority management for the different permissions of the Web AR platform.

#### 4.1.1 *Database Design*

When developing with the RBAC model, a strategy in which a user corresponds to multiple roles is used. A total of five tables have been established:

- 1) user: save account login name, password, role and other information.
- 2) role: save all system role information, such as role name, role ID.
- 3) user role: save user and role information.
- 4) role configure: saves the function information corresponding to different roles. For example, an administrator role has the right to add users and delete users. Ordinary users can have the right to view user information and create AR activities.
- 5) function: it is used to save all the function information of the system. The function corresponds to the button or link of the foreground presentation layer.

The relational model between tables is shown in figure 1.



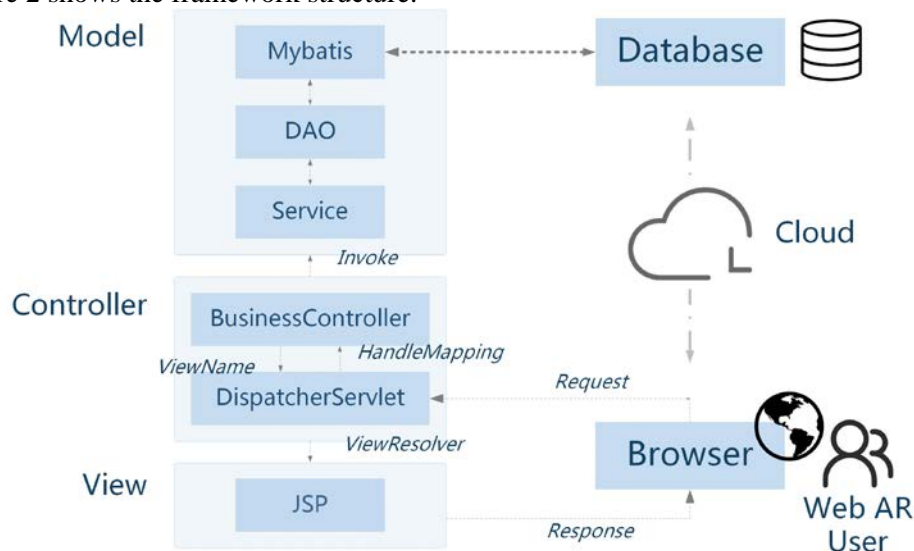
**Figure 1.** Relational Model of tables in Database based on RBAC.

#### 4.1.2 Program implementation

When the user selects a role to log in, it first passes the filter to confirm the permissions of the role, and then the JSP shows the desired result. If the role has a privilege, the corresponding label is displayed as true. When the label is true, the corresponding link will be displayed.

#### 4.2 Template-based Web AR Platform

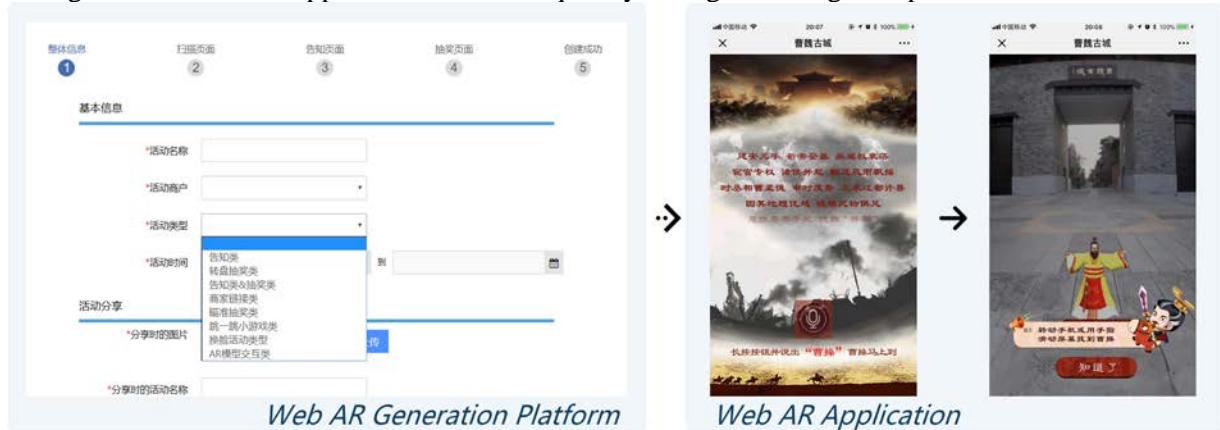
Combined with the above analysis, we chose the Spring MVC + Mybatis. Controller layer (Handler layer): responsible for the control of the specific business module process, the Controller layer controls the business process by calling the interface of the Service layer, and the configuration of the control is also in the Spring configuration file. Service layer: responsible for the logical application design of the business module. First design its interface, and then implement his implementation class. By configuring the association of the implementation in the Spring configuration file to complete this step, we can call the Service interface for business processing. Dao layer: responsible for interacting with the database to handle the persistence of data. View layer: responsible for the display of the foreground JSP page. This layer needs to be developed in conjunction with the Controller layer. Figure 2 shows the framework structure.



**Figure 2.** Framework Structure.

We create new Maven Project in eclipse (java project development editor), copy interface framework CSS, JS, images, modify pom.xml, build database (utf-8), create PDM, execute SQL script, create PO, Mapper.xml, Dao, service, controller, JSP file, configuration file sqlMapConfig.xml, beans.xml, j.

properties, web.xml [8,9]. By this way, the template-based Web AR service rapid generation management platform was finally built. The left side of the figure 3 is the platform page for users to create AR activities, it provides various types of activity templates for users to choose. The picture on the right is the Web AR application that users quickly configure through the platform.



**Figure 3.** Web AR Generation Platform and Web AR Application.

## 5. Conclusion

This paper analyses the development trends in the field of AR, finds the difficulty of customizing AR services. Spring MVC completely decouples the business logic and view layers, and Mybatis improves the efficiency of accessing the database and the speed of response development. Using the integrated technology of Spring MVC+ Mybatis, a Template-based Web AR service rapid generation platform was built, which greatly reduces the threshold for users to customize Web AR services. It has important practical significance for the universality of Web AR.

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